

Topics in Regulatory Economics and Policy

Pier Luigi Parcu
Timothy J. Brennan
Victor Glass *Editors*



Postal Strategies

Logistics, Access, and the Environment

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Preface and Acknowledgements

This book collects contributions presented during the 30th 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 (CRRRI) at the Rutgers Business School. This Conference celebrated its 30th anniversary at the iconic Grand Hotel Rimini, in Italy, on 25–27 May 2022. It was a triumphal return to an in-person gathering after two difficult years of the pandemic. Over three days, the Conference showcased presentations of more than thirty original papers and a roundtable discussion among some of the regulators present at the event. The Conference was also enriched by three keynote presentations given by Giacomo Lasorella, President of the Italian regulatory Authority AGCOM, Pedro Galides, President of the Cyprus Regulatory Authority OCECPR and Prof. William Kovacic of George Washington University. Prof. Kovacic masterfully recalled the history of the conference and celebrated its development over the last thirty years.

Among this year's topics, the role of digital platforms in the postal sector, and particularly the impact of vertically integrated firms in delivery markets, was discussed by several contributors, because that development presents many business, regulatory and competition-related issues. Other topics of great interest included national and international dimensions of both the regulation of parcel delivery and its environmental footprint, in light of innovations affecting the so-called last mile and the effects of the covid-19 pandemic on the postal sector. Among the traditional topics for postal and delivery sectors, the Conference hosted discussions about postal costs and pricing, the funding of Universal Service Obligation and the related role of Universal Service Providers, which remain of great importance.

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 providing, along with others, intellectual contributions, advice and encouragement: Bruno Basalisco, Matteo Bassi, Claire Borsenberger, Stephen Brogan, Alberta Corona, Peter Dunn, Stefano Gori, Felix Gottschalk, Annegret Groebel, James King, John Hearn, Adam Houck, George Houppis, Keith Kellison, Soterios Soteri.

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

As usual, we thank all the authors and conference participants who responded with great enthusiasm to the resumption of the gathering in person after two years of online conferences. This edition of the Conference brought together the "pioneers" and founders of this event and a new generation of professionals and researchers in the sector. The fruitful exchange that took place during the event is certainly a reason for optimism for the future of the Postal and Delivery Economics Conference.

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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Competitive Strategies of Marketplaces Vis-À-Vis Logistic Choices: Issues of Efficiency and Competition



Pier Luigi Parcu, Anna Renata Pisarkiewicz, and Chiara Carrozza

Abstract With continuously growing e-commerce with its increased demand for fast delivery, various e-commerce players have decided to enter this market to improve both efficiency and effectiveness of the service. Vertically integrated digital marketplaces' business models, however, raise the concerns of competition and regulatory authorities across the world because of the anti-competitive behaviours they might facilitate. The paper discusses motivations behind and potential implications for competition of the logistic choices in last-mile delivery of important e-commerce platforms, providing a comparison between Amazon, Alibaba and Allegro.

Keyword E-commerce · Last mile · Digital platforms · Logistic · Competition

1 Introduction

One new trend that raises particularly interesting industrial but also regulatory and competition issues is vertical integration by e-commerce platforms into B2C last-mile delivery. Delivery allows digital platforms to better control the quality of delivery, one of the most crucial factors in the online shopping experience (Blut, 2016). However, vertical integration can also enable firms, which are dominant in their core market, to leverage their dominant position to a neighbouring, ancillary market. Moreover, dominant e-commerce platforms are not just vertically integrated; they also tend to operate as ecosystems (Gawer, 2011, 2014). The notion of *platform ecosystems*, as developed by Gawer and colleagues, provides an alternative framework to the traditional notion of “vertical integration” to explain the logistic choices and business strategies related to value creation and value capture of these actors. It reflects what many have identified as the most significant paradigm shifts of modern business management: the fact that firms no longer compete as solely autonomous entities, but rather as supply chains (Lambert and Copper, 2000) in a business environment

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where the ability to control and orchestrate resources and capabilities is often more important than owning them.

Competition and regulatory authorities across the world are concerned about how digital marketplaces' business models might facilitate anti-competitive behaviours. The EU is investigating Amazon, concerned about preferential treatment of Amazon's retail business or of third-party sellers who use Amazon's logistics and delivery services, and its potential to distort competition in online retail markets. The Polish competition authority UOKiK has launched proceedings against its major national marketplace, Allegro, to examine whether changes made to its commission rules had granted Allegro unjustified advantages. In April 2021, China's State Administration for Market Regulation (SAMR) imposed on Alibaba the highest ever fine since the enactment of its Anti-Monopoly Law (AML). SAMR found that Alibaba had abused its dominance by effectively forcing sellers to rely exclusively on its platform, thereby contravening Article 17(4) of the AML, which prohibits dominant companies from "allowing their trading counterparts to make transactions exclusively with themselves or with the undertakings designated by them" without objective justification. In November 2021, the Italian competition authority, AGCM, fined Amazon 1.13 billion EUR for having leveraged its dominant position in the Italian market for intermediation services on marketplaces to favour its own logistics service—Fulfilment by Amazon (FBA) to the detriment of independent postal and express delivery courier operators. Finally, postal regulators, who actively monitor the delivery sector, note that vertical integration coupled with platformization and the resulting intensity of control that dominant platforms exert over parcel delivery create problems that call for regulatory or legislative intervention (AGCOM, 2021; CNMC, 2020; ERPG, 2021)

Analysis of dominant e-commerce platforms' business models can inform our understanding of the ability and incentives such platforms may have to engage in leveraging and our interpretation of the resulting competitive effects. A common concern with leveraging, be it in the context of traditional vertical integration or within an ecosystem, is that where a company is dominant in one market and is itself active in another vertically related one it can have incentives for self-preferencing or for other forms of discrimination against competitors. Indeed, various behaviours of e-commerce platforms that are currently being investigated resemble Google's self-preferencing conduct, which has been condemned as anti-competitive both by the European Commission¹ and the General Court.² Last but not least, while today the B2C e-commerce delivery market may still be largely considered as competitive (Parcu et al., 2022), concerns arise that despite its rapid growth driven by e-commerce, it may become excessively concentrated due to the role played by large e-commerce platforms in the delivery sector (ERGP, 2021; AGCOM, 2021). Hence, the question is whether e-commerce entry into last-mile delivery, bundling delivery with other services offered by online marketplaces raises serious competition issues, and if so, whether their assessment requires any adjustment.

¹ Commission Decision of 27 June 2017, Case AT.39740, *Google Search (Shopping)*.

² Case T-612/17, *Google LLC and Alphabet, Inc. v. Commission*, EU:T:2021:763.

The paper starts with a discussion of motivations behind the entry of e-commerce platforms into last-mile delivery in Sect. 2. Next, Sect. 3 compares logistic choices of platforms such as Amazon, Alibaba and Allegro, to show the extremely dynamic and evolving nature of their business models. Section 4 examines the entry into the B2C delivery market in terms of: (1) competitive effects of leveraging that is implemented through bundling or tying, and (2) how a transaction cost approach could inform competition enforcement. Section 5 briefly concludes.

2 Vertical Integration and Ecosystems

Firms can vertically integrate either downstream or upstream. While some delivery couriers have integrated upstream in the value chain, launching their own e-commerce management platforms or other e-commerce projects (Parcu et al., forthcoming), in this paper we focus on the e-commerce downstream integration towards the delivery phase.

When deciding whether to vertically integrate a complementary activity, firms engage in two types of evaluation: strategic assessment and financial calculation. The latter involves balancing of estimated cost savings with the investment that would need to be incurred whereas the first compares the impact of integration versus reliance on market transactions (Porter, 2004:31).

According to Hagel and Armstrong (1997), there are four reinforcing loops that determine the growth of online markets: content attractiveness, member loyalty, member profiles and transaction offering. Firms that are able to deliver on all of them are expected to grow faster than their rivals (Oliva et al., 2003). Members' loyalty depends on a firm's attractiveness, which in turn depends on several key attributes: price, product selection, site content, site performance, fulfilment accuracy and reliability, customer service and brand equity (Oliva et al., 2003). This paper focuses on fulfilment as timely, reliable and cheap delivery is one of the main factors that determine the user's choice of one e-commerce platform over another.³

In the current context of growing e-commerce, low consumer loyalty but increasing and more sophisticated demand, that last-mile delivery has become a key opportunity for platforms to differentiate one's own offerings.

Last-mile delivery in B2C exhibits a much higher degree of complexity than that of traditional B2B logistics, posing an enormous challenge for B2C retailers and delivery companies. A higher degree of complexity implies higher transaction costs if the activity is carried out externally by other couriers than if it is done internally. Transaction costs derive primarily from the costs of searching, negotiating, enforcing contracts, and coordinating logistics and delivery. In dynamic and rapidly changing markets, writing complete contracts that would consider all important future developments is practically impossible. This increases contracting costs,

³ The importance of delivery in certain instances may actually exceed that of the price of the products offered on the platform.

which are further inflated for recurring transactions and long-term relationships, both of which necessarily characterize online marketplace relationships with delivery couriers.

Integration of last-mile delivery may be very important not only because it can help reduce transaction costs, but also because it allows e-commerce platforms to gain end-to-end visibility and control over the entire supply chain. Entrusting the last mile to third parties cedes control over the most visible customer-facing part of the chain and may be at odds with those business models that are particularly customer-driven (Berg and Knights, 2019). Control allows firms to improve customers' trust, which in the online environment is essential. Insufficient service infrastructure, which includes last-mile delivery of inferior quality or that does not satisfy existing consumer demand, might result in a poor fulfilment experience, reduced overall attractiveness of the platform, and as a result limited growth opportunity. As expansion or improvement of existing infrastructure requires time, periods of decreased quality and capacity shortages can further reduce quality and constrain growth (Oliva et al., 2003).

Considering that investment in deploying last-mile delivery can be both time-consuming and quite substantial, alternative options may be equally, if not more attractive. As Gottfriedson et al. (2005:132) note: "*It's no longer a company's ownership of capabilities that matters but rather its ability to control and make the most of critical capabilities, whether or not they reside on the company's balance sheet*". What are the most critical capabilities that e-commerce platforms need to thrive? In its *Amazon* decision, AGCM (2021, para 49) explains that marketplaces base their success on a set of factors that increase consumer confidence in the security of the transaction, a key element in online purchases. These include: (i) greater guarantees of reliability of the seller, thanks to the verification and control carried out by the platform; (ii) greater security of payments; (iii) the possibility of concluding the transaction directly; (iv) more accurate and faster deliveries; and (v) better customer care services, including efficient handling of complaints and returns. It is the reinforcing nature of these capabilities that drive online marketplaces towards vertical integration and the expansion of the ecosystem towards the delivery activity.

According to ecosystem scholars, platform ecosystems take a *hub and spoke* form, with an array of peripheral firms connected to the central platforms via shared open-source technologies or technical standards. By connecting to the platform, complementors can generate interesting innovations, gaining access to both platform's resources and, in some cases (as in the app market) to its customers. In general terms, complementarities are of two main kinds: *unique* or *supermodular* (Jacobides et al., 2018). The first kind, in its strict form, can be explained by the expression "A cannot function without B", while the second by the expression "more of A makes B more valuable", where A and B are different products, assets or activities. Both kinds of complementarities might play a crucial role in e-commerce, where the actors in the marketplace, the logistics and the delivery segments of the business, are linked by complex relationships of collaboration and competition. The management of these relationships is challenging, as the vast literature on vertical integration and firm'

boundaries acknowledge, because of the potential problems related to both value capture and quality improvements.

3 Platform Strategy and Logistic Choices

This section focuses on B2C logistics in which a successful delivery requires an elevated level of automation, IT integration between warehouse logistics and online sales, a capillary distribution network, with warehouses distributed in various places on the territory to ensure fast delivery and, of course, an effective reverse logistics.

The major global platforms, Amazon and Alibaba, started as e-commerce companies and later expanded beyond internet-based activities. Amazon, for example, besides being a network orchestrator, is also an asset builder (i.e., logistic infrastructure), a service provider (AWS) and a technology creator. Alibaba integrates a logistic platform for delivery (Cainiao), a cloud computing services provider (Ali Cloud), designed to optimize Alibaba's own e-commerce ecosystem and, since 2004, Alipay launched as a third-party online payment platform. A similarity between the two global platforms is that today also their physical assets are noteworthy: first, the distribution network infrastructure (Rodríguez, 2020), and, second, the offline stores (including Amazon's acquisition of Whole Foods Market in the US and Alibaba's Hema Fresh Stores in China). However, while Amazon also owns over 100 private label brands that operate in dozens of markets on its site, including food and beverage, automotive, clothing and electronics, where it competes with third-party sellers, Alibaba has chosen not to engage in this business area so far.

Notwithstanding the similarities between the two giants of e-commerce, their business models differ substantially. The growth of Amazon reflects both horizontal and vertical integration to respond to increasing customer expectations for faster deliveries while offering an unprecedented diversity of items that physical retail stores cannot offer. Starting as a niche online retailer of books, music, movies and computer games in 1995 (Rodríguez, 2020), in the 2010s Amazon undertook a massive strategy of horizontal integration by opening a large number of e-fulfilment centres in the US and launching the "Fulfilment by Amazon" programme, allowing retailers to use its logistic facilities for a fee. Finally, by mid-2010s, with the explosion of e-commerce demand, the company undertook a process of vertical integration: ground transportation services were established to handle the additional demand and the operational requirements of its distribution system.

As for the last mile, since 2018 when it launched the Delivery Service Partner (DSP) programme, Amazon has been contracting with local delivery companies, which allowed it to enter into direct competition with UPS and FedEx on a massive scale. The DSP programme is active only in some countries since the business model adopted by the company differs according to the national conditions (ERGP, 2021). In Europe, Amazon has invested significantly in downstream logistics infrastructures (including sorting and distribution centres) to ensure reliable and fast delivery, and in some countries, it has been also active in the last-mile delivery. In Italy, for example

Amazon delivers parcels through its subsidiary Amazon Italia Transport (AIT) or uses third-party postal operators and express couriers. More specifically, in urban high-density areas, Amazon relies on Delivery Service Providers (DSPs). In rural zones, with low density and longer distance from sortation centres, the group contracts the services of national couriers (in Italy, GLS, Poste Italiane, BRT).

In contrast, Alibaba opted for an asset-light delivery model, integrating and streamlining the vast delivery resources that already exist across China, rather than investing in its own infrastructure. Cainiao, the logistics arm of the Alibaba Group set up in 2013, operates as a data-sharing platform allowing collaboration between warehousing, trucking and last-mile delivery. Cainiao, and hence Alibaba, employs all major delivery carriers, such as SF, ZTO and YTO. To ensure that packages get to the destination, fulfilling the targets of 24-h delivery domestically and 72-h delivery internationally, Cainiao relies on Alibaba Cloud's IaaS platform that tracks packages at every stage of the supply chain. Cainiao is actually far from being a typical logistic firm: it is rather an open platform that brings together around 3,000 logistics companies, which altogether employ around 3 million couriers, enabling merchants to choose the most cost and time efficient delivery solutions.⁴

China seems therefore to be a frontrunner in offering highly innovative solutions for last-mile delivery: around 70% of parcels are delivered on the same day and consumers in China expect delivery to be free without an upfront premium payment, as is the case with Amazon Prime now in the US or in Europe. While until very recently Alibaba did not have a membership programme with exclusive benefits, it has recently launched 88VIP to reward its most loyal customers with premium services. The benefits also include access to video-streaming platform Youku Tudou, a subscription to Alibaba's music platform Xiami as well as discounts on its food delivery platform Ele.me.

Compared with these two tech giants, the Polish platform Allegro, established in 1999, is much smaller. The platform has approximately 40% of the market share in the country, and with its 194 million monthly visitors, it is currently the tenth most visited marketplace in the world. Allegro is mostly focused on the e-commerce business, but its ad business has also been growing fast in recent years. It also expects to boost revenue with new offerings, including a network and logistics service for sellers, Allegro Fulfillment, and a payments service, Allegro Pay. In Poland, Allegro competes with the major marketplaces, such as AliExpress (part of the Alibaba family), Zalando and Amazon, which launched its fully Polish version on March 2, 2021.

The late arrival of global e-commerce platforms in Poland might explain their absence in the parcel delivery activity that has so far been provided solely by the traditional couriers (Parcu et al., forthcoming). The strategy of the Polish marketplace with respect to delivery seems, however, to be evolving. Historically, Allegro's hosted merchants organized delivery services directly with the carriers, with a limited

⁴ The model is explained in "China's Cainiao is Revolutionizing How Goods Get Delivered. Will the Rest of the World Follow Its Rules?" available at: <https://time.com/5914173/cainiao-logistics-alibaba-china-trade/>.

involvement of the platform in the process. Since 2017 Allegro's delivery model, however, has evolved significantly. While in 2017 approximately only 10–15% of delivery volumes were processed through Allegro's managed 3P delivery network, in 2020 they reached 70% (Allegro, 2020). This change was possible because Allegro introduced its own smart logistics 'HUB' platform, which allows Allegro to connect its merchants with leading delivery carriers (such as InPost, DPD, UPS and the Polish postal operator, Poczta Polska). To further improve its delivery service, in 2018, Allegro has launched Allegro Smart!, a free delivery subscription service (with a minimum order of 40 PLN or about 8 euros) and next, in 2021, it acquired X-press Couriers, a local same-day delivery company. Last but not least, in November 2021, Allegro launched a new logistics brand, One Box, under which it officially started deliveries to its proprietary network of parcel lockers.

This brief overview of the delivery models of three important e-commerce platforms shows how they all continuously adapt their delivery strategies. While they differ in organizational choices, improving the delivery experience appears a key area of competition for all of them. In the near future, Alibaba's Cainiao aims to digitize the logistic process from top to bottom and for the Alibaba group instant delivery seems to be the next technological challenge.⁵ Allegro has recently launched "Delivery Promise", a programme which allows clients to obtain information about delivery times with 95% accuracy. Finally, Amazon has been working for some years now on Prime Air, designed to safely deliver packages to customers in 30 min or less using drones, and it might be ready to launch it soon.

4 Competition and Efficiency Trade Offs

Vertical integration of retail commerce and delivery services is neither a new phenomenon nor a problem in itself. Still, the entry of dominant e-commerce platforms into delivery markets has implications both for the consumers' satisfaction and for the competitive conditions. The latter because such platforms are both customers of postal and delivery service providers and provide delivery services themselves, for their products as well as those of third-party sellers. As such platforms account for a substantial portion of the total parcel volume, they benefit from strong bargaining power on the demand side vis-a-vis postal service providers for whom they become indispensable customers. On the supply side, vertical integration allows them to directly leverage their market power from the market for intermediation services to the B2C parcel delivery market. Such leveraging will typically occur through tying or bundling.

Facing cross-sectoral competitive threats, ecosystems are more prone to engage in leveraging through the joint provision of complementary services as part of their defensive and expansion strategies (Eisenman et al., 2011). Competition authorities

⁵ How Alibaba tracks China's delivery drivers, available at: <https://www.technologyreview.com/2021/10/27/1037279/china-alibaba-group-delivery-drivers/>.

shall need to distinguish anti-competitive leveraging from pro-competitive expansion. As competition problems arise due to the very structure of the multi-product ecosystem and the platform's central role within it, rather than dominance in any particular market (Jacobides and Lianos, 2021), the following section examines: (i) competitive effects of leveraging implemented through bundling or tying within the ecosystem; and (ii) the potential contribution of the transaction costs approach to competition enforcement.

5 Leveraging Through Tying and Bundling

Tying and bundling are pervasive business practices. From an antitrust perspective they are difficult to assess, as in many cases they have a valid efficiency justification. In the case of online marketplaces, vertical integration, the multi-sided and multi-product nature of the activity are all relevant for the analysis of potential efficiencies as well as of anti-competitive effects that joint provision of services may cause. Thus, a marketplace's conduct should be evaluated by taking into account the commercial link between functionalities of services that are subject to tying or bundling. Considerations presented in Sect. 2 explain that joint provision of intermediation and delivery services by an online marketplace can have perfectly rational justifications, and as such can fall within the scope of legitimate commercial practices. The problem arises when the joint provision entails an element of coercion that limits competition and customer choice.

Leveraging through tying or bundling by a platform can be directed at either consumers or third-party sellers and, in each case, it will have different implications. Consider that the relationship between two tied or bundled products can be characterized as either independent or complementary. Two given products are independent when a consumer obtains value from the product irrespective of whether or not they consume the other product.. However, for consumers delivery is such an integral part of the online shopping experience that it often constitutes an essential element of the bundle. Driven by convenience, consumers expect one-stop shopping rather than having to arrange for the delivery themselves. Consequently, online marketplaces have been offering delivery options (be it free or for additional payment) as an integral part of the shopping experience long before platforms started integrating into B2C delivery.

In contrast, for third-party vendors that sell on e-commerce platforms, often delivery is considered just a complementary service, not an essential one. Whether this complementary delivery service is bundled or tied with a set of ancillary benefits or functionalities, will depend on the nature of those benefits and the competitive strength of the platform. If those benefits are essential for ensuring a level playing field between third-party seller's products and those of the platform, their joint provision practically forces third-party sellers to rely on the delivery managed by the platform. This restricts third-party sellers' free choice of delivery couriers, which in itself could turn out to be anti-competitive.

In the context of limited choice, AGCOM (2021, para. 49) in its analysis of the B2C parcel delivery market noted that Amazon's bundling of services, that also include a delivery service, allows third-party sellers not only to increase sales but to also obtain delivery conditions that are more beneficial than they could obtain independently from delivery couriers. This is because of the volume of parcels a platform handles, Amazon enjoys countervailing buyer power, which allows it to negotiate significantly lower delivery prices with large and small couriers alike.⁶ Furthermore, to make up for such big discounts, in a sort of "waterbed effect", delivery couriers may even seek to raise prices they charge to independent sellers widening the gap for them. Charging potentially excessively high prices is only possible if the lack of transparency in the parcel delivery market on the supply side, where delivery contracts tend to be individually negotiated, allows it. Nevertheless, in the absence of publicly available pricing lists, small and medium-sized firms in particular, which account for an important part of third-party sellers active on digital marketplaces, may often lack the information necessary to assess whether prices offered to them by delivery couriers are excessively high.

If a platform's gatekeeper position can restrict third-party's choices in the delivery market, but at the same time can offer them delivery at conditions that are more beneficial than those sellers would have been able to negotiate independently, then it is necessary to assess which of the two effects prevails. Also, considering that vertical integration of online marketplaces into the delivery sector as well as bundling or tying of delivery services with other services offered by the platform can produce other efficiencies, the question is whether such efficiencies may offset any potentially anti-competitive effect of the conduct. The CJEU confirmed that efficiency defence in Article 102 TFEU can be brought under objective justification. The legal test, which in practice corresponds to conditions laid down in Art. 101(3) TFEU, requires demonstrating that the conduct in question is proportionate to the objectives pursued and may generate economic benefits that outweigh the potential negative effects on competition. For example, the tying of FBA with Amazon's benefits or the tying of PayPal payments to Ebay may, respectively, foreclose competition on the market for B2C delivery or online payment services with respect to third-party sellers, while simultaneously reduce transaction costs for consumers in the online e-commerce. The tension is evident.

The examples above show the importance of accounting for the multi-sided nature of platforms when assessing potential efficiencies and weighing them against potentially anti-competitive effects that may arise in different markets. While the assessment of efficiencies across various markets is not a new issue and has already been carried out to some extent in previous cases, there is a concern that it may not sufficiently consider how different markets and different sides within the ecosystem are connected (Mandrescu, 2021).

⁶ For example, Khan (2017) reported that Amazon was able to obtain 70% (!) discounts over regular delivery prices. However, discounting practices due to buyer bargaining power exist also in bulk letter mail delivery, where supply is even more concentrated than in parcel delivery, and where such discounting is accepted by policymakers (Copenhagen Economics, 2021:9).

6 Transactions Costs

The rise of platforms and ecosystems and their pervasive presence have raised concerns that due to their unique position such platforms might exploit dependencies of their complementors and consumers by inducing co-specialization that restricts competition and entry (Jacobides and Lianos, 2021). Useful for understanding the degree of dependency is the concept of sunk investments. The strategic management literature differentiates between nonspecialized (generic) and specialized (non-generic) sunk investments (Teece, 1986; Jacobides et al., 2018). The former can be easily redeployed because they are not related to a specific trading partner. The latter, in contrast, are linked to a specific trading partner, and as such cannot be redeployed without incurring loss.

Transaction cost economics explains that sunk, non-generic, relationship-specific investments drive firms towards vertical integration and long-term contracts (Klein, B. et al., 1978; Fink et al., 2006). Such investments are particularly problematic in markets with a limited number of trading partners, and even more so in markets where a dominant company is practically an unavoidable trading partner. This is because non-generic sunk investments are exposed to the risk of holdup, i.e., ex post contractual opportunism in which one of the parties can alter terms and conditions of trade causing harm to its trading partner.

When applying this approach to e-commerce marketplaces, we need to distinguish economic relationships between the platform and third-party sellers on the one hand, and the platform and delivery companies, on the other, even if both categories may need to undertake non-generic investment to extract the most from the relationship with the platform. The risk of holdup seems to be particularly acute for delivery couriers and postal service providers in the e-commerce delivery market considering that demand is highly concentrated as significant part of online shopping takes place on just a few marketplaces (AGCOM, 2021). This grants dominant platforms significant countervailing buyer power. AGCOM, for example, has found that “some operators [had] made specific investments and significantly changed the organization of delivery to ensure a privileged supply relationship with the platform”. This could happen even in the case of a legacy operator. For example, in June 2018, Poste Italiane entered into an agreement with Amazon, which was renewed in early July 2021 for the next three years. The agreement foresees the preparation of Delivery 2022, which involves “*the reorganization of the delivery process by providing for the supply of innovative services and fast delivery solutions throughout the national territory*”. AGCOM acknowledges that such an agreement may produce different effects: it can render Poste Italiane economically dependent on Amazon, but it can also alter the degree of concentration in the B2C parcel delivery.

Should a competition authority assess such an agreement under the transaction cost approach, it would have to examine whether delivery couriers are locked in, whether they could easily redeploy or otherwise protect their investment, and whether the platform would have to compete to maintain commercial relationships with them.

If following a platform decision to adversely change the contractual terms and conditions, delivery couriers could easily switch to another platform, such conduct would not fall foul of competition law, but if the independence, on the delivery end, is jeopardized by relevant sunk costs the opposite conclusion could be warranted.

Where it is easy to adopt long-term contractual arrangements in the presence of sunk relationship-specific investment, market power poses little threat to investment (Biggar and Heimler, 2021). Chilling of investment is in fact the primary concern that exercises of market power raises under the transaction cost approach. It is also a particularly relevant concern because digital platforms both bring value to the market by aggregating demand and act as catalysts for complementary innovations that expand the ecosystem (Vezzoso, 2020). Online marketplaces have driven innovation both in last-mile delivery and e-commerce, making it more accessible for SMEs.

However, when adopting a medium- to long-term perspective, the following elements should also be taken into consideration. First, e-commerce has driven innovation in logistics, enabling new forms of distribution and retailing (Hortaçsu and Syverson, 2015). Second, delivery costs vary across customers: they are higher for rural and lower for urban areas (Borsenberger et al., 2018). This would explain e-commerce platform's preference for limiting integration of last-mile delivery activities only to urban areas, and relying instead on independent delivery operators in high cost rural areas. Such geographic differentiation of expansion into last-mile delivery may be quite problematic if scale of operations is important as it may restrict the scale of contestable markets to less profitable areas.

7 Conclusions

Firms compete on price, innovation, quality and output, and in doing so they also compete by innovating their business models. A key driver of their evolution (not to mention of the competition among them) is improving the customers' experience. Because success in online markets is driven by the control of various capabilities, the reinforcing nature of these capabilities drives, almost naturally, marketplaces towards vertical integration and the creation of ecosystems. Within multi-product ecosystem, platforms have clear incentives to bundle their different products as it allows them to achieve various types of efficiencies. Despite the variety of the business models, this paper presents examples in which major e-commerce platforms are moving towards increasing functional integration of retail and delivery.

Besides the differences, what emerges is the special role of e-commerce platforms as system orchestrators. They not only aggregate demand and offer scale that individually third-party sellers would not be able to achieve, but they assume full responsibility vis-à-vis consumers, which explains the relevance of brand visibility and the quality of the delivery for their success. As system orchestrators, platforms seek to control the quality of the shopping experience along the entire chain. In this process efficient delivery becomes not only a parameter that allows them to differentiate from competition but an essential component of their offer. The consequence

for consumers and third-party sellers can be reduced transaction costs and improved quality, which are both positive results. However, competition along the supply chain may be seriously reduced, as smaller sellers and delivery companies see their choices increasingly limited or altogether dictated. This seems to be the major concern of antitrust authorities and postal and delivery sector regulators.

The question of whether the positive results of orchestration of the e-commerce value chain may be achieved through less stringent means, or at lesser costs for competition, certainly deserve further research. A more detailed comparison of different business solutions, which the analysis of Amazon, Alibaba and Allegro models in this paper has clearly shown to exist, can constitute a good starting point for this effort.

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Lessons from the Experience of Telecommunications Regulation for Regulation in the EU Package Delivery Industry, with Focus on Access Regulation



Debra Aron and Geoff Edwards

Abstract We examine lessons from the telecommunications access regulation experience in the EU and US and apply those lessons to the package delivery industry. In hindsight, telecommunications assets thought to be bottlenecks necessary for competition were circumvented in unexpected ways. While access obligations facilitated entry based on incumbent networks, the evidence is that they have tended to impede investment in the purported bottleneck facilities as well as alternative technologies. These effects are likely to be particularly costly for social welfare in industries like telecommunications where there was the potential for substantial future investment and innovation. Recent calls to impose access obligations on e-commerce companies in relation to package delivery activities, where similar investment and innovation potential exists, are therefore particularly fraught.

Keyword Package delivery · E-commerce · Access regulation · Bottleneck · Telecommunications

1 Introduction

The package delivery industry in the European Union is typically regarded as highly competitive. For example, the European Commission (EC) has recently referred to “fierce competitive pressure” and “intense and dynamic competition” in parcel delivery (European Commission, 2021a). In recent years parcel senders and recipients have benefited from substantially enhanced delivery options and service quality.

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Moreover, in the modern package delivery marketplace, the number of competitive providers has grown tremendously. In many cases the providers have developed interconnected and interdependent operations through commercial agreements.

These industry characteristics and developments typically satisfy policy makers that there is no need to introduce regulation to promote entry and competition. Indeed, that has recently been the conclusion reached by the European Commission (European Commission, 2021b). Nonetheless, the package delivery industry's growth and increasing societal significance, together with the entry and growth of players that are vertically integrated into e-commerce, have fueled calls from some EU regulators for "greenfields" regulation of package delivery services. In particular, the European Regulators Group for Postal services (ERGP) expressed concern that online marketplace platforms were reshaping the postal sector by "integrating activities along the value chain (e.g., matchmaking, ordering, (traditional) fulfillment, payment)..." and urged the European Commission to expand the reach of postal regulation outside of the traditional bounds of postal services, calling for a reconsideration of "the scope of the postal sector in a forward-looking perspective to deal with these new players and business models" and a shift in focus of postal sector regulation from universal service obligations for letter delivery to parcel delivery (ERGP, 2020).

The ERGP concluded that sector-specific regulation remains necessary and that "a new framework should focus on a proper functioning of markets and competition as the primary means to meet user demand" with national regulatory authorities having "sufficient power to intervene ex-ante in case of actual or potential competition problems," including "the competence to impose regulatory obligations such as: access to the network and its components at cost orientated prices, the publication of a reference offer, non-discrimination and development of margin squeeze tests following an analysis of the relevant market." Hence, the commentary of the ERGP appears to contemplate the possibility of access regulation, imposed ex ante, to address competitive concerns that have not yet materialized. The ERGP was not specific about the nature of the access regulations it might advocate nor on whom it would advocate the access be imposed.

The Italian regulator, AGCOM, has adopted specific new regulatory measures in relation to package delivery services in Italy (AGCOM, 2022). This new regulation is notable in that it is targeted not at the incumbent operator, as has been traditional in regulatory policy in the postal, telecommunications, and other sectors, but instead on a relatively recent entrant, Amazon, that does not even operate its own last-mile delivery services in Italy.¹ Following a lengthy investigation of package delivery services in Italy, AGCOM concluded that Amazon is able to (among other things) leverage market power from its position as an e-commerce platform for third-party sellers into package delivery services; and may in the future make use of its vertical integration to generate barriers to entry into package delivery services.

¹ In Italy, Amazon is active in the form of an e-commerce marketplace and a logistics operation, which is downstream of last-mile delivery, but is not active in last-mile delivery services.

The forms of regulation adopted by AGCOM are focused on transparency and include a set of information requirements applying to all large operators,² and additional information requirements applying only to Amazon, particularly pertaining to Amazon's "Fulfillment by Amazon" ("FBA") program for delivery services, as well as to average prices paid to package delivery service providers.

Regulation can be imposed not only by sector regulators, but also by competition authorities. In late 2021, the Italian competition authority (AGCM) issued a decision related to its investigation of Amazon regarding alleged self-preferencing of Amazon's delivery logistics services (AGCM, 2021). AGCM concluded that Amazon leveraged a bottleneck in intermediation services on e-commerce "marketplaces" to impede competition in e-commerce logistics services, in which AGCM includes package delivery. In addition to a fine, the AGCM decision imposes access obligations on Amazon by which third-party sellers can obtain certain visibility benefits on the Amazon marketplace without having to fulfill orders using FBA. The efforts of the competition authority to impose access obligations at the e-commerce platform level of activity to purportedly protect competition in package delivery (broadly defined to include fulfillment) is noteworthy.

We cannot predict the outcomes of future regulatory efforts in package delivery, but given the commentary of the ERGP, AGCOM, and AGCM, it is clear that regulatory authorities are increasingly interested in access obligations and have begun, at least in Italy, to impose them.

The EU has extensive experience with access regulation in the context of telecommunications. Indeed, the telecommunications industry bears a number of high-level similarities to the package delivery industry. Like package delivery, the telecommunications industry is characterized by interconnected networks exhibiting economies of scale, scope, and density. It has experienced industry-altering technological developments and it exhibits vertical as well as horizontal relationships among competitors.

The purpose of this paper is to identify lessons learned from successes and failings of telecommunications regulation in the EU and examine how they inform concerns being raised in the package delivery arena. We draw on the experiences of telecommunications regulation in the EU and the US, which adopted somewhat different philosophical approaches and experienced substantially different evolutions of telecommunications regulation and deregulation.³ We focus our attention on access regulation, both because it has been a primary tool of market-opening regulation in telecommunications since the 1990s, and because, as noted above, recent calls for regulation in package delivery have embraced the concept of access obligations. As a matter of economics, requiring a company to allow its competitors to access

² The requirement applies to operators with at least 50 employees and annual turnover relating to postal services for each of the past three years of at least €10 million.

³ We refer the reader to Aron and Edwards (2022) for an extensive description of the regulatory and deregulatory history and outcomes in the US and EU telecommunications industries, as well as details of the history of regulation of package delivery in the EU and the evolution of the package delivery industry.

its facilities or assets is among the most intrusive of regulatory interventions, with potential to affect innovation and investment, and merits special scrutiny.⁴

The paper is organized as follows. In Sect. 2.1 we summarize the ways in which telecommunications regulation and deregulation over the last 25 years have succeeded or fallen short. Section 2.2 articulates key lessons from that experience, and Sect. 2.3 applies those lessons to the package delivery industry. We offer brief concluding comments in Sect. 3.

2 Lessons from the Experience of Telecommunications Regulation and their Application to Package Delivery

2.1 Where did Telecom Regulation Succeed and Where Might It Have Fallen Short?

To derive lessons from the regulatory experience in the telecommunications sector it is useful to first consider which aspects of telecommunications regulation were successful and which were unsuccessful. In Europe, liberalization of telecommunications occurred gradually beginning in earnest in the late 1980s and continues to evolve. The regulatory scheme included the requirement that incumbents provide broad access to the incumbents' networks, with the breadth of access obligations decreasing over time according to a framework known as the "ladder of investment" (LOI). According to the LOI theory, access obligations would be successively removed as access-only entrants made investments in facilities that provided alternatives to the incumbents' network elements. Liberalization and access regulation in telecommunications are regarded as having been largely successful in facilitating competition in the sector, albeit with substantial variation in outcomes across Member States (Parcu and Silvestri, 2014; Liikanen, 2001; Cave et al., 2019).

There certainly was significant entry following liberalization of European telecommunications markets that was facilitated by access regulation. EC data show that in 2014 incumbent shares of retail broadband services were below 50% in most Member States and competitive provision of broadband using access to incumbent DSL networks was significant in many (European Commission, 2014). Indeed, by 2015 entrants in Europe served nearly half of all broadband subscribers that were served using incumbent DSL networks (European Commission, 2016). For the vast majority of these subscriptions, entrants were taking advantage of access obligations imposed on incumbent operators by using unbundled incumbent local loops and combining these with their own core and aggregation networks, with only small

⁴ The principle that a company is not obligated by law under general competition principles to share its assets with a competitor was articulated by the US Supreme Court in *Verizon Communications, Inc. v. Law Offices of Curtis V. Trinko, LLP*, 540 U.S. (2003) (commonly known as the Trinko decision).

proportions served via wholesale broadband access or pure resale. Cable, fiber, and other technologies (mainly fixed wireless access) were also significant in many Member States; however, in many Member States and in the EU overall, competitors accessing DSL networks from incumbent operators served more broadband subscribers than competitors using alternative technologies.

Hence, access regulation undoubtedly resulted in declines in incumbent retail market shares. Some evidence also indicates that local loop unbundling was associated with broadband speed improvements⁵ and price reductions.⁶ Entrant investments in alternative core and aggregation networks have also, consistent with the LOI theory, allowed the access requirement to be narrowed substantially.

In these respects, it might be said that the European telecommunications regulatory framework was a success. However, while access-based entry and competition in itself might deliver some quality improvements and price reductions, these are relatively static gains. Access regulation does not come without a cost, and a full assessment of its success or otherwise necessitates accounting for the effects of a regulatory framework on investment incentives and longer-term dynamic efficiency. An incumbent that is required to allow its competitors to compete with it using its own facilities has depressed incentives and ability to engage in future investments in those facilities or new facilities (e.g., Grajek and Röller, 2012; Laffont and Tirole, 2001; Newbery, 2002; Yoo, 2012). Moreover, there are countervailing investment incentive effects of LOI regulation (or any regulation that provides access to the last-mile bottleneck) on entrants, potentially encouraging some investment by entrants in core and aggregation networks, but depressing investment by entrants in alternative last-mile infrastructures.⁷

It is well-accepted that facilities-based competition (inter-platform competition, in which competitors provide their own last-mile connections) tends to deliver greater benefits to consumers than access-based (intra-platform) competition and should be preferred where it is feasible. Empirical studies have found that broadband adoption is higher, quality is higher, and prices are lower where competition is inter-platform relative to intra-platform (see, e.g., Smith et al., 2013; Nardotto et al., 2014; Aron and Burnstein, 2003). Inter-platform competition also provides consumers greater choice of product attributes. Cave et al. (2019) summarized the literature by referring to full (facilities-based) competition between infrastructures as “the gold standard”

⁵ Consistent increases in broadband speeds have been a global phenomenon over the past two decades, and Europe is no exception. Attributing causality to these increases is difficult; however, Smith et al. (2013) find a positive relationship between the share of unbundled local loops out of all broadband lines and broadband speeds. Similarly, Nardotto et al. (2014) used a detailed data set from the UK to find that access to local loops had a positive effect on broadband speeds.

⁶ See, e.g., the charts showing the evolution from 1998 to 2014 of average revenue per line (ARPL) for fixed access and voice and for fixed broadband in Lear et al. (2017), pp. 49 and 50.

⁷ As Hellwig (2008) observed, for entrants, access regulation incentivizes investment in infrastructure needed to make use of the regulated inputs, but at the same time disincentivizes investment in alternative infrastructure that would bypass the regulated inputs.

and concluding that it “yields better results than access-based competition” (see also Cave 2014).⁸

There has been considerable empirical research on the effects of unbundling obligations on incumbent and entrant investment. While the literature does not provide unambiguous conclusions, there is evidence that access regulation in Europe negatively impacted last-mile investment by both incumbents and entrants. A much-cited empirical study by Grajek and Röller (2012) found that access regulation increased investment by entrants but reduced investment by incumbents and reduced investment overall by €16.4 billion (representing 23% of the infrastructure stock). The same study also found evidence of a regulatory commitment problem further discouraging investment: the more investment incumbents undertake, the more likely they will find their networks subject to access regulation. See also, Crandall (2005). Briglauer et al. (2017) found that more stringent access regulations harm incumbent investment in fiber networks.

In relation to entrant investment, using US data Crandall et al. (2004) found that growth of facilities-based entrants tended to be slower when prices for access to unbundled network elements were lower (i.e., when access regulation was more generous to entrants). Similarly, Cave et al. (2019) observed, anecdotally, that European countries that declined to regulate access to incumbent fiber networks experienced investments in alternative fiber networks by entrants, whereas countries that regulated access to incumbent fiber tended to find that only the incumbents made fiber network investments.

The premise that where access to particular facilities is required it will be used, at the expense of investment in alternative infrastructure and innovation, was vividly exhibited in the US, where competition has developed quite differently and in stark contrast to Europe. In the US, the access rules established by the FCC after the passage of the Telecommunications Act of 1996 provided for essentially complete access to incumbents’ end-to-end voice networks at low, “cost-based” rates, without sunset provisions and without a showing that competitors would be impaired without such access (at least, not without a showing that satisfied the US courts). Initially after the establishment of these rules there was an influx of new entrants into local voice telephony using the incumbents’ end-to-end services, including a reported \$30 billion in investment and hundreds of new companies (Huber, 2003; see also Woroch, 2002, reporting that between Q1 1996 and Q4 1999, the number of competitive local exchange carriers (CLECs) in the US holding telephone numbering codes had increased from 16 to 275). To a large extent, the investment was not in network facilities but rather in software, systems for interfacing with the incumbent, and other costs associated with standing up a business based on, effectively, resale of the incumbent’s service. At the same time, very low regulated prices made it difficult for companies to compete by investing in network facilities.

⁸ Cave et al. (2019) qualify that, in their view, at the time that the European Union embarked on access regulation there was no facilities-based alternative, as deploying an alternative copper-based infrastructure was unrealistic in the first decade of the twenty-first century, so that a regulated telecoms monopoly was the only real alternative. This somewhat glosses over the developments of cable and mobile networks around that time.

The chaos of the near-decade between the passage of the Telecommunications Act and the ultimate rescission of mandatory access to end-to-end service at low, “cost-based” rates in the US included the dot-com bust (Kellogg, 2015–2016), three court rulings remanding the FCC’s access regulations (*AT&T Corp. v. Iowa Utilities Bd.*, (525 U.S. 366 [1999]; *United States Telecom Ass’n v. FCC*, 290 F.3d 415 [D.C. Cir. 2002], and *United States Telecom Ass’n v. FCC*, 359 F.3d 554 [D.C. Cir. 2004]), multiple rounds of revised rules (FCC, 1999, 2003, and 2005), and the ultimate withdrawal by the FCC of mandatory access to certain components of the network that, in turn, ended the availability of end-to-end access at very low regulated rates (FCC, 2005). Most of the entrants operating at that time no longer exist today (or no longer exist as stand-alone companies).

Today in the US, although unbundled last-mile facilities (“local loops”) remain available at “cost-based” regulated prices based on forward-looking incremental cost, the number of lines served by competitors using incumbents’ local loops is miniscule (FCC, 2021). Competition for both voice and broadband service in the US today, particularly for residential customers, is largely provided by cable companies and wireless carriers. Moreover, the incumbent telecom providers, who provide broadband service over aDSL and fiber-to-the-home (FTTH), provide a minority of fixed broadband lines, and cable companies provide the vast majority (FCC, 2022).

Hence, in the US, unlike in Europe, competition initially followed a tumultuous path driven by overly-broad access obligations, the lack of a clear path toward narrowing those obligations, abrupt changes in policy once companies had begun to make investments in access-based business models, and, in no small measure, the failure to appreciate the effect that access to incumbent networks would have on the incentives for and viability of facilities investment. Until the access rules were limited, competition was largely access-based and once access rules were narrowed, and after a turbulent adjustment, competition has become largely facilities-based (inter-platform).

Cave et al. (2019) concede that the EU access regime was more successful at squeezing static efficiencies from the existing system than stimulating the dynamic transition to next generation infrastructures and services. According to Cave (2014), the ladder of investment did have the effect of an increasing prevalence of competitive lines offered over the incumbents’ last-mile infrastructure, but it was not necessarily intended to and did not lead to duplication of last-mile infrastructure by entrants.⁹

2.2 What Lessons Can We Draw from the Experience of Telecommunications Regulation?

The experience of telecommunications regulation teaches us that it is risky to innovate and potentially self-reinforcing to pronounce an asset to be a bottleneck and to

⁹ For some evidence that investment in cable networks suffered due to mandated access to incumbent telco networks see Waverman (2006).

regulate access to it. In telecommunications, the premise of access regulation in both the US and Europe was that at a minimum, the “top” rung of the ladder, the last mile, could not be economically replicated at any time in the foreseeable future. In fact, this proved to be false: the last-mile bottleneck was overcome through technological developments in wireless and cable. In wireless, the allocation of additional spectrum and the improvements in wireless technology that allowed vast improvements in capacity of the networks (which, in turn, reduced costs and prices) allowed for a proliferation of services beyond voice, starting with texting and advancing to high-speed broadband, real-time video streaming, and mobile social networks. This did not merely vault wireless technology into the ranks of a competitor to traditional wireline services, but relegated wireline services to second-tier status, at least for voice, and increasingly for broadband. Around the same time, and relatively quickly, the cable network became an economically viable platform for voice telephony with the development of VoIP, and, subsequently, also broadband internet access.

The lesson is that in markets that are characterized by technological change, regulators should be reluctant to assume that a purported bottleneck requires regulatory intervention (such as access regulation) to overcome or that regulated access to that purported bottleneck will advance competition and social welfare. Presuming that technology is static leads to myopic policymaking. Given the risk that regulation may actively impede investments in alternative technologies (e.g., by making life so easy for access-based entrants that investments in alternative technologies become uneconomic), this is an important lesson for regulatory design.

An access regime that is too favorable for entrants and that lacks a sunset provision is likely to depress incentives of entrants to invest in their own alternative facilities. According to Cave (2006):

one cause of lack of replication can be regulation itself: if comprehensive access products are too cheap, competitive investment will not materialise. The lack of investment may then be taken to justify the access policy, completing the circular argument.

The circularity of access obligations—reliance on a company’s assets discourages alternative investment, and the absence of alternative investment justifies the continuation of the access requirement—is partly attributable to the absence of evidence of the investments that would have been made and alternatives that might have been developed had access not been provided. The experience in the US was that depressing incentives to invest in alternative platforms and technologies via unbundling obligations in the early 2000s was costly.

Access regulations are least risky where investment is already sunk; and have the potential for the greatest social welfare costs where future investment is expected to be substantial and where innovation and the value of the service to consumers depend on that investment. In telecommunications, the greatest risks to social welfare from dampened incentives to invest that arose from access obligations related to the risk of delaying or dampening investment in next generation broadband services and alternative technologies, not the risks of dampening investments in pre-existing copper networks.

In the EU, the establishment of criteria for removing regulation that were based on traditional principles of economics and competition policy was valuable to the marketplace. The fact that the EC appears to have largely adhered to the established criteria over many years was perhaps more valuable and praiseworthy than has been appreciated. Whether the criteria were perfect or not, their adherence to well-accepted discipline-based principles provided limits on the scope of regulation, and the EC's continued application of those guidelines provided relative predictability to the market and a path for sunseting regulation. In contrast, the eagerness of US regulators to provide easy entry paths to competitors to the point of abandoning principles of sound governance and standard antitrust economics created the setting for ongoing, repeated conflicts between the courts and the regulators that whipsawed participants and disrupted business models of entrants and incumbents until the costliest access obligations were removed.

2.3 Applying the Lessons of Telecom to the Regulatory Concerns in the Package Delivery Sector

A number of characteristics of the package delivery sector are particularly salient to the lessons from the history of telecommunications regulation.

2.3.1 Access Regulation in Package Delivery is an Ill-suited Intervention in Light of the Dynamic Nature of IT and Adjacent Markets

The lesson from telecommunications that substitutes to bottlenecks can come from unanticipated sources is highly resonant with the package delivery industry and, indeed, with the e-commerce platform marketplace. After decades of relative technological stasis, the package delivery industry is being transformed by innovation driven by information technologies that are developing rapidly, and the ways that companies reach customers are proliferating in inventive ways. Package delivery networks are considered to be highly competitive, have evolved rapidly in recent years, and have a good chance of delivering as much if not more change in the near future (see, e.g., McKinsey & Co., 2019; Keeney, 2020). At the same time, e-commerce platforms are a relatively new business model and purported market power, if it exists, would be subject to the competitive pressures brought by rapid innovation in business models.¹⁰ In this context, and in light of the telecommunications experience, the premise advanced by some regulatory and competition authorities,

¹⁰ Indeed, there is no consensus that Amazon, or any other e-commerce provider, has market power in the first instance in e-commerce platforms and no consensus that Amazon has market power in package delivery; nor do there appear to be substantial concerns that Amazon has increased price or reduced quality in package delivery markets.

discussed earlier, that e-commerce platforms may come to constitute a bottleneck or essential facility that impedes competition in package delivery is a questionable basis for imposing access regulations and, if acted on, susceptible to the risk of depressing investment and innovation.

2.3.2 Investments in E-commerce Platforms and in Package Delivery are Ongoing and Continuing, Making Access Obligations Particularly Risky for Social Welfare

In contrast to the focus in the mid-1990s on access to the largely sunk copper voice telecommunications network, we know today that both e-commerce and package delivery are in the throes of technological development. Investments in package delivery networks have been massive in recent years and are anticipated to continue to be so in years to come, driven by the need to reduce costs and meet increasing customer expectations for same or next-day delivery (requiring more distribution centers closer to delivery addresses and enhanced logistics capabilities), tracking technology, and a variety of delivery options (e.g., parcel lockers). Companies are testing new modes of delivery such as automated cars, robotics, and drones (Barnard, 2022; Keeney, 2020). At the same time there are significant opportunities for brick-and-mortar retailers and international parcel operators to enter or expand their presence in same-day and next-day delivery (see, e.g., Netzer et al., 2017), as well as for urban delivery companies such as Uber, Lyft, and TaskRabbit and entrants offering new modes of delivery (McKinsey & Co., 2019).

As can be seen in Fig. 1, e-commerce sales worldwide are expected to continue to grow by around 10% or more each year, according to data research firm Statista. Reflecting this growth potential, funding for e-commerce tech firms reached US\$21 billion in Q1 2021 (CB Insights, 2021).

Ongoing industry growth not only enriches opportunities for existing providers to invest and diversify but facilitates new entry and new business models, including for retailers selling directly to consumers and organizing their own delivery.

As Fig. 2 shows, there are many existing industry participants who may benefit from and exploit these growth opportunities. Any of these marketplace competitors might be the source of fundamental change in e-commerce technology, although history tells us, and the telecommunications industry experience taught us, that radical change is most likely to come from a new challenger rather than an established player. Moreover, the future of e-commerce is not necessarily in online marketplaces. As can be seen in Fig. 2, according to Statista more than 50% of global e-commerce is transacted through channels other than online marketplaces. Headless commerce players such as Shopify facilitate more opportunities for retailers to sell their products directly to consumers online and are offering delivery logistics capabilities that allow small retailers to access scale economies in delivery when selling directly to consumers online.

We do not know how technology will shape these industries in coming years, but, unlike in telecommunications in the 1990s, we know that we do not know. And we

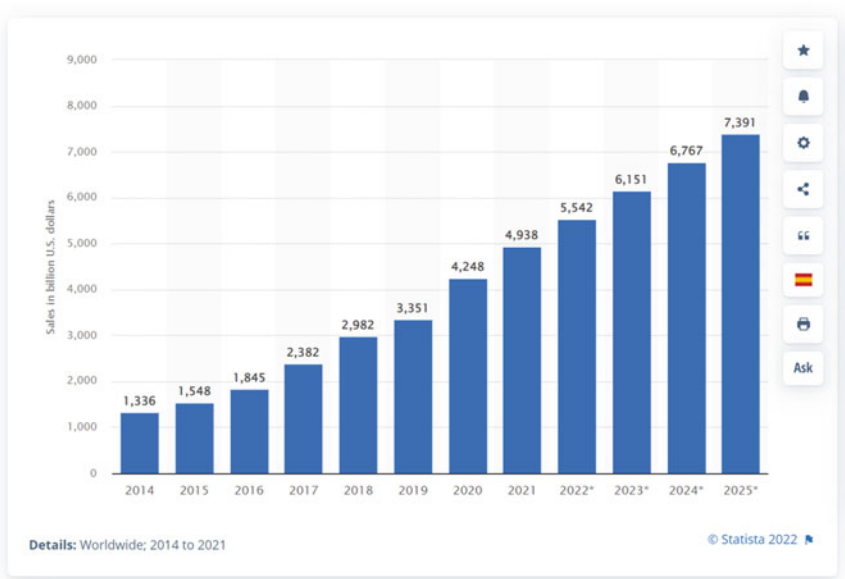


Fig. 1 Retail e-commerce sales worldwide from 2014 to 2025 (in billion US dollars)

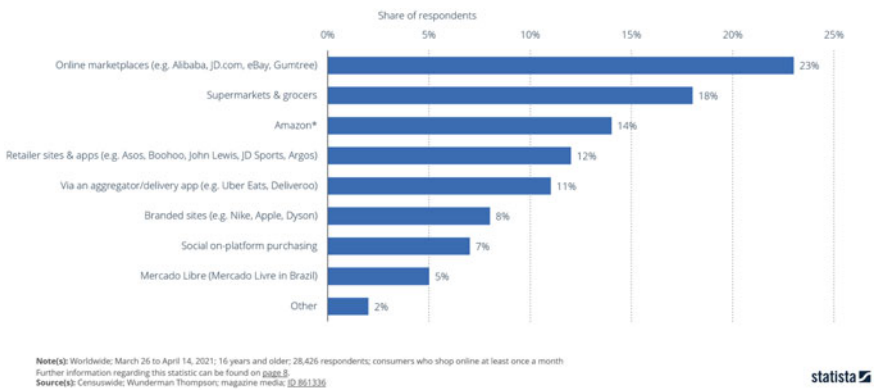


Fig. 2 Distribution of online purchases worldwide as of April 2021, by channel

know that the social costs of interfering with incentives to invest and innovate by imposing access regulations are likely to be high.

2.3.3 Rigorous Adherence to Standard Economic Principles for Criteria Necessary to Justify Regulation is Beneficial

The experience in the telecommunications industry taught us that unpredictability of regulatory policy in the US, due in part to the failure to adhere to well-known economic principles, did not promote the facilities-based competition that ultimately developed, but disrupted and damaged it. Current proposals from some quarters to apply access regulation to e-commerce operators in connection with package delivery invite similar risks because, at a minimum, they invite disputes and policy reversals of the sort that created chaos in US telecommunications in the early 2000s. Investment is depressed and business models are distorted when industry participants face material risks that the regulatory structure upon which their business models rely may be rescinded unexpectedly.

3 Conclusions

We have now had over 25 years of experience with liberalization and access regulation in the telecommunications industry. Even with the benefit of hindsight we do not know how the markets in Europe and the US would have ultimately developed differently, if at all, had the regulatory policy been different in either area. But there are nevertheless useful lessons from those 25 years of experience. At the top, interfering with markets that are in the vortex of rapid and profound reinvention, as are both package delivery and e-commerce, risks delaying or even depriving the economy of innovations in business models and products that we cannot know and whose value is therefore easily underestimated. Interfering by imposing access obligations—thereby depriving a company of the full benefits of its innovation and disincentivizing investments in alternative technologies—always risks harming incentives to the detriment of consumers and general social welfare. Doing so in an industry where the mandated access would be to assets that did not even exist until recently, and for which vast resources are expected to be invested in the future, is especially fraught. The experience from telecommunications teaches us that competition comes from unpredictable avenues and that the calculus of when and where to apply access obligations must take into account the effect of that unknown on social welfare.

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Self-Provision by Online Platforms Vertically Integrated into Delivery Activities



Alberta Corona, Claudio Lorenzi, and Anna Mucci

Abstract One of the main recent developments in postal markets is the emergence of e-commerce platforms that are gradually evolving from simple intermediaries to full-service providers offering, inter alia, delivery services. It is, therefore, necessary to establish whether online platforms engaged in delivery activities should be considered as postal operators. Once this has been clarified, one further issue to address is if self-provided delivery can be qualified as a postal activity. Indeed, generally online platforms deliver both their own goods and third-party sellers' goods. Some vertically integrated platforms believe that the delivery of their own goods should be excluded from the application of the postal services' legal framework on the grounds that they are carried out as self-provision. The issue is relevant not only from a legal point of view, but also from an economic point of view. The purpose of this paper is to investigate the legal and economic aspects relating to the relevance and applicability of the concept of self-provision in postal markets.

Keywords Platform · E-commerce · Self-provision · Postal services

1 Introduction

The digitization of the economy has triggered profound changes in the postal sector: the relentless decline in traditional mailings—gradually replaced by more immediate and user-friendly forms of communication (i.e., email and mobile messaging)—has been accompanied by a significant increase in the volume of parcels, attributable

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to the growth of e-commerce. This has been further accelerated by the Covid-19 pandemic, which has led consumers to make an increased number of online purchases.

In recent years, the growth of e-commerce has generated a growing demand for B2C delivery services, which are likely to become—in a not-too-distant future—the main growth driver in the postal sector. Such growth has thus given online platforms an increasingly important role in the exchange of goods. Initially platforms only collected orders from online shoppers, which were then delivered by postal operators (traditional postal operators or courier express). As the volume of parcels to be delivered increased, they gradually vertically integrated and, in many countries, started to provide delivery services to final customers.

In this changed landscape, it becomes necessary to establish whether these platforms should be considered, to all intents and purposes, as postal operators, i.e. whether they are subject to the regulatory, supervisory, and sanctioning powers of the NRAs, and whether they need a general authorization to provide delivery services.

In making this assessment, it should also be considered that, like all online platforms, vertically integrated delivery platforms may either only offer intermediation services to third-party sellers and buyers (so-called pure marketplaces, such as eBay) or sell products purchased in-house from other suppliers (hybrid marketplaces, such as Amazon) directly to online buyers. In the first case, the platform does not acquire the ownership of the goods from third-party sellers (who remain the owners), does not set the price, and remains extraneous to the contractual relationship between sellers and buyers and is, therefore, not responsible for the execution of the contract. On the contrary, in the second case (hybrid marketplaces), the platform owns the goods, sets their price, represents the contractual counterpart of online buyers, and, as such, is responsible for the proper execution of the contract.

By virtue of the property of the goods sold directly by the platform, some argue that the delivery activity should not be considered a postal activity as it would be self-provision. In the light of the above, the paper aims to clarify whether self-provision can be considered as a postal activity from a legal and economic point of view, whether the delivery activity carried out by the platform of its own products can be considered separately (extrapolated) and qualified as self-provision, and whether this part can be considered for the calculation of market shares.

The paper is organized as follows: Sect. 2 assesses whether online platforms should be considered as postal operators and provides an overview at the European level on how NRAs have dealt with vertically integrated platforms in parcel delivery activities so far. Section 3 analyzes the concept of self-provision from a legal and economic point of view. Section 4 assesses whether self-provision of delivery should be considered as a postal activity. Finally, Sect. 5 describes how self-provision has been assessed in the cases of Amazon in Italy and Spain. Conclusions are drawn in Sect. 6.

2 Should Vertically Integrated Online Platforms Be Considered as Postal Operators?

2.1 The Delivery Activity of Online Platforms

In the last years, some online platforms have gone from being mere intermediaries (matching online demand and supply), to become multiple service providers by vertically integrating along the value chain and offering further services, such as online payments and delivery.

To be able to offer delivery services, platforms have developed their own network, hence, from being relevant customers of postal operators, they have become, in some cases, their main competitors. Indeed, in the delivery market, on the demand side, platforms can exercise considerable countervailing buying power vis-à-vis delivery service providers and obtain particularly advantageous conditions from them by virtue of the high volumes of parcels they handle. On the supply side, the intermediation and match-making activities give major platforms a competitive advantage in e-commerce deliveries for the following reasons: *(i)* large economies of scale from the significant volumes of the sales they can reach in a very short time, *(ii)* the capability to obtain economies of scope from the joint sale of intermediation and delivery services, *(iii)* reduces transactional and commercial costs from the privileged contact channel with third-party sellers, already their customers in the intermediation market, *(iv)* an information advantage from transaction data that confers, over other postal operators, a greater ability to provide retailers with customized terms for delivery services, and *(v)* making the ranking of marketplace sellers' products dependent on whether or not the latter use their delivery services. On top of that, the gatekeeper nature allows platforms to leverage their market power from the online intermediation market to the parcel delivery market.

2.2 How Vertically Integrated Platforms Are Considered in Europe

The subjective scope of application of the EU Postal Service Directive (PSD) has been definitively clarified by the recent Confetra ruling¹ which establishes that road haulage, forwarding or express courier companies providing collection, sorting, transport, and distribution services for postal items are, unless their activity is limited to the "transport" of postal items, postal service providers within the meaning of Article 2, point 1a, of the PSD. The judgment also defines the service objectively by confirming, in particular, that "[...], an undertaking is to be classified as a 'postal

¹ CJEU, Joined Cases C-259/16 and C-260/16, "*Confetra and others*", 31 May 2018.

service provider' within the meaning of Article 2(1a) of Directive 97/67/EC where it carries out at least one of the services listed in Article 2(1) of that Directive".²

The other fundamental element is represented by the EU Regulation on cross-border parcels,³ which, following the same approach as the PSD, considers each phase of the relative processing cycle as a "postal service". Not only that, the aforementioned regulation provides a further, and not insignificant, indication for the assessment of the issue, since, in defining the parcel delivery service, it also identifies as postal service providers those subjects that use alternative business models which make use of the collaborative or shared economy or electronic commerce platforms. The business model used is irrelevant; what matters is the activity actually carried out and, therefore, in order to establish whether a company can be qualified as postal, it is necessary to assess whether the company carries out one of the phases of the postal value chain.

Based on these assessments, the European Group of Postal Regulators (ERGP), in a recently published Report,⁴ concluded that online platforms and alternative business models based on the collaborative economy may be subject to regulatory supervision to the extent that they provide postal services and parcel delivery services, as defined by the PSD and EU Regulation 2018/644, respectively. The ERGP document thus shows a generalized consensus among NRAs on the fact that online platforms that perform delivery activities should be treated like any other postal operator, to ensure a level playing field among operators in the parcel delivery services market and enhance consumer protection.

The report showed that in 2021, in eight countries (Austria, Switzerland, Denmark, Spain, Italy, Lithuania, Poland, and Romania) there are online platforms providing services similar to postal services. In several cases, NRAs analyzed the case of Amazon, which so far has been formally considered a postal operator in four countries (Austria, Germany, Spain, and Italy).⁵

The ERGP highlighted that in all cases in which online platforms are considered postal operators, there are a number of common elements: (i) the delivery service concerns an object that falls under the definition of postal item; (ii) the delivery activity concerns one or more stages of the postal value chain, excluding transport alone; (iii) the organization, management, and network used for delivery are similar, if not equal, to that of traditional postal operators.

Another aspect highlighted by the ERGP is that, since neither European nor national legislation regulates these new business models, none of the countries that consider online platforms as postal operators have referred to a special type of authorization. Thus, in cases where national postal legislation requires prior authorization,

² Paragraph 76, point (1) of the above mentioned Confetra Judgment.

³ REGULATION (EU) 2018/644 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 April 2018 on cross-border parcel delivery services.

⁴ ERGP, "Report online platforms", 2021, ERGP (21) 23.

⁵ In all four countries, Amazon delivers goods sold on its marketplace either through its own infrastructure or through third-party operators, which means that it is both a competitor and a customer of postal operators.

it is also required for these new operators, and the same is true in cases where prior registration is required. In addition, because the postal services provided by platforms are generally outside the scope of the universal postal service, many countries do not require an individual license, but simply a general authorization.

3 Self-Provision

3.1 *Legal Profile*

The concept of self-provision is not only relevant to postal services as it concerns all economic sectors and is strongly influenced by EU competition principles. Some of the principles that can be drawn from the legislation on so-called “private self-provision” and “public self-provision” can certainly be applied to the postal sector. A brief general overview of these legal concepts is, therefore, useful as a preface to the following considerations.

With regard to private self-provision, the legal reservation by a State of a market monopoly to a public body should not result in private companies being prohibited from producing such goods or services for their own use or for the use of the parent company and its subsidiaries.⁶ This right of self-provision is clearly limited to the production of goods and services that are not intended for and offered to third parties but are exclusively for one’s private use.^{7,8}

On the other side, i.e. public self-provisioning, the CJEU has recognized the legitimacy of entrusting “self-provisioning tasks” to public companies (companies wholly owned by a public entity) to carry out in-house activities,⁹ provided that the activity is exclusively for the public entity¹⁰ and any activity in favor of third parties is entirely marginal.¹¹ If the self-production activity is also intended for third parties, the alteration of the rules of competition occurs because the public company goes outside the assigned boundaries and also operates in the market, enjoying unjustified

⁶ Article 9, paragraph 1, Law No. 287/90.

⁷ Corte di Appello di Genova, 5 aprile 1995, in *Foro it.*, 1997, I, 3726; Corte di Appello di Torino, 17 febbraio 1995, in *Giur. It.*, 1996, I/2, 288; Corte di Cassazione, sezioni unite civili, 7 maggio 2002, n. 6488; Cass. Civ. sez. III, 24 gennaio 2000, n. 746.

⁸ M. Libertini, “Organismo di diritto pubblico, rischio d’impresa e concorrenza: una relazione ancora incerta, in *Contr. imp.*, 2008, 1201 ss.; Id., “Le società di autoproduzione in mano pubblica: controllo analogo, destinazione prevalente dell’attività e ad autonomia statutaria”, in www.federalismi.it, aprile 2010.

⁹ Public administrations that need certain services have the alternative to make (self-production, creating a wholly owned subsidiary) or buy (outsourcing to third parties operating in the market and in competition with each other).

¹⁰ Case C-340/04—Carbotermo.

¹¹ Case C-371/07—Commission v. Italy.

privileges over other competitors. This brief excursus on the two institutions shows that the general framework imposes strict constraints on self-provision, which are justified by the need to prevent the distortion of competition.

3.2 *Economic Profile*

In the presence of vertically integrated undertakings, the inclusion or non-inclusion of self-provision for the purposes of identifying the relevant market and calculating market shares may lead to very different conclusions as to the level of competition in the markets and the identification of possible dominant positions. In competition law and economics, the relevant market comprises any products or services that are substitutable or sufficiently interchangeable, having regard not only to their objective characteristics, but also to prices and intended use.¹² In other words, the relevant market comprises a set of products or services, within a geographic area, (actual and potential) that buyers regard as sufficiently close alternatives. To define relevant markets, the prevailing conditions of demand and supply-side substitutability are generally determined, according to the aforementioned EC Guidelines (2019/C 150/01, par. 29), by using the hypothetical monopolist test, so-called “SSNIP test”.

In the presence of vertically integrated undertakings, when carrying out the substitutability analysis for the purpose of identifying the relevant market, it is important to establish whether self-provision needs to be considered. For market shares to provide correct information on the existence or otherwise of market power, they must include all products/services capable of exerting competitive constraints on the market. On one view, as self-provision is a captive sale for the provision of a good/service intended for the company itself (or one of its subsidiaries), and not sold to third-party customers, it should be excluded from the calculation of market shares (so-called “merchant market rule”). In other words, all sales to customers linked to the company in question by full or partial ownership (so-called captive sales) should be excluded from the market share calculation and only sales to independent third parties (i.e., sales on the merchant market) should be included.

This criterion is based on the assumption that a company making sales to third parties may easily choose to supply customers willing to pay more; conversely, a company supplying its own subsidiary, at least in the short term, would not stop supplying simply because it could obtain a higher price in the merchant market. For this reason, captive sales would not exert the same competitive constraint on the market as merchant sales.

However, in practice, a vertically integrated company has the potential to use part of its captive production capacity to supply third parties, i.e. to enter the merchant market. Moreover, the ability of the firm to exert competitive constraints on the

¹² “EC Guidelines on market analysis and the assessment of significant market power under the EU regulatory framework for electronic communications networks and services” (2018/C 159/01), par. 29, 33, and 37.

merchant market depends on its market share in the retail market and, therefore, maybe also on its share of self-provision.

In the light of the above, it is preferable to assess on a case-by-case basis whether to include or not self-provision in the definition of the relevant market, hence in the calculation of market shares, by trying to establish whether captive sales may exercise a competitive constraint on the market under analysis. For this purpose, it may be useful to assess whether the company making captive sales would also be willing to make an offer to third-party customers within the time horizon of the analysis, considering as “captive” only those shares of self-provision which, during the relevant period, cannot be made available for sale to third parties.¹³

This is coherent with European regulatory practice in electronic communications for which one of the criteria for determining whether it is appropriate to include self-provision is to assess whether it places competitive constraints on market participants.¹⁴ As the Body of European Regulators for Electronic Communication (BEREC) has noted, “*the consideration of self-supply has the final aim of describing in the most appropriate manner the relevant competitive constraint faced by operators in the relevant market. In some case, considering only services provided to third parties could mislead the conclusions of the analysis*”.¹⁵

4 Self-Provided Delivery as a Postal Activity

The PSD (97/67/EC), in its original text defines self-provision, in recital 21, as “*provision of postal services by the natural or legal person who is the originator of the mail, or collection and routing of these items by a third party acting solely on behalf of that person*”. So, the PSD clearly states that this self-provision objectively provides a service that qualifies as a postal service.

The PSD goes on to state that there is no reason to include “self-provision” among the services that, under Article 7 of the original text, may be reserved for the universal service provider. The PSD incorporates, in this sense, the well-known principles regarding the EU right to self-provision (see above). The fact that the PSD does not allow self-provision to be included in the universal service does not exclude it from the scope of postal services; similarly, again in the original text of the PSD, “new services” (recital 21) and express mail services (recital 18) are postal services, even if they are not part of the universal service.

There is no doubt, therefore, that self-provision of delivery can be qualified as a postal activity within the meaning of European legislation. These considerations may justify, from the NRA’s perspective, the acquisition and evaluation of data relating to self-provision services as part of the market analysis. Moreover, from an economic

¹³ CRA International, “*Indirect constraints and captive sales*”, 2006.

¹⁴ See European Commission’s Explanatory Note to the “*Recommendation on relevant product and service markets within the electronic communications sector*” of 2014.

¹⁵ BEREC, “*Report on self-supply*”, March 2010, BoR (10) 09.

point of view, NRA must consider that if self-provision places competitive constraints on market participants, its inclusion in postal market boundaries allows to better represent the competitive dynamics.

In the European legal framework, the concept of self-provision is governed by precise boundaries, aimed at preventing the extension of the reserved area in favor of the universal service provider, and by the existence of internal requirements aimed at ensuring the competitiveness of the market. The former was the subject of the judgment of the CJEU in Case C-240/02. In the context then existing and in the light of the purpose then pursued by the PSD, namely the liberalization of postal services, the Court, through a restrictive interpretation of the rules, held that Member States were not entitled to extend as they wished the services reserved to the universal postal service providers under Article 7 of PSD 97/67. The judgment of the CJEU drew a clear boundary to safeguard the so-called “right to self-provision” of private individuals, configured as a subjective right exercisable in regimes of monopoly or legal reservation of certain activities.

The other profile, which is relevant in a market in which there are no longer situations of reservation or monopoly, concerns, instead, the requirements that the activity must possess to be qualified as self-provision. Self-provision, on closer inspection, takes the form of an exemption regime because it does not require the subject to apply for a license and, therefore, in a market, now fully liberalized, it allows the subject to operate on particularly favorable conditions compared to those of other competing operators. On the basis of the principles established by the doctrine and the jurisprudence, it can be said that the so-called “right of self-provision” is not absolute as it encounters impassable limits in the need not to disturb the market structure to the detriment of competition and its benefits. Hence, the activity carried out by a company can be considered self-provision if it is not in competition with the activities carried out by other companies in the markets concerned.

While it is true, therefore, that in a monopolistic situation, a restrictive interpretation is justified to avoid an inadmissible widening of the area of reservation, in a liberalized market, the competitive context would be distorted if the area of exemption (from the issue of a general authorization and from compliance with the provisions of the sectoral regulations) were extended to situations that cannot be qualified as self-provision. The same approach is followed in the EU Regulation on cross-border parcels. The notion of self-provision is not mentioned, but the concept of self-provision is clearly a prerequisite for the exemption (recital 18) from the application of the EU Regulation for undertakings which cumulatively meet the following requirements: (i) they are established in only one Member State; (ii) they provide only domestic parcel services under a sales contract; and (iii) they deliver the goods directly to the user under the sales contract. Also, recital 18, which confirms the view taken here, significantly clarifies that mixed forms of self-provision are not permitted because it considers the EU Regulation to be applicable to undertakings which also use the network intended for self-provision for the delivery of goods sold by third parties (“*Undertakings which also use domestic delivery networks for the delivery of goods sold by third parties should be subject to this Regulation*”).

In line with the European regulatory and jurisprudential framework, the above-mentioned ERGP document states that delivery services provided by an online platform can be considered as self-provision if: (i) the online platform delivers only its own goods through its own network; (ii) the online platform delivers only its own goods through its own network or through third-party companies working exclusively for the online platform. In conclusion, since online platforms generally deliver both their own goods and third-party sellers' goods, their deliveries cannot be considered as self-provision within the meaning of European legislation. In addition, as platforms' delivery of their own goods affects the competitiveness of the market, their inclusion in market shares allows a correct representation of the competitive dynamics.

5 The Italian and Spanish Amazon Cases

Said issues have been addressed in regulatory cases concerning Amazon delivery activities in Italy and Spain. On the basis of the regulatory principles and interpretative criteria set out in the previous paragraphs, both the Italian (AGCOM) and Spanish (CNMC) authorities have established that Amazon carries out, in their respective countries, postal activities and that the delivery of Amazon's own goods (self-provision) should be considered in the same way as other postal deliveries (i.e., deliveries concerning goods owned by third parties).^{16,17}

The decisions of the two NRAs show several similarities. First, Amazon's activity is considered to be fully in line with the concept of postal activity within the meaning of the European regulatory framework (PSD and EU Regulation), both subjectively and objectively.¹⁸ In fact, both for AGCOM and CNMC, Amazon has organized a parcel delivery service to the end-customer which in no way differs from the delivery service provided by other postal operators, such as express couriers, because it includes the ordinary processing phases of the postal cycle: from the sorting phase to delivery to the end-customer at the addressee's premises or to lockers.

In this respect, according to AGCOM, the outsourcing of the delivery phase of the postal service to third companies does not change Amazon's qualification as a postal service provider because traditional postal operators also use third-party couriers for delivery. Moreover, Amazon's activity cannot be seen as mere intermediation but as an integral part of an overall postal service because Amazon manages and coordinates the activities of local couriers, acting as a parent company: its influence on the organization of the work of local couriers is so strong and strict that it does

¹⁶ AGCOM, Decision n. 400/18/CONS of 25 July 2018.

¹⁷ CNMC, Resolution n. STP/DTSP/006/20 of 24 September 2020.

¹⁸ According to article 2.1bis of the PSD, as clarified by the CJEU notably in its recent Confetra decision (31 May 2018), a company which provides even just one phase of the postal service (clearance, sorting, transport, and delivery of postal items) must be considered as providing a postal service (although providing transport services alone would not be sufficient to be considered a postal operator).

not leave local couriers with a sufficient degree of independence. Thus, Amazon and the local couriers operate as a single organization.¹⁹

Moreover, according to CNMC, the classification of an activity as a postal activity is not determined by the place where it is carried out (logistics center, automated processing center, warehouse, etc.) but by the characteristics of the activity itself and by whether they coincide with the definitions of the various phases of the postal cycle. In this regard, CNMC notes that the register of postal service providers includes many companies whose main activity is not postal services but which, as they carry out postal activities in a marginal or ancillary way, have nevertheless considered it necessary to register because the specific features and regulatory objectives relating to other sectoral regulations (transport, commercial distribution, consultancy or assistance activities, foundations, etc.) do not apply and do not hinder or prevent compliance with the provisions of the postal sector.

CNMC also notes that the difference between Amazon and other online retailers offering home delivery services is, firstly, that all goods leaving the warehouses of such retailers are their own property (and that they do not provide postal or logistical services to third parties), and that, even when they prepare these parcels for delivery, once the carrier takes care of it, the retailer has no ability to influence their route, the number of parcels to be distributed or the route to be followed to deliver them (in the case of Amazon Flex, Amazon would exercise such influence), and finally the fact that this service covers the various activities of the postal cycle and that the Amazon group's network is used to provide services to third parties. In this respect, the status of a postal operator is directly linked to the decision-making and control capacity that is exercised over the management and delivery of parcels, as well as the direction and organization of the elements that make up the network.

The second similarity is that for both NRAs, the service provided by Amazon cannot be characterized as "self-provision" and, therefore, be excluded from the application of postal legislation, since Amazon uses the delivery network for the delivery of its own goods and of third-party's sellers good, both sold through the e-commerce platform. Since it delivers both its own goods and goods sold by third-party retailers, Amazon's production capacity is not exclusively captive. In this regard, according to CNMC, Amazon's delivery activity also cannot be considered self-provision from the perspective of postal legislation because for delivery Amazon uses both Amazon Flex program partners (DSPs that constitute the Amazon network) and third-party couriers. As mentioned above, postal legislation establishes that a self-provision regime exists when the provision of postal services is carried out directly by the sender of the mail, or when it is carried out through a third-party acting exclusively for the same person. This form of mixed supply, therefore, excludes Amazon from the self-provision regime since the definition of self-provision requires choosing either an "own supply" model or a model external to the company but acting exclusively for it and does not support a combination of the two systems.

¹⁹ AGCOM also drew from the precedent of the CJEU's judgment in case C-434/15 (Elite Taxi/Uber Systems Spain) to rule that Amazon exerted a decisive influence over the conditions under which the delivery service was provided by local couriers.

According to AGCOM, the joint use of its own delivery network and that of third-party suppliers is also relevant from the point of view of the competitive constraint exerted by Amazon's own deliveries on the delivery services market for the following two reasons. Firstly, being a large customer of e-commerce delivery service providers, the fact that Amazon can take its own deliveries off the market gives it significant bargaining power as a purchaser of delivery services from third-party suppliers. In addition, by virtue of the market share that the platform holds in the e-commerce sales market, self-delivered volumes allow it to achieve significant economies of scale that positively affect the cost efficiency and, therefore, the final price of the delivery service that it offers to platform sellers in competition with other market players (couriers and postal operators). Since Amazon can combine, in the most advantageous way possible, delivery with its own network and that entrusted to third parties,²⁰ it would also be able to allocate increasing proportions of its network capacity to the sale of delivery services, being able to meet the delivery needs for its own goods also by turning to third-party suppliers. In the light of the above, AGCOM considers that Amazon's self-provision represents a competitive constraint for operators of the e-commerce parcel delivery market and, therefore, must be taken into account in the calculation of market shares.

6 Conclusions

Self-provision, whether public or private, is a special scheme subject to precise requirements, especially as regards the restriction on its use by companies, which must be prevalent or almost exclusive. In a liberalized market, the assertion of a private right meets an insuperable constraint in the requirement not to disrupt the competitive structure of the market and not to distort the competitive context by exploiting a situation of privilege.

To sum up, the claim of a subject to be able to carry out the same activity, partly under the hat of self-provision, partly under that of supply to the market, is an unacceptable hybridization. The simultaneous application of the same activity of two different regimes (market supply and self-provision) would lead to a deviation from the strict self-provision model based on the rulings of the CJEU, with a clear distortion of the rules of competition. This thesis, which denies the possibility of hybridization, as well as being affirmed in the Italy and Spain decisions, is based on recital 18 of the EU Regulation which does not allow forms of mixed use of self-provision and which, therefore, affirms the applicability of the EU Regulation to undertakings which use the network intended for self-provision as well as for the delivery of goods sold by third parties. In addition, from an economic point of view, the delivery by a company of both own goods and third-party's goods implies that its

²⁰ This emerged from the Italian Antitrust proceeding on Amazon for abuse of a dominant position. See AGCM decision n. 29925, 30 November 2021.

activity cannot be considered captive, as it is able to exert a competitive constraint in the delivery markets.

In conclusion, the activity consisting of the provision of postal services by a single entity cannot be divided and classified partly as self-provision and partly as supply to the market. The activity carried out must be considered as a whole and, consequently, can only be qualified as ordinary postal activity. A partial application of the special self-provision scheme is not permissible, either on the basis of general economic and legal regulatory principles or on the basis of the sectoral rules.

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The Confluence of Competition Law, Consumer Protection, and Sector-Specific Regulation in the Postal, Delivery, and Related Sectors



John Hearn

1 Introduction

This chapter reviews how, in the European Union (EU), competition law, consumer protection law, and postal regulation interact with one another.

The rules designed to foster fair competition are set out in the Treaty of Rome (1957)—a prohibition of anti-competitive agreements (Article 85), abuses of a dominant position (Article 86), and state aid (Articles 92 and 93). Article 90 imposed restrictions on the grant of special or exclusive rights. When the Treaty was signed, postal services were provided by governments and protected by state monopolies. This did not sit easily with the “fair competition” provisions of the Treaty. These issues are discussed in Sect. 2.

Consumer Protection was not explicitly mentioned in the Treaty of Rome, but the Maastricht Treaty (1992) corrected this lacuna. The Consumer Rights Directive (2011) has particular implications for e-commerce and the services used to deliver goods to consumers. These initiatives are discussed in Sect. 3.

Forty years after the Treaty was signed, a system of Postal Regulation was put in place. Sixteen years later all legal barriers to entry, as regards postal service provision, were finally removed. Postal Regulation was thereafter confined to ensuring universal service provision. Section 4 explores these issues.

There is a broad consensus that the status quo concerning the provisions of these laws is about right. This consensus includes the European Commission, operators, users, etc. The “application reports” on the impact of the Postal Directives published by the European Commission in 2015 and 2021 did not make any specific proposals to amend the Directives. Rather, the Commission proposed to continue to engage with Member States and other stakeholders “to further explore potential adaptation

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in the future.” Most stakeholders have long argued that enforcement of competition law alone would be sufficient to protect users. These issues are discussed in Sect. 5.

The exception to this consensus is the European Regulators who want to significantly expand the scope of postal regulation. This paper shows that the concerns of the regulators can, and are, being addressed by competition law and consumer protection law. See Sect. 6.

The institutional arrangements for enforcement of competition law and postal regulation are where there is a need for change. There is a strong case for the same institution to be responsible for enforcement of competition law and postal regulation; not least to avoid Double Jeopardy. Currently only institutions in seven countries have the authority to enforce both competition law and postal regulation. Section 7 recommends a way forward.

2 Competition Law

Article 3 of the Treaty of Rome mandated the institution of a system to ensure that competition in the common market was not distorted. Specific provisions with regard to competition set out in the Treaty included prohibition of anti-competitive agreements (Article 85), abuses of a dominant position (Article 86), and state aid (Articles 92 and 93). Article 90 imposed restrictions on the grant of special or exclusive rights. Undertakings entrusted with the operation of services of general economic interest were to be subject to the competition rules so far as the application of those rules does not obstruct the performance, in law or in fact, of the particular tasks assigned to them.

Later, at the end of 1989, the European Council agreed to a Regulation to control mergers.¹ A revised (consolidated) version was published in 2004.² The provisions apply to significant structural changes, the impact of which goes beyond the national borders of any one Member State. These mergers, as a general rule, are reviewed exclusively at European level. Other mergers come, in principle, within the jurisdiction of the Member States.

The Commission also published a Postal Notice (1998) setting out its interpretation of the relevant Treaty provisions and how it would apply competition rules to the postal sector in individual cases. Inevitably it is also necessary to consider the case law, i.e., the decisions of the European Commission and the European and National Courts, to fully understand the impact that these competition rules have on the provision of postal services and the activities of its service providers. In the following sections a summary is provided of the principal impacts of competition law on postal service provision.

¹ Council Regulation (EEC) No. 4064/89.

² Council Regulation (EC) No. 139/2004 of 20 January 2004.

2.1 Prohibition of Anti-competitive Agreements

In the context of the provision of postal services, the Commission's intervention under this heading has been concerned with alleged price fixing agreements. The most important interventions have concerned the multi-national Terminal Dues agreements, CEPT³ and REIMS,⁴ devised to supplant the UPU⁵ worldwide arrangements. Since 2006, the Commission no longer has the power to grant exemption to such agreements; the onus is now on the undertaking or association of undertakings to show that their agreements did not infringe the Treaty requirements.⁶

Another concerned surcharges applied to international freight forwarding services. The European Commission in March 2012⁷ identified four separate infringements of the Treaty by many undertakings, including subsidiaries of DPAG⁸ and UPS,⁹ who participated in a set of agreements and concerted practices.

Finally in 1993, Ducros Services Rapides SA (France), DHL Worldwide Express (DHL), and Elan International GmbH (Elan Rindt—Germany) entered into an agreement to set up a European network of express delivery services meeting guaranteed deadlines, using mainly road transport and exceptionally rail and air transport. Details were published in the OJ,¹⁰ but the Commission does not appear to have intervened.¹¹

2.2 Abuses of a Dominant Position

In Case 27/76 United Brands v Commission the CJEU defined dominance as

*a position of economic strength enjoyed by an undertaking which enables it to prevent effective competition being maintained on the relevant market by giving it the power to behave to an appreciable extent independently of its competitors, customers and ultimately of its consumers.*¹²

Article 86 of the Treaty of Rome gives a number of examples of actions that might be considered to be an “abuse.” These include unfair pricing or other unfair trading conditions, limiting production, applying dissimilar conditions to equivalent transactions, and making contracts subject to acceptance of supplementary obligations which

³ European Conference of Postal and Telecommunications Administrations, a restricted Union of the UPU.

⁴ System for the Remuneration of Exchanges of International Mails.

⁵ Universal Postal Union.

⁶ See Council Regulation (EC) No. 1/2003 of 16 December 2002 OJ 2003/L 1/25 of 4.1.2003.

⁷ See CASE AT.39462—Freight forwarding Brussels, 28.3.2012 C(2012) 1959 final.

⁸ Deutsche Post AG.

⁹ United Parcel Service of America, Inc.

¹⁰ Official Journal of the European Communities.

¹¹ OJ No. C 165/ 10 of 17.6.1994.

¹² Paragraph 65.

have no connection with the subject of such contracts. Selected specific examples are set out in the following sections.

2.2.1 Fidelity Rebates and Predatory Pricing

DPAG was found to have adopted anti-competitive practices involving fidelity rebates and predatory pricing in the market for business parcel services, and fidelity rebates in the mail order parcel deliveries market.¹³

2.2.2 Cross-Subsidization

UPS complained that DPAG should not be allowed to cross-subsidize activities on a liberalized market from profits earned on the letter market or to use exclusive rights for purposes other than that of complying with the USO.¹⁴ The Commission argued that it did not matter how acquisitions were financed as long as it “does not result in the creation or strengthening of a dominant position.”¹⁵ Section 3 of the Postal Notice (1998) gives examples of where cross-subsidization may be acceptable and recognizes that dominant companies may compete on price unless the prices are predatory. On the other hand, it recognized that subsidizing activities open to competition by allocating their costs to reserved services is likely to distort competition.

2.3 *State Aid*

Article 92 of the Treaty of Rome declares that aid granted by a government or through State resources which distort competition by favoring certain undertakings or the production of certain goods shall be incompatible with the common market. The Commission has required some Member States to recover what it considered to be incompatible aid. For example, in 2018, the Commission found that Correos, the Spanish operator, had been overcompensated for the delivery of its postal Universal Service Obligation (USO) between 2004 and 2010 and had benefited from incompatible tax exemptions. The amount, which had to be paid back, came to €167 million. Two capital injections of about €66 m, granted by Denmark and Sweden, to the PostNord Group were also considered to be incompatible State aid.

There are however exemptions set out in the treaty principally to facilitate the development of certain economic activities or of certain economic areas. The Commission has approved state aid on this basis for the postal universal service providers in the Czech Republic, Italy, Poland, and Denmark. It has also approved

¹³ Case 35.141, Deutsche Post AG, [2001] OJ L125/27.

¹⁴ Universal Service Obligation.

¹⁵ Case No. IV/37.129—USP/DP and DHL 10 June 1999.

state aid to facilitate geographic reach across remote regions of Belgium and France. State aid for press distribution at preferential tariffs in Belgium, France, and Italy has also been approved.

2.4 *Special or Exclusive Rights*

The provision of postal services by the State, or public undertakings, appeared to be inconsistent with the Treaty of Rome, but it was some thirty years before the special or exclusive rights (monopolies) granted to the public undertakings were challenged under competition law. It took the intervention of the CJEU to bring the challenge to a conclusion. In the “Corbeau” case,¹⁶ the Court held that the Belgian Post Office had a “*dominant position in a substantial part of the common market*” and that:

[i]t is contrary to Article 90 of the EEC Treaty for legislation ... to prohibit, under threat of criminal penalties, an economic operator established in that State from offering certain specific services dissociable from ... the service of general economic interest. [i.e., the traditional postal service]

See Hearn (2018) for detail of how the Court reconciled this with need to ensure the economic equilibrium of the service of general economic interest performed by the holder of the exclusive right.

The scope of the postal monopoly differed from country to country. In particular while all member states maintained a monopoly over “letters” up to 2 kg,¹⁷ Spain, The Netherlands, Ireland, and Portugal claimed a monopoly over Express Mail and Italy over parcels.¹⁸ Unsurprisingly the Commission intervened in at least two instances, The Netherlands¹⁹ and Spain.²⁰

2.5 *Mergers*

Although the European Commission and national authorities have considerable powers to control mergers this has not prevented some former state-owned postal administrations from building formidable European and global networks. Other former state-owned postal administrations have built smaller regional networks. Two American-owned companies have also developed a considerable presence in Europe but not without significant difficulties. The (originally) Australian-domiciled

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

¹⁷ Exceptions DK, DE (1 kg), NL(500G), UK £1.

¹⁸ See Green Paper (1992) Annex 4.

¹⁹ Commission Decision of 20 December 1989 concerning the provision in the Netherlands of express delivery services. OJ No. L 10/47-52 12.01.90.

²⁰ Commission Decision of 1 August 1990 concerning the provision in Spain of international express courier services OJ No. L 233/19-23 28.08.90.

company, TNT, was a significant player for some time, but has now been absorbed by FedEx.

There have been many notifications of proposed mergers to either the European Commission or national authorities. The European Commission has opposed only one of these, the proposed acquisition of TNT by UPS in 2013. The General Court annulled this decision in 2017. This annulment was confirmed on appeal by the CJEU in 2019.²¹ Recently the General Court rejected UPS's claim for €1.7 bn compensation.²²

It would not be appropriate to detail a complete record of all the merger and acquisition cases in the postal sector, but three case histories outline different approaches to expansion with different implications for merger approval.

2.5.1 Deutsche Post (DPAG)

While the former state-owned postal administration was transforming itself into a private limited company,²³ it was growing and diversifying mainly by acquisitions. There was a peak of activity between 1998 and 2002. DPAG's policy appeared to be to acquire worldwide networks in their own right and manage them at arm's length. Acquisitions included DHL International Ltd. ('DHL'),²⁴ Danzas,²⁵ Ducros Services Rapides SA,²⁶ Securicor plc (joint venture for distribution services), Nedlloyd's European transport, distribution, and logistics division,²⁷ and Airborne Inc.²⁸

DPAG also disposed of some of the businesses it had acquired. For example, in 2010 DHL Express (UK) Limited's domestic parcel delivery service was sold to Home Delivery Network Limited (HDN).^{29,30} HDN's parent company also owned the Shop Direct group of home shopping businesses for which HDN conducted

²¹ Case C-265/17 P Commission v United Parcel Service.

²² Case T-834/17, United Parcel Service Inc v European Commission.

²³ In 1995 Deutsche Bundespost Postdienst became a public limited company under the name Deutsche Post AG (DPAG). Initially the DPAG was owned 100% by the German government, but the latest annual report shows the government's interest in DPAG's share capital is now 20.49%.

²⁴ DHL had been founded in the late 1960s by entrepreneurs based in Hong Kong and developed into a global transportation company—see P Chung and R Bowie (2018). In June 1998, DPAG acquired a minority interest in DHL International Ltd. ('DHL'), Case No. IV/M.1168—Deutsche Post/DHL. In 2002 DPAG acquired control of the whole of DHL International Ltd. ('DHL'), Case No. COMP/M.2908 Deutsche Post/DHL.

²⁵ Approved by the Commission under Case No. IV/M.1410—Deutsche Post/Danzas.

²⁶ When it acquired its interests in DHL DPAG indirectly acquired a small shareholding in Ducros Services Rapides, a French parcel delivery company which had an agreement with DHL. In December 1998 it acquired a controlling interest in Ducros Services Rapides.

²⁷ Approved by the Commission under Case No. IV/M.1513—Deutsche Post/Danzas/Nedlloyd. Nedlloyd was to become part of Danzas.

²⁸ Approved by the UK's Competition and Markets Authority in 2003.

²⁹ Since 2013 called Yodel Delivery Network Limited.

³⁰ Not opposed by the UK's Office of Fair Trading (OFT) under reference ME/4389/10.

B2C delivery operations. One of the issues which the UK's OFT³¹ considered was “whether the merger may give HDN the ability and incentive to foreclose ‘upstream’ parcel delivery services to ‘downstream’ rivals of Shop Direct.”³² However, in December 2016 DPAG acquired control of UK Mail Group plc, a competitor of Yodel.³³ In 2018 this company's name was changed to DHL Parcel UK Limited.

2.5.2 La Poste (France)

La Poste adopted a different approach.³⁴ It established a holding company Geopost SA for its parcels and logistical businesses. It initially developed a ground transport network based on a franchise model. Its first acquisitions were the Parceline (UK) and Interlink (Ireland) networks from Mayne Nickless.³⁵ The next step was to acquire the franchise network of Deutsche Paket Dienst, which at the time operated in six European countries.³⁶ This was a rather convoluted transaction: La Poste increased its stake in Denkhäus to 51%; because of Denkhäus' holdings in DPD La Poste acquired a right of veto on all decisions of DPD's meeting of shareholders; La Poste therefore acquired control of DPD within the meaning of Article 3 of the Merger Regulation.³⁷

In 2008 La Poste/Geopost united its express parcel companies in Europe under one single brand—DPD.³⁸ In 2015 it rebranded the holding company as GeoPost/DPDgroup. The Group operates in many countries worldwide under various names including Jadlog (Brazil), Tigers (US, Australia), and the Lenton Group (Hong Kong, China, India, etc.). In October 2021, GeoPost/DPDgroup acquired a 24.9% stake in Aramex, the Dubai-based international express parcel operator.³⁹

2.5.3 Royal Mail (UK)

While there are some similarities with La Poste's approach, Royal Mail has essentially followed a third route. Royal Mail built a ground-based European network based on the acquisition of a German franchised network—German Parcel. It created

³¹ Office of Fair Trading.

³² A similar concern currently arises in the case of Amazon—see Press Release of 6 July 2022 “CMA investigates Amazon over suspected anti-competitive practices.”

³³ Approved by the Commission under Case M.8280—Deutsche Post DHL/UK Mail.

³⁴ See <https://www.lapostegroupe.com/en/geopost-dpdgroup-parcel-delivery-in-france-and-abroad>.

³⁵ Case No. COMP/M.2236-SHFCLP (La Poste)/Mayne Nickless Europe.

³⁶ Germany, Belgium, Luxembourg, The Netherlands, Switzerland, and the Czech Republic.

³⁷ Case No. IV/M.1371—La Poste/Denkhaus 26.02.1999.

³⁸ Dynamic Parcel Distribution as opposed to Deutsche Paket Dienst.

³⁹ See Geopost press release <https://www.dpd.com/group/en/news/geopost-dpdgroup-increases-its-stake-in-aramex-to-24-9/>.

a new company General Logistics Systems BV, registered in the Netherlands, to acquire German Parcel and which has also been the channel through which its other acquisitions have been channeled. It is managed at arm's length.

There is one significant difference between the two legacy operators' approach. La Poste provides services in France under the DPD brand. Royal Mail however maintains an arm's length distance from GLS. GLS does not collect or deliver parcels in Britain; Royal Mail's parcel division Parcelforce Worldwide delivers parcels on behalf of GLS in Britain, and it uses GLS to deliver parcels on its behalf through its European network.

3 Consumer Protection

Consumer Protection was not explicitly mentioned in the Treaty of Rome. It was not until the Maastricht Treaty was signed on 7 February 1992 that specific provision was made for consumer protection—Article 129a (now Article 169 TFEU). The three European Directives of particular relevance to the postal and related services are discussed in the following paragraphs. In addition, the European Institutions have imposed specific sectoral requirements such as Telecoms roaming charges, Airline passenger rights, etc.

Directive 93/13/EEC on unfair terms in consumer contracts is significant because Article 3 provides that a contractual term which has not been individually negotiated shall be regarded as unfair if it causes a significant imbalance in rights and obligations to the detriment of the consumer. Postal services were and are invariably provided on the basis of non-negotiable terms and conditions which historically excluded the right to reimbursement and/or compensation. Recital 34 of the Postal Directive (1997) confirms that Directive 93/13/EEC applies to postal operators.

Directive 2011/83/EU on consumer rights is especially important in a postal sector context as it sets out the obligations on e-commerce sellers to consumers, and which de facto preclude the use of postal services for fulfillment of orders. Hearn (2022-2) discusses this point but it worth emphasizing the view of Ecommerce Europe,⁴⁰

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.

Directive (EU) 2019/2161 amended Directives 93/13/EEC, 98/6/EC, 2005/29/EC, and 2011/83/EU to assure the better enforcement and modernization of the consumer protection rules. It introduced a new article, Article 6a, into the original Directive 2011/83/EU which sets out new specific information requirements for contracts concluded on online marketplaces.

⁴⁰ In its submission to the EU Commission Public consultation on the review of the Postal Directive 9 November 2020.

4 Postal Regulation

Following the reforms of the nineteenth-century postal services were invariably provided by the State and protected by a state monopoly. An important point was that the monopoly was restricted to “Letters” and other items of correspondence. There was no mention of freight or parcels containing merchandise or other services often provided by postal administrations including savings service, telephones, and telegraphs. Indeed, some European Countries, notably France, Belgium, and Spain did not provide postal parcel services until near the end of the twentieth century.⁴¹

As already noted, the provision of postal services by the State, or public undertakings, appeared to be inconsistent with the Treaty of Rome. Initially the status of postal operators was not challenged, but postal operators were changing in response to commercial, environmental, and political vicissitudes. Hearn (2020) analyzed many of the changes during this period. State provision was eliminated by the transformation of postal administrations into state-owned companies or public corporations, some of which were eventually privatized. Electronic communications were divested. It was the emergence of competition in response to quality deficiencies that ultimately led to challenges to the postal monopolies. Some of the competition cases have been noted in Sect. 2.4.

4.1 *Green Paper*

In 1992 the European Commission published its Green Paper on the development of the Single Market for Postal Services. This started the process leading to the removal of all special or exclusive rights in the European postal services market. The Postal Directive (1997) initiated a scheme of Postal Regulation. This set out to ensure the gradual and controlled liberalization of the European postal services market, rather than risking immediate and uncontrolled liberalization as a result of an unfavorable decision in the Courts. Parcel and express services were not part of the area reserved for the public undertakings and therefore did not need to be liberalized.

4.2 *Universal Service Obligations*

The Postal Directive (1997) also guaranteed that postal services would remain accessible everywhere and to everyone under the same conditions. To achieve this it required the imposition of Universal Service Obligations (USO). These include specific requirements in terms of scope and quality of the services to

⁴¹ 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.

be provided, price controls more stringent than those applicable under competition law,⁴² accounting transparency and complaints procedures including, where warranted, a system of reimbursement and/or compensation. This aspect is of greater importance today given the decline in the market and the lack of competition as discussed in Hearn (2022-2).

4.3 *Scope of Postal Services as Defined by Postal Directive*

The scope of postal services is quite limited. Section 3 of Hearn (2022-2) *Regulation: Quo Vadis? Revisited* discussed the issues in depth. Suffice it to say here that the CJEU has confirmed⁴³ the scope is limited to services involving the “*clearance, sorting, transport and distribution of postal items.*” The Postal Directive 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.

Article 19 of the Postal Directive makes it clear that the provider of a service for postal items must have legal obligations to both the sender and addressee.

4.4 *Courier Express Parcel Services*

For the last three decades of the twentieth century, there were reductions in the quality of the monopoly postal services in many countries, especially the number of deliveries per day. This led to the emergence of competition in the form of courier services, within cities, nationally and internationally. In many cases, international networks such as TNT Skypack, DHL, and FedEx⁴⁴ used onboard couriers before developing their own air networks.

In the early days, the courier services were focused on carrying documents, exploiting loopholes in the postal monopolies.⁴⁵ But courier services, just as much as the monopoly postal services, were impacted by the emergence of email, the internet, and electronic communications generally. The global companies such as FedEx,

⁴² For example the ceiling is “affordable prices” rather than “excessive Prices.”

⁴³ Confetra Judgment of 31 May 2018 (Joined Cases C-259/16 and C-260/16, EU:C:2018:370).

⁴⁴ UPS always focused on parcels.

⁴⁵ Examples of loopholes include exemption of self-provision and “employment of a messenger” from the monopoly.

TNT, DHL, and UPS therefore began to focus instead on the carriage of merchandise (often in parcels). New Regional companies emerged, e.g., DPD, GLS.⁴⁶ This presents significant issues for competition authorities in terms of market definition.

4.5 Other Services Provided by Postal Administrations

Equally it must be acknowledged that the postal administrations originally responsible for the state-controlled monopolies often provide services outside the scope of the limited definition of postal service. These include financial services, electronic communications services, parcel delivery and freight services, and even printing services. Frequently these services are provided in competition with economic operators. Some of these services can legitimately be considered as part of a wider postal, logistics, and delivery sector, but outside the scope of postal regulation.

5 The Confluence of Competition Law, Consumer Protection, and Postal Regulation

The third Postal Directive (2008) achieved the objective of elimination of monopolies and there were no reserved areas after 2013—see Hearn (2018) for more details. However the need to guarantee the provision of a universal postal remained, and indeed became more important given the decline in the size of the postal services market. The Postal Directive (2008) therefore made provision for universal service providers to be compensated for the net cost of providing the universal service when this net cost represents a burden for the operator.

The issue of whether postal regulation would be necessary once the market has been liberalized has long been debated—see for example Tilburg (2005) and IPC (2007). These issues have been considered in detail in Hearn (2018), which concluded, “[I]f 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.”

The Commission’s Application Report (2015) recognized that significant change had taken place but made no specific proposals for reform. Neither did the Application Report (2021) 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.” These conclusions were broadly in line with the submissions of most stakeholders, with the exception of the European Regulators. See Hearn (2022-2) for more details.

⁴⁶ See Sects. 2.5.2 and 2.5.3.

6 ERGP Concerns

While most stakeholders accept this position, the ERGP⁴⁷ continues to argue that the scope of postal regulation should be increased. In its response to the Commission’s 2021 report, the ERGP argues the case for “a ‘greenfield approach’ on the ground of the fundamental shifts that have taken place in the postal sector since the last revision of the PSD in 2008.”⁴⁸ It also argues that “the regulatory framework needs to adapt to the development of a competitive market,” and that there is a “need for clear rules on consumer protection, which should be explored and adopted in a new and updated regulatory framework.”

Equally there is concern that new entrants, the so-called disrupters and those operating in the “gig economy,” are using their dominance in upstream digital markets to compete unfairly in more mainstream markets. Specifically the ERGP argues that

new players have entered the postal market such as online platforms bringing together demand and supply in e-commerce. Some of these platforms are gradually evolving from simple match-making intermediaries to full-service providers, integrating activities along the physical value chain and offering multiple services to senders and customers, creating potential competition threats in the postal sector.

However, it seems that it is competition law rather than an expanded Postal Regulatory Framework that is better placed to deal with these concerns. Both the European Commission and the UK’s CMA have already launched investigations into concerns in this regard.

On 17 July 2019, the Commission opened a formal investigation to assess whether Amazon’s use of non-public data from independent retailers selling in its marketplace breached EU competition rules. In parallel, the Commission opened a second investigation into Amazon’s Buy Box and Amazon’s Prime program. The Commission is currently examining commitments offered by Amazon to address the Commission’s concerns. See also the Press Release “CMA investigates Amazon over suspected anti-competitive practices” published on 6 July 2022.⁴⁹

There are undoubtedly issues concerning the actions of online platforms. But it is demonstrably better to use existing competition law, and consumer protection law, rather than putting in place an expanded system of postal regulation, either in terms of the definition of postal service or the obligations on service providers. It must be remembered that the European Commission is constrained by the tests developed by the Commission for the introduction of sectoral regulation: Are there high and persistent barriers to entry? Is there no prospect of effective competition over time? Will competition law alone not suffice to address problems?

In the author’s opinion there is no prospect of effective competition over time for the provision of postal services (as currently defined). But this is because of declining

⁴⁷ European Regulators Group for Postal Services.

⁴⁸ ERGP 22(4).

⁴⁹ <https://www.gov.uk/government/news/cma-investigates-amazon-over-suspected-anti-competitive-practices>.

demand rather than barriers to competition. The real issues concern services outside the limited scope of postal services as defined in the Postal Directives. The existing legislation does not appear to require urgent adaptation. But it is necessary to consider the institutional aspects of enforcement of competition and consumer protection law and postal regulation.

7 Enforcement and Conclusions

Enforcement of competition law was initially centralized within the European Commission. Regulation No. 17 of 21 February 1962.⁵⁰ By the turn of the century, the centralized scheme was no longer suitable. Council Regulation (EC) No. 1/2003 of 16 December 2002 proposed that the Commission should concentrate its resources on curbing the most serious infringements and therefore reduce the costs imposed on undertakings. Article 35 required Member States to designate the competition authority or authorities responsible for the application of Articles 81 and 82 of the Treaty.

7.1 Institutions

Article 11 of Regulation (EC) No. 1/2003 makes specific provision for “cooperation between the Commission and the competition authorities of the Member States” regarding the enforcement of competition law. Regulation (EC) No. 2006/2004 requires the competent authorities in the Member States designated as responsible for the enforcement of consumer protection laws to cooperate with each other and with the Commission to ensure compliance with those laws and to enhance the protection of consumers’ economic interests.⁵¹ Article 22(1) of the third Postal Directive (2008) requires that:

Member States shall ensure, where appropriate, consultation and cooperation between those [National Regulatory] authorities and national authorities entrusted with the implementation of competition law and consumer protection law on matters of common interest.

Despite the considerable overlap between competition law, consumer protection, and postal regulation, the institutional arrangements appear to be far from ideal. In the Netherlands, the Authority for Consumers and Markets (ACM) is responsible for competition law enforcement, consumer protection, and postal regulation which enable the authority to decide on the most appropriate legal measure to deal with

⁵⁰ First Regulation implementing Articles 85 and 86 of the Treaty.

⁵¹ This objective is carried forward in its replacement Regulation (EU) 2017/2394.

any particular issue. In Estonia the Estonian Competition Authority is also the postal regulator. Five Member States (and the UK) give the Postal Regulator equal (Latvia, UK) or exclusive (Germany, Greece, Luxembourg, and Poland) authority over application of the competition rules in the postal sector. In the other 20 Member States enforcement of the competition rules are committed to the national competition authority alone.

7.2 *Double Jeopardy*

It seems to the author that the institutional separation of competition law enforcement and postal regulation may not be best practice. A recent case in Belgium⁵² (discussed in detail by Fratini in this volume) underlines that undertakings may be liable more than once on the same material facts when authorities act a under different legal basis but in a complementary manner. The particular case relates to a discount tariff scheme operating in 2010 and 2011 allegedly discriminatory against certain customers. Bpost was fined €2.3 m by Postal Regulator (which was annulled by Brussels Court of Appeal) and €37.4 m by the Belgian Competition Authority. Such duplication is unlikely to happen where a single Authority is responsible for competition law enforcement, consumer protection, and postal regulation.⁵³

8 Conclusions

The scope of postal services is quite limited. Following the elimination of postal monopolies Postal Regulation is now focused on ensuring that the postal universal service (services of general economic interest) meets the needs of users. Postal service providers and other economic undertakings are now competing in a wider postal, logistics, and delivery sector. Rather than extending the scope of Postal Regulation into this sector it seems more efficient and effective to harmonize the relationship between Postal Regulators and National Competition Authorities, preferably on the model adopted in the Netherlands, or as a minimum the model adopted in Estonia, Latvia, Germany, Greece, Luxembourg, and Poland.

⁵² Case C-117/20 Bpost.

⁵³ See Fratini A “Double jeopardy between regulatory and competition proceedings: the bpost judgement and the DMA” in this book for more details.

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Double Jeopardy Between Regulatory and Competition Proceedings: The *bpost* Judgment and the Digital Markets Act



Alessandra Fratini

Abstract With its judgment in the *bpost* case, the Court of Justice clarified that the protection against double jeopardy (principle of *ne bis in idem*), enshrined in Article 50 of the Charter of Fundamental Rights of the EU, does not preclude an undertaking from being penalized for an infringement of competition law where, on the same facts, it has already been the subject of a final decision for failure to comply with sectoral rules, subject however to specific conditions, including the “strict necessity test”. The judgment was welcome as signaling a shift in the case law towards a unified test for *ne bis in idem* across EU law, including EU competition law, where the principle had been applied more narrowly. The judgment bears implications for the enforcement of the upcoming Digital Markets Act: as compliance with the strict necessity test can only be verified *ex post*, the test does not prevent the duplication of investigations under the DMA and (EU and national) competition law.

Keywords Double jeopardy · *Ne bis in idem* · DMA · Duplication · Necessity test

1 Introduction

The protection against double jeopardy (principle of *ne bis in idem*), enshrined in Article 50 of the Charter of Fundamental Rights of the EU as regards criminal proceedings, is a fundamental principle of EU law. It precludes an undertaking from being subject to new proceedings against it on the grounds of conduct for which it has been convicted or acquitted by an earlier decision that can no longer be challenged. The principle is subject to a twofold condition: that there is a prior definitive decision (the “*bis*” condition) and that such prior decision and the subsequent proceedings concern the same person and the same offense (the “*idem*” condition). In competition law matters, however, the Court of Justice of the EU has interpreted the principle narrowly and required, for the application of the “*idem*” condition, an additional

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third criterion, i.e., that not only the offender and the facts, but also the protected legal interest must be the same.¹

The competition-specific criterion, or rather the double jeopardy test being different depending on which area of law is concerned, has been questioned several times. In *bpost*, the Court of Justice was asked to clarify the application of *ne bis in idem* in a situation where the national competition authority imposes a fine on an undertaking that has already been fined by the postal regulator for the same conduct (a rebate system) on the basis of sector-specific regulation. On 23 March 2022, the Court issued its judgment and clarified that the protection conferred by the Charter does not preclude an undertaking from being penalized for an infringement of competition law where, on the same facts, it has already been the subject of a final decision for failure to comply with sectoral rules, subject however to specific conditions.²

After a concise overview of the two lines of case law of the Court of Justice on the *ne bis in idem* principle in Sect. 2, Sect. 3 reviews the facts and proceedings of the *bpost* case at national level, and then Sect. 4 focuses on the *bpost* judgment. The chapter goes on to discuss the implications of the judgment for the enforcement of the Digital Markets Act,³ as a number of its recitals⁴ make it clear that the Regulation aims at protecting “a different legal interest” from the competition rules and is without prejudice to Articles 101 and 102 TFEU, the corresponding national competition rules and other national competition rules regarding unilateral behavior (Sect. 5). Section 6 briefly concludes.

2 The *ne bis in idem* Principle and the Two Lines of Case Law of the Court

The principle of *ne bis in idem* precludes a person from being subject to new proceedings against her/him on the grounds of conduct for which she/he has been convicted or acquitted by an earlier decision that can no longer be challenged. The principle, which is common in the Member States’ legal traditions and has been enshrined in Article 4 of Protocol 7 to the ECHR, acquired added recognition at European level with its inclusion in the Charter of Fundamental Rights of the EU,⁵ whose Article 50 provides that “no one shall be liable to be tried or punished again in criminal proceedings for an offence for which he or she has already been finally acquitted or convicted within the Union in accordance with the law”.

¹ Court of Justice, judgments of 7 January 2004, *Aalborg Portland A/S*, joined cases C-204/00 P et al., EU:C:2004:6; and of 14 February 2012, *Toshiba*, case C-17/10, EU:C:2012:72.

² Court of Justice, judgment of 22 March 2022, *bpost*, case C-117/20, EU:C:2022:202.

³ Regulation on contestable and fair markets in the digital sector and amending Directives (EU) 2019/1937 and (EU) 2020/1828 (Digital Markets Act), not yet published in the Official Journal.

⁴ See recitals 9, 10, 11.

⁵ OJ C 326, 26.10.2012, p. 391.

It began as a criminal law principle under which a person cannot be punished and subject to several procedures twice for the same facts. The Court of Justice expanded its scope to cover not only formally criminal proceedings but also administrative punitive proceedings with a criminal nature in light of the so-called Engel criteria, developed by the European Court of Human Rights to establish whether or not there was a “criminal charge”.⁶ Three criteria are relevant in this respect: the legal classification of the offense under national law; the intrinsic nature of the offense and the degree of severity of the penalty, which the person concerned is liable to incur.⁷ That resulted in a growing list of administrative procedures and sanctions considered criminal, and thus a growing range of procedures and sanctions requiring the assessment of the *idem*—with the possible consequence that any and every second set of administrative or criminal proceedings be found barred, irrespective of the various purposes it may pursue.

In that respect, as Advocate General Bobek put it in his Opinion in *bpost*, “[a]t EU level, the principle *ne bis in idem* has developed in what can best be described as successive waves of case-law”.⁸ The Court of Justice has interpreted the principle more narrowly when applying it to competition law cases. In fact, while in general the principle is subject to a twofold condition—that there is a prior definitive decision (the “bis” condition) and that such prior decision and the subsequent proceedings concern the same person and the same offense (the “idem” condition)—in competition law matters the Court of Justice required, for the application of the “idem” condition, an additional third criterion, i.e. that not only the offender and the facts, but also the protected legal interest must be the same.

At the origins of the case law on *ne bis in idem* in competition matters is the 1969 judgment in *Wilhelm and Others*,⁹ which concerned parallel investigations in a cartel carried out by the German Competition Authority and by the Commission. The Court of Justice held that the *ne bis in idem* principle did not preclude parallel proceedings, because of the different legal interest protected by EU and national competition laws. This stringent test, with the additional condition of the identity of the legal interest protected, was confirmed in 2012 by the *Grande Chambre* in *Toshiba*,¹⁰ where the Court held that the Commission and the national competition authorities can respectively apply the European and the national competition rules to the same company for the same facts because the two sets of rules are considered to view restrictive practices in a different manner. In this respect, however, it has been argued by Advocate General Bobek in *bpost*, “*in similar vein to all [his] learned colleagues who have taken a position on that issue in the past*”, that it is difficult to

⁶ See, *ex multis*, X. Groussout, A. Ericsson (2016), D. Sarmiento (2016).

⁷ Judgments of 5 June 2012, *Bonda*, C-489/10, EU:C:2012:319, pt. 37, and of 20 March 2018, *Menci*, C-524/15, EU:C:2018:197, pt. 26 and 27.

⁸ See, AG Opinion, *bpost*, case C-117/20, EU:C:2021:680, pt. 42.

⁹ Judgment of 13 February 1969, *Wilhelm and Others*, case 14/68, EU.1969:4, pt. 2–9.

¹⁰ Court of Justice, judgment of 14 February 2012, *Toshiba*, case C-17/10, EU:C:2012:72. The same approach was accepted by the European Court of Human Rights until its decision in *Zolotukhin v. Russia*.

maintain that the scope of the protection conferred by Article 50 of the Charter may be different depending on the area of EU law to which it is applied.¹¹

In a second wave (*Menci*, *Garlsson* and *Di Puma*),¹² the Court shifted the analysis from Article 50 to the limitation of rights clause enshrined in Article 52(1) of the Charter,¹³ which sets the conditions for limitations on the exercise of the rights and freedoms recognized by the Charter. The relevant judgments concerned a second set of proceedings brought on account of tax evasion, market manipulation and insider trading delicts, in spite of the fact that previous criminal proceedings had already been initiated for the same acts. In those cases, the Court admitted that a duplication of proceedings was justified under Article 52(1) of the Charter for the purpose of achieving complementary aims, subject to the condition that the national laws allowing such duplication pursued an objective of general interest, contained “rules ensuring coordination which limits to what is strictly necessary the additional disadvantage which results, for the persons concerned, from a duplication of proceedings, and provides for rules making it possible to ensure that the severity of all of the penalties imposed is limited to what is strictly necessary in relation to the seriousness of the offense concerned”.¹⁴

In his Opinion in *bpost*, Advocate General Bobek found it difficult to see how the case law in *Toshiba* and in *Menci* could be reconciled and applied in one and the same proceeding.¹⁵ In his view, the *bpost* case offered the Court a unique opportunity to provide coherent guidance on the scope of the protection conferred by Article 50.

3 The *bpost* Case: Facts and Proceedings at the National Level

The dispute in the main proceedings concerned the quantity rebate scheme applicable to bulk mailers and consolidators, which *bpost* had introduced in 2010. Differently from before, the rebate granted to a consolidator was no longer calculated on the basis of the total volume of mail items from all the bulk mailers to which it provided

¹¹ Opinion, pt. 92, referring to the three Advocates General who have criticized that criterion (Advocate General Kokott, in *Toshiba*, pt. 114 to 122; Advocate General Wahl in *Powszechny Zakład Ubezpieczeń na Życie*, C-617/17, EU:C:2018:976, pt. 45; and Advocate General Tanchev in *Marine Harvest*, C-10/18 P, EU:C:2019:795, pt. 95).

¹² Court of Justice, judgments of 20 March 2018, *Menci*, case C-524/15, cit.; *Di puma*, case C-596/16, EU:C:2018:192; *Garlsson Real Estate*, case C-537/16, EU:C:2018:193. *Ex multis*, see, M. Luchtman (2018), G. Lo Schiavo (2018), M. Vetzo (2018).

¹³ Article 52(1) of the Charter: “Any limitation on the exercise of the rights and freedoms recognised by this Charter must be provided for by law and respect the essence of those rights and freedoms. Subject to the principle of proportionality, limitations may be made only if they are necessary and genuinely meet objectives of general interest recognised by the Union or the need to protect the rights and freedoms of others”.

¹⁴ Court of Justice, judgment of 20 March 2018, *Menci*, cit., pt. 45.

¹⁵ Opinion, pt. 6.

their services. It was based on the volume of mail items generated individually by each of its bulk mailers.

In its decision of 20 July 2011, the Belgian Regulatory Authority for Postal Services (IBPT) fined bpost €2.3 million on the ground that its discount system was based on an unjustified difference in treatment between bulk mailers and consolidators.¹⁶ bpost challenged the decision before the Brussels Court of Appeal, which in turn requested a preliminary ruling from the Court of Justice on the interpretation of Article 12 of the Postal Services Directive.¹⁷ In its judgment of 11 February 2015,¹⁸ the Court of Justice held that bulk mailers and consolidators are not in comparable situations with regard to the objective of *per sender* quantity discounts, which is to stimulate demand, since only bulk mailers are in a position to be encouraged by that system to increase the volume of mail handed on to bpost and its turnover. As a result, different treatment between those two categories of clients was not discriminatory and did not breach Article 12 of the Postal Services Directive. The Brussels Court of Appeal, by judgment of 10 March 2016, annulled the IBPT's decision.

In the meantime, in its decision of 10 December 2012, the Belgian Competition Authority found that the different treatment under the same rebate scheme constituted an abuse of dominant position in breach of Article 102 TFEU and its equivalent national provision, in so far as it placed consolidators at a competitive disadvantage to bpost by encouraging major clients to contract directly with the latter. It fined bpost €37.4 million for the application of that rebate system between January 2010 and July 2011.¹⁹ The amount of the fine was calculated considering the fine previously imposed by the IBPT. bpost applied to the Court of Appeal for the annulment of the decision, invoking the *ne bis in idem* principle. It argued that the judgment of 10 March 2016 had ruled on the merits of the IBPT's decision in relation to acts essentially the same as those at issue in the action taken by the competition authority (*i.e.*, the "per sender" tariffs of 2010). Based on that principle, the Court of Appeal held that the proceedings before the competition authority had become inadmissible and annulled the 2012 decision.

Following the appeal of the Belgian Competition Authority, and relying on Article 52(1) of the Charter, the *Cour de Cassation* held that Article 50 of the Charter does not preclude the duplication of criminal proceedings, within the meaning of that provision, based on the same facts, even where one set of proceedings has ended in a final acquittal, when—subject to the principle of proportionality and for the purpose of attaining a general interest objective—those proceedings cover different aspects of the same unlawful conduct. With its judgment of 22 November 2018, the *Cour de Cassation* set aside the judgment of the Court of Appeal and referred the case back to it.

¹⁶ Decision adopted pursuant to Article 144ter of the Law of 21 March 1991 on the reform of certain public commercial undertakings, which transposed the Postal Services Directive into Belgian law.

¹⁷ Directive 97/67/EC, as amended, *cit.*

¹⁸ Court of Justice, judgment of 11 February 2015, *bpost*, case C-340/13, *cit.*

¹⁹ Decision 2012-P/K-32 of 10 December 2012, Affaires CONCP/ K-05/0067, CONC-PIK-09 0017 et CONC-P/K-10/0016 Publimail, Link2Biz International et G3 Worldwide Belgium/bpost.

The Court of Appeal raised two questions to the Court of Justice for a preliminary ruling, as suggested by both the Belgian Competition Authority and the European Commission, who had intervened as *amicus curiae*. The former claimed that its decision did not breach the *ne bis in idem* principle, as interpreted by the Court of Justice in its competition case law, i.e., as including the additional criterion of the “legal interest protected” for the purpose of defining the *idem factum*. Recalling the judgment in *Toshiba*,²⁰ the Competition Authority maintained that the two proceedings (the one of the IBPT and its own) had complementary objectives covering different aspects of the same unlawful conduct and, therefore, they protected different legal interests.

The Commission also pleaded against the application of *ne bis in idem* principle in the case at hand,²¹ highlighting the risk of depriving competition law of its scope and making it ineffective, were the different legal interests protected by the applicable sets of rules not taken into account.²² It said, “[that] is crucial to preventing an undertaking that has been prosecuted under sectoral rules that pursue a very specific objective from being able to rely on the principle *non bis in idem* in order to evade the application of competition law”.²³ The Commission said that this case did not imply an exception to the principle (Article 52 of the Charter) but the principle itself was not applicable (Article 50 of the Charter) to the case, since there was no legal *idem factum* in the sense used in *Toshiba*. The case concerned two separate sets of proceedings, for two different offenses based on different laws, which are applicable simultaneously within the same Member State but pursue distinct and complementary legal interests.

The Court of Appeal noted that sector-specific legislation and competition law do not pursue the same aim. The two sets of proceedings find their basis “in different legislation intended to protect different legal interests, that is to say, first, ensuring the liberalization of the postal sector by means of transparency and non-discrimination obligations and, secondly, ensuring free competition within the internal market by prohibiting operators from abusing their dominant position”.²⁴

While it *prima facie* appeared that the *ne bis in idem* principle should not apply, the Court of Appeal shared the hesitation voiced by some Advocates General of the Court of Justice and decided to raise two preliminary questions to the Court of Justice. With the first question, it asked whether the *ne bis in idem* principle prevents a national competition authority from imposing a sanction for an offense that has already been subject to an administrative fine by the national postal regulator, in so far as the protected legal interest is different.²⁵ In essence, the national judge asked

²⁰ Court of Justice, judgment of 14 February 2012, *Toshiba*, case C-17/10, EU:C:2012:72.

²¹ Summary of the request for a preliminary ruling, case C-117/20, pt. 35.

²² *Ibidem*, pt. 40.

²³ *Ibidem*, pt. 42.

²⁴ *Ibidem*, pt. 44–64.

²⁵ “Must the principle *non bis in idem*, as guaranteed by Article 50 of the Charter, be interpreted as not precluding the competent administrative authority of a Member State from imposing a fine for infringing EU competition law, in a situation such as that of the present case, where the same legal person has already been finally acquitted of an offence for which an administrative fine had been

whether it should apply the “*idem*” test for the combination of two competition proceedings, as confirmed in *Toshiba*.

With its second question,²⁶ the referring court asked whether the legality of the second proceedings should be instead examined under the limitation of rights clause and the test established for the combination of criminal and administrative proceedings in the *Menci, Di Puma, Garlsson Real Estate* case law, i.e., if the circumstances of the case called for a restriction of the *ne bis in idem* principle, justified by the fact that competition law pursues a complementary objective of general interest, subject to the principles of necessity and proportionality. In other words, the doubt of the national judge concerned the test to be applied in the assessment of the *idem*: the one established in *Toshiba* or the one established in *Menci*?

4 The Judgment of the Court

While the Advocate General, after having examined the problems raised by the existing parallel regimes,²⁷ had proposed making the examination of the protected legal interest part of the consideration of the *idem*, thereby suggesting a unified test that should rely on a threefold identity (of the offender; of the relevant facts; and of the protected legal interest), the Court took a different approach. Instead of opting, as suggested, for the *Toshiba* test and extending it to all fields of EU law, the Court chose *Menci* as the basis for a unified test.

Without touching upon the parallel regimes, the Court moved from the *ne bis in idem* principle as laid down in Article 50 of the Charter and applied it to the case at issue, subject to verification by the referring court. After noting that the criminal classification of the two proceedings was not in question, it recalled that the principle is subject to the twofold condition of there being a prior final decision (the *bis*) and of the prior decision and the subsequent proceedings or decision concerning the same facts (the *idem*). As for the “bis”, for a judicial decision to be regarded as having

imposed on it by the national post regulator for an alleged infringement of postal legislation, on the basis of the same or similar facts, in so far as the criterion that the legal interest protected must be the same is not satisfied because the case at issue relates to two different infringements of different legislation applicable in two separate fields of law?”.

²⁶ “Must the principle non bis in idem as guaranteed by Article 50 of the Charter, be interpreted as not precluding the competent administrative authority of a Member State from imposing a fine for infringing EU competition law, in a situation such as that of the present case, where the same legal person has already been finally acquitted of an offence for which an administrative fine had been imposed on it by the national postal regulator for an alleged infringement of postal legislation, on the basis of the same or similar facts, on the grounds that a limitation of the principle non bis in idem is justified by the fact that competition legislation pursues a complementary general interest objective, that is to say protecting and maintaining a system of undistorted competition within the internal market, and does not go beyond what is appropriate and necessary in order to achieve the objective that such legislation legitimately pursues, and/or in order to protect the right and freedom to conduct business of those other operators under Article 16 of the Charter?”.

²⁷ Opinion, pt. 81–117.

given a final ruling on the facts subject to a second set of proceedings, that decision must not only have become final but must also have been taken as to the merits of the case,²⁸ which appeared to be the case for the annulment of the IBPT's decision.

As for the "idem", the two sets of proceedings shall concern the same person for the same offense. According to what the Court interestingly defined a "settled case-law",²⁹ referring to *Menci* and *Garlsson*, the existence of a same offense requires identity of the material facts, understood as the existence of a set of concrete circumstances, which are inextricably linked together in time and space and which have resulted in the final acquittal or conviction of the person concerned. The "idem" condition, in other words, requires the material facts to be identical, not just merely similar.

It is in this context that the Court, nonchalantly, clarified that the legal classification of the facts under national law and the legal interest protected are not relevant for the purposes of establishing the existence of the same offense, as the scope of the protection conferred by Article 50 of the Charter cannot vary from one Member State to another. The same holds true, in contrast to the Commission's contention, when it comes to the application of the *ne bis in idem* in the field of competition law, as the scope of protection cannot vary from one field of EU law to another, unless otherwise provided by EU law.³⁰

While it left it to the national judge to determine whether the facts under the sectoral and competition law proceedings were identical, in particular on account of the infringement period alleged, the Court concluded that, in the affirmative, the duplication of proceedings would constitute a limitation of the fundamental right guaranteed by Article 50 of the Charter. By extending, in essence, the *Menci* criteria to the antitrust sector, the Court went on by recalling that such a limitation may be justified on the basis of Article 52(1), if it meets the conditions thereof, namely: it is provided by law; it genuinely meets objectives of general interest recognized by EU laws; it complies with the principles of proportionality; and it is strictly necessary.

In this turn, the Court verified that those conditions were met in relation to the case at stake, subject to verification of the national judge.

(a) *Duplication provided by law*

The involvement of each of the two national authorities concerned was provided for by law, with the national legislation only providing for the possibility of a duplication of proceedings and penalties under different legislation (sectoral rules and competition law)—not on the basis of the same offense or in pursue of the same objective.³¹

²⁸ Judgment, pt. 29.

²⁹ *Ibidem*, pt. 33.

³⁰ *Ibidem*, pt. 34–35.

³¹ *Ibidem*, pt. 42–43.

(b) *Meeting objectives of general interest*

The two sets of legislation pursued distinct legitimate objectives. The national law incorporating the Postal Services Directive promotes liberalization of the internal market for postal services. Article 102 TFEU and national competition law ensure that competition is not distorted in the internal market. As such, it is legitimate for a Member State to punish infringements of the sectoral rules and of competition law, as also envisaged in recital 41 of the Postal Services Directive (“[w]hereas this Directive does not affect the application of the rules of the Treaty, and in particular its rules on competition and the freedom to provide services”).³²

(c) *Proportionality*

The Court acknowledged that the two sets of proceedings pursue different objectives of general interest, which it is legitimate to protect cumulatively. It then analyzed the proportionality of the duplication, provided that those proceedings are complementary (i.e., pursue complementary aims relating to different aspects of the same unlawful conduct). It found that resulting additional burden can accordingly be justified by the two objectives pursued and the overall penalties imposed correspond to the seriousness of the offenses committed.³³

(d) *Strict necessity*

Compliance with strict necessity is the condition that the Court considered most relevant for the purposes of the preliminary questions, which it wisely considered together. Under the relevant case law of the Court and of the European Court of Human Rights,³⁴ that condition requires clear and precise rules that make it possible to predict which acts or omissions are liable to be subject to a duplication of proceedings and penalties. The different authorities will also sufficiently coordinate the two proceedings within a proximate timeframe; and any penalty imposed in the first proceedings will be taken into account in the assessment of the second penalty. That means, in essence, taking account of “*the existence of a sufficiently close connection in substance and time between the two sets of proceedings involved*”, in line with *Menci* (pt. 61).

The Court left it to the national judge to ascertain whether the “strict necessity” condition was satisfied in the main proceedings, in the light of the circumstances of the case. Nevertheless, with a view to providing the referring court with a useful answer, the Court made three points. First, for the purposes of ensuring coordination between the authorities, the existence of a provision on the cooperation and exchange of information between the authorities concerned, like the one in the applicable Belgian law, appears to provide an appropriate framework.³⁵ Second, the

³² *Ibidem*, pt. 44–47.

³³ *Ibidem*, pt. 48–50.

³⁴ Judgment of 20 March 2018, *Menci*, cit., pt. 49, 52–53, 55 and 58, and ECtHR, 15 November 2016, *A and B v. Norway*, CE:ECHR:2016:1115JUD002413011, pt. 130–132.

³⁵ Article 14, Law of 17 January 2003 on the statute of the regulator of the Belgian postal and telecommunications sectors: «3° *coopère avec: (a) la Commission européenne; (b) les autorités de*

connection in time between the two sets of proceedings appears sufficiently close, the two decisions having been adopted about 17 months apart (20 July 2011 and 10 December 2012, respectively). Third, the fact that the second fine was larger than the one imposed in the first proceedings does not, in itself, demonstrate that the duplication of proceedings and penalties was disproportionate.

For those reasons, the Court ruled that “*Article 50 of the Charter, read in conjunction with Article 52(1) thereof, must be interpreted as not precluding a legal person from being fined for an infringement of EU competition law where, on the same facts, that person has already been the subject of a final decision following proceedings relating to an infringement of sectoral rules concerning the liberalisation of the relevant market, provided that there are clear and precise rules making it possible to predict which acts or omissions are liable to be subject to a duplication of proceedings and penalties, and also to predict that there will be coordination between the two competent authorities; that the two sets of proceedings have been conducted in a sufficiently coordinated manner within a proximate timeframe; and that the overall penalties imposed correspond to the seriousness of the offences committed*”.

5 Implications for the Enforcement of the DMA

The paper has reviewed the *ne bis in idem* principle in the *bpost* case against the background of the partially contradictory case law of the Court of Justice, with the aim of drawing the boundaries of its application in the current status of EU law.

The *bpost* judgment confirms that a restriction of the *ne bis in idem* can be justified under Article 52(1) of the Charter, which allows duplication of proceedings based on the same facts, when those proceedings have additional complementary objectives which cover different aspects of the same unlawful conduct. That is the case for postal services regulation and competition law, which can legitimately be applied cumulatively where the “strict necessity” test is satisfied. For delivery operators that have incurred in a final decision by the postal regulator, a second proceeding for the same facts by a competition authority (be it at the national or EU level) will not be barred by the *ne bis in idem* principle, where there was a framed cooperation between the authorities, the two proceedings and decisions were sufficiently close in time (1.5 year apart, as an indication) and the second fine took into account the fine previously imposed.

The same would apply, *mutatis mutandis*, to the parallel application of competition law and other sectoral regulation, in particular the DMA. With a view to addressing potential duplication of proceedings and the resulting fragmentation of the internal market, recital 9 provides that while Member States are prevented from applying national rules which are within the scope of and which pursue the same objectives as

régulation étrangères en matière de services postaux et de télécommunications; (c) les autorités de régulation des autres secteurs économiques; (d) les services publics fédéraux en charge de la protection des consommateurs; (e) les autorités belges en charge de la concurrence».

the DMA, they may apply to gatekeepers “other national legislation which pursues other legitimate public interest objectives as set out in the TFEU or overriding reasons of public interest as recognized by the case law” of the CJEU. The following recital is even more explicit when it comes to the requirements “duplication provided by law” and “meeting objectives of general interest”, as it states that “since this Regulation aims at complementing the enforcement of competition law, it should be specified that this Regulation is without prejudice to Articles 101 and 102 TFEU, to the corresponding national competition rules and to other national competition rules regarding unilateral behavior that are based on an individualized assessment of market positions and behavior, including its actual or likely effects and the precise scope of the prohibited behavior, and which provide for the possibility of undertakings to make efficiency and objective justification arguments for the behavior in question, and to national rules concerning merger control”.³⁶

Following the *bpost* judgment, where a gatekeeper is subject to two separate proceedings for the same unlawful facts, under the DMA and national competition law, each run by a distinct authority, a limitation of the protection against double jeopardy would be justified only where the two proceedings pursue, for the purposes of the respective legitimate public interest objectives, complementary objectives concerning different aspects of those same facts—which is in principle, as stated in the recitals above, the case. In fact, however, compliance with the strict necessity test would also require that the two authorities have actually cooperated in the course of the (proximate) proceedings and that any fine imposed in the first proceedings has been taken into account when setting the fine in the second proceedings. That is a test that can only be run *ex post*, when a judge is called to assess the application of Article 52(1) of the Charter to a situation of double proceedings, having regard to the particular circumstances of the case: as such, the test does not prevent the duplication of investigations and (possibly) fines. In other words, the *bpost* judgment apparently leaves the door open for duplication of proceedings under the DMA and (EU and national) competition law against the same gatekeeper for the same facts.

³⁶ See also Article 1(6). Recital 11 further explains that Articles 101 and 102 TFEU and the corresponding national competition rules, as well as merger control, have as their objective the protection of undistorted competition on the market. The DMA pursues an objective that is complementary to, but different from, that of protecting undistorted competition on any given market, as defined in competition law terms, “which is to ensure that markets where gatekeepers are present are and remain contestable and fair, independently from the actual, likely or presumed effects of the conduct of a given gatekeeper covered by this Regulation on competition on a given market. This Regulation therefore aims at protecting a different legal interest from those rules and should be without prejudice to their application” (emphasis added). Following the *bpost* judgment, the legal interest protected is no longer relevant for the purposes of the *ne bis in idem*.

6 Conclusion

To conclude, with new “*segments, layers, and sub-fields of regulation*”³⁷ being introduced in the digital services market, the potential overlap of mandates to investigate (and fine) and the resulting duplication of proceedings and penalties arising from the same facts make the limitations to the *ne bis in idem* crucially relevant for all operators concerned.

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³⁷ Opinion, *bpost*, cit., pt. 2.

Twenty-Five Years of the National Postal Regulators in the EU: A Critical Review



Mateusz Chołodecki

Abstract The regulatory framework needs a regulator. This is common for all infrastructure markets under sector-specific regulations in the EU. The main goal of the National Regulatory Authorities (NRA) is to safeguard the implementation of the regulatory goals. These goals focus on various issues, primarily economic (e.g., protecting competition) and social (e.g., safeguarding the universal service). The EU Directive 97/67/EC from 15 December 1997 (the first postal directive) established each Member State's requirement to designate one or more NRAs for the postal sector. Twenty-five years after the first postal directive, the EU is preparing new legal frameworks for the constantly changing postal sector. The new directive should resolve current crucial concerns, specifically the future role of the postal NRA. I critically evaluate the postal NRA in the EU legal framework and if the existing legal apparatus given to them has been sufficient to meet the regulatory goals. I present literature on postal NRAs and reports about implementation of EU directives in the Member States. I compare selected EU NRAs and focus on their characteristics of the EU regulators, particularly emphasizing their legal status. The author expresses his thanks to UKE for assistance in providing data, especially for Karol Krzywicki and Magdalena Sławińska.

Keywords Postal market · Postal regulation · NRA · Regulators · Sector-specific regulation · Regulatory power

1 Introduction

A regulatory framework needs a regulator. This is true of all infrastructure markets under sector-specific regulations in the EU. The main goal of National Regulatory Authorities (NRAs) is to safeguard the implementation of the regulatory goals in their given sectors. These goals essentially focus on different issues from economics (e.g., protecting competition, preventing monopoly pricing), including consumer

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protection, privacy, environmental effects, and other social regulation, particularly safeguarding universal service. Following past telecommunication regulation, the EU Directive 97/67/EC from 15 December 1997 (the first Postal Directive) required each Member State to designate one or more NRAs for the postal sector. According to this Directive, the purpose of the NRA was to ensure proper functioning of the universal service and to ensure undistorted competition in the non-reserved sectors of the postal market.

Twenty-five years after the first postal directive, the EU is preparing new legal frameworks for the constantly changing postal market. Any new directives must address current postal sector concerns, including the future role of the postal NRAs. With this in mind, this paper aims to investigate postal regulation by looking first at NRAs. In this chapter, I evaluate the postal NRAs in the EU legal framework and assess whether the existing legal apparatus has been sufficient to effectively pursue regulatory goals. In this research, I have asked most of the NRAs from the EU and UK to answer questions about their regulatory power and other structural informations. Fifteen of them have responded with pieces of facts, which have been presented in this paper.¹

Section 2 presents literature on the definition of regulation. Sections 3 and 4 focus on the role and the legal status of NRAs in EU law. Section 5 discusses the status of NRAs in selected EU Member States. Section 6 describes the NRAs' tasks under their Universal Service Obligations (USOs). Section 7 discusses other significant regulatory tasks. Finally, Section 8 concludes the paper.

2 Regulation

Why, in general, do we need regulation? In economics, regulation has been defined as “state intervention in the economic decisions of companies” (Foster 1992, p. 186). Thus, for economics, the reason for regulation is the need to correct market failures such as monopoly power or to increase the efficiency of a market (Majone, 1997).

Modern economic market regulation is a consequence of the liberalization process that came to Europe in the 1980s. This liberalization process removed legal barriers to entry. Along with this process, sector-specific regulation was introduced. Therefore, controlling market power in infrastructure markets, such as postal or telecom, can be done mainly through sector-specific regulation or competition rules (Geradin, 2004). De Streel (2008, p. 70) points out that: “substantive differences between antitrust and sector regulation are that sector regulation mainly deals with unsatisfactory market structures whereas competition law deals with unsatisfactory firms' behaviours.” In the context of the postal sector, opening markets to competition caused a specific

¹ These are Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Poland, Portugal, Spain, Sweden, and the UK. Unfortunately, not all of them have delivered all the necessary data.

risk to meeting public service obligations. In an open and competitive market, such a public service may no longer be provided, or provided at an unsatisfactory level.

Previous authors have considered two main motives for regulation: controlling market power (economic or pro-competitive regulation) and meeting universal (public) service obligations (social regulation) (Geradin, 2000; Prosser, 1997). In the postal market, these two regulatory objectives are strictly related because the obligation for universal service generally can be provided only by the former monopolist (incumbent operator).

According to Prosser, economic regulation can involve regulating monopoly with interventions such as price controls, and regulation for competition, which involves “creating the conditions for competition to exist and policing it to ensure that it continues to exist” (Prosser, 1997, p. 5). Regulation on the postal market encompasses both tasks. However, social regulation has contrasting objectives than economic regulation. The goal of economic regulation is to minimize the role of the incumbent operator. However, social regulation is “justified by the need to provide access to basic public services to all groups, independently of their level of wealth and location” (Geradin, 2000, p. 10), and, in the postal sector, only the incumbent operator can safeguard this.

3 National Regulatory Authorities

Enforcement of regulation and pursuit of the regulatory objectives need a public body. In most countries, sector-specific regulation is enforced by special regulatory agencies (RAs). The typical EU RA is the National Regulatory Authority. NRAs are defined as “administrative authorities, established at Member State level, that are separate from the central state administration and that are entrusted with specific regulatory or supervisory missions that involve the implementation of EU legislation” (De Somer, 2017, p. 581). The powers of NRAs can be categorized into three types: (i) advisory to other state bodies, (ii) decision-making powers, and (iii) ancillary to decision-making powers, e.g., investigation and auditing powers (De Somer, 2017).

EU legislation has established mandatory NRAs for each regulated sector, such as postal, telecom, and railways. While they differ, their institutional character and the elements required by the EU law include independence from market players and possession of statutory authority.² Table 1 shows the structure of EU NRAs. A common factor for all of them is that regulatory authority over the postal sector is combined with authority over telecommunication. Five NRAs are dedicated only to these two markets (France, Ireland, Poland, Portugal, and Sweden). Four other NRAs are additionally responsible for media (Austria, Belgium, Italy, and the UK).

² Recital 47 of the 3rd Postal Directive highlighted independence of the NRA: “In accordance with the principle of separation of regulatory and operational functions, Member States should guarantee the independence of the national regulatory authorities, thereby ensuring the impartiality of their decisions.”

Table 1 General structure of NRAs—sectoral coverage⁴

National Regulatory Authority in the EU						
Country	NRA	Postal	Telecom	Media	Railways	Electricity&Gas
Austria	RTR	■	■	■		
Belgium	BIPT	■	■	■		
Finland	Traficom	■	■	■	■	
France	ARCEP	■	■			
Germany	BNetzA	■	■	■	■	■
Ireland	ComReg	■	■			
Italy	AGCOM	■	■	■		
Luxembourg	ILR	■	■	■	■	■
Netherlands	ACM	■	■	■	■	■
Poland	UKE	■	■			
Portugal	ANACOM	■	■			
Spain	CNMC	■	■	■	■	■
Sweden	PTS	■	■			
UK	Ofcom	■	■	■		

Finally, four EU countries possess large multisectoral NRAs (Finland,³ Germany, Luxemburg, Netherlands, and Spain). Some NRAs, however, have a separate internal section purely responsible for postal regulation (Austria, Germany, Italy, and Poland).

4 NRAs in the EU Law

Liberalization in most infrastructure sectors, like the telecommunication, electricity, and postal sectors, has been driven by EU law. In the postal and telecommunication sectors, new rules have always been introduced in the form of directives. EU regulation came with well-specified goals, requiring the Member States to incorporate them into their legal systems. Due to the difference in legal systems, it was hard to create a “one size” model of the NRAs.

The NRA appeared for the first time on the postal market in the Postal Services Directive 97/67/EC of 15 December 1997,⁵ which established the first regulatory framework for the European postal services. There were two main objectives of the Postal Services Directive 97/67/EC, liberalization of the market and safeguarding

³ Finland’s Traficom is not responsible for electricity and gas regulation.

⁴ After 31 January 2020, the UK ceased being a member of the EU.

⁵ 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, OJ L 15, 21.1.1998, pp. 14–25.

the USO. Article 1 of the Postal Services Directive stipulates the obligation for *the creation of independent NRAs*. According to the legal definition, the postal NRAs are *the body or bodies, in each Member State, to which the Member State entrusts, inter alia, the regulatory functions falling within the scope of this Directive* (Article 2, point 18 Postal Services Directive).

Additionally, Article 22 of the Postal Services Directive states that the NRAs shall ensure compliance with obligations arising from the directive and that they may also be charged with ensuring compliance with competition rules in the postal sector. Dieke et al. (2009) has explained the independence of the NRA primarily as legal separation and operational independence from postal operators. The Postal Services Directive was amended twice, by Directive 2002/39/EC⁶ and Directive 2008/6/EC (the 3rd Postal Directive).⁷ The directives have added some new duties to the NRA, but the shape and main goals remain unchanged. Notably, the term NRA was never defined, neither in the EU Directive 2018/1972 of 11 December 2018 establishing the European Electronic Communications Code (EECC),⁸ which aims to regulate the telecom market in the EU, nor in the EU Directive 2019/944 of 5 June 2019 on common rules for the internal market for electricity, or the amending Directive 2012/27/EU,⁹ which aims to regulate the electricity market in the EU.

In the light of the Postal Services Directives, the postal NRAs are not obligated to ensure competition in the postal market through sector-specific regulation. Thus, EU Law does not require a mandatory sector-specific ex ante regulatory toolbox like telecoms regulators have in the EU. Nevertheless, the role of NRAs is essential in ensuring and safeguarding the USO in the postal market. As a result, in the postal market, most of the NRAs' regulatory power and obligations are focused on that social regulation.

5 The NRAs' Ability to Perform Their Duties

The Postal Service Directive's purpose was to make the Member States responsible for the postal NRA. The NRA's administrative power must be adequate to carry out its regulatory duties. Additionally, the Member States that retain ownership or

⁶ Directive 2002/39/EC of the European Parliament and of the Council of 10 June 2002 amending Directive 97/67/EC with regard to the further opening to competition of Community postal services, OJ L 176, 5.7.2002, pp. 21–25.

⁷ 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, pp. 3–20.

⁸ Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast)Text with EEA relevance, OJ L 321, 17.12.2018, pp. 36–214.

⁹ Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU, OJ L 158, 14.6.2019, pp. 125–199.

control of postal service providers must ensure effective structural separation of the regulatory functions from activities associated with ownership or control, that is, the independence of the NRA.

An overview of the selected NRA structure indicates that they have limited regulatory scope. As most postal regulators are part of a larger regulatory structure combined with other sectors, primarily with telecommunication, they employ a large number of clerks (the NRAs of Germany, Luxemburg, Netherlands, and Spain are responsible for nearly all regulated markets). Only four NRAs from Ireland, Poland, Spain, and Sweden have released information about the number of employees devoted to the postal market regulation. This is limited to just a dozen administrative employees. It is less than 5% of the total number of NRA employees (5 in Ireland, 12 in Sweden, 26 in Portugal, 27 in Spain, and 30 in Poland).

Five of ten of the NRAs have provided information about the budget linked to the postal regulatory responsibilities. Spain's NRA, the CNMC, reported that the yearly budget dedicated to postal market regulation is less than 2% of the total budget (approximately 1.2 million EURO). Data from the remaining NRAs are similar (Swedish PTS approximately 2 million EURO, Irish ComReg approximately 2.2 million EURO, Portuguese ANACOM approximately 3.6 million EURO, or UK Ofcom approximately 7 million EURO). Thus, it can be presumed that postal issues are taking not more than 2% percent of the other NRA budgets. This also depends on how many regulated markets are in charge of the particular authority. Such a presumption is based on the indicated number devoted to the postal market employees. All the NRAs described in Table 1 are responsible for both postal and telecommunication markets. The telecommunication regulator's technical obligations, i.e., radio spectrum policy and management, the assurance of the technical quality of electronic communication service, or the provision of next-generation broadband services, are notoriously costly.

Comparing data from different NRA across the EU shows that Member States retain different legal systems with distinct administrative procedures. Thus, it is hard to precisely define the term "regulatory decision." Directives are binding upon each Member State concerning the result to be achieved but leave to the national authorities the choices of the form and methods. Nevertheless, performing regulatory obligations always requires law enforcement, usually by administrative decisions.

Jurisprudence is evidence of public authority activity. The indicated NRAs have provided information about the number of the decisions adopted regarding postal market issues. As is shown in Table 2, an NRA passes only a few decisions per year. Only the Italian AGCOM informed about more than 100 decisions in two years (2019–2020), but it is unclear if all of them were strictly related to postal regulatory issues. The explanations received from the Spanish CNMC show that the majority of the main issues clarified by regulatory decisions concern annual deliverables including review of universal service (US) prices, assessment of the cross-border regulations, verification of analytical accountings, quality of service measurements, and the annual report and market monitoring annual report. A similar situation is with Portuguese ANACOM which most of the regulatory decisions (5) concern the quality of service of UPS.

Table 2 Regulatory decisions passed by the postal NRA

Country	NRA	2019	2020	2021	Additional info
Germany	BNetzA	Approximately 10 overall			
Czech Rep.	CTU	1	5	3	Additional decisions on imposing a fine according to the Postal Service Act: 2019—64; 2020—56 and 2021—85
Spain	CNMC	–	20	–	
Italy	AGCOM	57	54	25	
Ireland	ComReg	26	9	13	
Portugal	ANACOM	6	4	9	
Sweden	PTS	4	4	2	
UK	Ofcom	3	2	1	
Poland	UKE	10	8	21	2019: 7 of the decisions are penalties for missing annual report; 2020: 5 of the decisions are penalties for missing annual report and 2021: 13 of the decisions are penalties for missing annual report

6 NRA and the USO Regulation

According to the Postal Service Directive, the main interest of the postal NRA is focused on *establishing monitoring and regulatory procedures to ensure the provision of the universal service*. The Postal Service Directive reserves some discretionary powers to the NRA. This power can be categorized into three groups. The first discretionary power related to the US includes derogation of one delivery to appropriate installations instead of one delivery to the home or premises of every natural or legal person (Article 3.3), increasing the weight limit of US coverage for postal parcels to any weight not exceeding 20 kg, and potentially specifying arrangements for the door-to-door delivery of such parcels (Article 3.5). It also includes monitoring quality standards for mail (Article 17) and determining exemptions from the quality standards (Article 18.2). The second group of discretionary powers involves financing the US, including approval of cost accounting systems (Article 14.4), ensuring that compliance with the cost accounting systems is verified by a competent body that is independent of the USP (Article 14.5), providing detailed information on the cost accounting systems applied by a USP (Article 14.6), permission for not applying the mandatory requirements of the accounting of the USP (i.e., to keep separate accounts within USP internal accounting systems) (Article 14.8), and verification of the net cost (Annex I). The last group covers collection of data about the US. In this group, NRAs have the ability to collect information from the postal service

Table 3 USP changes made in the past

Universal service providers				
Country	NRA	USP	Has USP been ever changed?	Additional info
Germany	BNetzA	Deutsche Post (voluntarily)	No	Since 2008 no provider has been formally designated
Czech Rep	CTU	Česká pošta	No	
Spain	CNMC	Correos	No	
Italy	AGCOM	Poste italiane	No	
Ireland	ComReg	An Post	No	
Portugal	ANACOM	CTT	No	
Sweden	PTS	Postnord Group AB	No	USP has changed its name after its merger with Danish post
Netherlands	ACM	PostNL	No	
Poland	UKE	Poczta Polska	No	
UK	Ofcom	Royal Mail	No	

providers, including financial information and information concerning the provision of the US (Article 22a).

A fundamental element for social regulation (*condicio sine qua non*) is designation of a USP. This power has been primarily vested in the Member States, not in NRAs. Based on the EU and national postal law, the social regulation apparatus of the Polish NRA (UKE) has been focused on (Chołodecki and Popowska, 2018) designation (establishment) of the USP, impact on the US tariffs, and financing of the US. Only some of the EU Member States have granted the NRA the authority to designate the USP (Czech Rep., Sweden, Poland). In countries like Spain, Italy, Ireland, Portugal, and the Netherlands, the government is responsible for designating the USP. It is evident that none of the responding EU Member States has ever changed the designated USP (Table 3). This suggests that only the incumbents have the ability to perform universal services according to national obligations.

The form of USP ownership does not change the above conclusion about the immutability of the postal incumbents. For the countries listed in Table 4, which provides a broader EU perspective, most USPs are owned by the state (government). Nevertheless, three of them are private entities with dispersed shareholders. Thus, irrespective of the ownership, the postal incumbents continue to be the USPs.

The last EU Commission Report on the application of the Postal Services Directive published in 2021 emphasized the permanence of state ownership of USPs.¹⁰ Although the Commission has highlighted that the state still controls the universal

¹⁰ REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL on the application of the Postal Services Directive (Directive 97/67/EC as amended by Directive 2002/39/EC and 2008/6/EC), Brussels, 8.11.2021 COM(2021) 674 final.

Table 4 Universal Service Providers type of ownership

Country	USP	State-owned (direct and indirect)	Private
Czech Rep	Česká pošta	100%	
Spain	Correos	100%	
Ireland	An Post	100%	
Poland	Poczta Polska	100%	
Sweden	Postnord Group AB	60% (40% by Danish)	
Italy	Poste italiane	64%	
Germany	Deutsche Post	21%	Stock exchange
Netherlands	PostNL		100%
Portugal	CTT		100%
UK	Royal Mail		100%

service providers, establishing a set of harmonized and unbiased principles at EU level for the regulation of the postal sector remains relevant both for the Single Market and international trade. The fact that USPs are state-owned does not seem to be per se problematic for fulfilling the legal aims and obligations imposed by Postal Service Directive.

Directive 2008/6/EC introduced the legal basis for regulating the internal market for the postal services by providing the last legislative step in the process of gradual market opening. However, most of the EU countries had fully implemented the EU postal regulations before the 3rd Postal Directive was introduced. As a result, by 2008, their postal markets had already passed through the structural transformation process (Pimenta and Amaral, 2011, pp. 61–62). Nevertheless, the liberalization in the US segment of the postal market seems to be only a matter of appearance, meaning that the postal incumbents largely retained their pre-liberalization positions and functions. In Table 5, the designation periods are shown. This data indicates that the designation process has not been started in some countries, since incumbents have been designated by law for nearly 15 years (Italy, Spain, UK).

7 NRA and the Other Regulatory Obligations

Beyond the USO regulations, NRAs can have additional regulatory tasks and aims in order to ensure compliance with the obligations arising from the Postal Service Directive. However, the directive is very terse, stating only that the NRA may be charged with ensuring compliance with competition rules in the postal sector. Other explicit regulatory powers for the NRA have not been defined in the Postal Service Directive.

The NRAs selected for this survey were asked about the possession of powers to protect competition and consumer rights in the postal market and to regulated

Table 5 USP designation periods

Germany	Deutsche Post (voluntarily)	Since 2008 no provider has been formally designated		
Czech Rep.	Česká pošta	2013–2017	2018–2022	2023–2024
Spain	Correos	2011–2025		
Italy	Poste italiane	2011–2026		
Ireland	An Post	2011–2023		
Portugal	CTT	2000–2022	2022–2029	
Sweden	Postnord Group AB	–	2022–2024	
Netherlands	PostNL	2009–		
Poland	Poczta Polska	2013–2015	2016–2025	
UK	Royal Mail	Since 2012		

electronic postal services, for example, digital correspondence. These two issues seem to be essential for effective postal regulation. The first question was answered only by some of the NRAs. The answers are as follows:

7.1 The Czech Rep

CTU supervises compliance with the provisions of the Postal Services Act¹¹ and the Consumer Protection Act¹² and, in the event of suspected breaches, CTU carries out inspections.¹³ If CTU finds that there has been a violation of the law, it can issue a decision most often, to impose a fine. Furthermore, CTU resolves complaints of users of postal services¹⁴ or resolves disputes between the user of postal services and the operator of postal services.¹⁵ If the user is a consumer, CTU acts as an alternative dispute resolution (ADR) body.

7.2 Germany

BNetzA does not have specific legal powers to enforce consumer rights. However, BNetzA offers out-of-court dispute resolution procedures for customers of postal operators in case of loss or damage of postal items. Under the German Postal Act,

¹¹ Act No 221/2012, amending Act No 29/2000, on postal services and amending certain acts.

¹² Act No. 634/1992 Coll., on Consumer Protection, as amended.

¹³ There were: 190 (2019), 217 (2020), and 526 (2021) such inspections carried out by the CTU.

¹⁴ The number of cases: 449 (2019), 388 (2020), and 454 (2021).

¹⁵ The number of decisions issued in disputes between postal users and postal operators is: 391 (2019), 300 (2020), and 331 (2021).

the Ruling Chamber is empowered to intervene in cases of competition violations and discriminatory and exploitative behavior in the postal sector. The Ruling Chamber can annul contracts and even prohibit them in the case of abuse.

7.3 UK

Ofcom's powers in relation to postal services are set out in the Postal Services Act 2011 (PSA). It gives Ofcom several powers to protect and/or further the interests of consumers. These include power to impose "essential conditions" on postal operators (not just the USP). These conditions contain those obligations which Ofcom considers necessary to impose, for example, to safeguard the confidentiality and security of mail and guard against theft or loss of or damage to mail (Section 49 of the PSA). The significant power is to impose specific "consumer protection conditions" applicable to all postal operators in the market (not only in the USP). These conditions require postal operators to, for example, assume liability in respect of loss of or damage to postal items, and to establish and maintain procedures, standards, and policies with respect to consumer protection matters, in particular, concerning the handling of complaints and resolution of disputes (Section 51 of the PSA).

7.4 Ireland

ComReg does not have a specific power to protect consumers in the postal market.

7.5 Portugal

The ANACOM, as the regulatory authority, is responsible for protecting the rights and interests of consumers and other end-users. One of them is promoting and establishing mechanisms for the settlement of out-of-court disputes between postal operators, consumers, and other end-users. Additionally, ANACOM provides information, guidance, and support to consumers and other end-users in cooperation with the Consumer Directorate-General (*Direção-Geral do Consumidor*) and other relevant bodies in the scope of consumer protection.

7.6 *Spain*

CNMC does not have a specific power to protect consumers in the postal market. However, the CNMC can sanction postal operators for not complying with the rights of postal users, which are set out in detail in the Spanish Postal Act.

7.7 *Netherlands*

ACM is a multipurpose¹⁶ agency, so it has authority for competition and consumer law in general, including for the postal sector.

7.8 *Sweden*

PST is not empowered to act on competition or consumer rights matters in the postal market.

Electronic postal services or digital correspondence is a part of the digitalization process, which includes e-substitution for public services.¹⁷ Many EU countries have modernized their services and created digital correspondence that is equivalent to a traditional postal service. However, EU law does not include digitalization as a part of the postal services, e.g., as a part of USO. This is contrary to Universal Postal Union (UPU) regulations, which recognize electronic postal services, encompassing electronic postal mail, electronic postal registered mail, electronic postal certification marks, and electronic postal mailboxes (Article 17 of the UPU Convention).

There is no doubt that digital correspondence is becoming a more common alternative to traditional postal service. The consequence of this process is a decline in letter volume. Digital correspondence can be a “cost-saving potential for senders” providing “the convenience to access, save, and store communication” (Copenhagen Economics, 2020, p. 36).

There is some form of digital correspondence in all the countries listed in Table 6. However, in only three of the countries (Italy, Poland, and Sweden, where it is not part of the postal regulation) is the postal NRA also responsible for electronic

¹⁶ It is charged with competition oversight, sector-specific regulation of several sectors, and the enforcement of consumer protection laws.

¹⁷ The e-substitution is covered by Regulation (EU) no 910/2014 of the European Parliament and the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC (eIDAS). The eIDAS provides e-administration for registered electronic delivery, allowing sending and receiving data that enjoy a legal presumption of its authenticity and integrity. This tool may be effectively used in courts and administrative proceedings. Such deliveries are analogous to those assigned to the delivery of traditional registered mail.

Table 6 Responsibility for electronic postal services (digital correspondence)

Country	NRA	Responsible for electronic postal services	Additional info
Germany	BNetzA	No	Digital correspondence does not fall under German postal regulation. In the case of hybrid mail, only the embedded postal services are regulated, not the electronic components.
Czech Rep.	CTU	No	
Spain	CNMC	No	Digital correspondence falls outside of the scope of the Spanish Postal Act. However, undertakings providing services related to registered e-mail, registered sms, electronic notification, registered bill, fax, etc., are supervised by the Telecommunication Directorate of CNMC, through the Register of operators providing electronic communication services managed by CNMC (according to the Spanish Electronic Communication Act)
Ireland	ComReg	No	
Portugal	ANACOM	No	
Italy	AGCOM	Yes	Hybrid services that fall within the scope of the USO, e.g., online registered mail, online priority mail, and online ordinary mail.
Sweden	PTS	Yes?	Digital mailboxes fall under Swedish electronic communications act concerning, for example, the operational reliability of electronic communication services.
Netherlands	ACM	No	
UK	Ofcom	No	
Poland	UKE	Yes	Sole responsibility.

postal services (digital correspondence). For example, in the Czech Republic the USP, Česká pošta, is responsible for public data mailboxes (Datová schránka), but the CTU is not in charge of electronic postal services.

8 Conclusions

In general, the aims of regulation are to control market power of the dominant player through pro-competitive regulation and to ensure the fulfillment of universal (public) service obligations. The special agency established following EU legislation to fulfill these aims is the NRA. This paper reviewed EU postal regulation by presenting the aims and tasks of selected postal NRAs.

According to the Postal Service Directive, the postal NRA has a limited regulatory scope, which is almost entirely devoted to the USO. Nevertheless, the EU postal regulation does not prevent a Member State from attributing broader aims and scope

to its postal NRA. Research presented in the paper from selected Member States shows that countries rarely provide such authority, even though the primary aims of the Postal Service Directive were achieved long ago.

Copenhagen Economics (2020) formulated questions about whether there is a need for regulatory remedies for failures in dynamic postal services and delivery and, if so, what remedies would be appropriate. This question can be extended to address the issue of whether there is still a need for postal NRA and, if so, what kind of regulatory power it should have? The answer to such a question lies in the aims of the regulation. The regulatory policy will, in the future, shape the postal NRA and their regulatory power. The results presented in this paper are a step forward in building our knowledge about postal regulation in the EU.

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Locked into an Access Mindframe? Reflections on Access Regulation in Postal and Delivery Based on the Case of Parcel Lockers



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Access regulation is one of the tools employed by regulators to promote efficiency and competition in the postal sector. In Basalisco et al. (2017), we discussed the most prominent economic questions relating to the design of access regimes, from both regulators' and operators' points of view. Since that chapter was published, there have been several contributions to the discussion on access regulation in the postal sector in both the letter and parcel delivery segments. *First*, market consolidation in the letter delivery segment has reignited discussions related to the implementation of access regulation (see for example Russo et al., 2021). *Second*, ongoing evaluation of the EU Postal Services Directive has raised a discussion whether the lack of competition in the letter delivery segment could be addressed by expanding national regulators' mandate into *ex ante* access regulatory powers (see European Commission, 2021). *Third*, as delivery to parcel lockers has grown increasingly popular, we are seeing more discussions about the potential need for granting access to parcel lockers (see for example Rozman, 2019; Streule, 2021).

This chapter, builds on Basalisco et al. (2016), applying an economic perspective to assess recent developments in the discussion about access to parcel lockers. Section 1 discusses the most recent policy developments regarding the regulation of access to parcel lockers in the EU. Section 2 identifies potential challenges to regulating parcel locker access. Section 3 explores how economic analysis and quantitative techniques can be applied to data gathering and competition assessments in the case of regulated access to parcel lockers. Section 4 identifies future research possibilities.

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1 Recent Policy Developments Regarding the Regulation of Access to Parcel Lockers

Strong growth in e-commerce has drastically increased the demand for parcel delivery services in recent years. In combination with the Covid-19 pandemic, which forced both delivery operators and recipients of parcels to adjust their ways of working, this has led to a dynamic development in recipients' preferences for parcel delivery and the proliferation of alternative delivery models. As a result, delivery to parcel lockers has become increasingly popular among both delivery providers and recipients. If sufficiently ubiquitous, parcel lockers have the potential to become an important infrastructure for delivery of parcels, small packages, and eventually even high-value letter items from businesses to consumers (B2C), from businesses to other businesses (B2B), and even among consumers (C2C).

Several different types of parcel locker infrastructures have developed in parallel throughout Europe. These include open (carrier agnostic) locker networks as well as closed networks which only allow access for one specific parcel delivery provider or a small subset of preferred logistics partners. There is also large heterogeneity with respect to the players leading the development of parcel locker infrastructures, including national postal operators, alternative delivery providers, e-commerce platforms, government departments, and independent private locker operators. As a result, parcel lockers have recently become a significant regulatory discussion topic. In particular, discussions suggesting a potential need for regulation of parcel locker providers and *ex ante*-regulated access to parcel lockers have arisen across Europe.

1.1 Recent Calls for Regulating Access to Parcel Lockers

As postal regulation at the European level currently is predominantly focused on the provision of Universal Postal Services, there is no uniform regulation applying to parcel lockers across Europe. Still, the question about regulating access to parcel lockers has been the subject of research by a variety of public and private stakeholders (European Regulators Group for Postal Services - ERGP, 2019a; Streule, 2021).

In 2019, the ERGP and national postal regulators called for an increase in regulatory powers, covering both the letter mail and parcel segments of the postal sector. In particular, the ERGP stated that national postal sector regulators should have “*sufficient powers to define, monitor and analyse markets (including adjacent markets) and, in particular, the competence to impose regulatory obligations such as access to the network and its components at cost orientated prices*” (ERGP, 2019b, p. 7). Following this, national regulators through the ERGP proposed to broaden the definition of postal services and postal operators to broaden the regulatory scope for national regulatory authorities and to include Significant Market Power (SMP) regulation as a standard tool in the toolbox of national postal sector regulators.

With respect to the first suggestion, the ERGP suggested broadening the definition of what constitutes a “postal service” to include all market players who engage in *at least one* of the steps in the traditional postal service value chain (collection, transport, sorting, delivery), unless that only step is to transport. This would, for instance, mean that in addition to operators active in-home delivery, operators active in last-mile delivery to parcel lockers, or e-commerce platforms engaging in transport, sorting, and sometimes delivery of products sold on their platform, might become subject to regulatory oversight. In many countries, this would significantly increase the scope of which companies fall under the supervisory mandate of national regulatory authorities overseeing the postal sector (ERGP, 2020).

The European Commission addressed this call for reassessing postal definitions in their Postal Services Directive evaluation report (European Commission, 2021, p. 10). The Commission acknowledged that postal definitions come into question as a result of structural and technological changes in the sector but concluded that there is no need to broaden or redefine postal definitions as “*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*” (European Commission, 2021, p. 10).

With respect to the second suggestion, the ERGP also suggested that all national postal sector regulatory authorities should receive increased powers to identify operators with Significant Market Power¹ (SMP) and impose detailed access conditions where relevant (see ERGP, 2020). If a provider of delivery to parcel lockers with a dense network of lockers is considered to hold SMP, the national regulatory authority would have the power to *ex ante* enforce access to that network based on sector-specific regulation. Combined with an extension of the definition of postal services, this could mean that even providers of parcel lockers who do not engage in all steps of the traditional postal value chain could be regulated.

In some countries such regulatory powers already exist; for example, in the Netherlands, where the national postal sector regulator (and competition authority) ACM’s intention to regulate downstream access to 24 h letter mail delivery a few years ago led to a longstanding regulatory battle. The difficulty in defining appropriate access conditions in this case led to high financial costs for PostNL. In 2017, PostNL estimated the financial impact on its business of the access conditions imposed by the national regulator to be somewhere between 30 and 50 million Euros per year (PostNL, 2017).

¹ See European Commission’s Guidelines on market analysis and the assessment of significant market power under the EU regulatory framework for electronic communications networks and services, available online at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018XC0507%2801%29>.

Another example of this development is the market investigation conducted by the Italian postal sector regulator Agcom. In 2020, Agcom's Interim Report provisionally found that Amazon holds significant market power in a market for deferred B2C parcel deliveries in Italy—a finding reinstated in the Agcom December 2021 final decision (AGCM, 2021). As a result, Agcom is introducing several asymmetric regulatory obligations on Amazon, as well as a set of symmetric information reporting obligations on all large delivery players.

To minimize the risk of excessive regulatory costs and to also minimize the risk that excessive regulation hampers competition and innovation in the market, it is important that any calls to increase regulatory powers or to impose access regulation are firmly founded on actual market failures.

1.2 Potential Market Failures and Competition Issues Related to Parcel Locker Infrastructures

According to the First Fundamental Theorem of Welfare Economics (Debreu, 1959), competitive markets provide the efficient level of goods and services in the absence of market failures. As such, regulation to support competitive markets should only be introduced in cases where market failures arise.

Existing research highlights several potential market failures and competition issues which may emerge in relation to the development and deployment of parcel locker infrastructures. These include (Streule, 2021, p. 10):

First, dominance from adjacent sector: for example, if dominant e-commerce platforms are able to influence the availability of last-mile delivery options or prices of last-mile delivery options (ERGP, 2019a).

Second, first-mover occupancy/land banking: for example, if investors purchase land most suited for parcel lockers under the assumption that it would be a desirable location for a parcel locker, this might lead to high costs for introducing parcel lockers to the area, thereby limiting the number of parcel lockers in an area to a suboptimal level. New market entrants would be further constrained if an existing parcel locker provider with significant market power would refuse to provide access to its parcel locker network occupying scarce prime locations. In this case, it might be difficult for a competitor of small or medium size to establish and compete in the market (see Zurel et al., 2018). Even if building a competitive network succeeds, the resulting formation of parallel networks might be (environmentally) inefficient (see Rozman, 2019).

Third, complete geographical absence of parcel lockers: for example, if city or municipality planning constraints prevent parcel lockers from being implemented in a given city or municipality. Particularly, uncertainty related to authorization processes and building permits could be detrimental to investment (see Lagorio and Pinto, 2020).

Fourth, partial geographical absence of parcel lockers: for example, if a lack of demand in rural areas compared to urban areas or lack of demand in poor economic zones prevent the establishment of a parcel locker infrastructure on pure commercial terms.

Fifth, abusive pricing: for example, if the exertion of market power leads to predatory pricing or excessive pricing. For example, in 2011 the Estonian parcel locker provider SmartPost filed a complaint against the Estonian postal incumbent, Omniva, regarding alleged exclusionary pricing abuse and cross-subsidization in the parcel locker market (see Zurel et al., 2018, p. 12). Although the Estonian Competition Authority did not find evidence of dominance in this case, this type of complaint is a real concern (see Konkurentsiamet, 2013).

Sixth, failure to reflect externalities: An externality is a cost or benefit that impacts a third party although the third party did not participate in the transaction creating the cost or benefit and has no control over the amount of cost or benefit created. For example, introducing parcel lockers might entail several benefits for society such as the impact on public space, environment, congestion, and road safety, which are not accounted for in the price for investing in parcel lockers. In contrast to the market failure of geographical absence discussed above, this market failure can manifest in such dimensions as quality, choice, or pricing, e.g., if the quality or accessibility to parcel lockers is sub-optimal from the social perspective.

To tackle many of the abovementioned potential market failures, some regulatory proposals have identified that granting access to parcel lockers might be an appropriate remedy (ERGP, 2019a). However, granting access to parcel lockers also comes with key risks and challenges which should be weighed against the identified benefits.

2 Key Risks and Challenges of Regulating Access to Parcel Lockers

To avoid regulatory failure, i.e., a situation where the regulatory remedy does not succeed in creating the intended effect or where the cost of regulation does not outweigh its benefits, regulators and policymakers would benefit from assessing key risks and challenges regarding access to parcel lockers. In particular, the existence of a valid theory of harm, the likely effect of the remedy, and the remedy's robustness in relation to market dynamics would have to be thoroughly assessed.

2.1 *Is There a Valid Theory of Harm?*

Regulatory decisions shape the market—they affect both decisions on the supply- and demand-side. By creating uncertainty, intervention (or the mere threat of it) can undermine incentives to invest. This will lead to a less efficient market and ultimately harm consumers. Hence, interventions are only necessary when there is a need to address actual market failures—for instance by curbing the effects of SMP, when this is firmly established.

As discussed in Sect. 1.2, several papers have outlined *potential* market failures which may emerge in relation to deliveries to parcel lockers. To identify if there is such a valid theory of harm, regulators would have to assess how competition is functioning in the relevant market where delivery to parcel lockers is provided. So far, in the countries where the national postal sector regulators have de facto reviewed the need for granting access to parcel locker infrastructures no market failures have so far been found.²

2.2 *What is the Likely Effect of the Remedy?*

When a theory of harm is identified and validated, economic principles should help assess the costs and benefits of any proposed course of action. Based on economic theory, a key objective in relation to regulatory intervention is the pursuit of allocative, productive, and dynamic efficiency. When considering intervening in a market, however, regulators will face several trades-off between different goals. To ensure a robust regulatory assessment, a quantitative assessment (i.e., regulatory impact assessment) must be made to identify and estimate the costs and benefits associated with each regulatory option (compared to the baseline “no action” option, which may also be found to have the most favorable impact).

To properly assess the impact of regulating access to parcel lockers, all potential benefits and costs must be carefully assessed and weighed against each other. In terms of benefits, current regulatory calls have identified several potential benefits of regulating access to parcel lockers. These include better usage of public space, higher convenience to recipients, lower costs to senders, etc., see Box 1.

² National regulatory authorities in Germany (ERGP 2019a, pp. 33–36) as well as in Italy (AGCOM 2020) have reviewed the need to regulate access to parcel lockers. Both of them found that the parcel locker infrastructure in question did not constitute an essential facility to which access had to be granted in order to ensure effective competition in the market.

Box 1 Potential benefits of regulating access to parcel lockers according to national postal sector regulators

Public interests that could be served by access to pick-up locations and/or parcel lockers:

- Better usage of public space;
- Convenience to the users of parcel services;
- Less pollution and sustainable delivery;
- Less congestion in cities;
- Higher efficiency of delivery.

Other benefits of access:

- Cost sharing between parcel service providers and therefore lower prices;
- The parcel service provider providing access would achieve better utilization of its parcel lockers;
- Easier for the access provider to earn back investment if he would be able to recover the costs for excess capacity;
- The access seeker would be able to provide services without developing an extensive network;
- End users would be able to benefit from a wider choice while keeping the comfort of a unique network;
- Delivery would always be possible, therefore less returns;
- Convenient, faster, and unlimited time to pick up parcel at closest location for end users;
- Benefit for urban logistics in terms of sustainability.

Source: ERGP (2019) "On the development of postal networks and access practises regarding infrastructure related to the parcel market," ERGP PL1 (19) 10

To our knowledge, however, neither the validity of the abovementioned potential benefits nor their size or likely trade-offs with other objectives have been analyzed empirically, neither at a single-country (or city) level nor Europe-wide. Given the wide variation in urban patterns and customer preferences both between and within countries, empirical evidence is key to progress the understanding of the above regulatory considerations.

In terms of costs, the ERGP also reports on several potential downsides to regulating access to parcel lockers. In addition to concerns regarding administrative burden and overregulation, regulators contributing to a survey run by the ERGP pointed to challenges of maintaining the quality of service (particularly around peak periods when capacity is already high) and the potential for access competition to decrease the incentive to invest (thereby hindering innovation). Access regulation could also lead to a rise in disputes between parcel service providers and confusion among end users when filing complaints (ERGP, 2019a).

2.3 Is the Remedy Robust to Market Dynamics?

A strategic approach to remedies should explicitly discuss whether market outcomes are expected to change substantially over the mid-to-long run. If so, the regulatory assessment should discuss whether any remedies should be taken at all and in which direction and how trade-offs are expected to change over time. This is even more important in dynamic markets such as that for delivery to parcel lockers where new technological solutions, new business models, and customer needs have evolved significantly in the past few years and are expected to continue to do so in coming years.

3 Economic Methods for Validating the Theory of Harm and Assessing the Likely Effects of Remedies Concerning Access to Parcel Lockers

Economic methods and tools are often valuable to validate any proposed theory of harm and to assess the likely effects of any remedies proposed to alleviate the identified concern. The following sections contain four examples directly related to the case of access to parcel lockers. Section 3.1 explains how economic tools normally used in merger analysis, combined with novel data collection techniques, can be applied to assess whether an existing parcel locker infrastructure should be considered an essential facility. Section 3.2 thereafter provides guidance on how regulators and other policymakers could move from purely qualitative to more quantitative cost-benefit assessments and what factors that should be considered in the case of regulated access to parcel lockers. Section 3.3 discusses how competition for delivery to parcel lockers can be assessed by looking into consumer behavior with consumer surveys and a SSNIP test.

3.1 Assessment of First-Mover Occupancy/Land Banking Theory of Harm Through Web Scraping and Catchment Area Analysis

As discussed in Sect. 1.2, if a dominant operator manages to occupy the most attractive locations for parcel lockers and refuses to provide access to the parcel locker network occupying scarce prime locations, new (equally efficient) entrants might be prevented from competing in the market. Such theory of harm may draw on evidence indicating that some geographic areas are “running out” of spaces where additional

parcel lockers can be located and that the existing parcel locker infrastructure thus is an essential facility to which access must be granted.³

In this section we explore a quantitative method to assess the validity of such theory of harm. In particular, we show how one can investigate empirically to what extent available places belonging to real properties (which could be used to deploy an alternative set of parcel lockers) exist. To assess this, we employ a novel approach combining web scraping and catchment area analysis, commonly employed in merger assessments. The assessment can be conducted in four steps:

First, we start by identifying the types of properties that are ideal for parcel locker placement. Parcel lockers are typically placed in spaces that are easily accessible for consumers and couriers. The typical requirements for such spaces are a certain minimum area that allows placing the parcel lockers and convenient physical access to them (also for consumers with physical disabilities), easy accessibility 24/7, parking places nearby, which both couriers and recipients of parcels can use, and visibility. Suitable spaces could thus include, for example, supermarkets, convenience stores, petrol stations, retail centers, and residential properties. This analysis will determine which property types are most popular for hosting parcel lockers.

Second, we look for evidence of potential lease locations where new parcel lockers could be placed.

This can be done by combining data on existing parcel locker locations, acquired through web scraping, and data on potential locations for placement of additional parcel lockers, identified using, e.g., Google Maps' scraping tool Places API, see Fig. 1.⁴

Third, we identify optimal parcel locker locations as well as underserved areas relative to population density. This can be done through catchment area analysis which combines the existing and potential parcel locker locations with NASA gridded population data. Catchment area analysis is a term used in competition economics, often used to identify the geographic area where the most (normally about 90%) of a facility's clients are located. Since population density varies throughout a country, the radius of a catchment area will vary accordingly (smaller catchment areas, e.g., 5–15 km, in more densely populated areas and larger catchment areas in more sparsely populated areas, e.g., 15–20 km), see Fig. 2.

Finally, to assess if land banking does in fact prevent parcel locker providers from introducing the optimal number of parcel lockers in an area, one should consider at least two dimensions. The first is a distribution across real estate property types.

³ It could be argued, however, that land owners could reallocate space and developers of new buildings would dedicate sufficient space if parcel lockers were profitable. In other words, the number of lockers may not be fixed per geographic location.

⁴ Google's Places API is a service that returns information about places using HTTP requests. Places are defined within this API as establishments, geographic locations, or prominent points of interest. For more information, see <https://developers.google.com/maps/documentation/places/web-service/overview>.

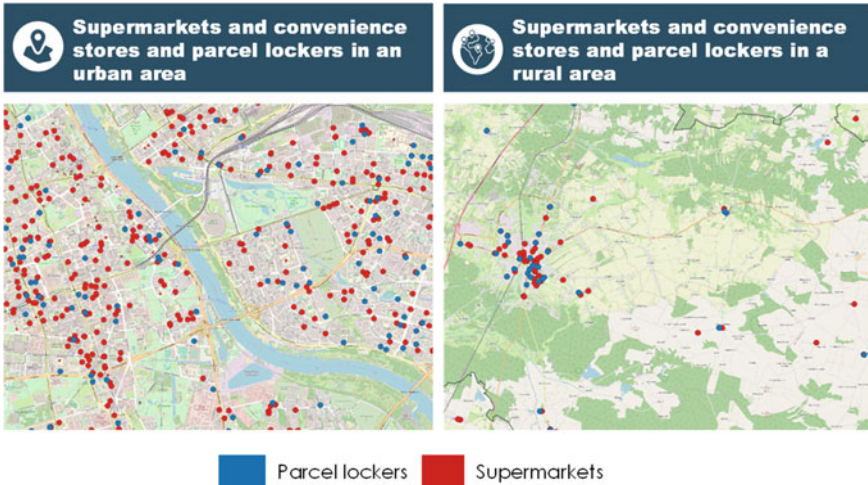


Fig. 1 Illustration of supermarket and parcel locker locations in urban and rural areas (Source Copenhagen Economics based on Google Maps’ scraping tool Places API)

Store	Core (Basic circle)		Outer circle (“Donut”)	
	Inner radius	Shops	Outer radius	Shops
Cities	5 km	All	15 km	Hypermarkets
Outer areas of cities	10 km	All	20 km	Hypermarkets
Rural	15 km	All	20 km	Hypermarkets

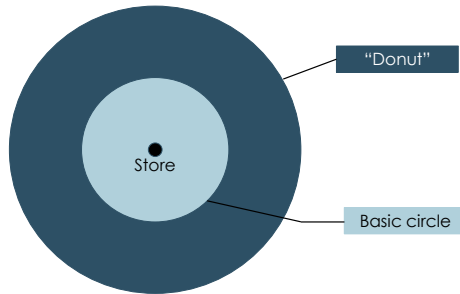


Fig. 2 Illustration of catchment areas (Source Copenhagen Economics based on FCCA [Decision KKV/1575/14.00.10/2015])

Different real estate property types (e.g., supermarkets, petrol stations, public institutions) may vary in terms of level of human activity. Hence, it may be more attractive (advantageous) to have a parcel locker next to one type of real estate property type than the other. The second is distribution across geographic areas with different profiles, for example, densely populated urban areas versus sparsely populated rural areas. Such areas typically have a different density of buildings and level of human

activity. If land banking is taking place in a region, we would find that there are limited locations available for parcel lockers to be placed in the future. Through this approach it is possible to demonstrate whether there are properties available for hosting parcel lockers and whether the number of available locations is sufficient to support an alternative parcel locker network, given the population density.

3.2 Assessment of Consumer Switching Patterns, Consumer Behavior, and Substitutability

When assessing the competitive market for parcel lockers, it is important to understand consumer behavior. In particular, consumer switching patterns determine the competitive dynamics in the market. For example, in terms of deliveries to parcel lockers, e-shoppers' preferences directly influence the services that e-retailers buy to present on their web pages. In turn, this affects which delivery services and providers compete with each other. Such competition between delivery operators can manifest itself either at the wholesale level (i.e., in terms of getting a contract with the e-retailer) and/or at the retail level (i.e., when e-shopper can choose between several options).

One well-established method for understanding consumer behavior is to conduct a consumer survey. In this case, a consumer survey should investigate how consumers use parcel lockers, whether and how often they switch between delivery options (e.g., parcel lockers, delivery to the address, PUDO points, etc.), and how they foresee future use of parcel lockers and other delivery options.

A consumer survey can also be used to perform a critical loss analysis and a SSNIP test, which can be used to measure product substitutability. This test is mostly used in market definition assessments, but it can also be used to determine how essential a product is. If a SSNIP test determines that a product is highly substitutable, consumers can easily switch between products. For example, if a SSNIP test found that parcel lockers are highly substitutable, it would mean that consumers have many alternatives, such as delivery to PUDO lockers, that they would prefer to use before paying the higher price. In this scenario, parcel lockers are unlikely to be deemed an essential facility requiring access regulation because consumers have many alternative choices, they can use to receive their packages. More specifically, a SSNIP test measures what changes in buyer behavior would arise as a result of a 5–10% increase in the price for, in this case, parcel locker delivery services, as shown in Box 2.

Box 2 SSNIP test implementation at a glance

Defining a relevant product market: the SSNIP test

The key quantitative test for relevant market definition is the Small but Significant Non-transitory Increase in Price (SSNIP) test. A SSNIP test is used to establish whether a hypothetical monopolist offering parcel lockers in Poland would find it profitable to increase its price by 5 to 10%.

The price increase is not profitable for a hypothetical monopolist if the decrease in volumes sold offsets the increase in price. In other words, if enough consumers switch to other products (or stop buying altogether) the decrease in volumes sold will offset the increase in price, the net result would be a decrease in profits for the hypothetical monopolist. In this case, the price increase is not profitable, consumers see other products as close enough substitutes for the candidate product—the relevant product market is wider than the candidate product.

The price increase is instead profitable if the decrease in volume will be small such that overall, the hypothetical monopolist's revenues will increase. In other words, if only a few (not enough) consumers switch to other products after the price increase, the net result of the price increase is an increase in profits for the hypothetical monopolist. This indicates that consumers do not see other products as close enough substitutes for the candidate product—the relevant product market corresponds to the candidate market.

A SSNIP test can be conducted through a critical loss analysis.

A critical loss analysis to assesses whether a 5–10% price increase would be profitable for a hypothetical monopolist offering a specific product, in this case delivery to parcel lockers. The critical loss is the percentage loss in volumes that would make the price increase not profitable for the hypothetical monopolist. The critical loss is a function of the percentage price increase and the monopolist's profit margin.

The actual loss is the estimated loss (e.g., by running a survey) in volumes for the monopolist after the price increase. The actual loss is instead a function of the percentage price increase and the candidate product's own price elasticity.

If the actual loss is higher than the critical loss, the hypothetical monopolist would lose too many sales as a result of a price increase. Therefore, the price increase is not profitable. On the contrary, if the actual loss is lower than the critical loss, the price increase is profitable.

- **Critical loss** = $\frac{\%price\ increase}{\%price\ increase + profit\ margin}$
- **Actual loss** = **Price elasticity** * **% price increase**
- **if Actual loss > critical loss:** the relevant market is wider
- **if Actual loss < critical loss:** candidate market is the relevant market

Source: European Commission, Commission notice on the definition of relevant market for the purposes of Community competition law, 1997

3.3 *Quantitative Tools for Regulatory Impact Analysis*

Regulated access may result in significant regulatory compliance costs for the access providers. To reduce the risk of adverse outcomes and regulatory failure, any proposed regulatory intervention must be carefully examined in terms of its expected costs and benefits before any remedies are implemented. This assessment should also account for the market dynamics at play (see Sect. 2.3).

Whereas historically many cost–benefit assessments have focused primarily on qualitative aspects of introducing regulation, more recently quantitative assessments have also been compiled. For example, ACM, the Dutch postal regulator’s assessment in relation to its regulation of access to the postal network in 2017 included a quantitative assessment of costs and benefits. In this case, the ACM used scenario analyses to calculate the impact on consumer surplus, producer surplus, and the total surplus for the regulatory period in question (see ACM, 2017).

In this case, the ACM used a differentiated Bertrand model to estimate the best response from a transport company in terms of pricing if they purchased access to PostNL’s network depending on whether a wholesale tariff is cost-oriented, equals the average retail price charged by the access provider, equals the most favorable retail price, or is differentiated by the volume of mail from the original sender to which the access seeker provides services.

This model estimated the demand function for the potential access product under these scenarios to determine the wholesale tariffs for the product as well as the allocation of sales among the market players. By comparing the results of these scenarios to a scenario without regulation, ACM was able to identify the costs and benefits of implementing access regulation.

A similar analysis could be conducted in relation to potential access regulation for parcel lockers. Other relevant cost categories arising from regulatory compliance with access regulation for parcel lockers and which thus should be considered in a quantitative cost–benefit analysis include six cost categories. First, *Labour costs*, including staff, wages, and training. In particular, this includes staffing regulatory experts and staffing a wholesale department, responsible for shielding information from the access infrastructure from the rest of the organization. Second, *Administrative overheads*, including specific costs that are associated with the portion of the business responsible for granting parcel locker access and ensuring regulatory compliance with the access regulation. Third, *IT and system costs*, providing access to the parcel locker network would require updating the IT system to allow other operators to use and access the parcel lockers. Fourth, *Legal expenses*, including costs to prepare, appeal, and finalize the access regulation as well as remaining up to date when changes to the regulation arise. Fifth, *Non-recurring costs*, including the cost of designing conditions for access seekers, design of the specific digital interface, and design of the wholesale tariff system. Sixth, *Recurring compliance*, this would include the continuous costs of meeting the regulatory requirements to ensure compliance. This also includes adjustments to systems to accommodate confidentiality.

As mentioned already in Sect. 2.2, potential benefits could and should also be quantified. For example, an assessment of how access to parcel lockers would impact carbon emissions and congestion in urban areas can be developed, founded in economic analysis and empirical evidence of transport and travel patterns. In this case, it would be necessary to quantify to what extent providing access to parcel lockers would limit the number of trucks delivering parcels and what impact that would have on carbon emissions and congestion.

Once both costs and benefits are estimated, they need to be weighed against each other and compared with the status quo to determine the net effect of the proposed regulatory intervention.

4 Future Research Possibilities

In this paper we have outlined some of the theories of harm which might support proposals to regulate access to parcel lockers. Although this paper has looked at three methods which can be applied to validate these theories of harm, further research could look into other methods which can be employed to validate the already mentioned theories of harm or additional theories of harm.

Further research could also address, in greater detail, how to quantify the benefits of imposing access regulation. Such research could for example analyze the expected impact that granting access to parcel lockers would have on environmental sustainability and if such regulation would actually lead to any significant changes in carbon emissions or if further behavioral remedies would be necessary to achieve the desired outcome.

Finally, it would be interesting to understand if—and if so, how—the principles of access regimes in the telecommunications sector can be applied in the postal sector. Several contributions have been made, providing a comparative exercise. In this case, assessing the specific nature of parcel lockers and how their advent affects the demand-side and supply-side performance of delivery markets remains key to test the merits of access regulation.

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Do We Need Regulation for Parcel Lockers?



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Abstract The parcel market offers a number of options for delivery such as specific time windows, pick-up points, and parcel lockers. The parcel lockers sector is growing in Europe, with some countries more active than others depending on consumers' habits and preferences. Networks are expanding and innovations are developing. After defining an essential facility and showing that lockers are the only one way to deliver parcels, we show that they cannot be considered as an essential facility. We question the need for ex ante regulation of access given the dynamic of the sector, the effect on innovation of such regulation, and the absence of evidence of the inefficiency of ex post competition law.

Keywords Parcel locker · Access · Regulation · Essential facility · Network

1 Introduction

The covid-19 pandemic has accelerated the use of e-commerce. In 2020, in Europe, the number of e-commerce users has increased in the last four years with 71% of Europeans buying online against 66% in 2019 (Ecommerce Europe & EuroCommerce, 2021). This trend will continue in the near future. According to McKinsey (2022), cross-border e-commerce will expand to \$1 trillion in merchandise value by 2030 from its current value of approximately \$300 billion. The pandemic led to new ways of delivery without contact. Hence, new delivery means are developing like parcel lockers installed in public or private spaces.

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The parcel locker sector has numerous participants, including traditional postal operators, parcel operators, manufacturers of lockers, and new start-ups. Some markets are more active than others, for example, Poland or Nordic countries, but this sector is growing all over Europe with new entrants and multiple innovations to secure lockers or to offer new services. Many operators have announced wide development of parcel locker networks, including Deutsche Post, PostNord, or the Polish operator InPost. Alibaba, the Chinese e-commerce platform, is also developing its own locker network in Europe. In addition to parcel lockers located in public space, we see the development of lockers located at the recipient's home or place of business.

How and whether to regulate access to the parcel market, including parcel lockers is sometimes raised (ERGP, 2019). The development of parcel lockers in the public space may also lead local governments to examine the need for regulation given their rapid growth in some places.

This paper will discuss the need for access regulation of parcel lockers in light of their growing development. In Sect. 2, we summarize recent trends of the sector regarding networks, players, and innovation. Section 3 explains what an essential facility is. Section 4 questions the application of the concept of essential facility to the network of parcel lockers. Section 5 questions the need for an *ex ante* regulation, given that parcel lockers are only one way to deliver parcels. Section 6 concludes.

2 The Market of Parcel Lockers in Europe

As emphasized by the European Commission in its report on the application of the Postal Services Directive published in November 2021, the parcel delivery segment is highly competitive. Numerous actors offer different types of services to deliver parcel and parcel lockers are one of them. The parcel locker sector is also expanding, and is very dynamic with the growth of the existing networks, new players entering the sector, and innovation in parcel lockers in Europe.

2.1 Business Models

Regarding parcel lockers, a first difference has to be done between parcel lockers located in a public space, i.e., along the street; parcel lockers located in a semi-public space, i.e., train stations, supermarkets, at work, and those located in the private space, i.e., at home. As described in WIK (2021), for parcel lockers located in public space, three business models exist in Europe. The first is open networks with the logistic operation¹: parcel locker networks developed by parcel operators

¹ Logistics operations include collection and transport services, operations of logistics hubs (sorting facilities) as well as delivery of parcels to parcel locker stations.

and opened to parcels of other operators like Lehtipiste in Finland. A second is open networks without logistics operation: parcel lockers opened to multiple parcel operators developed by firms who have concluded agreements with postal operators like Smartmile in Finland, Hambourg Box in Germany. A third is closed networks with logistic operation: a parcel operator has developed its own parcel locker network to deliver the parcels he is in charge of. This includes traditional postal operators in charge of the universal postal service and other operators like Amazon or InPost.

A diverse range of players is active in the market, including national postal operators, parcel carriers, e-commerce platforms, and independent residential lockers operators (Streule 2021). Recent literature (Anson et al., 2021; Rozman, 2020; Streule, 2021; WIK, 2021) well describes the market. We will concentrate here on the main evolutions observed in 2021.

2.2 A Fast-Evolving Sector

There are numerous examples of evolution of parcel locker networks in the public space and for residential use. In Germany, the national postal operator, Deutsche Post, has planned to speed up the development of its parcel locker network, with a target of 15,000 lockers compared to 12,000 for 2022. It plans also to install 800 parcel lockers in train stations in partnership with Deutsche Bahn. InPost, the parcel lockers leader in Poland, aims for 19,000 to 19,600 lockers in Europe in 2022 against an initial target of 18,250 to 19,000 lockers² and has expanded its parcel locker network in the United Kingdom by 180% in 2021 (3,000 parcel lockers). Also in the United Kingdom, Amazon has doubled its network in two years with a total of 5,000 lockers.

In France, Alibaba, via its e-commerce platform AliExpress, has installed lockers since September 2021. In November 2021, it concluded an agreement with the super-market chain Match to expand its network in the north of France, with a goal of 650 lockers at the end of 2021. Amazon has made a similar agreement with the super-market chain Casino to install new lockers in France. La Poste has won the tender launched by the Paris Transport Authority (RATP) to roll out 50 parcel lockers (Pickup) in train stations in the Île-de-France region in 2022. In the Nordic region, PostNord is investing in parcel lockers with an objective of 4,500 lockers in Sweden, 1,500 in Norway, and 600 in Finland by the end of 2022.³

Regarding residential parcel lockers, in France, Boks has installed 3,000 parcel lockers for 20,000 users and Quadient has started deploying its residential lockers

² Inpost Q3 2021 trading update.

³ <https://www.postnord.com/media/press-releases/2021/postnord-invests-substantially-in-parcel-boxes-in-the-nordic-region#:~:text=By%20the%20end%20of%202021,Trondheim%20in%20use%20as%20well.>

in France in 2021.⁴ The French market is unusual because the mailboxes are standardized and can contain nearly half of the parcels delivered throughout the whole territory. The development of stand-alone parcel lockers is therefore less important than in other countries. Their development is linked to cultural and consumers habits and the historical development of mailboxes. In spite of this, some operators, participants in the mailbox market, locker operators, and various start-ups have important ambitions in France.

For individual dwellings, there is only one owner who decides on the type and location of the mailbox or parcel lockers he or she wants to install. In the case of collective dwellings, in France, installation is subject to co-ownership rules and requires a vote of the general assembly of the owners. Decision-making can be complex if there is no consensus on the installation of parcel lockers or on the allocation of the associated charges among the various inhabitants of a building.

On the supply side, some new players are also investing in the sector. CTT, the national postal operator in Portugal, concluded a partnership with YunExpress, the Chinese Zongteng Group logistics business unit, to create a joint venture to manage a parcel locker network in Portugal and Spain. The network will be open to any operators with the aim of 1,000 lockers at the end of the year.⁵ In France, Mondial Relay, which has been bought in July 2021 by InPost, began to deploy parcel lockers in 2021 (300 at the end of the year) and plans to continue.⁶ Panasonic is also introducing its parcel lockers (“Smartlocker”) in Europe after its development in Asia.⁷

In this growing sector, we also see the development of technological and service innovations. In Finland, Posti plans to use artificial intelligence to predict the number of parcels that will be collected by consumers before the next delivery.⁸ In Spain, Correos has allowed parcel returns in the lockers “Citypaq” since November 2021.⁹ Mondial Relay in France is also considering this. Omniva in Estonia bundles deliveries to maximize parcel lockers usage. If a new parcel arrives for a customer and there is still a previous parcel waiting in the parcel locker, the new parcel will be put in the same box. In France, Boks, which sells parcel lockers for residential use, has

⁴ <https://www.lsa-conso.fr/quadient-lance-ses-consignes-A-colis-automatiques-pour-immeubles-residentiels,376883>.

⁵ <https://www.ctt.pt/grupo-ctt/media/noticias/ctt-and-zongteng-group-develop-partnership-to-manage-parcel-lockers-network-in-portugal-and-spain>.

⁶ <https://region-aura.latribune.fr/strategie/logistique/2022-02-01/e-commerce-mondial-relay-imagine-le-futur-de-la-livraison-avec-ses-lockers-fournis-par-son-actionnaire-inpost-902656.html#:~:text=Mais%20pour%20Mondial%20Relay%2C%20cette,qui%20lui%20fournit%20ses%20propres>.

⁷ <https://business.panasonic.fr/solutions/news/smartlocker-panasonic-la-solution-de-livraison-et-de-retours-sans-contact#:~:text=Une%20solution%20retail%20durable%20pour,et%20des%20retours%20sans%20contact>.

⁸ <https://www.posti.fi/en/customer-support/news-releases/postis-smart-parcel-lockers-predict-the-filling-rate-of-lockers>.

⁹ <https://www.correos.es/es/es/particulares/enviar/devolver-un-paquete/devuelve-con-citypaq>.

introduced connected scales in its lockers in order to strengthen the security of its lockers (to monitor thefts and if the good parcel has been delivered).¹⁰

Parcel lockers may be used to send as well as receive packages. Inpost has introduced the “Elektro Returns” service, the return of used electrical and electronic equipment, via parcel locker network in Poland.¹¹ The equipment goes to a professional company, where its efficiency and the possibility of partial or complete reuse are checked.

3 What is an Essential Facility?

3.1 Legal Definition

Whether a facility is essential is determined *ex post* through litigation. An operator in a dominant position could be penalized for abuse if its competitors are denied access to an infrastructure considered an essential facility. Legal practice has established cumulative criteria to characterize essential infrastructure. The infrastructure must be owned by a dominant undertaking or a monopoly company, and be indispensable to carry out a competitive activity in a market upstream, downstream, or complementary to the one in which the infrastructure holder holds a monopoly or a dominant position. Moreover, the infrastructure cannot be duplicated under reasonable conditions by competitors of the infrastructure holder. Access to the infrastructure must be possible, but is refused or authorized under unjustified restrictive conditions. When these criteria are met, the refusal by the owner of the essential infrastructure to give access to its competitors on fair and non-discriminatory terms constitutes an abuse of a dominant position, unless such access refusal is justified by legitimate reasons.

Borsenberger et al. (2017, p. 5) define essential facilities as “inputs that are unconditionally necessary to provide some goods or services and that are unfeasible or too costly to be duplicated or to be bypassed. At the same time, there must not exist sufficient demand side substitution possibilities for the service itself.” In addition, “essential facilities not only have to be nonreplicable but also non-substitutable with regard to the service they are needed for (Heitzler, 2009, p. 80).”

These legal criteria for determining “essential facility” status are strict. Indeed, Competition Authorities consider that the right of access to an essential infrastructure should not be too easily recognized. Otherwise, the incentive to innovate could be compromised and economic efficiency could be undermined.

In the postal sector, some decisions have been taken regarding distribution networks. The French Authority has repeatedly rejected the application of the essential facility theory to La Poste’s infrastructure. Indeed, in its decision of May 12,

¹⁰ <https://itrnews.com/articles/191446/boks-ajoute-une-balance-connectee-A-ses-consignes-intelligentes-pour-renforcer-leur-securite.html>.

¹¹ <https://www.inpost.eu/sites/cffcom-ir/files/media/company-news/pdfs/2021-11-16-inpost-lau-nches-electronic-waste-recycling.pdf>.

2011,¹² the Authority considered that access to La Poste's distribution network was not "strictly necessary" to operate a parcel delivery service, as companies have alternative solutions for distributing parcels. They can rely on an existing network or create a new network. In this context, the Authority estimated that La Poste's distribution network could not be regarded as an "essential facility."

More generally, in its *Bronner* decision,¹³ the European Court of Justice ruled on the refusal of a daily newspaper publisher and holder of the only home delivery system for daily newspapers at a national level to give access to a competing publisher. In this decision, the Court stated that the access refusal must eliminate all competition on the part of the undertaking and the home delivery service must be indispensable to the business of a daily press publisher, i.e., there is no real or potential alternative to the home delivery system. Specifically, in this decision, the Court held that the refusal at issue did not eliminate all competition in the daily newspaper market.

3.2 *Economic Definition*

An infrastructure can be qualified as essential if it is proven that it can neither be duplicated (i.e., there is no perspective for the development of an alternative infrastructure) nor substituted (i.e., there is no perspective for the development of an alternative technology that would permit to bypass the existing infrastructure). For Borsenberger et al. (2017), "in practice, there are two steps to determine whether an input is essential: first, examining whether there are high entry barriers on this input's market, i.e., barriers that reduce the probability of an effective competition for the provision of this input; second, examining whether the input is vital to be active on the market, i.e., the facility cannot be duplicated or substituted." They went on to say, "the economic literature distinguishes two main reasons for the presence of natural barriers¹⁴ that prevent entry into markets (Bain 1956): the existence of economies of scale or of sunk costs." Economies of scale are an entry barrier only when coupled with demand inertia. As McAfee et al. (2004) observed, "In the absence of demand inertia, an efficient new entrant (i.e., an entrant offering a lower tariff and/or a better-quality product) should be able to attract enough consumers to benefit from economies of scale."

¹² Decision 11-MC-01.

¹³ Case C-7/97, 26 November 1998.

¹⁴ Natural entry barriers are defined in opposition to legal barriers (for instance, a legal monopoly) and strategic barriers that result from operators' anticompetitive behaviors.

4 Parcel Lockers, a New Possibility to Deliver Parcels

4.1 *Parcel Lockers Are Part of the Distribution Network*

E-commerce has been stimulated as the Coronavirus crisis led to new consumer habits. Xerfi Precepta (2021) predicts an annual increase of 8% between 2021 and 2023 for the volume of parcels in France and 6% for revenue in the same period. Since 2017, the number of parcels distributed in France has exceeded one billion and continues to grow year on year. In 2020, the number of parcels delivered in France reached 1.2 billion, up 6.6% in one year. The revenue associated reaches €6.3 billion and is growing at a similar rate to the number of parcels delivered (Arcep, 2021).

The parcel market is very dynamic. There is more volume to deliver, and customers are not reluctant to switch from one operator to another. Consequently, there is a large room for competition based on price or quality. Some firms have developed omnichannel distribution (combining multiple channels, for example a combination of online (computer or mobile device) and offline (brick-and-mortar) channels).

In this context, parcel locker is a new service offered to the consumer to deliver parcels. High demand for parcel delivery has stimulated the growth of parcel lockers as part of the distribution networks of operators. As said previously in Sect. 2, parcel lockers networks are expanding; and on the supply side, some new players are entering the market and new services are developing.

4.2 *Parcel Locker Networks in the Public Space Cannot Be Qualified as Essential Facilities*

If we focus for example in the B2C parcel delivery market, including home and out of home delivery, it appears that all parcel delivery methods are substitutable. Thus, the delivery to parcel lockers in the public or semi-public space can be substituted for by home delivery or delivery in post offices.

If we focus only on out-of-home B2C parcels, delivery via parcel lockers in the public or semi-public space also appears to be substitutable with other delivery methods such as delivery to a relay point. For instance, in France, La Poste's delivery network has never been qualified as essential facility by the Competition Authority, and delivery to parcel lockers can be substituted by delivery in relay points or in post offices. French e-consumers prefer delivery to relay points; 3% of French e-consumers use parcel lockers delivery versus 68% using relay points (Xerfi Precepta, 2021). Access to a network of parcel lockers is therefore not essential to deliver parcels.

In addition, as described in Sect. 2, many non-dominant operators throughout Europe are developing parcel delivery networks, for example, Smartmile in Finland and Hambourg Box in Germany. Parcel locker networks are therefore duplicable. Rozman (2020) also reached this conclusion. The existence of substitutes for the

delivery of parcels, the absence of obstacle preventing duplication of the parcel locker network and the possibility to refuse access due to shortage of parcel lockers' compartments are the main arguments.

A proceeding on access to postal lockers is pending before the Spanish Competition Authority. In 2020, the Spanish logistics and transport trade organization filed a complaint against Correos, denouncing the conditions of access to the "Citipaq" network. The organization contests the fees to be paid to access Correos' network, stressing that the delivery in parcel lockers is a right of the consumers, equivalent to delivery to the home, even if it cannot be the object of a private contract. Correos, for its part, responded that this service is a commercial service and encourages its competitors to invest in this area.¹⁵

It is therefore clear that parcel locker networks in public spaces or semi-public spaces cannot be qualified as essential facility. They correspond to one delivery modality among others.

4.3 Residential Parcel Lockers, an Essential Facility?

We have previously shown that parcel lockers in public space cannot be considered as essential facilities, whether we consider that the relevant market includes home and out-of-home parcel delivery or only out of home delivery. With regard to residential parcel delivery, if we focus on an overall market including home and out-of-home parcel delivery, various delivery methods are substitutable. Indeed, access to residential parcel lockers is not necessary to carry out a parcel delivery activity insofar as there are alternative modes of delivery.

If we focus only on home parcel delivery, we can see that there is sufficient competition. The network of parcel lockers is not essential to deliver to consumers; in some countries, residential parcel lockers are not developed such as in Hungary, Bulgaria, or Malta. As shown in Sect. 2, many operators are creating alternative parcel locker networks. In France, mailboxes are standardized and their size is such that they can contain about half of the number of parcels delivered. Since 1979, a regulatory framework¹⁶ requires that for each new building, at least one mailbox per dwelling must be installed that has to comply with AFNOR (French association of standardization) standards.¹⁷ It should be noted that the choice of a format allowing the distribution about half of the parcels¹⁸ makes it possible to sustain the growth of e-commerce by offering efficient home delivery. This framework has been stable for

¹⁵ <https://elmercantil.com/2019/12/02/correos-defiende-el-libre-acceso-de-los-operadores-al-sis-tema-de-taquillas-citypaq/>.

¹⁶ Decree of 29 June 1979. Ces dispositions sont actuellement reprises par les articles R111-14-1 du Code de la construction et de l'habitation et L1 et R1-1-5 du Code des communications électroniques. These provisions are currently included in articles R111-14-1 of the «Code de la construction et de l'habitation» and L1 et R1-1-5 of the «Code des communications électroniques».

¹⁷ NF D27-404 and NF D27-405.

¹⁸ 260 × 260 × 340 mm *a minima*.

more than forty years and has allowed the development of a particularly large stock of standardized mailboxes (around 80% of the current stock).

The Spanish case law goes in the same direction. In 2016, the Spanish Competition Authority issued an opinion on the parcel locker network installed in the private space (“HomePac” of the Spanish postal operator Correos).¹⁹ This opinion followed several questions asked by UPS and the professional organization of logistics and transport in Spain (UNO).

In this decision the Spanish Competition Authority has more precisely pronounced itself on the possible qualification of essential facility of the “Homepac” network. On this subject, the Authority first considered that Correos is far from being a dominant operator on the whole parcel delivery market. Moreover “Homepac” network is an infrastructure of the postal network and does not require a disproportionate or unaffordable investment from parcel operators on the market. Thus, the Spanish Authority does not consider it is necessary to regulate access to “Homepac” lockers at this time. Nevertheless, the Authority states that once the market is more mature, the Spanish Authority may eventually intervene. Indeed, the Authority stresses that such a network of residential lockers could be difficult to develop given the limited space in residential buildings. For the Authority, the provision of sufficient physical space and the prior authorization of the inhabitants play a fundamental role and could become a barrier to entry. In any case, the Authority considers that parcel operators should ideally first undertake projects to extend the residential parcel locker networks, together with other operators.

We agree that parcel locker networks cannot be qualified as essential facilities. It is likely that parcel lockers will continue to be one of several means of delivering parcels. In the following section, we will demonstrate that access to both residential and public parcel lockers should not be regulated.

5 What About Today’s Regulation of Parcel Lockers?

We have previously shown that the parcel lockers sector is very dynamic and is only one way among numerous solutions to receive parcels for consumers. Their development has raised the question of access regulation (in Spain, and Luxembourg²⁰).

¹⁹ Decision CNS/DTSP/028/15.

²⁰ In 2018 Ertzberg (which deploys Bringme parcel lockers in the public space but is not a delivery operator) informed Post Luxembourg of its desire to establish itself on Luxembourg territory. Discussions had started between the two operators, but Post Luxembourg finely decided that it would not deliver Bringme lockers. Ertzberg filed a complaint with the Luxembourg Competition Authority against Post Luxembourg for abuse of a dominant position. The complaint was finally withdrawn because an agreement was reached between the two parties. The Authority has therefore closed the case without further action.

5.1 *Ex Ante Regulation for Parcel Lockers in Public Spaces*

The question of the need to implement *ex ante* regulation of a sector arises when *ex post* competition law appears insufficient to maintain effective competition in a market.

Ex ante regulation is necessary for sectors of activity where market conditions create barriers to entry that cannot be removed by a posteriori intervention. In the telecommunications sector, the European Commission considers that sector-specific regulation should be implemented only in the presence of high and lasting barriers to entry, the absence of evolution toward effective competition over three years, and the insufficiency of competition law to remedy the identified problem (Bacache-Beauvallet and Perrot, 2017).

Firstly, regarding the parcel lockers, we have shown in Sect. 4 that they cannot be considered as an essential facility. Secondly, as the parcel delivery market is emerging, there is no evidence at this stage that *ex post* competition law is not effective enough to address potential competition concerns. Third, *ex ante* regulation is not necessary to push operators to share their parcel lockers. On this point, Rozman (2020) argues that “if operators have economic interests for sharing parcel lockers (e.g., in order to recover investments), there is no need to impose an obligation on them to open parcel lockers for other providers since they already have (economic) incentives to do so.” The market is still emerging and as long as the players are self-regulating and respect competition rules, there is no need to impose *ex ante* regulation.

Moreover, imposing *ex ante* regulation of access to parcel locker networks could create disadvantages. In general, the choice to regulate a distribution network can bring complexity and reduce the incentive for actors to innovate. In this case, regulating access to parcel locker networks could reduce the incentive for actors to innovate. Indeed, as described in Sect. 2, the parcel locker sector is subject to technological and service innovation. For instance, in Finland, Posti plans to use artificial intelligence to predict the filling rate of its parcel lockers, in Poland, InPost has developed parcel lockers with sensors to monitor air quality.²¹ Innovation can also concern subjects such as new technologies to ensure locker security, smart lockers, choice of materials, etc.

Fixing general conditions for access to delivery networks impacts innovation. As underlined by Borsenberger et al. (2017), “given the speed at which innovations are implemented, these conditions will rapidly be outdated. In particular, the access charge decided at time t will no longer be adapted to the situation in $t + \varepsilon$ and would thus considerably threaten the operator’s financial viability. Postal operators will be less incited to invest into innovative delivery modes because they will not only bear the risks related to innovative investments but also the risks related to regulatory failures.”

²¹ <https://postandparcel.info/143743/news/e-commerce/inpost-committed-to-providing-consumers-with-real-time-information-about-air-quality/>.

Consequently, having parcel lockers in a public space is one modality to deliver parcels and not an essential infrastructure to be active in the delivery market. As previously highlighted in Sect. 2, new actors are entering the market, proving that access to lockers is not a barrier to entry.

5.2 Residential Parcel Lockers, the French Example

As demonstrated previously, residential parcel lockers cannot be qualified as an essential facilities, and it is likely that parcel locker network will remain just another means of parcel delivery. As with parcel lockers in public space, *ex ante* regulation of access to residential lockers is not appropriate. *Ex post* competition law is sufficient to address potential issues between competitors and parcel locker networks can easily develop. In addition, operators can find ways to share parcel lockers. In any case, residential parcel lockers could be subject to standardization to protect users' rights.

On this point, the French example is interesting. The development of parcel lockers and residential lockers in France offering a new standard of service has called into question the current definition of "mailbox" in France and implies consideration of its evolution toward greater connectivity and security. In residential buildings, the future scheme could consist of a modernized, compulsory mailbox, possibly supplemented by a variable number of optional parcel lockers according to the needs of the residents.

Under French law, mailboxes are considered an extension of the home and, as such, benefit from special protection. As in most countries, there is an offense under French criminal law of trespassing, i.e., entering against the will of the occupant or without his or her knowledge. The exceptions to this principle concern certain persons who are agents of the public authority and in particular circumstances, most often under the control of a judge. Thus, mailboxes benefit from a protective legal status, and the question of its extension to residential parcel lockers seems relevant.

This point is particularly sensitive with regard to access rights of different actors: delivery operators, neighbors, persons of public authority, and others. It is still too early to have court decisions on this subject, but extension of trespassing protections to residential parcel lockers could be retained if the user is in a position to control access rights to what would appear to be an extension of his home. This reasoning may be more difficult to apply when the definition of access rights is in the hands of the parcel lockers operators. Both system types exist in currently offered lockers. It will be important to see how these issues are dealt with in the standardization currently underway in order to protect users' rights.

Historically, La Poste has developed an authentication technology called "VIGIK" that has been widely adopted and deployed for access control in more than 450,000 buildings. VIGIK allows authorized operators to identify and authenticate themselves using a badge or a smartphone that applies public key infrastructure. The access right is temporary and expires quickly in order to secure the system. Experiments are currently underway to see how this technology could be used to organize access

control to future mailboxes and residential parcel lockers. VIGIK allows access control while respecting the right of users to retain control over the definition of access rights.

The content of the parcel lockers must also be protected by the legislation with respect to the right to privacy, a general principle present in most national laws. For the sake of completeness, mailings are also covered by a specific regulation that organizes the respect of the right to privacy in an even stricter way with the offense of violation of the secrecy of correspondence.²²

On the issue of standardization of parcel lockers, in addition to the topic of access rights, the design of the parcel locker itself has been questioned. In response, the Belgian Council of Ministers approved in June 2022 a draft royal decree that establishes a legal framework for residential parcel lockers. The royal decree specifies, among other things, the dimensions of parcel boxes and the identification elements of the lockers, to facilitate the delivery of parcels.

6 Conclusion

Parcel lockers are a growing market with many innovations regarding services or technology for security and connectivity. The future evolution of this market will depend on the adoption of this delivery method by e-shoppers as the different consumers' habits and preferences in Europe relating to parcel delivery.

Today nothing calls for an *ex ante* regulation of parcel lockers in the public space or for residential use. This market is very dynamic and growing. Parcel lockers are only one solution to deliver parcels in a very dynamic parcel market.

If we look at the parcel delivery network, it is not an essential facility. Borsenberger et al. (2017) stated that “strong pieces of evidence show that the postal delivery network cannot be qualified as essential.” The authors found that sunk cost and economies of scale associated with the delivery activity are not sufficiently high to constitute an entry barrier. Since the national postal operators' delivery network is not only duplicated but also has substitutes from alternative technologies to home delivery, it is anything but essential.

Sunk costs are fixed costs already spent that cannot be recovered. When entry into a market requires substantial investments, sunk costs that will not be recovered in case of failure could discourage entry. Borsenberger et al. (2017) observe, “contrary to other network industries (such as electricity, telecommunications, or rail) in which investments are very specific and hardly recoverable, investments in a postal delivery network are in their vast majority easily recoverable.” Indeed “whatever it concerns mails, parcels, domestic or cross-border flows, the postal delivery network is mainly made of workers, vehicles, sorting machines and warehouses.” Sunk costs would not constitute a barrier to entry into the parcel market. The fact that the postal delivery

²² Articles 226–15 et 432–9 du code pénal.

network cannot be qualified as essential might be additional evidence that parcel lockers are not essential.

More generally, regulating access to parcel delivery networks does not seem necessary. Parcel delivery networks are not an essential facilities, and imposing access can discourage innovation. Postal operators also have an interest in offering access to their delivery network in concluding agreements. For example, negotiated work-sharing agreements are a way to increase the volume handled, thus benefiting from higher economies of scale and economies of scope, and in the end, increasing the competitiveness of their services. For a complete analysis, Borsenberger et al. (2017) have discussed more broadly the limits and risks of regulating access.

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A Universal Support Fund for Postal Services in the United States



Victor Glass, A. Nicita, and S. Gori

Abstract The long-term financial sustainability of the postal operator in the United States (USPS) has been thoroughly discussed in the past few decades, but the implemented reforms have not yet achieved this objective. In this chapter, we attempt to address the possibility of financing the USO in the United States through a Universal Support Fund (USF) because of its potential advantages. It would fund service targets that an ordinary business would not be required to meet. It is consistent with economic theory that places a value on the option to have mail and parcels delivered to every door. It is also consistent with funding that supports other essential services. Leaving aside the political difficulties associated with introducing a USF, there are two major technical challenges: sizing the fund correctly and funding it in a way that allows USPS to plan effectively. This paper will address both challenges by examining the advantages and disadvantages of a Compensation Fund (CF) supported by other providers (mainly from parcels and courier express) versus a public fund financed through an income tax (Brennan in *The postal and delivery contribution in hard times*. Springer, New York, 2022). This comparison will consider the practical feasibility, the potential market distortions, and the economic equity issues linked to spending financed by taxes.

1 Introduction: USPS at a Crossroad

The long-term financial sustainability of the United States Postal Service (USPS), the postal operator in the United States, has been thoroughly discussed in the past few decades, but the implemented reforms have not yet achieved this objective. Since 2006, total mail volume has fallen by 39%. This decline has occurred despite the growth in population from 298 million in 2006 to 330 million in 2020. Yet, due to a

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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, only about 3 in 2020, and in 2030 the estimate is 1.7 (WSJ, 2022). The USPS is meant to be self-sufficient, but its losses since 2007 have reached nearly \$90 billion (WSJ, 2022, 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 are also those who believe that without the health care funding problem (Anderson et al., 2019) and with more freedom in its pricing policy and the growth in parcels, USPS is now or could turn profitable (e.g., United States Postal Service, 2017, updated on 2021). Nonetheless, mail as a dominant market product should be self-supporting. Shortfalls in revenue should be made up through the USF, not through cross-subsidies from parcels, which may distort pricing in a market deemed competitive.

In mid-February, USPS announced its financial results for the first quarter of its fiscal year 2022 (Oct. 1, 2021–Dec. 31, 2021), reporting an adjusted loss of approximately \$1.3 billion for the quarter, compared to an adjusted loss of \$288 million for the same quarter last year (Parcel Post, 2022). All things equal, the sudden jump in inflation will also contribute to USPS's losses. Inflation has risen sharply from 1.7% in February 2021 to 7.5% in January 2022 (Trading Economics, 2022), and will likely rise from there because of the war in Ukraine. The inflation adjustment to the USPS's price caps is a weighted average of past inflation levels (Ravnitzky, 2006, p. 17). This method will understate the price increase allowed by USPS. As a result, the inflation increase will likely further erode USPS profits unless there is emergency relief.

However, a form of relief has finally arrived. On March 8, Congress passed the Postal Service Reform Act 2021. Two notable features of the Act are that it requires future USPS employees to enroll in Medicare. Currently, only one-quarter of retirees opt to do this even though they pay into Medicare. Second, the Act rescinds the requirement that USPS pre-fund retiree health care benefits (House Committee on Oversight and Reform). As a consequence, USPS expects to save \$50 billion over the next ten years (Katz, 2022). While this shift in funding to the government reduces USPS's deficit, it is still not a permanent fix because the primary source of USPS's revenue base, mail, is declining with no turnaround in sight.

Glass et al. (2022) discussed if Panzar's (1991) seminal paper of thirty years ago on whether the postal service is a natural monopoly was still valid. Consistent with Panzar's conclusion that mail is a natural monopoly, our paper noted the long-term difficulties facing USPS. Competitors to incumbent postal services in Europe have chosen to offer only parcel services. Joint delivery of mail and parcels appears to be an unprofitable venture for competitors. Because mail is a natural monopoly that is losing money, we want to address the possibility of financing the USO in the United States through a Universal Support Fund (USF) and analyze how to estimate its size using net cost methodology consistent with the rules described by the European Union in the Annex I of the Postal Directive (Annex I PSD, 2008).

The remainder of the paper is organized as follows: Sect. 2 explains the need for a support fund and the problems associated with establishing one. Section 3 describes the Net Cost method the European Union uses for sizing a support fund and associated implementation issues. Section 4 describes alternative approaches used in the European Union for establishing a revenue base and contribution rate to fund a universal service obligation. Section 5 describes why state funding may be the most appropriate funding strategy in the United States. Section 6 describes a proposal for sizing the universal service fund obligation in the United States. Section 7 concludes the chapter.

2 A Support Fund for Postal Universal Service?

A USF for USPS recognizes that USPS requires funds to meet service objectives that are unprofitable. Examples include delivery in sparsely populated service areas where delivery costs exceed revenues. Longer-term, an ordinary business is not likely to enter a declining market where delivery addresses keep growing and total mail volume is declining unless it could raise rates to offset cost increases. In 2020, the PRC prescribed an adjustment formula to the USPS price cap to offset declining demand by raising the price ceiling for mail (PRC, 2020). A very important constraint on USPS is that it does not and probably cannot charge for “home” delivery. No other basic network service offers free customer connection to its grid. A universal service fund would be sized to include the option to have mail and parcels delivered to every door. Policymakers have recognized the value of universal service funds in other basic industries such as telecommunication to offset policies that produce economic losses but produce net social benefits. One recent example of adjusting the fund for basic telecommunication services to meet a newly defined category of universal service is its extension to broadband service to high-cost rural service areas (Casper, 2021).

The first challenge is to size the fund in a way that allows USPS to plan effectively—meaning to provide service at target quality levels and at the least possible cost. The next three sections address the “Net Cost,” methodology used in the European Union to size the fund and the advantages and disadvantages of a Compensation Fund with provisions from other providers (mainly from parcels and courier express) versus state-financed fund through income tax. Most of the analysis will be based on the experience in Europe with these funds; however, in the last two sections we will present an open proposal and a possible way forward for the United States. The comparison between the two financing methods will consider practical feasibility, potential market distortions, and economic equity issues linked to spending financed by taxes.

3 Net Cost

In 2008, the European Commission provided guidance on calculating the net cost of universal service (Annex I PSD, 2008) for postal services. In the first part of the annex there is a brief definition of the Universal Service Obligation (USO) placed upon a postal service provider, which concerns the provision of a postal service throughout a specified geographical area, including uniform prices, number of days of delivery or provision of certain free services for certain categories of citizens (e.g., blind and partially sighted persons).

According to the European Commission, national regulatory authorities (NRAs), in calculating the cost, should aim at cost efficiency. To do so it defines also how the calculation should be carried out (Annex I PSD [2008]). The European Commission requires that the NRA estimate any cost related to and necessary for the provision of the universal service and then calculate the cost difference (net cost) between a designated universal service provider operating with the USO and the same postal service provider operating without the USO. This calculation should consider intangible and market benefits that accrue to a universal service provider. Furthermore, the universal service provider is entitled to a reasonable profit to remunerate investments needed to update the network and incentives are put in place to stimulate an ongoing process to improve cost efficiency.

According to Annex I of the European Postal Directive (Annex I PSD [2008]) the calculation is to be based upon the costs attributable to which can only be provided at a loss or provided under cost conditions falling outside normal commercial standards. Moreover, services provided to specific users or groups of users who, considering the cost of providing the service, the revenue generated, and any uniform prices, can only be served at a loss or under cost conditions falling outside normal commercial standards. The responsibility for verifying the net cost lies with the NRAs, with the objective to create the least distortion to competition and to user demand. This can be ensured in an objective, transparent, non-discriminatory, and proportionate manner.

The European Commission goes a step forward and defines a sharing mechanism of a Compensation Fund which needs to be transparent and neutral for collecting contributions that avoid a double imposition of contributions falling on both outputs and inputs of undertakings. Such funds should be administered by an independent body responsible for collecting contributions from undertakings, which are assessed as liable to contribute to the net cost of universal service obligations and to oversee the transfer of sums to the undertakings (Annex I PSD, 2008).

Concerning net cost, Ghalumyan (2022) recently presented an insightful report (explaining the calculation details of the USO and the rules of Annex 1 in one equation:

$$\begin{aligned} \text{USO Net Cost} = & (\text{Base case (including USO) revenues} - \text{Costs}) - \\ & (\text{Counterfactual (excluding USO) revenues} - \text{costs}) + \\ & (\text{Intangible assets from being USP}) \\ & + \text{reasonable profit,} \end{aligned}$$

This simplified scheme has not been defined in detail in some European countries (Ghalumyan, 2022, page 1). His report analyzed methods for recognizing cost efficiency, by applying specific ex post adjustments or by embedding cost savings due to increased efficiency. Another issue he discussed was intangible assets including branding benefits, advertising opportunities, and the VAT exemption.

The EU has defined “reasonable profit” in three different ways. In a SGEI (Services of General Economic Interest) 2011 decision, the European Commission referred to the rate of return on investment as a measure of reasonable profit. The European Commission later observed in a Greek state aid decision (SA.35608) that in the postal sector the return on sales is very often used. This contrasted with calculating the return on capital (as in the Belgian Case SA 14588). (Ghalumyan, 2022, p. 2).

On November 2021, the European Commission presented a report assessing the Postal Directive and, in it, addressed the issue of the net cost of the USO and of its financing. In that report the European Commission (EC) explains (restating what we presented above in the discussion on Annex I of the PSD) that the provision of universal services entails a net cost. The EC also explained that the net cost of the universal service obligation represents the difference between the cost for a designated universal service provider operating with the universal service obligation and the cost for the same postal service provider operating without the universal service obligation. Furthermore, the EC recognized that the net cost of universal service provision can be substantial. If the universal service provider had to bear such costs on its own, it would put that provider at a disadvantage vis-à-vis its competitors.

Hence, EU countries may compensate the universal service provider for the net cost through state aid. The EC regulatory framework also allows Member States to set up a so-called Compensation Fund (CF) on providers of services that substitute for universal services to finance the net costs. Such funds operate in a way that the universal service providers and other major postal services providers in a given Member State have to contribute to finance the net cost if it constitutes an unfair burden for the universal service provider (European Commission, 2021, p. 7).

4 Pros and Cons of Setting a Compensation Fund

Article 7 of the Postal Directive 97/67EC states that if universal service obligations entail a net cost, a Universal Service Provider (USP) can be compensated through public funds or a Compensation Fund (CF). A CF envisions sharing the net cost of the USO among several postal services providers (Gori et al., 2018). The key elements of a CF are the contribution base and the contribution rate. It is first necessary to determine which services are to be included in the contribution base. The contribution base refers to the revenues of the companies offering universal services and their substitute services. As noted by Gautier and Paolini (2011), if a CF is not set correctly, competition might be affected because newcomers could make the wrong decision in deciding to enter or not and the choice of the size of the scale of operations. We

examine in this section the experience in the European Union on the Compensation Funds to learn if there are possible takeaways.

The second key element of the CF is the rate of contribution. In Poland, it was set up as a limited percentage (2%) of relevant revenues. The percentage is uniform among participants (principle of nondiscrimination), and the same proportion of revenues they obtain from universal services or their substitutes (principle of proportionality, Postal Directive, article 7 subparagraph 5). Furthermore, there is also a revenue threshold below which postal operators do not have to contribute to the CF. Both the limit to the maximum percentage of relevant revenues to be paid and the threshold for exclusion reduce the possibility that the CF becomes a barrier to the development and competition of the postal industry by small potential entrants. The Postal Directive, article 3, subparagraph 4, establishes a minimum set of facilities that the universal service provider has to provide (Gori et al., 2018).

The EC (2021) seems not very satisfied on how this fund has been applied so far in Member States.

There are weaknesses in relation to how compensation funds operate. Providers' contribution to the fund is often not sufficient to cover the entire cost, especially as the cost is growing in a declining letter mail market and the universal service providers have a strong position. In these situations, State aid funding is also required to finance the costs. It also seems that the administrative costs of the sharing mechanism are relatively high in proportion to the contribution fees. Moreover, sharing the burden among postal operators sets low incentives for a universal service provider to improve its efficiency and may deter market entrance. In its current form, the provision of the Directive on the compensation fund is not working in an optimal manner to fund the universal service. This may also explain why Member States very rarely use this way of funding the net costs of universal service provision. (European Commission, 2021, p. 7)

5 Pros and Cons of State Financing

State funding of basic services has been discussed in the United States. The telecom industry has opted to forgo this method because annual funding becomes politicized. The industry has opted for an assessment of long-distance revenue providers to fund local infrastructure. This method has become increasingly unsustainable as traditional traffic has migrated to the Internet. Many reform proposals have been discussed (Glass and Tardiff, 2021).

State financing has the advantage of being less distortive compared to a Compensation Fund from a competition point of view. It may also have the advantage of the funding source could be from a progressive tax structure, making funding less of an equity issue. Either source of funding runs into the difficulty of the USPS's postal unions, which would require especially careful cost containment because of the incentive to pay for employee benefits through the proposed universal service fund.

6 A Proposal for the United States

In this section we provide the rationale and template for a universal service fund to finance USPS's mail services by explaining in more detail why USPS is not likely to recover its USO costs and has more onerous obligations than other providers of last resort (POLR). We also offer a version of a net cost methodology that would be applicable to USPS. To begin, as with other POLRs such as electric utilities, the USPS has four basic service obligations: universal availability of mail service, comparable quality of delivery service in all areas, resiliency of delivery, and comparable services at comparable rates in rural and urban areas (Bluhm and Phyllis, 2009). The issue is whether a POLR can operate like a normal business. The answer is no because it has obligations to deliver services that are unprofitable in many areas. For USPS, this is stated explicitly (39 U.S. C. 101(b)),

USPS shall provide a maximum degree of effective and regular postal services to rural areas, communities, and small towns where post offices are not self-sustaining. No small post office shall be closed solely for operating at a deficit, it being the specific intent of the Congress that effective postal services be insured to residents of both urban and rural communities.

Unlike other POLRs, the USPS is not privately owned, hence it cannot borrow by issuing debt to the public. It can borrow from the Treasury but has a maximum limit. Its decision-making authority is also highly circumscribed (Crew and Kleindorfer, 2013). The Postal Regulatory Commission has ten objectives and fourteen factors for evaluating Postal Service performance (PRC, 2017). These examples show that the value propositions are hard to measure.

- Objective 7: to enhance mail security and deter terrorism.
- Factor 3: the effect of rate increases upon the general public, business mail users, and enterprises in the private sector of the economy engaged in the delivery of mail matters other than letters.
- Factor 8: the relative value to the people of the kinds of mail matter entered into the postal system and the desirability and justification for special classifications and services of mail.
- Factor 11: the educational, cultural, scientific, and informational value to the recipient of mail matter.

Paradoxically, while there is increasing competition for parcel delivery, competition for mail delivery is drying up in European states where it is allowed, suggesting that mail delivery remains a natural monopoly (Parcu et al., 2021).

In the United States, POLRs that deliver telecommunications or electric utility services, have moved toward cost-causative pricing. This has not happened yet for USPS. Three groups benefit from USPS: senders, recipients, and government. Senders are shouldering the entire load, instead of paying incremental costs for what they send. Recipients are paying nothing, but it is awkward to collect from them. Delivery is valuable and should have a price. If it were not provided automatically, it would be the equivalent of having an option value of directly connecting to the network. It also has a social value associated with delivering ballots and medicine.

Although postal service categories cover the average incremental cost, they still contain subsidies among customers. The cost of delivery increases with distance and decreases with density. Specific rural areas are likely to produce economic losses even if wide rural geographic areas do not. The same may be true of specific urban areas where physical delivery is more difficult.

USPS's realized costs include significant tax and borrowing rate advantages because it borrows directly from the Treasury (Shapiro, 2015, p. 4), although this credit line has a ceiling (Office of Inspector General, 2016). Other financial advantages include exemptions from state and local property taxes and the special arrangement for federal taxes that go into a Postal Universal Fund to cover USPS's expenses. These are inefficient substitutes for universal service funding, which should be eliminated.

Our recommendation is to estimate the economic cost of last-mile to-the-door delivery by delivery types, such as single residences and apartment buildings, and estimate internal service category cross-subsidies among service categories and geographic regions and use them to estimate a universal service fund. Estimated savings are available from USPS's perspective for delivery to the door, delivery to a curbside mailbox, and delivery to the post office (Shapiro, 2015, p. 16).¹ These estimates are probably a floor on the value from the customer's perspective, if the customer had to pick up mail from the post office, because USPS enjoys economies of scale in delivery. The benefits of the accurate social value of postal delivery would lead to cost-causative pricing and fair pricing from an equity perspective because it would not rely on price increases for least price elastic services to cover costs, which are likely necessities such as prescription drugs.

A universal service fund is realistic because the telecom and transportation have support funds. The Federal Communications Commission established four programs within its Universal Service Fund: The Connect America Fund, Lifeline, Schools, and Libraries, and Rural Health Care (FCC, Universal Service). The U.S. Department of Transportation administers a TIGER Discretionary Grant program that allows the Department of Transportation to invest in road, rail, transit, and port projects that achieve critical national objectives (U.S. Department of Transportation).

Following the strategy used for sizing the universal service fund for broadband services, the required level of support for postal delivery may begin with calculating the Average Incremental Cost (AIC) pricing for mail service categories but make them more geographically granular. Cost estimation would include middle-mile transport costs and last-mile transport costs. This last-mile cost would serve as an estimated access price for the option of having mail delivered to the door instead at some other collection point. The usage price would recover middle-mile costs through the current stamp tariffs. Separate rates could be estimated for classes of mail based on an Average Incremental Cost (AIC) analysis.

Other joint costs with parcels and common costs would also need to be estimated. Because the cost of retirement funds may be shifted to the Treasury Department, these costs should be eliminated from shortfall calculations when this occurs.

¹ In this case, net economic cost is associated with last-mile service.

To calculate support, a basic formula would serve as the starting point:

$$\begin{aligned} & \text{Revenues from access and usage revenues and retirement funds—} \\ & \quad \text{Cost of usage (based on AIC) – Other joint and common costs} \\ & \quad \quad \text{–Cost of retirement funds = funding shortfall} \end{aligned}$$

The USPS could use a variety of methods to estimate costs such as making its current cost estimate methodology more granular or by developing a cost simulation model like the one developed by the Federal Communications Commission.

Once the fund calculation methodology is in place, the next issue is to decide on the funding mechanism. If the telecommunications industry is a guide, the USPS POLR should avoid having the fund sized through the political process each year or from competitor revenues. Perhaps funding could be associated with a line item on the Federal Income Tax form subject to some form of cap. The funds should go to USPS alone since it will continue to be a monopoly for mail services. Other sources of funding could lower the size of the new universal service fund such as tapping into the support funds for Electronic Vehicles.

7 Conclusion

Europe recognizes the need for a universal fund for mail delivery and state funding seems to be preferred versus a Compensation Fund. The proposal for a universal service fund for USPS is similar in concept to the European approach based on the estimate of the net cost of mail delivery for USO services. If instituted, a Universal Support Fund for USPS has many advantages. It recognizes that USPS requires funds to meet targets that an ordinary business would not be required to meet. It is consistent with economic theory that places a value on the option to have mail and parcels delivered to every door. It is consistent with support funding of other essential services. The challenges are to size it correctly, to fund it in a way (state funding vs. Compensation Fund) that allows the United States Postal Service to plan effectively and to find a way to take into account the work sharing discounts of large mailers without creating competitive distortions in the upstream market and in the courier and express segment.

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Incentives of Compensating USO Net Costs



Felix Gottschalk, Urs Trinkner, and Eva Zuberbühler

Abstract This chapter rebuts the widespread intuition that compensating the net costs of universal service obligations narrows the provider's incentives to reduce its costs or achieve growth. An illustrative example and a numerical simulation show that net cost compensation implies that potential gains of efficiency and growth measures are shared between the universal service provider and the public, and therefore, the former has incentives to implement such measures while the latter benefits from paying lower compensations.

Keywords Universal service obligation · Postal service funding · Net cost compensation · Cost efficiency · Growth incentives

1 Introduction

The EC postal directive¹ foresees that universal service providers (USPs) shall be compensated the net costs of their universal service obligations (USOs). Meanwhile, universal postal services are increasingly compensated by the government or, in fewer cases, by fund mechanisms throughout Europe. In case of USO compensation, the

¹ Directive 97/67/EC, amended by Directives 2002/39/EC and 2008/6/EC.

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EC directive also states in Annex 1 of amendment 2008/6/EC that, in relation to the calculation of net costs, “National regulatory authorities are to consider all means to ensure *appropriate incentives for postal service providers [...] to provide universal service obligations cost efficiently*” (Part B, Sentence 1). More explicitly, “*the calculation [of net costs] shall take into account [...] incentives for cost efficiency*” (Part B, Sentence 4).

In this chapter, we investigate the effect of USO net cost compensation on incentives for USPs to increase cost efficiency and achieve growth. Whereas governments are reluctant to pay USP cost inefficiencies as part of the USO net costs, it is important that USPs themselves have enough incentives to increase efficiency of universal services when they are compensated for USO net costs. In that respect, efforts of USPs to increase efficiency might be reduced if they result in a constant profit due to correspondingly lower USO net cost compensation (instead of a higher profit in the case of no reduction). Similarly, growth in non-USO segments might have a similar effect, thereby undermining the development of USPs. For example, WIK (2015) lists “poor incentives for USP to reduce cost of USO (since that cost is funded by the government)” as a weakness of state funding. This view might be true for deficit coverage of universal services, where the public covers the sum of losses of all non-profitable services. However, compensating the net costs of the USO according to the profitability cost approach—in essence implemented in the EC postal framework—does not imply that the state funds a USP’s deficit, rather, its profit situation in a benchmark scenario without USO is restored. We present strong evidence that net cost compensation preserves a USP’s incentives to seize efficiency improvements and growth compared to the benchmark while lowering USO net costs and hence reducing the financing need of the public.

We first provide an overview of the existing literature on incentives under net cost compensation, including foreseen elements in EC countries to ensure cost efficiency. Because these incentives are non-trivial, in a second step we model incentives for efficiency and growth in a stylized example of a postal incumbent acting in a regulated USO segment under net cost compensation as well as in two unregulated segments, with one of them requiring some common infrastructure together with the USO segment and the other not. We are primarily interested in the marginal profits of a set of arbitrary options of USPs to invest in cost efficiency (in variable and/or fixed cost) and growth (volume or price increases) in the regulated or unregulated parts of the business.

The paper is structured as follows. Section 2 provides a review of the literature. Section 3 explains the intuition behind the result that net cost compensation does not weaken a USP’s incentives to reduce cost or achieve growth. Section 4 outlines the simulation model and its results. We summarize and conclude in Sect. 5.

2 Review of the Literature

The literature on incentive regulation is not only vast but strongly influential and covers different topics as cost-of-service or price caps regulation (for an early paper on the latter see, e.g., Brennan, 1989; for a review Armstrong and Sappington, 2007). Not surprisingly, there is a strong interplay between these topics and the USO net cost (see e.g., Jaag, 2013). However, modeling such interplays is beyond the focus of this paper, which lies on the USP's incentives provided by net cost compensation in comparison to a benchmark without USO. This type of funding rather applies in liberalized postal markets as in the EU. Consistently, the USP considered is not a monopolist but faces some competition in providing the USO.

Therefore, this paper is closer to the literature concerning the determination of net costs, both from a theoretical as well as practical point of view. Naturally, different methods have different scopes of application. For the calculation of an adequate compensation widely accepted is the profitability cost approach, amongst others established by Panzar (2000) and Cremer et al. (2000). In principle, this method defines net cost as the difference between the profit in a counterfactual scenario without USO and the actual profit of the USP with USO. The specific design of the counterfactual and the main drivers of net costs are broadly analyzed, not only in theory (e.g., Gottschalk et al., 2022a) but also regarding their implementation in the actual funding of USOs (e.g., ERGP, 2012).

While papers on the effects of different funding mechanisms on the structure of (reserved and competitive) markets and entailed welfare implications form an important strand of literature (e.g., Gautier and Paolini, 2011), only few of these studies discuss potential consequences of different methods for USO net cost compensation on the efficiency of the USP. That is, to the best of our knowledge, there is little theoretical research focused on the USP's efficiency incentives under net cost compensation. An example is Nicolaidis (2016) who compares different calculation methods for compensating USO net costs. His exercise illustrates how to minimize public funding while holding the USP's volume and service quality constant. He concludes that the method must leave the USP a share of the efficiency gains in form of a profit.

Due to the economic importance of USO compensation, also national regulatory authorities (NRAs) have analyzed the policy-relevant incentives of USPs if their net costs are compensated. Recently, the US Postal Regulatory Commission (2020) published an extensive order on regulating market-dominant products that, amongst other objectives, also considers efficiency incentives of the US Postal Service. For the EU, Annex 1 of amendment 2008/6/EC obliges NRAs to ensure appropriate incentives to provide universal service obligations cost efficiently and further specifies that the calculation of net costs shall entitle the USP to "a reasonable profit and incentives for cost efficiency." The European Regulators Group for Postal Services (ERGP, 2016) conducted a survey on the role of efficiency in the national regulatory practices. They find that almost all NRAs have legal requirements to consider or assess

efficiency, e.g., within tariff control, net cost calculation, universal service designation, requirements for financial sustainability and others. The ERGP stated that USPs increased their efficiency in both dimensions: They reduced costs (mainly by downsizing the postal network and staff, as well as by optimizing delivery). Second, they introduced new services while improving existing ones (e.g., they performed additional governmental tasks as issuing certificates or expanding activities in financial markets). The NRAs name the decline in volumes, the intensified competition and privatization as the main market-driven incentives of the USPs to increase efficiency. Additionally, NRAs actively promote efficiency, mostly by imposing cost orientation requirements and/or *ex ante* price control. Our analysis of the responses in the ERPG questionnaire on efficiency cannot identify any pattern between different funding mechanisms and the USP's efficiency incentives.

3 Intuition: Sharing Gains Preserves Incentives

This section outlines an illustrative example of a possible cost reduction to illustrate the intuition of why net cost compensation preserves a USP's incentives to seize efficiency improvements while also benefitting the public funder. Note that the same logic applies in the case of profitable growth (also shown by the simulation results in the next section).

Assume a profit-maximizing USP facing a USO that consists of a set of constraints, for example daily letters delivery. As a result, costs in the benchmark without USO are (weakly) lower than in the USO scenario. Profit maximization implies that cost-reducing measures available in the latter are implemented in the former anyway.

Consider, for instance, a relative cost reduction (i.e., the postal operator reduces its costs by a certain proportion in both scenarios): In absolute terms, this relative cost reduction is lower in the benchmark with lower costs than in the USO scenario with higher costs. This implies that the absolute efficiency gain in the benchmark is lower than in the USO scenario, which in turn implies that the absolute difference between the two gains, i.e., the change in net costs due to the cost reduction, is negative. Therefore, net costs after the cost reduction are lower than before.²

As a consequence, it seems obvious that both parties, the USP and the public, benefit from the measure if the regulator *ex ante* determines the amount of compensation, i.e., before the implementation of the measure. In that period, the USP's profit with USO is higher and it retains the entire efficiency gain. In the subsequent periods, the public then benefits from the lower amount of net cost compensation.

However, the gain is also shared if the amount of compensation is determined *ex post* the measure is implemented, i.e., after the lower net costs are realized. To illustrate this, we compare the USP's profits (both with USO) before and after a

² Note that this is true for *relative* cost reductions, and analogously, for *relative* growth achievements. However, *absolute* cost reductions or growth achievements have no effect on net costs since increases in the profits in both scenarios by an identical fixed amount cancel out when taking the difference.

relative cost reduction. We consider an example of a 5% reduction in fixed costs F (no matter whether segment-specific or joint), where NC_b denotes the net costs before any measure is implemented (subscript b), and π_a^{USO} the profit in the USO scenario (superscript USO) after fixed costs are reduced by 5% (subscript a). For simplicity assume that the fixed costs in the benchmark (BM) equal half the fixed costs in the USO scenario. The net costs before the measure equal $NC_b = \pi_b^{BM} - \pi_b^{USO}$. After the cost reduction net costs are $NC_a = \pi_b^{BM} + 0.05 \cdot F/2 - (\pi_b^{USO} + 0.05 \cdot F) = NC_b - 0.05 \cdot F/2$, and thus, lower. It follows that in the case of ex post determination of the compensation, the public's benefit amounts to half of the efficiency gain. The other half is kept by the USP itself, as its profit after compensation is $\pi_a^{USO} = \pi_b^{USO} + 0.05 \cdot F + NC_b - 0.05 \cdot F/2$, and thus, higher than before it implemented the measure (by the amount of $0.05 \cdot F/2$). This example shows that both parties, the public and the USP, benefit from a cost reduction even in the case of an ex post determination of the compensation.

The same insights result from analogous exercises for relative reductions in variable costs as well as relative growth achievements. However, they crucially depend on the assumption that the efficiency or growth measures indeed yield gains. That is, the insights hold true only if, in both scenarios, the absolute effects of a measure on the returns are lower than on the costs. More precisely, for cost reductions we assume that the gains are not competed away, and demand is rather inelastic such that the efficiency gains exceed the change in price times units sold. Similarly, we assume growth measures to be profitable. The simulation presented in what follows relies on the very same assumptions made in this section.

4 Simulation: Effects of Measures on Net Costs and Profits

We tackle the question of whether net cost compensation weakens efficiency or growth incentives by means of a stylized simulation that represents the situation of several EC postal markets. Our numerical results suggest that the USP's incentives are not weakened under direct (i.e., external) compensation of USO net costs, a compensation scheme that was provided by law in 25 of the 28 EU member states in 2018, and applied in 14 cases (Copenhagen Economics, 2019).

The simulation is conducted as follows. We start with a description of the additional assumptions in the model (the assumptions outlined in the previous section also apply to the simulation) and present the calibrations of the benchmark scenario as well as the scenario with USO. The thereby implied profits and net costs serve as baselines for the comparisons with profits and net costs after the implementation of efficiency or growth measures. The measures themselves are not endogenous to the model but exogenously available to the USP. This allows us to calculate the profits and net costs if the USP implements the measures, and finally, compare them to the baseline outcomes.

In our model we assume a postal incumbent acting in three segments: (i) A regulated segment \mathbf{R} of universal services, e.g., letter services; (ii) An unregulated

segment **U1**—in the sense that it does not create considerable net costs when part of an USO—with some joint operational fixed costs with the regulated segment. This could be parcels³ or just business parcels that use some common processes with the regulated segment, e.g., collection in post offices, transport, or distribution in remote areas. Other interpretations could be financial services or third-party products that are offered in post offices; (iii) An unregulated segment **U2**, operating completely independent of the other two segments, e.g., digital services or early morning newspaper delivery.

For every segment, we assume quantities, prices, variable costs and segment-specific fixed costs.⁴ Moreover, we consider joint fixed costs between segments R and U1. To keep things as simple as possible, we assume no overhead costs (which would not alter results as the effects are analogous to those between R and U1).

We start our modeling with a scenario *without* USO that we refer to as our benchmark scenario. In a second step, we add the USO as a set of changes to costs and revenue of the benchmark scenario and report the resulting USO net costs. In a third step, we simulate possible efficiency improvements and growth initiatives in both the benchmark and the USO scenario. This allows us to analyze the effect of these measures on profits and USO net costs per segment and overall.

4.1 Calibration Benchmark Scenario (No USO)

We first calibrate a situation without USO that we will use as our benchmark scenario.

Table 1 shows the main calibration of the three segments in the scenario without USO, where R represents letters at an average price of 1 unit of money, U1 parcels with an average price of 5. Without loss of generality, we assume both segments to have a turnover of 1,000 M units of money in order to simplify the interpretation of the results. The segment U2 represents some electronic services with very low variables but high fixed costs. In all segments, the benchmark calibration translates to a margin of 10% (return on revenue).

In this calibration, segments R and U1 both get—although different prices, unit costs and segment-specific fixed costs—exactly the same allocation of joint fixed costs (50% each) regardless of using a revenue key or a cost key. This has been designed with the intent to make the effect of different cost allocation keys more transparent (without any loss of generality in the qualitative results). Moreover, note that this allocation of costs to the three segments, in particular using the cost key, is compliant with the EC postal directive (Art. 14).⁵

³ Typically, also parcel delivery creates net costs when regulated as part of a USO. We nevertheless make this assumption to show the mechanisms more clearly.

⁴ We abstain from modeling a demand function, that is, we take quantity and price changes as exogenously given by market mechanisms in interaction with regulation.

⁵ Article 14 appears to favor applying a cost key as opposed to a revenue key.

Table 1 Model calibration in benchmark scenario assuming situation without USO

Benchmark: No USO	R	U1	U2
Units sold	1,000 M	200 M	1,000 M
Average Price	1.00	5.00	0.01
Revenue	1,000 M	1,000 M	10 M
Variable costs per unit	0.20	2.25	0.0001
Total variable costs	200 M	450 M	0.1 M
Segment-specific fixed costs	450 M	200 M	8.9 M
Joint fixed costs	500 M		
Joint fixed costs allocated using cost key	250 M	250 M	
Joint fixed costs allocated using revenue key	250 M	250 M	
Total costs	900 M	900 M	9 M
Profit	100 M	100 M	1 M
Return on revenue	10%	10%	10%

4.2 Calibration of the USO Scenario

We change the benchmark without USO to a USO scenario by making a series of assumptions. In our main analysis we calibrated the effects of the USO as reported in Table 2.

On the cost side, we assume for segment R—recall that this is the segment that contains the universal services (and products)—that the universal service obligation increases variable costs by 5% and fixed costs by 20%. Reasons could be more households that have to be served at their premises, additional delivery days and/or

Table 2 Simulated effects of the USO

USO: Changes relative to benchmark	R	U1	U2	Total net costs
Cost side				
Variable costs per unit	+4.0%	+2.0%	+0.0%	
Segment-specific fixed costs	+20.0%	+10.0%	+0.0%	
Joint fixed costs	+10%			
Revenue Side				
Average Price	+4.0%	+2.0%	+0.0%	
Units sold	−1.0%	−1.0%	+0.5%	
Resulting Net Costs				
Cost key	105 M	26 M	−0.05 M	131 M
Revenue key	94 M	37 M	−0.05 M	

Note that if the USP receives compensation according to these net costs (131 M), it achieves exactly the same profit with and without the USO, making the USP indifferent about providing the USO, which is in line with Panzar (2000) and Cremer et al. (2000)

a higher number of post offices. Such obligations generally have a stronger impact on fixed costs than on variable costs in the postal market. On the revenue side we assume “positive” effects on prices (due to higher costs) and muted opposite effects on volumes sold (limited volume losses because of more loyal customers). Taken together, the revenue effects are somewhat smaller than the cost effects. Segment U1 has been defined to use some common processes with segment R, hence we assume similar but more moderate effects except for the change in demand with the idea that competition in U1 is stronger.⁶ Segment U2, by definition operationally independent, is assumed to receive a positive⁷ effect on volumes, resulting in negative net costs of that segment (i.e., the segment is better off because of the USO—no additional costs, but additional revenue).

The USO net costs equal the difference in profits of the benchmark and the USO scenario. With this calibration, the total net costs of the USO amount to 131 M, thereof 94 and 105 M, respectively, stemming from the USO segment R, and 26 and 37 M, respectively, from segment U1. The exact distribution, although not affecting total net costs, depends on the cost allocation key applied. As the cost effects of the USO are more pronounced than the revenue effects, the cost allocation key attributes a higher share of joint fixed costs to segment R in the USO scenario and therefore results in a higher USO net costs for segment R compared to a situation where a revenue key is applied.

4.3 Baseline Effects of Increased Efficiency and Growth on Overall Profits and Net Costs

We now come to the core of the paper: What happens if a new technology becomes available that increases cost efficiency? What happens if an opportunity becomes available to profitably stimulate volumes or increase prices?

In the following, we assume a series of efficiency improvements and growth opportunities and analyze the effects on profits with and without USO, and thus, also on net costs.

For net cost compensation we assume two different regulatory regimes:

- (i) **Regime 1 “ex post”/“endogenous”**: The USP receives exactly the net costs computed above reflecting all efficiency improvements and growth effects (endogenous). In practice this would mean that the net costs are calculated for a given financial year once the relevant figures are available, i.e., calculation and compensation take place in the year that follows the base year (ex post);

⁶ Considering the situation in European member states, usually market shares in letter services remain considerably higher than for parcels. In Switzerland, in addition there remains a residual monopoly in segment R.

⁷ A positive effect could result if the USO strengthens the brand and image of the USP, with positive spillovers to all products of the USP. One could argue also for a opposite effect, for example if the USO is perceived as anachronistic, static or outdated.

- (ii) **Regime 2 “ex ante”/“exogenous”**: Net costs are estimated in advance for the year(s) to come (ex ante), and the USP receives these net costs irrespective of efficiency gains and other effects that occur during the covered period (exogenous).

Both regimes have their advantages, and one might expect that regime 2 provides weakly higher incentives to improve efficiency and achieve growth because the USP fully benefits from the efficiency gains in the period before the amount of compensation is updated. However, incentives are preserved in regime 1 since under ex post determination of the net costs as the profitability cost approach ensures a share of the gains for both parties, the USP and the public (see Sect. 3 for a more detailed intuition of the mechanism).

Efficiency improvements will affect at least one cost component of at least one segment. For example, if a technology improvement is introduced that can be used for parcels only, this will affect segment-specific variable and/or fixed costs of U1. If more efficient transport means can be introduced, this will likely affect the joint fixed costs of R and U1, as well as variable costs and segment-specific fixed costs of the two segments. These examples indicate that it will be likely that efficiency improvements affect processes in their entirety, meaning that of a service, both USO and non-USO elements will benefit in a similar way. In fact, it is hard to think of an efficiency improvement that would affect USO services only (not being a reduction of the USO), for example a technology that can be applied exclusively to the subset of post offices that are not commercially viable. Rather, a new technology will be implementable in all post offices. The reported efficiency improvements considered are therefore of generic nature affecting both USO and non-USO elements in a given cost component.⁸

By analogy, in our model we can reflect growth opportunities by assuming higher volumes or prices in a given segment, possibly complemented by adjustments in the cost structure.

To keep things simple and align the model to the Swiss situation, we assume sticky prices.⁹ We do not model demand effects explicitly, these can however be set as an input parameter. A consequence of this assumption is that the different cost allocation rules do not change prices, and therefore, overall net costs and profits remain the same (for an analysis of welfare effects of different cost allocation rules see Haller et al., 2019; for a review of the literature on pricing independent of average costs and its effects on incentives see Armstrong and Sappington, 2007). However, segment-specific profits and net costs remain sensitive to different cost keys as they lead to different allocations of joint costs.

⁸ The effect of an efficiency improvement only available to USO services would have no impact in the non-USO benchmark scenario and therefore directly reduce USO net costs. In regime 1, such improvements would benefit the public only. In regime 2 vice versa, that is the USP would be able to keep all benefits during the ex ante defined period (in subsequent periods the public).

⁹ In Switzerland, for institutional reasons, prices can be adjusted very rarely only; since 2004, letters prices could be increased the first time in 2022.

Table 3 presents the results for some possible efficiency and growth measures. For completeness, every possible efficiency gain is analyzed, and for transparency, they are analyzed separately, i.e., all other parameters are held constant according to the calibration outlined above. We assume an effect of 5% for each efficiency gain, being representative for lower or more pronounced effects (effects are mainly linear).

The results of the simulation allow a series of observations and conclusions:

- (i) In regime 1, where the net costs are determined endogenously (i.e., ex post), efficiency and growth measures change the profit of the USP exactly in the same (positive) way with and without USO. Hence, *compensating the USO net cost*

Table 3 Effects of efficiency and growth measures on overall profits and net costs

Measure	D Total profit regime 1 (endogenous) (M)	D Total net costs (M)	D Total profit regime 2 (exogenous) (M)
Increase efficiency			
5% lower variable costs R	10.0	-0.3	10.3
5% lower variable costs U1	22.5	-0.2	22.7
5% lower variable costs U2	0.0	-0.0	0.0
5% lower fixed costs R	22.5	-4.5	27.0
5% lower fixed costs U1	10.0	-1.0	11.0
5% lower fixed costs U2	0.4	-	0.4
5% lower joint fixed costs	25.0	-2.5	27.5
Seize growth opportunity			
5% higher volume R	40.0	-1.2	41.2
5% higher volume U1	27.5	-0.3	27.8
5% higher volume U2	0.5	-0.0	0.5
5% higher price R	50.0	-1.5	51.5
5% higher price U1	50.0	-0.5	50.5
5% higher price U2	0.5	-0.0	0.5
Conclusion	Strictly positive effect, exactly same size as without USO. Thus, net cost compensation does not weaken incentives	Strictly negative effect, i.e., cost of USO to the public decreases in regime 1	Equals sum of endogenous profit and net cost reduction, i.e., USO increases profitability of measures

- does not weaken any incentives of the USP to take the measures.* That is, the USP strictly implements every efficiency improvement or growth opportunity that it would implement in the benchmark scenario with no USO.¹⁰
- (ii) As a side result, in regime 1 *the USP is indifferent on providing the USO*—with and without USO its profit is the same in both scenarios.¹¹
 - (iii) *Efficiency improvements and growth strictly reduce the USO net costs.* This holds also true for measures in segments U1 and U2, as long as these are affected by the USO (for example, we assume slightly USO-related higher variable costs for U1, therefore, efficiency improvements affecting variable costs of U1 will reduce the USO net costs).
 - (iv) *For regime 1 (iii) means that fewer public means are necessary to finance the USO*—compensation of the USO is reduced by the exact same amount. *In regime 2*, where the net costs are determined exogenously (i.e., ex ante the implementation of a measure), *reduced net costs fully add to the USP's gain of the measures resulting in the benchmark scenario.* This holds true during the period, in which the amount of net cost compensation is determined. In subsequent periods, i.e., with a renewed determination, the public will be better off (like in regime 1).
 - (v) *In regime 2 (iv) implies that incentives to increase efficiency and achieve growth are even larger under USO net cost compensation than in the benchmark scenario without USO.* Due to the delayed adjustments of the net cost calculations, decreases in net costs can be retained for one more regulatory period.
 - (vi) *In the given calibration, the effects of the measures on baseline profits are clearly larger than those on the USO net costs.* This can be expected for a broad range of reasonable calibrations, as it can be expected that the cost-increment of the USO-constrained processes is lower than the baseline process costs (without the increment). The sharing of efficiency and growth gains between USP and the public is driven by the same argument and appears reasonable in both regimes.

All results also hold vice versa. Lowering efficiency will primarily affect the USP through lower profits. Under-proportionally, net costs will increase. This holds true not only for other efficiency measures, but also for profitable growth achievements. However, the results crucially depend on the definition of the benchmark to be more profitable than the USO scenario—a reasonable assumption. For more details on assumptions as well as on the intuition of above results see Sect. 3.

¹⁰ Note that this result crucially depends on the assumptions that the measures yield gains. That is, we assume that the gains are not competed away and demand is rather inelastic such that the efficiency gains exceed the change in price times units sold.

¹¹ Note that this conclusion has been derived assuming that the USO net costs are compensated by public funds. With a universal service fund, fed by contributions from some or all operators in the sector, effects are more complex, see Jaag and Trinkner (2010).

Table 5 Impact of a segment's measure on the other one

		Effect on other segment's profit...	
		...with cost key to allocate joint costs	...with revenue key to allocate joint costs
Measure in one segment	Increase efficiency	Negative	Neutral
	Seize growth	Positive or neutral/negative ¹²	Positive

4.4 Intersegment Effects and Effects of Cost Allocation Rules

The joint fixed costs between segments R and U1 have to be allocated. Depending on the basis for allocation, (e.g., revenue-based or cost-based), measures in one segment can reduce profit of the other segment. In Gottschalk et al. (2022b), we analyze the effects of the above efficiency and growth measures on business segment results in detail.

Summarizing, the general findings of the above section are confirmed on the level of individual business segments. Their analysis however shows that using segment costs to allocate joint fixed costs can lead to misaligned incentives between business segments, that is, the manager of one segment might oppose efficiency improvements in the other segment, see Table 5. In this light, basing allocation on revenue seems more reasonable, despite not appearing to be the first choice according to the EC postal directives (Art. 14). This result might be driven by a rather abstract implementation of cost-based allocation; more refined methods might better streamline company-internal incentives. Note that the negative externality of cost-based allocation from one segment's cost reductions to the costs borne by the other segments could be mitigated by fixing the basis for cost allocation *ex ante*.

5 Conclusions

We have asked how USO net cost compensation affects a USP's incentives to increase cost efficiency and seize growth. Table 6 summarizes the main results.

Our simulation shows that under reasonable calibration assumptions, the incentives of a USP for improving cost efficiency and seizing growth opportunities *remain unchanged compared to a situation without any USO*. A profit-maximizing USP always seizes a profitable opportunity as if it had no USO, a result that is in line with the literature on price cap regulation, and amongst others, driven by the interdependency of cost and prices. Seizing such opportunities generally also decreases USO net cost compensation, hence, also the public is better off. Relevant conditions for this main result are a USP that is *ex post* compensated for its net costs as well as the

¹² Positive for volume increases, neutral for price increases assuming no effect on volumes. Considering volume effects in case of a price adjustment, the effect is negative.

Table 6 Summary of results

		Determination of USO net costs	
		Ex ante for a regulatory period	Ex post for the past year
Impact on incentives for cost efficiency and growth	Measures affecting USO <u>only</u> (rare case)	(✓) Increasing incentives with duration of regulatory period	~ USP is indifferent of implementing the measure
	Measures affecting non-USO activities too (normal case)	(✓) Stronger incentives than in benchmark without USO	✓ Same incentives as in benchmark without USO

availability of efficiency and growth measures that increase its profits not only in the USO scenario but also in the benchmark, i.e., that have an overall positive impact not only on the regulated segment but also on the non-USO components. In that case, the USP is also indifferent on providing the USO as its overall profit after net cost compensation coincides with the one in the benchmark scenario without USO.

In contrast, if the amount of compensation is defined ex ante such that its calculation does not anticipate efficiency improvements and growth, the USP’s incentives to implement such measures are further strengthened. The net present value of a measure is then even higher than in the benchmark scenario without USO and the public also benefits once net costs are redefined in the following year or regulatory period.

For potential measures affecting *USO components only*—a scenario we consider to be an exception, an ex ante determination of USO net costs will provide appropriate incentives for the USP. With ex post compensation, however, the USP is indifferent to implement the measures, as the net gains accrue to the public through lower USO net costs.

We conclude that compensating the USO net costs ensures, as foreseen in the EC directive Annex 1, “appropriate incentives” for the USP to provide universal service obligations in a cost-efficient way. Our modeling suggests that no additional regulatory measures are necessary for a profit-maximizing USP. Besides, incentives for seizing growth opportunities outside the USO remain unchanged compared to a situation without any USO.

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Public Funding and Industrial Synergies: How They Impact on the Calculation of the Net Cost of the USO?



Emanuele Frezza

Abstract The postal services market is rapidly changing due to the letter mail decline and parcel delivery growth. Universal service providers (USPs) need to sustain their universal service obligation (USO) while trying to become efficient parcel delivery operators. In this scenario, USPs can receive government funding to compensate for the net cost of their USO but are also becoming the recipients of funding related to the EU recovery plan and the EU Green Deal. In order to address the declining cost efficiencies related to letter mail and to cope with growing parcel volume, USPs are also often integrating their letter mail and parcel services offer through the integration of the technology and infrastructure used to provide them. However, the interplay between these two trends could make the correct estimation of the USO net cost more difficult to national regulators (NRAs) attempting to check the correct allocation of costs between universal and non-universal services. This might imply a risk of USO overcompensation.

Keywords Postal transformation · USO funding · Cost allocation · Competition

1 Introduction

The postal services market is undergoing a significant transformation, where service provision is expanding, and where universal service providers (USPs) still need to sustain their universal service obligation (USO) but are also becoming parcel delivery operators. USPs can receive governments funding to compensate for the net cost resulting from the provision of their USO, as allowed by the EU Postal Services Directive (PSD). Moreover, USPs are also expected to be among the recipients of funding related to the EU's recovery plan and the EU Green Deal. Many traditional postal operators have announced further integration of their letter mail and parcel delivery activities, partly to address the declining cost efficiencies related to letter mail and also to cope with growing parcel volume. In its Staff Working Document

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(SWD)¹ accompanying the 2021 report on the application of the PSD, the European Commission has shared insights into the calculation of the net cost and has alerted that the methodology based on the development of a counterfactual scenario to compare cost with and without the USO may be difficult to implement because of funding overlaps and continued service integration.

This paper stresses that the difficulty of correctly calculating the net cost burden, which may pose a challenge to national regulators (NRAs) when estimating the resources needed for the provision of the USO and therefore the correct allocation of costs between universal and non-universal services. In this scenario, overcompensation of the USO burden may be difficult to avoid. The paper is organized as follows: Sect. 2 explores the current conditions for funding the USO, the challenges around the calculation of the USO net cost, and the increasing funds available for USPs; Sect. 3 explains how USPs are integrating the provision of letter mail and parcel delivery services and Sect. 4 discusses the implications of both increased funding and relevant synergies from services integration for the calculation of the USO net cost. Section 5 presents conclusions and recommendations.

2 Funding the Universal Service Obligation (USO)

2.1 *Current Legal and Regulatory Framework*

Basically, the USO ensures that a minimum range of services of a specified quality is provided at an affordable price to postal users, as reported in the EU Postal Services Directive.² As the decrease of letter mail volumes due to digitization of communications and the growth of parcel volumes due to the increase of e-commerce are changing the market mix for postal services. This trend implies that the financial sustainability of the USO has become now more difficult for traditional postal services providers.

In its 2021 report on the application of the PSD,³ the European Commission refers to the increasing cost of universal service provision and to the need to ensure long-term financial sustainability of the USO. The Commission remarks how EU Member States may compensate the universal service provider for the net cost burden of the USO through state aid, which can be seen as a viable funding option, under the state aid rules for Services of General Economic Interest (SGEI). It is here important to

¹ European Commission Staff Working Document—Evaluation of Directive 97/67/EC on common rules for the development of the internal market of Community postal services and the improvement of quality of service amended by Directives 2002/39/EC and 2008/6/EC.

² 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.

³ Report from the Commission to the European Parliament and the Council on the application of the Postal Services Directive (Directive 97/67/EC as amended by Directive 2002/39/EC and 2008/6/EC).

remind that, as per the PSD, the net cost of the USO is calculated as the difference between the net cost of a universal service provider subject to an obligation to provide the universal service and the net cost of the same operator without this obligation (counterfactual scenario).

Other than state funding, EU Member States may also set up compensation funds to finance the net cost, so to share the burden among all actors in the postal services market. However, only four EU countries (Denmark, Poland, Slovakia and Estonia) have so far established a compensation fund and there are relevant economic arguments explaining how these funds may provide low incentives for inefficient universal service providers to improve their economic and operational efficiency and may negatively impact the competitive position of other market players asked to contribute to the fund (WIK, 2021). Moreover, the PSD states that a request to contribute to the fund to other market players is legitimate only if the services they provide can be considered as “interchangeable” with the universal service, but it does not provide clear specifications on how to measure interchangeability between USO and non-USO services. Several studies also showed how the concept of interchangeability does not properly hold in the postal and delivery market.⁴

Overall, state aid seems to be the most effective and reliable option to compensate the net cost of the USO. Traditional postal operators have claimed that public funding is the main guarantee to have the USO sufficiently financed, and that with no or limited public funding, under-compensation of the net cost would negatively impact the quality of the universal service and/or unfairly affect the financial stability of USPs (PostEurop, 2022).

2.2 Challenges Around the Calculation of the USO Net Cost Burden

The European Commission recently confirmed that only 15 EU Member States have so far relied on its guidance for the calculation of the USO net cost, which is based on the development of a counterfactual scenario. In its 2021 report on user needs and the evaluation of the postal regulatory framework, WIK Consult has shown that not only the calculation of the net cost by the Member States which use it can vary significantly, depending on the counterfactual scenario chosen by the USP, but also that developing a completely hypothetical scenario specific to each country can present critical challenges.

The significant differences among Member States’ net costs calculations may depend on the different definitions of the scope of the universal service in each Member State. For instance, in some countries the scope of services ensured as universal services include single-piece letters only and not bulk letters, while some other countries have maintained a wide scope of the universal service, including

⁴ “Study on the interchangeability of USO and non-USO services”, Copenhagen Economics for the EEA (2015).

bulk mail and even newspaper delivery. In addition, some Member States have also introduced slightly different weight steps for postal items, which can also contribute to differences in the scope of the universal service. On top of that, there is also an additional layer of complexity that makes it almost impossible to compare Member States' net costs on the level of services. When looking at the compensation for the USO net cost, even where the scope of USO is similarly defined, there are countries in which compensation is paid only for specific elements of the USO, and other countries in which it is paid for the entire USO.

Another explanation for relevant differences among Member States' net costs calculations can be the specific methodology applied. Indeed, Member States apply different methods of net cost calculation. The main methods applied are the net avoidable cost (NAC) approach and the profitability cost (PC) approach.⁵ Both approaches aim to estimate and compare the profits of a USP with the USO and those of the same USP without the USO, and the final net cost is then the difference between those two profits. However, the approach to develop a counterfactual scenario is different. Frontier Economics (2013) explained how under the NAC approach, the counterfactual scenario can be seen as the USP ceasing to provide all loss-making USO and continuing to provide all non-USO products together with profitable USO through an unchanged network. Under the PC approach, the USP absent the USO in a competitive market would seek to reorganize its operations in order to maximize its profits. While this may include removing elements of USO products that are loss-making, as under the NAC, however the USP would also be expected to seek changes in its operations to minimize costs. It comes out that the adoption of different methodologies may lead to slightly different calculation results.

As mentioned at the beginning of this section, developing a hypothetical counterfactual scenario entails also practical challenges. Other than the approach, or formula, for net cost calculation, it is clear that a counterfactual scenario is also hard to develop as it entails developing a very reliable hypothesis on costs and revenues. As explained by WIK (2021), any calculation of costs and revenues has to depart from the accounting information available from the USP, and therefore models are likely to differ significantly among Member States. In a nutshell, the counterfactual scenario has to be developed individually for each Member State in which a net cost calculation is undertaken.

The burden of calculating the net cost represents an additional effort for USPs and, because developing the counterfactual scenario is not possible based on accounting data alone, an operator will have a strong incentive to calculate the net cost only if it expects to be compensated. Another challenge, and cost, is also sustained by NRAs who have to verify the plausibility of the data provided by the USP and may require external support to do so. It turns out that the full cost of developing and reviewing net cost models can still represent a relevant obstacle to overcome for both USPs and NRAs in some Member States.

⁵ "Study on the principles used to calculate the net costs of the postal USO", Frontier Economics (2013).

2.3 *USO Compensation Scrutiny and Increasing Funding Streams Available for USPs*

Traditional postal operators have constantly called for Member States to observe the principle of full compensation of the net cost with national funding, as from their perspective the USO should be sufficiently funded given its societal benefits (PostEurop, 2022). They have also often remarked the non-distortive nature of state funding as the most efficient compensation scheme, calling for shorter and less burdensome state funding procedures. However, according to EU competition rules, when net cost compensation involves state aid it must be notified to and evaluated by the Commission if the amounts at stake exceed 15 million Euros per year. The Commission is therefore tasked with verifying that the net cost calculation is a correct estimate of the true economic burden of the USO.

A recent state aid case involving Post Danmark provides an example of how the European Commission can scrutinize compensation of the USO and its related challenges. Post Danmark is the Danish USP and as such is entrusted with a USO. The postal operator is 100% owned by PostNord which is in turn 40% owned by Denmark and 60% by Sweden. On December 22, 2019, the *Brancheorganisation for den danske vejgodstransport* (ITD), a Danish transport and logistics association, lodged a state aid complaint in which they argued that compensation for the USO entrusted to Post Danmark for the year 2020 constitutes incompatible aid. This measure concerns compensation for an amount of about 225 million DKK (30 million Euros) to be granted to Post Danmark for carrying out the USO.⁶ While the Danish authorities, who had granted the aid, considered that the measure constitutes state aid under Art. 107(1) of the TFEU and is compatible under Art. 106(2) of the TFEU, the Commission considered that the measure constitutes state aid under Art. 107(1) but expressed doubts that all the compatibility requirements under the 2012 SGEI Framework were met and decided to launch a formal investigation in November 2021.

The rules on state aid for SGEI are quite flexible as they allow both investment and operating aid, but at the same time it is not easy to comply with those rules because the calculation of the compensation for the net extra costs of the SGEI can be a difficult task (Nicolaidis, 2021).

The Commission reached an initial conclusion that the USO compensation actually complies with several provisions of the SGEI Framework (i.e. presence of a genuine SGEI; duration sufficiently limited in time; compliance with transparency requirements, etc.) but raised concerns over two main aspects: (i) the compliance with Directive 2006/111/EC on the transparency of financial relations between Member States and public undertakings, as well as on financial transparency within certain undertakings; and (ii) the correct implementation of the NAC methodology, which

⁶ State aid SA.57991 (2021/C) (ex 2021/NN)—Denmark: USO compensation for Post Danmark 2020; State aid SA.55918 (2020/FC)—Denmark: Alleged State aid for Post Danmark for USO in 2020.

required establishing how Post Danmark would have operated in the absence of the USO with which it is entrusted, leading to the so-called counterfactual scenario.

With regard to the first aspect, Post Danmark needs to have a clear separation of accounts between the USO and other services and apply uniform and objective criteria in order to allocate costs. However, following its preliminary investigation, the Commission expressed doubts on the cost accounting methodology adopted by Post Danmark and therefore on the separation of accounts, mainly due to a lack of clarity about the regulatory supervision of Post Danmark's accounts and the validation of these accounts by external auditors. The Commission concluded that while it is possible that the cost accounting method was correct, the fact that the supervision has not been adequate casted relevant doubts on the reliability of the costs accounting itself.

With regard to the second aspect, the Commission expressed doubts about the estimation of the impact of specific assumptions on the cost of delivering letters or parcels for Post Danmark in the counterfactual scenario (i.e. absent the USO). The Commission casted doubts over the assessment by Danish authorities that a reduction of volume in the counterfactual scenario would not lead to an increase in terms of unit costs. At the same time, the Commission disagreed with the Danish statement that a closure of sorting and distribution centers would not lead to an increase in delivery costs for letters and parcels, as in the counterfactual scenario the need to travel longer distances to deliver postal items would necessarily raise costs. Therefore, the Commission observed how underestimated unit costs in the counterfactual scenario would unduly increase profits in that scenario which in turn would unduly increase the NAC amount. It follows that if the NAC is inflated, the verification of the absence of overcompensation is not possible.

The example described, concerning the recent Post Danmark state aid case, has shown once again the complexity around the calculation of the USO compensation and explained how potential inconsistencies in the application of the calculation methodology may also lead to relevant risks of overcompensation.

On a separate note, a 2022 report published by the Free and Fair Post Initiative (FFPI) has pointed out how in some countries USPs who already receive substantial amounts of direct funding by the government to compensate for their USO net cost continue to also receive public funding for other activities, such as their regional presence, their activities aimed at preserving territorial cohesion and even access to financial services. In some of these countries, this type of public support is motivated by a reference to a wider scope of the universal service compared to the narrower scope adopted in other Member States. However, in some cases such financial support reflects a willingness to sustain more general political or economic strategic objectives.

Other important developments can be seen at the EU level. Starting from 2021, the EU has also launched its "Next Generation EU" plan to support Member States' recovery from the economic crisis due to the COVID-19 pandemic. The EU Recovery and Resilience Facility (RRF) has made €672.5 billion in loans and grants available to support reforms and investments undertaken by Member States and part of those funds are likely to be channeled toward traditional postal operators who may use

them to sustain their USO but also finance their ongoing transformation into more efficient parcel delivery operators. The EU RRF should allocate almost 60% of total dedicated resources to support green and digital investments, as the EU's goal is to support the recovery of Member States' economies while funding their digital and environmental transition.

At the same time, USPs should also have access to further resources through the main investment pillar of the European Green Deal, which should mobilize relevant resources to boost sustainable investments in the EU. These resources are meant to help the EU's transition toward a more energy-efficient economy, and it can be expected that USPs will become active in seeking these funds, for instance to renovate postal buildings, including warehouses and logistics facilities.

3 How USPs Innovate: Synergies Between Letter Mail and Parcel Delivery Services

3.1 Coping with Volume Shift and USO Challenges

As small parcel shipments continue to increase, they currently account for a larger share of national and cross-border shipments. In this context, many delivery companies have benefitted from this development and today's most successful USPs are those able to mitigate letter volume decline and take advantage of the growing e-commerce business, both domestically and internationally.⁷ In fact, growing e-commerce and an increased demand for parcel delivery have represented an opportunity for traditional postal operators to increase their profits, but the general recent trend has witnessed a global decline in profitability for the majority of USPs in Europe.

Therefore, a volume shift from letter mails to parcels poses a relevant challenge to the financial sustainability of the USO and causes the cost of universal service provision to increase.⁸ As the introduction of mechanisms such as operational and price flexibility have limitations and cannot effectively reduce the USO burden (WIK, 2019), the use of compensation for the net cost of the USO has become more prominent and the current policy debate, as already discussed in the sections above, evolves more and more around the appropriate level of state intervention in the postal sector. With changing users' demands and needs, identifying where state intervention is required while avoiding to alter competition in the market remains a key objective.

In this scenario, traditional postal operators try to become more efficient delivery providers by enhancing the integration of letter mail and parcel delivery services in

⁷ "Postal Services in the EU", Copenhagen Economics, Research for the European Parliament's TRAN Committee (2019).

⁸ "Report on Development of Cross-border E-commerce through Parcel Delivery," WIK Consult, Study for the European Commission (2019).

order to exploit advantages, such as economies of scale and scope, deriving from a shared approach with respect to the use of advanced technologies, core infrastructures and a more comprehensive operational strategy.

3.2 Investments to Address Parcel Delivery and Integration of Letter and Parcel Services

In recent years, USPs have upgraded their existing postal networks in order to adapt for increasing parcel deliveries. As already mentioned, the application of new technologies to the parcel segment of the postal market has allowed USPs to significantly improve their parcel delivery efficiency (ERGP, 2020).

As described in the 2019 ERGP “Report on the development of postal networks”, in many European countries USPs have invested into both infrastructure, technologies and their services’ offer in order to introduce elements able to improve parcel delivery. For instance, several USPs have upgraded their existing sorting centers, especially with the introduction of new equipment or automated processes, in order to cope with additional parcel volumes. Traditional postal operators such as Poste Italiane, Deutsche Post and La Poste have invested in dedicated parcel sorting facilities and, in Belgium, bpost has consolidated all parcel sorting activities at a single new sorting center. In all these cases, the centralization of outbound and inbound sorting of parcels has allowed to increase the number of parcels processed per location⁹ as centralized sortation makes it possible to automatically sort parcels by using more sophisticated conveyors as well as sortation systems equipped with advanced scanning technology.

Investments in new operational technologies are motivated by the need to reduce costs and increase efficiency. A relevant technological development entails the improvement of track and trace systems, which can also include specific notification services. Ad hoc applications recently launched by Poczta Polska and PostNL (i.e. MyPost) to monitor and track the shipment of postal items at every step of their way are clear examples of this technology. Other technological innovations include the use of barcoding to allow for the scanning of labels on letters and parcels in an effort to improve handling speed in sorting facilities, as well as the use of RFID technology to identify parcels thanks to radio frequencies, therefore improving the logistics process.

In a more receiver-oriented postal services market, it is also important to apply innovations to last-mile delivery, in an effort to increase delivery options and improve customers’ experience. Last-mile delivery in e-commerce has rapidly evolved thanks to dynamic route optimization, data analytics, geolocation as well as the use of artificial intelligence. In fact, the partial or complete digitalization of the delivery process has the potential to increase safety and efficiency, for example by verifying information on delivery confirmation, by optimizing the number of delivery routes, etc. Thanks to the application of these technologies USPs can now provide more

⁹ “Review of Postal Operator Efficiency”, WIK Consult—Study for Ofcom 2013.

flexible delivery services but the costs of last-mile delivery directly to customers have become very high.¹⁰

In this context, an important innovation concerns the use of parcel lockers as alternative delivery or even pick-up points. Parcel lockers are increasingly used for deliveries as they can reduce last-mile costs for postal services providers and increase convenience for customers,¹¹ as they are usually installed in highly frequented areas (e.g. post offices, railway stations, shopping centers) and provide the possibility to collect parcels within flexible schedules. Therefore, the use of lockers can generate efficiencies otherwise not attainable via traditional delivery services (Frezza, 2022). It is interesting to note that while the number of parcel lockers is growing in many European countries, national differences in the demand for parcel services have had an impact on the expansion of locker networks. USPs in countries like Spain, Italy and Germany, have highly invested in such infrastructures with respect to lower investments in other countries (ERGP, 2019).

Other innovations that can be observed concern transport optimization, especially through the introduction of new vehicles with greater capacity to cope with more parcel volumes or through the use of alternative fuel vehicles (e.g. natural gas vehicles, electric vehicles, cargo bikes) in order to perform more environmentally sustainable deliveries. As customers' preferences evolve and the attention to sustainability increases, users tend to attach greater value to this type of solutions and pressure on postal operators to innovate their fleets by reducing their carbon footprint is increasing. Some USPs are also experimenting the use of hydrogen and biofuels, in particular for freight transportation.

Having described the main investments in technologies and infrastructures, it emerges how those investments often involve a substantial redesign of the postal logistics network. As observed, for many traditional postal operators redesigning their delivery networks is generally motivated by the need to respond to a changed postal products mix of letter mails and parcels.¹² One approach that many USPs select is the integration of letters and parcels into one delivery stream, as merging letters and parcels delivery could lead to potential efficiency gains,¹³ even though this evidence is not straightforward (Copenhagen Economics, 2018).

¹⁰ "Report on Key Consumer Issues", ERGP, June 2020.

¹¹ "Technology and Change in Postal Services – Impacts on Consumers", study for Citizens Advice, WIK (2016).

¹² "The endgame for postal networks: how to win in the age of e-commerce", McKinsey & Company (2019).

¹³ "Postal Services in the EU", Copenhagen Economics, Research for the European Parliament's TRAN Committee (2019).

3.3 Joint Use of Technologies and Physical Infrastructures

In most European countries USPs are opting for a joint logistics network for the delivery of both letter mail and parcels. As reported by many NRAs (ERGP, 2019), a joint network can yield relevant benefits in terms of total cost reduction, development of economies of scale and scope and operational efficiency and flexibility. Even in countries where USPs use separate logistics networks for letter mail and parcels, still there is a tendency of USPs to use a joint network at least in rural areas, while relying on separate networks in urban ones. The below graph clearly shows how widespread is the use of joint networks among European traditional postal operators (Fig. 1).

There are many examples of the benefits of sharing a postal logistics network, and its related infrastructure, for both letter mail and parcel delivery. For instance, joint sorting systems (i.e. multi-sorters) can allow to sort all postal items, from letters up to large parcels, by using parcel sorting and conveyor machines, usually used to determine the precise weight and size of parcels, also to sort letter mails more efficiently.

Moreover, the use of a joint network also implies that USPs can use the same network to provide other postal services apart from letters and parcels. These services can include, for example, newspapers, magazines, and other publishing material, in countries where USPs guarantee territorial coverage with respect to the delivery of those products, but they can also include any non-postal items that might be delivered by USPs through their postal network (ERGP, 2019). Overall, the main reason for distributing letters and parcels with the same network appears to be an opportunity for significant cost reductions and cost efficiencies. These can be also achieved by simultaneously relying on the same transport and delivery fleet, given that fleet

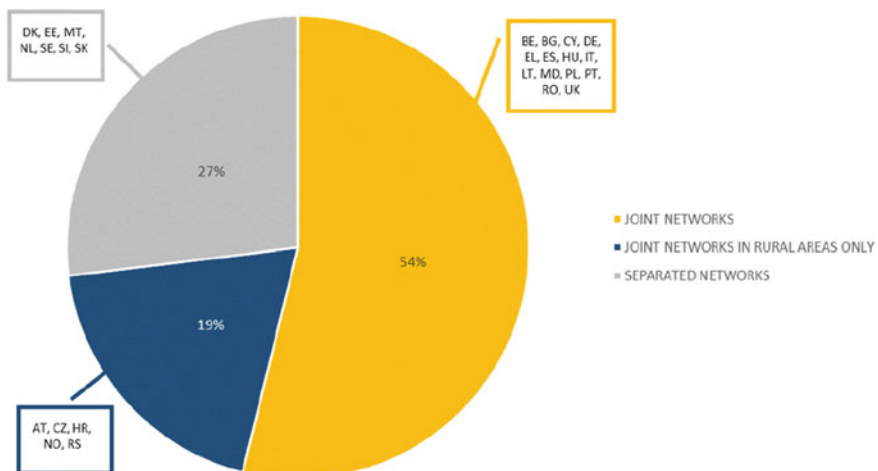


Fig. 1 Use of a joint or separate network for the delivery of letter mail and parcels by USPs (%) (Source ERGP Access regulation WG questionnaire 2019, based on the reply of 26 NRAs)

management represents a major fixed cost that can be therefore spread on a larger volume of postal products, leading to important economies of scale.

The integration of letter mail and parcel delivery services provides a further benefit for traditional postal operators, namely the possibility to minimize overhead costs thanks to the fact that these costs can be shared among services. In fact, operating expenses needed to run both letter and parcel delivery operations are largely similar and the integration of services provision allows to attain efficiency gains by avoiding duplications or redundancies of these kinds of costs.

Recent investments in IT solutions and applications by Royal Mail in the UK offer an example of technologies that were introduced to enable more efficient parcel deliveries but can also be used for letter mail services. According to Ofcom (2021), Royal Mail has invested in shipping solutions to enable customers to easily order their parcels. In particular, the USP has built a range of Application Programming Interfaces (APIs) that allow businesses to more easily connect their shipping systems to Royal Mail's own IT system. Royal Mail has also relaunched its local "Click and Collect" service so to provide shoppers with the option to collect their parcels from more than 10,000 of its post office branches in the UK.¹⁴ It follows that the integration of letter and parcel services can translate into positive operational spillovers also for the delivery of letter mail items as part of the postal product mix.

4 Implications of Synergies for the USO Net Cost and Compensation

The general complexity around the calculation of the net cost burden seems to increase in a scenario where not only more funds become available to USPs but also the integration of letter mail and parcel services offered by USPs deepens. In order to observe this, it is helpful to adopt a step-by-step approach and examine how investment synergies can impact cost allocation between USO and non-USO services, then how cost allocation can affect the calculation of the USO net cost burden, and at last how such calculation can affect USPs requests for additional funding.

As a preliminary simple observation, cost allocation may entail either direct costs or joint costs. Direct costs are those that can be directly attributed to a particular product through a unique cost driver and, as such, are not difficult to allocate. Joint costs, instead, are more complex to allocate because their attribution to a single product or service is not straightforward. These costs can be defined as costs that are common to a group of products, but the identification of the specific cost drivers depends on the individual attributes of these respective products. At the same time, joint costs can also be seen as costs that are incurred when supplying more than one product and are often referred to as common costs.¹⁵ In this case, they cannot be

¹⁴ Ofcom (2021). Annual Monitoring Update on Postal Services, Financial Year 2020–21.

¹⁵ "Draft ERGP report on common costs allocation", ERGP, November 2011.

easily attributed to a unique product because they are not immediately affected by changes in the output of any product.¹⁶

When USPs rely on a joint network and joint investments for the delivery of letter mails and parcels, they can have an incentive to portray network and investment costs as fixed costs, which are the result of their USP status and therefore would have to be sustained regardless of whether the network is used to deliver USO or non-USO products. It follows that USPs would likely allocate all these costs to universal service provision. More specifically, within an evolving postal services market USPs could allocate more costs to letter products by moving costs away from parcel products as well as allocate more costs to USO parcel products by moving costs from non-USO parcel products. This effort might be motivated by the need to cope with changes of the operational reality of the market, however the end result may yield benefits for USPs in two different ways: (i) less costs would be allocated to more competitive products (i.e. parcels) and this could help justify the application of lower prices; (ii) more costs would be allocated to less competitive products (i.e. letters) and this may lead to consider the USO as even more costly to provide and justify the application of higher prices to USO products. In this case there would be a serious risk of potential competitive distortions in the market, as both below cost pricing as well as cross-subsidization between USO and non-USO services may occur.

It is relevant to note that disproportionate cost allocations may be incentivized when USPs are given significant operational and commercial flexibility by NRAs. At this point, a second important aspect to consider is how cost allocation can affect the calculation of the USO net cost. As we know, the estimation of profit in the counterfactual scenario (i.e. USP without the USO) is a complex exercise which relies on a right cost allocation. The direct consequence of disproportionately allocating excessive costs to letters may lead to overestimate profit in the counterfactual scenario and, therefore, to inflate the USO net cost burden, regardless of the calculation methodology applied (i.e. NAC or PC).

To complete the analysis, the relation between the calculation of the USO net cost and USPs' requests to fund their universal service provision has to be observed as well. A potential overestimation of the net cost burden may lead USPs to advance requests for funding that are excessive as they do not reflect the true USO-related burden. In turn, excessive funding given to USPs for their USO can negatively affect competition in the market and result in further distortions. This concern is higher in a scenario where the streams of funds available to USPs are increasing and the lines between USO and non-USO services provision become even more blurred.

The Post Danmark state aid case, described earlier, has shown how the European Commission has already expressed concerns over misallocations of costs and their effect on profit in a counterfactual scenario, specifically leading to an undue increase in such profit with consequential risk of overestimating the USO net cost and ultimately overcompensating USPs. Indeed, regulators' oversight, at both EU and national level, will continue to be key to monitor these aspects and it will remain

¹⁶ "ERGP report on specific issues related to cost allocation", ERGP, November 2013.

under significant pressure to correctly perform its tasks. The final section reviews NRAs responsibilities and shares recommendations to mitigate risks.

5 Conclusions and Recommendations

It cannot be denied that appropriate cost allocation can be a challenging process for both traditional postal operators and regulators. This paper has tried to explore how current market trends and dynamics, and in particular increased availability of funds for USPs and deeper interconnection between letter mail and parcel services provision, are shaping an even more complex scenario.

NRAs play an essential role in continuing to oversee how appropriate USO compensation can be preserved but still need not to lose sight of their prerogative of promoting competition in the postal sector. That is why an increased level of commercial and operational flexibility allowed to USPs by national regulators can only be sustainable when accurate monitoring mechanisms are simultaneously put in place.

In a 2022 paper published in response to the EU PSD evaluation report, the Free and Fair Post Initiative (FFPI) has remarked that the way USO compensation is calculated does not necessarily take into account the rapid integration of letter mail and parcel delivery service offered by USPs and that the overall costs of the related technology and infrastructure (i.e. buildings, vehicles, IT platforms) are significant but not entirely dedicated to USO provision, which implies that correct cost allocation should be carefully applied when government compensation is at play. This reinforces the need to maintain effective costs regulation at NRAs level to avoid risk of anticompetitive spillover effects.

Moreover, regulators should also ensure that cost accounting transparency is guaranteed and that USPs closely cooperate with them in providing full costs visibility. This is a core regulatory principle to be preserved because lack of transparency may be one of the main determinants for excessive USO funding. Investigating USPs practices related to the cost accounting of delivery activities should be seen as instrumental to preserve a refined cost allocation (ERGP, 2013).

However, ensuring transparency alone is not enough and NRAs should also make sure that regular active reviews of USPs' implementation of cost allocation methodologies take place. This is already the case for most postal regulators in Europe, however, performing a fitness check on the different methodologies applied, as well as on how they are actually applied, could help to develop a more comprehensive understanding on the implications of current market dynamics for USO compensation, especially when taking into account delivery of all postal services through joint networks and investments.

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Can Parcel Growth Support the Sustainability of the USO?



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Abstract As a result of ongoing digitalisation, Universal Service Providers (USP) across Europe faced significant declines in letter mail volumes and significant growth in parcel mail driven by the growth of e-commerce, most recently strengthened by the Covid-19 pandemic. Profit margins of letter mail are generally expected to be higher than those of parcel mail, because USPs are typically the only major provider of letter mail, whereas they face competition from parcel provider rivals. In this paper we consider the drivers of these profit margins. Then, considering the likely future trends in letter mail decline and parcel growth, we analyse how the financial viability of the universal service obligation (USO) could be affected. We find based on our modelling that under traditional USOs (e.g., daily delivery) future parcel volume growth consistent with historic trends is, at first glance, sufficient to sustain overall profitability by compensating the negative impact on profitability from letter volume declines. Real-world data overall supports this by showing that USPs generally continuing to return a profit. However, USPs profitability in several countries were also likely to be affected by structural changes in their markets and changes in USO obligations suggesting that, without those changes, their profitability may have been lower. Considering finding a negative impact on USP profitability in several modelled scenarios, we conclude that the changes in volumes and volume mix that USPs face, at the very least, mean that the risk of the USO becoming unsustainable has increased.

1 Introduction

There has been significant growth in parcel demand because of the growth of e-commerce, which could further gain strength if the trends for working remotely and

The views expressed are those of the authors.

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shopping online that developed during the Covid-19 pandemic persist. This growth has to a certain extent offset the negative trends in demand for letter mail.

The profit margins for letter mail are expected to be higher than those for parcels because universal service providers (USP) typically face competition for parcel delivery from rivals, although this may vary country by country. In this paper we consider the drivers of these margins and, considering the likely future trends in letter mail decline and parcel growth, and we analyse how the financial viability of the universal service obligation could be affected.

Our analysis is based on modelling the costs and profitability of a hypothetical universal service provider, a review of recent trends in letter and parcel volumes and profitability of USPs and a qualitative analysis of the factors likely to drive margins of letters and parcels in the future.

The next section outlines recent trends in European postal markets. Section 3 describes the model of a hypothetical “average” European USP and its cost sensitivity to volume changes. Section 4 sets out our scenario analysis assessing the USP’s profitability in each of them. Section 5 compares our modelling to how profit margins have evolved for several European USPs. Section 6 concludes.

2 European Postal Market Trends

Letter mail volumes have been declining due to changes in consumer preferences towards digital communication and relaxations of requirements of physical forms of legally binding communication (Alimonti et al., 2022; Gottschalk et al., 2022). In contrast parcel volumes have been on a constant rise driven by the trend of an ever-growing range of products shopped for online (Frezza, 2022).

The digitalisation of more and more areas in life is likely to continue and thus these demand trends as well. In some European countries, the Universal Service Obligation (USO) for delivery is largely unchanged while in others the obligation has been significantly altered. The cost of delivering this USO remains a critical element of the sector (Nehrebecki et al., 2016) and with it the sustainability of the universal service providers (USP) (Russo et al., 2022).

The profit margins of letter mail are generally expected to be higher than the margins of parcels where USPs face several challenges including competition from rivals (Hearn, 2016). This is often not the case for letter mail, although this may vary country by country, and raises the question of whether the increase in parcel volumes can compensate for losses in letter mail volumes in the years ahead. A reduction in profitability puts pressure on USPs’ USO cost compensation mechanisms (Borowiec, 2021), and policymakers in charge of defining the USO. This paper assesses how costs and revenues evolve as parcel and letter mail volume trends continue to play out.

The decline in letter mail volumes has been remarkable in recent years. Figure 1 shows the rate of decline of letter volumes for Universal Service Providers (USPs) in

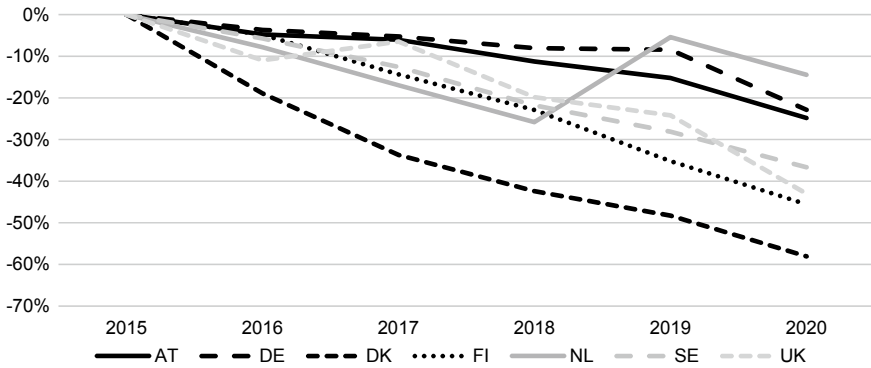


Fig. 1 Letter volume decline by USP (Cumulative, relative to 2015) (Source Analysis of PostNL data and USP’s annual reports. Note Sweden volumes include parcel volumes as letter volumes are not reported separately)

several countries.¹ Despite some intermittent growth, letter volumes in all countries have declined overall since 2015, sometimes significantly so.

In relation to the significant decline in Denmark, PostNord, the USP in Denmark and Sweden, states:

The steep decline in the number of letters since the turn of the millennium therefore places strong pressure on the economic sustainability of the universal service obligation. If the business is to be financially sustainable, the conditions must be adapted to the pace at which mail volumes decline. (PostNord, 2022)

Note that for PostNL, the relatively modest overall decline is the result of a merger with a rival postal operator.

While letter volumes decline, USP parcel volumes in each of the sample countries have been increasing over the past years. For the same set of countries as above,² Fig. 2 shows an increase in the annual parcel volumes handled by USPs.

This increase in parcel volumes is driven by the rise in e-commerce over the past decade. The parcel volume growth for operators in the sample ranges between ~40% and ~20% since 2015. Covid-19 accelerated this growth with working from home and lockdowns due to the pandemic driving customers further to digital communication and online shopping.

However, while letter mail is almost exclusively delivered by USPs, the parcel market is divided among several rivals across Europe. While USPs seem to enjoy some advantage because of their extensive delivery networks and scale, they also face competition over price and service quality. Figure 3 illustrates this for several countries.

¹ Austria, Germany, Denmark, Finland, Netherlands, Sweden and the UK.

² PostNord is USP both in Denmark and Sweden and also operates in Norway and Finland. Note that PostNord started reporting letter mail and parcel volumes only in 2017. We calculated 2015 and 2016 volumes based on PostNord’s overall changes in volumes before 2017.

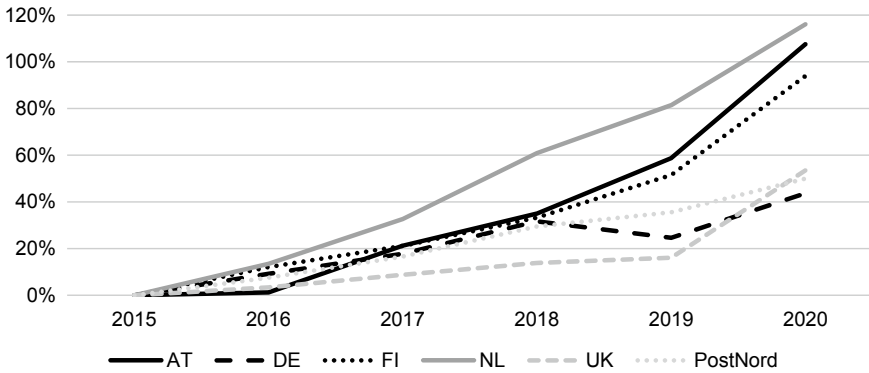


Fig. 2 Relative Parcel volume* growth by USP** (Cumulative, relative to 2015) (Source Analysis of PostNL data and USPs’ annual reports. Note *USO and non-USO parcels; **PostNord includes USP and non-USP operations)

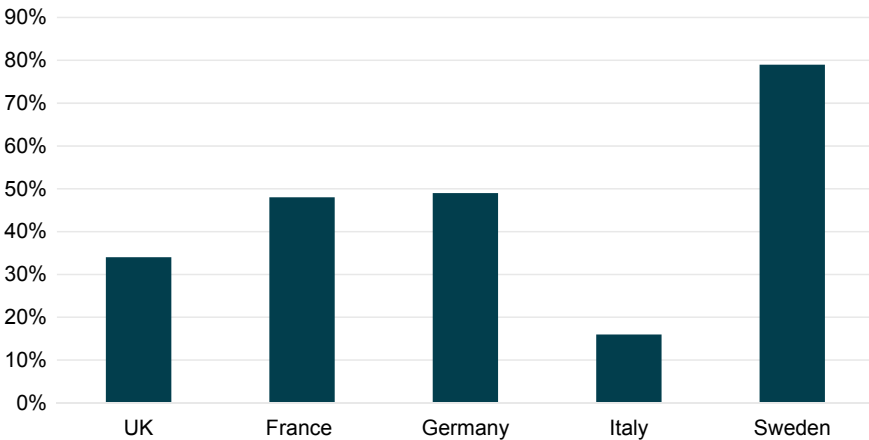


Fig. 3 USP parcel market share 2020 (by volume) (Source Pitney Bowes Index 2021)

This much more competitive background³ in the parcel market is important when considering the role that parcels may play in the ability of USPs to generate revenues. Historically, letter volumes were orders of magnitude higher than parcel volumes and generated most of the revenue. And still, even with the trends of increasing parcel volumes described above, letters represent most mail volumes. However, parcels now exceed 10% of mail volumes for most USPs as illustrated in Fig. 4.

³ Sweden is an outlier in the sample with PostNord retaining a significantly larger share of the market than USPs in other jurisdictions. This could be related to the fact that Sweden is a much more sparsely populated than other countries in the sample although we have not tested this hypothesis in this paper.

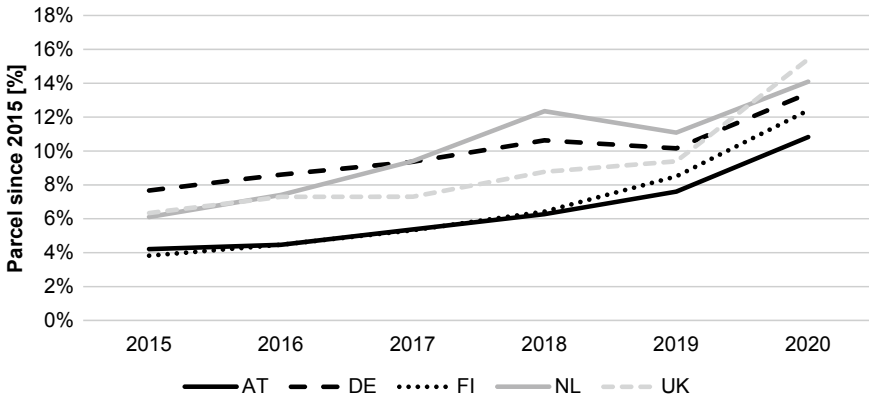


Fig. 4 Parcel share of mail by USP (2015–2020) (Source Analysis of PostNL data and USPs’ annual reports)

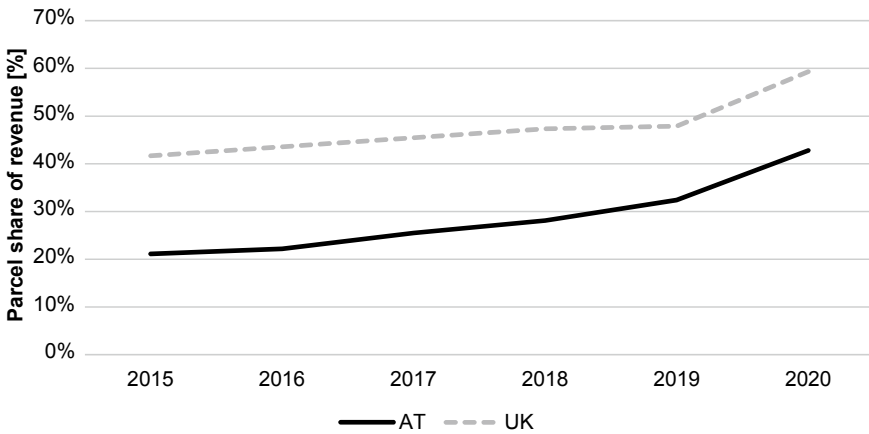


Fig. 5 USP parcel revenue share of total revenue (Source Based on USPs’ annual reports)

Even at a share of 10% of volumes, or just above, parcels are becoming a major driver of USP revenues. For example, at 15% of total mail volumes in 2020, parcels represented around 60% of Royal Mail’s (the UK incumbent) revenues. In Austria, the parcel share of total revenue of Österreichische Post increased to above 40% in 2020, with parcel volumes making up 11% of total mail in the same year. That is, in several countries, the majority or a major share of revenues are and can be expected to be generated in a market where USPs face competition.

With parcel mail playing an ever-increasing role in the capability of USPs to generate revenues, it is reasonable to consider whether parcel growth can help maintain the profitability of the USPs and hence support their ability to deliver the USO. This critically depends on the cost of parcel delivery versus letter delivery, and the resulting profit margin that the USPs can make.

Table 1 Key characteristics of the simulation model in the Base Case

Characteristic	Value
Population	25 million, ~60% urban
Volume per capita per year	150 (135 letters; 15 parcels)
Country size population density	160,000 km ² 155 pop/km ²
Post offices Postboxes	3,000 30,000
Mail centres Delivery offices	2011,000
Labour cost	€20.00/hour
USO delivery & collection days	5 days/week

Note Frontier simulation model

3 Modelling the Impact of Volume Changes on USP Revenues and Costs

To test the potential impact of the decline in letter mail and growth in parcel mail on USPs revenues and costs, we have modelled a hypothetical USP in an *average*⁴ European country using an adaption of a model previously used in the context of estimating the cost of the USO (Carslake et al., 2014). Some of the key characteristics of the country/USP are set out in Table 1.

Our hypothetical USP distributes mail via air and road transport and delivers on foot and in vans on 5 working days. We differentiate between high-density urban and low-density rural areas. Parcels and letters are delivered jointly.⁵ We calculate the cost of this USP using a hybrid modelling approach using (a) average costs per item assumptions for elements of the postal pipeline where we assume that costs are largely variable in the long run (sorting, indoor delivery—for example cost of post offices is based on the number of post offices times an annual operating cost for office and staff); and (b) a bottom-up modelling approach for the delivery function. We model the number of routes for outdoor delivery and the corresponding number of delivery staff based on a cubic root distribution to describe the likelihood of a delivery taking place at a given address based on the volume of mail per capita. This function is calibrated using a range of observations from several countries of the number of items per capita, daily delivery points and total delivery points in different postal delivery areas accounting for differences in population density across countries. The model then estimates the time it takes to deliver to daily delivery points given the density of delivery points in the hypothetical country while differentiating urban and rural areas.

Carrying out this calculation for our base case, we arrive at a total cost of ~3.7 billion euros. Figure 6 shows the total costs breakdown by postal pipeline element.

⁴ Broadly reflective of the range of USP/country characteristics in the EU.

⁵ Although we note that some USPs have considered or implemented separate delivery networks for letters and parcels but have also done the reverse after having operated separate networks for some time.

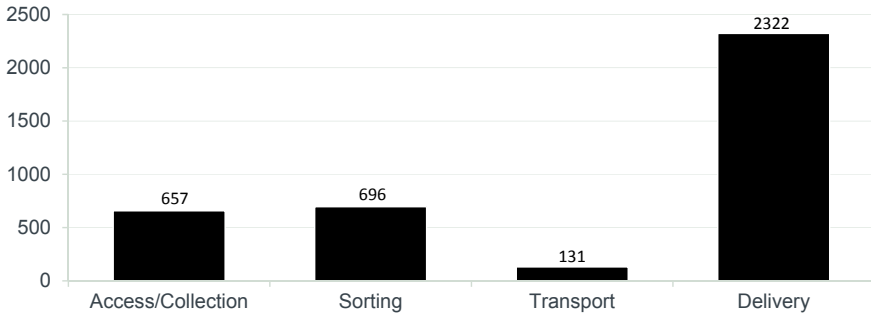


Fig. 6 Breakdown of USP cost in the base case (MN Euro) (*Note* Model simulation)

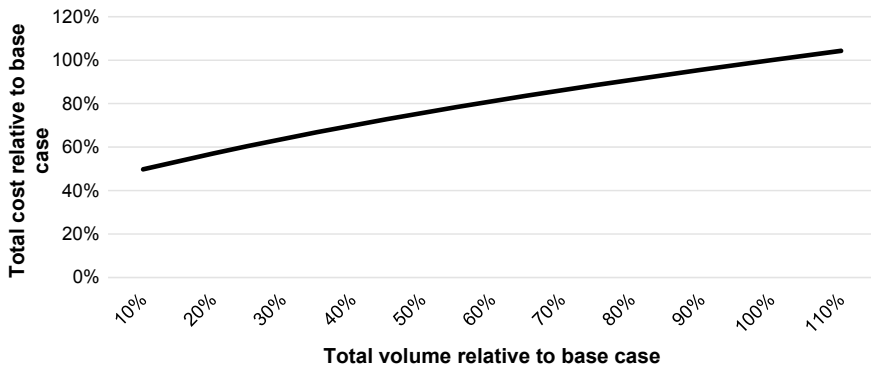


Fig. 7 Cost curve of Hypothetical USP (*Source* Model simulation)

Figure 7 shows how the cost of the hypothetical USP varies with changes in total volumes.⁶ This suggests a relatively large amount of variable costs which can be explained by the model considering full flexibility for restructuring delivery routes and no restrictions on labour reductions, i.e., long terms view of how costs could evolve (we explore a range of sensitivities in the following sections).

In practice, especially in the short run, costs could be considerably less variable, which, in relation to the scenarios considered in the next section, would imply a reduction of margins as overall volumes decrease.

From this, we see that when the model’s USP reduces its volume by 90%, the costs only fall by about half. This is due to fixed costs. Note, however, that extrapolating far below 10% should not be done using the equation above as there are discontinuities in costs at this margin.

⁶ We derived a hypothetical cost curve based on our model simulations as $c(v) = -0.1183v^2 + 1.1494v + 0.9572$ with v being the total volume (in bn) and c being the total cost (in bn). That is, the simplified cost curve is based on the bottom-up modelling, not the bottom-up modelling on the cost curve.

We estimate revenue assuming a margin of 5% based on typical margins in the sector. For example, the margins of the USP in the UK ranged from 2 to 5%, whereas those in Germany and Austria ranged from 7 to 20% in recent years. We then set prices just above €0.75 for letters and €3.75 for parcels based on a ratio of 1:5 between average letter and average parcel prices, informed by typical price ratios observed in several countries (see Annex A). The model simulation outcomes depend on this assumption: if parcel prices are relatively higher compared to letter prices (say 1:7), this would imply a relatively higher parcel margin and, hence, the threshold of the parcel growth needed for retaining positive overall margins falls. These alternative assumptions are also examined below.

The approach outlined above implies that the model does not explicitly estimate letter and parcel margins. This would require an allocation of fixed costs. Since we are interested in the overall sustainability of the USP, we skip this step and look at the overall USP margins instead.

4 Scenario Analysis

Using our base case as a starting point we then vary volumes based on the changes in letter and parcel volumes typically observed in the sample countries, while holding constant the prices *within* each scenario. The average change in letter mail volume is around minus 8% while parcel volumes have increased by 12% annually. The scenarios below illustrate the extent to which such changes apply over a longer period (A), explore the impact on margins when parcel growth is less material (B) and letter mail falls to a larger extent at the same time (C).

This shows an increase in margins if parcel and letter volumes evolve as they did on average before the Covid crisis. This result is also driven by holding prices constant which may not be fully in line with reality. For example, prices of letter mail (also regulated ones) have increased over time to compensate for the loss in volumes that USPs have experienced. However, such an increase in prices⁷ can further accelerate the reduction in volumes as demand responds to higher prices in addition to changes in consumer preferences.⁸ On the other hand, holding parcel prices constant may not be reflective of changes in the market either. As demand increases for the market as a whole, prices could also increase if there are supply side constraints, leading to higher margins. The competitive position of USP's parcel offers relative to rivals could also change, if growth in demand for parcels post-Covid-19 is associated with a higher increase in demand for delivery in more remote/rural areas where USPs are likely to enjoy a competitive advantage. However, competitors gaining a greater foothold in parcel markets vis-à-vis USPs may also drive parcel prices down.

We explore several sensitivity scenarios in relation to the underlying assumptions of the results in Table 2. Table 3 shows results when assuming different letter to

⁷ We consider prices and costs in the absence of inflation.

⁸ Also see (Carslake et al., 2011) in relation to demand responses and the cost of the USO.

Table 2 Model scenarios

Scenario	Mail volume [MN]	Letter [MN]	Parcel [MN]	Margin
Base case	3,750	3,375	375	5.0%
A: 20% letter decrease and 30% parcel increase	3,187	2,700	487	5.8%
B: 20% letter decrease and 16% parcel increase	3,135	2,700	435	2.4%
C: 40% letter decrease and 16% parcel increase	2,460	2,025	435	-4.8%

Source Model simulation

Table 3 Model scenarios—price ratios

Scenario	Margin (Letter to parcel price ratio of 1:7) (%)	Margin (Letter to parcel price ratio of 1:3) (%)
Base case	5.0	5.0
A'	9.5	0.3
B'	5.4	-1.8
C'	0.8	-13.3

Source Simulation model

parcel price ratio. First a ratio of 1:7 instead of 1:5, i.e., illustrating the case when an incumbent may be able to generate a relatively higher parcel margin. Second, a ratio of 1:3, reflecting a USP that faces stronger competitive pressures on its parcel prices.⁹ Scenarios A', B' and C' then consider the change in margins resulting from the same volume changes as discussed in relation to Table 2.

In line with the earlier hypothesis, relatively higher parcel prices imply that the growth in parcel volumes is more likely to overcompensate the loss from reductions in letter, or in other words, that a USP would need to experience substantial losses in letter volumes to risk its sustainability. Correspondingly lower parcel prices imply that sustainability could be at risk even as letters only moderately decline.

Returning to a price ratio of 1:5, we then explore how a reduction in total mail volumes impacts our analysis. Instead of 150 mail items per capita, we consider two lower volume scenarios, 100 and 75 items per capita, mirroring the lower end of the range of USP mail volumes observed in the sample countries. In so doing, we keep the parcel volume per capita at 15 and adjust the letter volumes correspondingly.

Although Tables 4 and 5 show margins increasing as letter volumes fall, this is mainly driven by the fact that percentage decreases in letter volumes are smaller in absolute terms when starting at a lower base. It is likely that an operator with lower letter mail volumes already required an increase in letter prices to maintain its margin or implemented other operational changes (e.g., in response to reductions in

⁹ In each scenario, prices are recalibrated to obtain an initial 5% margin. The volumes in the base case and scenarios are the same as those in in Table 2.

Table 4 Model scenarios—mail volumes (100 per capita)

Scenario	Mail volume [MN]	Letter [MN]	Parcel [MN]	Margin
Base case	2,500	2,125	375	5%
A''	2,187	1,700	487	9.3%
B''	2,135	1,700	435	5.1%
C''	1,710	1,275	435	0.1%

Source Simulation model

Table 5 Model scenarios—mail volumes (75 per capita)

Scenario	Mail volume [mn]	Letter [mn]	Parcel [mn]	Margin
Base case	1,875	1,500	375	5%
A'''	1,687	1,200	487	11.7%
B'''	1,635	1,200	435	7%
C'''	1,335	900	435	3.3%

Source Simulation model

USO obligations) to lower its costs. This could imply a letter to parcel price ratio like the ratio of 1:3 explored earlier or an operational change foregoing some of the competitive advantages in parcel delivery that a USP may enjoy vis-à-vis its rivals in the parcel market. This would mean that margins could be affected more severely, e.g., facing lower parcel growth at lower parcel prices.

5 Profitability of a USPs Under Growing Demand for Parcels

To compare our modelling with actual operator margins, we have looked at the performance¹⁰ of USPs in Europe excluding group earnings from other sectors such as financial or telecom services. This is shown in Fig. 8 for the period 2015 to 2020. While some USPs, such as the Danish operations of PostNord, were operating at negative margins,¹¹ other incumbents managed to maintain a reasonable profitability despite experiencing letter volume losses. This overall is in line with the model results for a hypothetical USP.

It is difficult to draw distinct conclusions from this analysis given the dynamics of the market, changes in regulatory obligations that operators face, the impact of Covid-19 in 2020, as well as structural changes in the postal market such as mergers of USPs with rivals, as, for example, observed in the Netherlands' merger between PostNL and Sandd.

¹⁰ EBIT/Revenue.

¹¹ And therefore, received funding to sustain their operations.

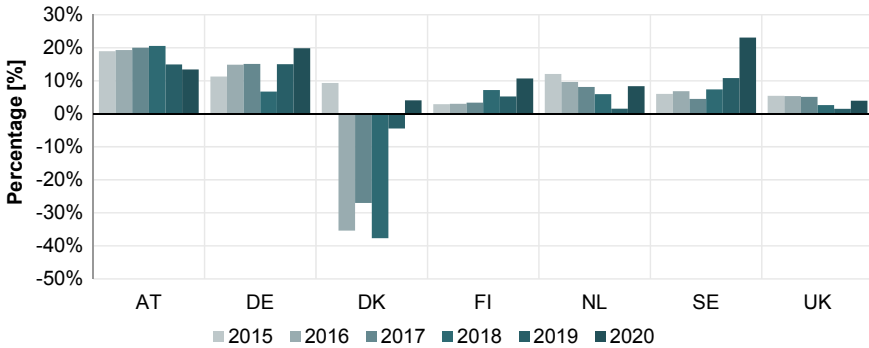


Fig. 8 Development of gross margins for USP incumbents (Source Based on PostNL data and USPs annual reports)

Operators and policymakers have also reacted to the challenges faced, which contribute to obtaining results that are more mixed than reflected in our stylised modelling. For example, Austria has relaxed its USO requirements for letter delivery to enable *Österreichische Post AG* to offer a more cost-efficient lower priority service (a price-reduced mail product with delivery targets of 2–3 days instead of next-day delivery for the standard mail product (Österreichische Post AG, 2022). Also, Denmark has significantly increased the time that former *Post Danmark A/S* (now *PostNord*) is allowed to make letter deliveries to up to 5 days after posting (Transport and Construction Agency, 2016). The aim of these changes is to allow USPs to deploy a more economic delivery system by aggregating volumes and shaving off volume peaks. PostNord in Sweden has also operated part of its business on an every-other-day model enabling it to deliver more efficiently lower mail volumes. Regulators have also generally allowed USPs to increase letter prices over time to at least partly offset for losses in volumes.

This seems to suggest that in several countries, the USP margins are the result of significant structural and operational changes. It is fair to assume that profitability results could have been less favourable for USP's in those countries had those changes not been made. This seems to support our hypothesis that some policy changes could be needed to counter the impact of letter mail decline despite growing parcel volumes.

6 Conclusion

Our analysis suggests that if trends in letter mail decline and parcel demand growth persist, the implied losses from the letter mail decline may be compensated by parcel growth. However, some combinations of parcel growth and letter decline may not be sufficient to maintain profit margins. As a result of strong parcel growth during the Covid-19 crisis, USPs may benefit from the increasing demand for deliveries in relatively more remote/rural areas, where they maintain a competitive advantage. This could further improve parcel margins. Actual operator profit margins also appear stable, broadly consistent with results from the modelling despite a steep decline in letter volumes. However, some of these margins appear not only to be the result of parcel growth but can further be explained by increases in letter prices and changes in the USO and market concentration. This suggests that in some countries parcel growth alone was not sufficient for USPs to maintain or improve margins.

The extent to which price changes can be relied on further in the future will depend on how sustainable they would be in the face of substitution with other forms of communication and competition. However, it is important to remark that, in a sort of reverse causation, the degree to which changes in the scope of the USO could be considered to maintain USP sustainability will also depend on the USPs' ability to compete in the parcel market considering such changes.¹² Stronger competition in most parcel markets also implies that the future sustainability of the USO could be at greater risk because a loss in market share can more readily occur than sudden changes in overall market demand.

Annex A—Price Ratio Letter Parcel

See Table 6.

¹² For example, with a USO of delivering parcels 5 days a week, Royal Mail has, since Spring 2021, expanded its delivery offer to include Sunday to match the offers of its rivals (Espiner, 2021).

Table 6 Price ratio letter to parcel for some European USPs

	Letter	Parcel	Ratio
GER	0.85	4.50	0.19
AT	0.74	4.10	0.18
AT next day	0.85	4.30	0.20
UK	0.66	3.20	0.21
UK next day	0.85	3.85	0.22
FI	1.95	6.90	0.28
SE	13.00	142.00	0.09
DK	12.00	50.00	0.24
DK next day	29.00	65.00	0.45
IT	1.10	9.00	0.12
IT next day	2.80	13.90	0.20
Average			0.22

Source National USP websites

Note Local currencies. Parcel prices for 1 kg parcels with height >10 mm

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E-commerce's Effects on the Turkish Postal Market: From Classical to New Business Models



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Abstract Two interesting dynamics have emerged over the past decade when assessing postal markets. First, many markets are undergoing a radical shift from a letter-centricity to parcel-centricity. Second, the fragmentation of the postal supply chain leads to alternative business models in the postal market. This chapter acquaints the reader with the dynamics of the Turkish postal market, where e-commerce is increasingly altering the market landscape. After providing the legal framework, this chapter gives an overview of the Turkish postal market, including an assessment of major demand trends, alternative delivery methods, and new market segments. The chapter highlights regulatory challenges and possible tools, and then concludes.

Keywords E-commerce · Instant delivery · Vertical integration · Subcontractor · Regulatory sandbox

1 Introduction

Postal markets worldwide have undergone two interesting dynamics. According to Schumpeter, the “*gale of creative destruction*” describes the “*process of industrial mutation that continuously revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one*” (Schumpeter & Richard, 1987). Today, many postal markets are undergoing a radical shift from a letter-centric landscape to a parcel-centric one.

Regulatory policies have not caught up with this market shift. The initial role of postal legislation, and more specifically that of the Universal Service Obligation, was to safeguard the accessibility of social mail. However, the social function of

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(letter) mail has been, or is being, hollowed out by e-substitution (internet, e-mail, and social media). At the same time, the internet has enabled double-digit growth rates for parcel volumes.

A second exciting dynamic is the fragmentation of the postal supply chain, leading to alternative business models entering the postal market. Whereas the traditional postal supply chain encompassed four consecutive stages (collect, sort, transport, and distribute), new business models focus on mainly one or a combination of several of these stages. An example is a digital delivery platform that provides a crowdsourced delivery service that residential and/or professional couriers can subscribe to. In this case, only the collect and distribution phases are being used. The physical sorting phase is, as it were, e-substituted with a virtual one, being the algorithm used by the digital delivery platform which links the delivery need to a courier in the most efficient way (Zurel & Scorca, 2020).

This paper aims to make the reader acquainted with the market dynamics of the Turkish postal market, where e-commerce is increasingly changing the postal market. The paper provides, in Sect. 2, the current legal framework, followed by an overview of the current postal market landscape. Also, major trends, including alternative delivery methods and new market segments, are being assessed. Section 3 discusses some regulatory challenges. Section 4 looks into the regulatory sandbox approach as a possible answer to these challenges. The paper then concludes.

2 The Turkish Postal Market

2.1 *Legal Framework*

Turkish postal regulation is mainly focused on letter mail. Postal service providers are required to obtain a local or national authorization certificate from the Turkish national regulatory authority, Information and Communication Technologies Authority (hereafter: ICTA). Regarding geographical coverage requirements, postal operators are obliged to open branches or agencies in at least three provinces in each of the seven nationwide regions. There are 42 postal service providers, including the universal postal service provider.¹

The Universal Postal Service is defined in Article 14 of Law No. 6475 on Postal Services (OG No. 28655 of 23 May 2013; hereafter: Postal Law) as the acceptance, collection, processing, shipment, distribution, and delivery of (1) Letter posts up to 2 kg; (2) Parcel posts up to 20 kg; (3) Printed documents; (4) Documents for the visually impaired; (5) Letter posts up to 100 gr including documents for the visually impaired, military students and OR-1, OR-2, OR-4 ranks (conscript soldiers) in military conscription; and (6) Letter posts of convicted children and children under the state protection.

¹ Bilgi Teknolojileri ve İletişim Kurumu Posta Yetkilendirmeleri. Available at <https://postayetkilendirmeleri.btk.gov.tr/posta/>.

There is a reserved area foreseen in the postal sector, as defined in Article 6 of the Postal Law. This reserved area is limited to the universal postal service provider, which is the General Directorate of Post and Telegraph Corporation (hereafter: PTT), and contains: (a) acceptance, collection, processing, shipment, distribution, and delivery of domestic and international correspondence items whose weight and fee are to be determined by the President of the Republic upon suggestion of the Authority (ICTA) and proposal of the Ministry (Ministry of Transport and Infrastructure) by taking the base fee into consideration; (b) without prejudice to the provisions related with electronic notification of the Tax Procedural Law No. 213 dated 4 January 1961, acceptance, collection, processing, shipment, distribution, and delivery of any type of notification including the electronic environment within scope of the Law No. 7201 on Notifications and other laws; (c) postal services of Turkish Armed Forces in peacetime; and (d) printing and selling of postal stamps, personal stamps, commemorative stamps, postcards, and first day covers.

Universal service obligations and principles are regulated in the Fifth Part of the First Section of the Postal Law. According to the relevant provision in Article 14, the Universal Postal Service Provider is responsible for ensuring the acceptance, collection, processing, distribution, and delivery of letter posts in the scope of universal postal service. Furthermore, a By-law on Universal Postal Services was published in the Official Gazette No. 29639 of 29 February 2016 to ensure the proper implementation of the mentioned provisions.

According to the By-law on Universal Postal Services, universal service cost in Turkey is determined based on net cost. Net cost is described as: "The net costs must be calculated as the difference between the net cost for a designated undertaking of operating with the universal service obligations and operating without the universal service obligations". In the same By-law, it is ruled that the universal service provider should maintain separate accounts for their universal service transactions.

2.2 Market Landscape

In line with many other postal markets, letter mail has witnessed a substantial decline in Turkey in recent years, while there has been an increase in parcel post fueled by e-commerce. Parcel volumes have increased over the years and reached approximately 1 billion units in 2021 (ICTA, 2022). This increase can be explained by the sharp growth of e-commerce.

With the growth of e-commerce and the increase in the volume of postal parcel, fast delivery now ranks high among users' expectations. Regarding delivery speed: approximately 1.5% of the shipments are delivered on the same day; while 47.2% of deliveries are delivered to the recipient one day later; and 51.2% at least two days or later (ICTA, 2022).

In 2021, total postal revenues increased by approximately 53% compared to the same period of the previous year and reached 18.2 billion TL in total. While the HHI in the Turkish postal market had a value of 1357 in the first half of 2017, it declined

to 1211 in 2021. This situation shows that the postal-parcel market in Turkey is a competitive marketplace.²

The n-firm concentration ratio (n-firm concentration ratio, CR_n) is an index that quantifies market concentration (Ünsal, 2014). It is measured by adding up the market shares of the n largest companies in the market (Shy, 1995). Looking at the Turkish postal market, the concentration ratio CR₄, adding up the market shares of the 4 largest companies, displays a value of around 0.68. When taking the 8 largest companies into consideration, being ratio CR₈, this value augments to 0.94.

2.3 Market Trends

2.3.1 Vertical Integration

Turkey has witnessed the emergence of alternative business models, and both postal service providers and e-commerce platforms move toward new mergers and acquisitions. Nowadays, know-how, branding, innovative ideas, etc., are considered essential drivers to company mergers (Özkan, 2010). In Wayson Wyatt's research, increasing the level of competition, increasing the market share, creating synergy in production, reaching new markets, minimizing costs, using the latest technology, and expanding the fields of activity are counted among the objectives of mergers (Wyatt, 1999).

2.3.2 Vertical Mergers

There has been an increase in vertical mergers in the postal sector, where companies at different stages of a product or service merge. If one or more of the merging parties have market power at a horizontal level, this may distort competition (Aritürk, 2008). As a result of vertical mergers, companies may prevent competitors from market entry due to their lower and upper market position, or they may try to strengthen their market position by reducing competition (ICTA, 2014). Vertical mergers can be examined in two directions: downstream and upstream. The level where a product is closest to the end user can be defined as downstream. If a downstream located company enters the upstream market, we speak of a backward vertical merger. Likewise, an upstream located company entering the downstream market can be considered a forward vertical merger. An example of a vertical merger is a company, manufacturing durable goods, creating a sales chain in the retail market, or merging with a retail store (Şahin, 2010).

² The Herfindahl–Hirschman Index (HHI) is an indicator that measures the market density of an industry and is obtained by squaring the market share of each firm competing in a market and then summing the resulting numbers. A market with an HHI of less than 1,500 is considered a competitive marketplace, an HHI of 1,500 to 2,500 is moderately concentrated, and an HHI of 2,500 or greater is highly concentrated.

Vertical mergers are generally less likely to have a strong downward effect on market competition as compared to horizontal mergers because unlike horizontal mergers, vertical mergers do not reduce direct competition within the same market segment of the supply chain. In addition, vertical mergers can even increase efficiency due to the complementary nature of activities and/or products. Moreover, vertical mergers might provide efficiency due to the complementary nature of the merging entities' activities and/or products. This process may encourage the integrated firm to increase supply by lowering prices, as it can reap most benefits. Producing innovative solutions by improving the service quality can also create greater profits for the integrated company (European Commission, 2008).

In economic literature, vertical restraints are sometimes considered practical solutions to tackle market failures. Consumers, however, must benefit from the merger. Otherwise, there will be competitive concerns (Geradin, 2004). On the other hand, vertical mergers can create additional problems, which in some cases might lead to market foreclosure. For example, when a dominant e-commerce platform is coupled with a service provider, it may offer preferential access to the demand side for that supplier and, as a result, choose to restrict consumers' options. At the same time, it can use the data and information it collects from external suppliers participating in its ecosystem to benefit its subsidiary when designing vertical sales strategies and products. In either case, the playing field in the vertical market will deteriorate as the relevant platform market power is leveraged (Parker et al., 2021).

2.3.3 Determining Dominant Positions and Measuring Competition

While market share is the first indicator in determining a dominant market position, it remains essential to measure market shares of all market players. Elevated market shares are also considered an indicator of a significant market power in EU practices. A business operating at every stage of the supply chain may create entry barriers for competitors. The wide variety of products and discount campaigns with these products can also be considered a dominant position indicator (Tuygun & Gürel Hukuk ve Danışmanlık Bürosu, 2010).

Looking at EU competition law, there is generally no dominant position in a market where the operator's market share is below 25%. A dominant position can start to emerge if the market share lays between 25 and 40%. Furthermore, if the market share is over 40%, it is generally considered to have a dominant position. In the case of a monopoly (100% market share), the dominant position is undeniable (Pinar, 2004). In Turkey, there is no market share threshold determined by the Competition Authority regarding a dominant position. However, in practice, the probability of a dominant role with a market share below 40% is very low. If it is over 40%, more detailed research is conducted. At this point, the stability of the market share over the years, the number of competitors, and competitors' market shares are considered. The more significant and stable the market share of the relevant undertaking, the more significant the difference with competitors' market shares, and the more unlikely it

will be for existing competitors to exert an effective competitive pressure on the relevant undertaking. (Competition Authority, 2014).

According to the Communiqué No. 2010/4 of the Turkish competition authority RK, some turnover thresholds are foreseen for merger or acquisition transactions, and it is stated that if these thresholds are exceeded, permission from the RK is required for the transaction to gain legal validity. With the update made in the Communiqué in 2022, the definition of “*technology undertakings*” was added, and an additional notification obligation was introduced. This regulation aims to prevent killer mergers. In particular, digital marketplaces might transfer their power from their own markets to the cargo and logistics services market, which entails postal services, and cause some exclusionary effects in the market associated with this advantage, creating, in turn, barriers to entry and growth.

In 2019 and 2020, average delivery times made by these digital marketplaces, Trendyol and Hepsiburada, which have created their own parcel delivery companies, were 1.52 and 2.11 days, while average delivery times for contracted service providers were 2.52 and 2.92 days (Competition Authority, 2021). These data suggest that vertically integrated service providers might increase consumer satisfaction by providing faster delivery than others.

However, in a production or service chain, there may be significant market power in the upstream and downstream markets simultaneously. Pricing applied by a vertically integrated company aiming to exclude its competitors in the downstream market is called price squeeze. By controlling production in the upstream market, this company chooses to cut the margin between the price of the input and the cost of the downstream product produced from the input by creating price changes. As a result of the narrowing price margin in the lower and upper markets, existing or potential competitors will not be able to enter the market, even if they are sufficiently efficient in the lower market (Bouckaert & Verboven, 2004).

2.3.4 Turkish Postal Market Analysis

While the Turkish postal market gives the impression of a competitive market in general, it exhibits the characteristics of a monopolistic competition market. In addition, the services offered by delivery service providers such as Trendyol Express, which is vertically integrated with the Trendyol e-commerce platform, and Hepsijet, which is vertically integrated with the Hepsiburada e-commerce platform, can be considered operating in a different market segment from the classical postal service. While such vertically integrated companies contribute to competition by reducing the density of the postal market, they already contribute to the postal market with their practices and service quality elements that will ensure consumer satisfaction. The increase in such platforms, which establish their distribution network, is an issue that needs to be examined to prevent negative consequences such as creating a dominant position in the market within the scope of competition law, increasing market density, and engaging in restrictive behaviors.

However, Trendyol Express (9–10% market share) and Hepsijet (2–3% market share), which are currently operating as vertically integrated companies, do not exert dominant positions within the Turkish postal market. Neither do they engage in activities that may significantly reduce competition. In any case, it is necessary to prevent vertically integrated companies from developing anti-competitive behaviors such as price and customer discrimination (ICTA, 2022).

Considering the concentration level and market shares of the postal sector in Turkey, there is currently a competitive environment for parcel delivery. In this context, while applying the triple criterion test, we get (1) The existence of high and non-temporary barriers to market entry; (2) The market structure will not reach a competitive structure on its own within a certain period; and (3) Other criteria such as the inadequacy of applying competition law rules alone in removing these obstacles are examined (ICTA, 2014). For this reason, we consider that there is no need for regulation in the sector since the Turkish postal sector has a competitive structure, and there are no barriers to market entry under the mentioned criteria.

2.3.5 Effect of New Business Models on Quality of Service

The pandemic, which has affected Turkey as of the first quarter of 2020, led to substantial increases in e-commerce volumes and revenues. In Turkey, e-commerce revenue increased by about 66.3% in 2020 compared to 2019 and reached 30 billion EUR, while e-commerce volume increased by about 68.4% to 2.29 billion units in the same period. While the share of e-commerce in total trade was approximately 10% in 2019 (21 billion EUR), this rate increased to almost 16% in 2020 (30 billion EUR). Approximately 70% of the businesses in the Turkish market sell through their own website or applications and 60% of them from digital marketplaces (Ministry of Commerce, 2021).

E-commerce end-users have high demands and expectations regarding service characteristics, such as delivery speed and delivery location. Therefore, the postal sector, which is an integral part of the e-commerce supply chain, is constantly undergoing changes and developments. In addition, the share of e-commerce parcels in total parcel delivery has increased rapidly in recent years, reaching 60% in 2020 in Turkey (ICTA, 2022).

Eight platforms, namely Amazon Turkey, ÇiçekSepeti, EpttAvm, GittiGidiyor, Hepsiburada, N11, Morhipo, and Trendyol, have a significant market share in the Turkish e-commerce market. These marketplaces cover approximately 80% of the Turkish e-commerce market (Competition Authority, 2021). In the sales made through these marketplaces, there are three options for the sellers to deliver the products to the consumers: (i) delivery via the contracted parcel companies of the marketplace, (ii) delivery through the sellers' parcel agreements, (iii) delivery via the parcel companies belonging to the marketplaces.

Furthermore, e-marketplaces have an increasing tendency, through various incentives, to have sellers use their own parcel companies or their own contracted parcel companies. There are two main reasons for this: (1) problems experienced in delivery

processes carried out by subcontractors, and (2) more favorable prices can be obtained from the parcel companies because of the increased bargaining power of these marketplaces. While the first purpose may be a measure to improve the service quality and protect the brand image of the marketplace, the second purpose is to provide more cost-effective services.

Finally, one can observe that this tendency may also lead to unfair income extraction from the sellers under the parcel service fee, depending on the asymmetric bargaining power of the marketplace. The critical point is whether e-marketplaces oblige sellers to use their parcel delivery services.

2.3.6 Toward a More Granular Postal Network

In a competitive postal market, it has become essential for operators to focus on customers' requests related to delivery location and delivery time. Customers expect last-mile solutions that allow them to receive parcels outside of standard working hours, from pick-up zones or locked postal lockers. Using independent Pick Up and Drop-Off (or PUDO) points such as shopkeepers, gas stations, and stands in shopping centers is one of the many alternative options where customers can receive or return their parcels. For parcel operators, these options can increase delivery efficiency and significantly reduce costs, enabling new market opportunities to emerge.

The costliest element in the supply chain for postal service providers is, unmistakably, the last-mile delivery, providing strong motivation for last-mile innovations. In this context, Turkish postal service providers have started implementing different innovative solutions in the last mile. First, PUDO points have emerged: a contract between e-marketplaces/postal service providers and the shopkeeper/workplace, site settlements, and shopping mall allow to establish a relationship with the end consumer as a delivery point. While shopping on the e-commerce platform, the end consumer is offered the alternative of choosing one of these PUDO points close to their home/office other than delivery to the address and delivery from the postal office in their parcel preferences. Second, parcels are delivered to end-users through postal lockers established in shopping malls, gas stations, site entrances, student dormitories, and universities or central squares. These lockers may be owned by postal service providers or operated by locker companies. Thirdly, virtual postal companies have emerged. A few start-ups are developing an Uber-like business model for Turkey's last-mile delivery segment. These companies are trying to get a share from the classic postal-parcel sector, which is run entirely by traditional postal operators. Fourth, Trendyol and Hepsiburada, two of Turkey's largest e-marketplaces, for their postal services, have implemented subcontracting. In this model, companies have established a distribution network of independent suppliers using their vehicles. Fifthly, new start-up companies have emerged that distribute their grocery products via motorcycle couriers with a fast delivery system through warehouses operated by third parties but controlled by platforms.

These innovations and new business models have caused a profound change in the postal sector. For ICTA, it is critical to analyze the effects of these developments on the postal market in order to enhance the postal market, to have legal certainty, to guarantee a level playing field, and to avoid competition problems.

3 Regulatory Challenges

3.1 PUDO Points and Lockers

In order to deliver with the PUDO model, e-marketplaces must either obtain a postal operator license or make the clearance (collection), sorting, and transport to PUDO points through a postal service provider. Companies delivering to PUDO points, therefore, are regarded as postal service providers.

Similar to the EU Postal Directive, in Turkish postal law, *“Postal services including the clearance, sorting, transport, and distribution of postal items are performed by service providers operating following the provisions of this Law”*. In this context, it is understood that postal service providers should do the distribution and delivery of postal services.

However, it states in the article titled “Rights and Obligations of Postal Service Providers” of the Authorization Regulation for the Postal Sector; *“The service provider may provide services through alternative business models within the scope of agreements it will make with third parties, under the responsibility of the service for which it is authorized. However, the service provider is obliged to provide the postal service it offers on its own name and account, cannot provide the said service on behalf of another person or company, or in a way that gives the impression that it is provided”*.

Legislation, thus, allows for the development of business models for making deliveries to customers at the PUDO points in the last mile. According to this legislation, drop-off point services offered by small retailers in Turkey may be seen as agency services offered on behalf of the delivery company (e.g., the national post). Therefore, no authorization would be required.

There are two critical issues arising from the regulatory point of view. First, independent companies with their own distribution network have emerged, providing their own PUDO points. Some companies manufacture and operate their own parcel lockers through commercial agreements with postal service providers (and in some cases even with e-marketplaces). These companies, although having their own distribution network, do not need to acquire a postal license. The most critical issue for the regulator is whether these companies are subject to postal authorization.

Under the EU's Postal Services Directive (which is transposed into the postal law in EU member states), someone is providing “postal services” when they carry out any one of the following activities: the clearance (collection), sorting, transport, and distribution (delivery) of postal items. Decisions by the EU's Court of Justice (CJEU)

have clarified that this definition includes related value-added services. The CJEU has also clarified that carrying out the transport activity alone (without at least one of the other three listed activities) is insufficient to provide a postal service.

At the EU level, there is no clear decision on whether the provision of PUDOs is by itself a postal service, although it seems to fall into the delivery service category. In Turkey, there are several PUDO and postal locker companies. These companies provide a commercial service as part of an integrated postal/delivery service (which would include, for example, e-commerce platform providers) and as a stand-alone commercial service (which would include parcel locker companies).

3.2 Virtual Postal Operators

New start-ups, called virtual postal operators, have emerged in Turkey, working with a gig economy model, and providing postal services by bringing together senders and receivers. The question arises whether such services can be considered postal services. These platforms may have anti-competitive effects if they do not fall under the licensing regime because licensed operators pay 2.35% of their net sales as contribution to universal service fund and to the Authority's expenses. This contribution is obligatory for all service providers. In addition, some obligations licensed postal operators have to comply with in terms of consumer complaint handling procedures and service quality standards. According to the authors of this paper, the fact that the clearance and sorting process is virtualized does not necessarily mean that these processes are not postal supply processes. Technology may affect the operational process, but the services one can define as of a postal nature remain the same.

It may also be considered that the CJEU's decision as to whether Uber is an electronic mediator between car owners and users or offers a transportation service can serve as a guide. According to this decision, considering that these platforms control the entire operational aspect of the couriers and provide collection, processing, and delivery services, these services could be considered postal services. One can definitely argue that virtual operators can be considered postal service providers in this context.

3.3 The Subcontractor Model

A significant number of last-mile delivery companies, including postal service providers, are trying to alleviate fixed labor costs, of payroll employees, with alternative employment methods. The "gig economy" is widely used in the postal sector. This term is generally used to refer to digital platforms' labor markets and are defined by subcontracting. Sometimes, it is also called "independent contracting" or "freelance work".

The gig economy model applied in the postal sector is pioneered by companies such as Amazon Flex and Deliveroo in the field of food and grocery delivery. In this delivery model, one can witness how non-professional local couriers providing services of collecting and delivering orders to the front door within 1 h. The working principles of the gig economy are based on complete subcontractor responsibility, task-based workforce, databased human resources, algorithms for business allocation, and temporariness.

This model was implemented in Turkey in 2017 and is now used by Turkey's two largest e-marketplaces and partially implemented by other traditional postal operators. One can argue that this model does not bring innovation to the traditional postal system but rather changes the employment form in the delivery sector. Companies advocate this type of employment as a win-win system which gives independent couriers or subcontractors more income and (commercial) flexibility. They also claim that this system is a gig economy model built on non-professional carriers. While these companies insistently claim the benefits of innovation, entrepreneurship, and flexibility, from the workers' point of view, this creates lower wages and unsecure working conditions with a risk of physical harm.

When e-commerce started rising, independent couriers or subcontractors initially earned more than payroll employees because they were paid per item delivered. However, the slowdown in this increase and the severe increases in costs, especially gasoline prices, have made this model no longer profitable for subcontractors. This has led to downward pressure on the revenues of these subcontractors. In short, the financial responsibility and professional risks are all allocated to them, while companies that implement this model bear less responsibility than traditional postal operators.

The system, which was carried out by two vertically integrated companies competing with postal operators, started to be implemented by other traditional postal operators due to its cost advantages. Approximately 40% of the employees in the postal sector in Turkey are now contracted as independent subcontractors, causing severe question marks on the social level playing field and these carriers' well-being and working conditions (ICTA, 2022).

3.4 Instant Delivery Models

Getir³ is the first company to provide grocery delivery in Turkey. It built a widespread distribution network by establishing hundreds of warehouses, managed by independent dealers. However, Getir controls all processes from renting space to refurbishing these warehouses. It has recently started to implement this same business model in different countries. The critical point is that, unlike the examples in other countries, Getir is not just an intermediary between the buyer and non-professional couriers or between the buyer and the seller but carries out the whole process from the top

³ <https://getir.com/en/locals/>.

of the supply chain to the delivery to the front door. It is a full-service provider integrating activities along the entire postal value chain. Deliveries by Getir can be addressed as last-mile express services. Getir delivers products ordered via its own platform in a very short time (instant or flash delivery) by couriers with motorcycles or commercial vehicles. These deliveries are carried out by payroll employees of the abovementioned warehouses or by independent couriers.

In addition, Getir bought the majority shares of N11, one of the largest e-marketplace platforms in Turkey. It is rather likely that the company plans to deliver e-commerce items to end-users through the same fast delivery network it has established. Under current market conditions, four prerequisites must be met to enable same-day delivery: product availability, real-time product tracking, order fulfillment capacity, and flexible last-mile delivery. With its current business model, Getir fulfills all these four conditions and has a clear advantage in respect to e-commerce and large retail companies in terms of same-day delivery.

Several questions arise here from a regulatory point of view. Which activities of Getir are potentially relevant to be included in the postal sector and/or are postal services and which are not? In order to answer these questions, we see that the following questions come to the fore: (1) How can postal services be redefined in terms of clearance, sorting, transport, and distribution? (2) What is the definition of a postal service provider? (3) How can postal items (including weight or a dimension limit of postal items) be defined? (4) What is the definition of a postal network and postal user? (5) How can we define postal self-provision?

There are no consistent and harmonized postal definitions in the EU acquis. Boundaries between postal services and transport, logistics, and online intermediation services offered through platforms have become increasingly blurred (ERGP, 2021). In this context, taking into account all of the above elements, determining a postal definition is one of the most important agenda items of ICTA.

4 Regulatory Sandbox

Under the EU's Postal Services Directive and Turkish postal legislation, a company that performs a distribution (delivery) of postal items business is required to have a postal authorization. In addition, there are various regulations on service quality, consumer complaints, network and information security, and data reporting. These regulations can be a substantial entry barrier for innovative start-ups. In this context, ICTA has applied a regulatory sandbox approach to monitor innovative start-ups within a certain timeframe. At the end of this timeframe, an analysis is conducted to see whether postal authorization is required for these companies.

Home delivery rates, for example, remain very high in Turkey. The relatively late implementation of alternative delivery models such as PUDO points and postal lockers is one of the most important reasons for this. With the implementation of these models, one can see that the number of products delivered from these points has increased rapidly. Vertically integrated postal providers use alternative delivery

methods (especially PUDO points) very effectively and started to deliver about 10% of their shipments in this way as of 2021. With traditional postal service providers, this rate is still below 1%, even if we can observe that these companies are trying to establish and expand their own PUDO network.

Although PUDO points and parcel lockers might be viewed as postal services in terms of legislation, the Authority allowed a controlled test to see the market impact of these alternative delivery models. In a regulatory sandbox framework, these companies were exempted from getting a postal authorization for a defined period. This way, possible advantages, and disadvantages could be assessed before the model being rolled out nationally.

5 Conclusion

Postal markets are undergoing radical changes, fueled by a two-fold effect of technological innovations. First, e-substitution has hollowed out the social function of letter mail, leading to a substantial decline in the letter mail segment. Second, e-commerce has partly filled this gap by fueling the parcel market segment. Legislative adjustments seem to lag behind technological innovations that have accelerated at an increasing speed over the last decades.

In Turkey, we see many alternative business models responding to changing consumers' needs. Putting these alternative business models in existing business categories or operational processes is not an easy task. The theme also seems to involve many key aspects outside the scope of postal national regulatory authorities, such as the labor conditions.

The Turkish regulatory authority has applied a regulatory sandbox approach for several alternative business models, such as stand-alone parcel locker providers and robotic last-mile delivery. This way, a balance between enabling modernization of the sector and fulfilling new consumers' needs on the one hand and safeguarding a stable and predictable implementation into the market, on the other hand, can be reached. After a specified time, a regulatory assessment can determine whether these alternative business models can be rolled out on a national scale.

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Compensation of Net Costs Generated by SGEIs. Examples from Different European Network Industries



F. Russo, S. Romito, F. Leone, F. Spadaccia, and S. Gori

1 Introduction

More than a decade ago the European Commission (European Commission, 2011 and 2012) adopted a set of guidelines for designated Services of General Economic Interest (SGEIs) in order to define the conditions under which State aid in the form of public service compensation can be considered compatible with EU rules.

In this paper we will analyze two case studies on the compensation mechanisms adopted for two different network industries in two different countries. The first one is from Belgium, where the SGEI is national in scope with regard to the Belgian Postal operator (Bpost) that administers the program and is paid under contract with the Belgian government. The second one is local in scope and funds public transportation in a Lander (state) in Germany.

The objective of the paper is to understand if the compensation mechanism of SGEI that have been applied differently in the different contexts (cost structure, sector, national versus local, and size of the country) and if there are lessons to be learned for the ongoing debate on the European postal regulatory framework on the USO.

This chapter is divided in sections: in Sect. 2 we present the framework for SGEIs, in Sect. 3 we present the Bpost case, and in the fourth, the specific case concerning public transportation in Germany. In the next to last section, we will present the

All four authors work in Poste Italiane. However, the views presented are those of the authors and do not necessarily reflect those of the affiliated institution.

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lessons to be learned for the discussion on the funding of the USO in the postal sector. In the last section, we summarize the conclusions and propose a way forward for future research.

2 What Is an SGEI and How it Is Funded

At EU level, Services of General Economic Interest are mentioned in Articles 14 and 106(2) of TFEU (Treaty on the Functioning of the European Union) and in Protocol No. 26 to the TFEU, but they are not precisely defined in the TFEU or in secondary legislation. However, in 2012 the European Commission (EC) clarified that SGEIs are economic activities which deliver outcomes in the overall public good that would not be supplied by the market without public intervention or would be supplied under different conditions. These conditions are specified by the EC in terms of objective quality, safety, affordability, equal treatment, or universal access. A PSO (Public Service Obligation) is imposed on a provider by way of an entrustment and on the basis of a general interest criterion, which ensures that the service is provided under conditions allowing it to fulfill its mission.¹ The European Court of Justice has intervened several times on SGEIs. It has established that they are services that exhibit special characteristics as compared with those of other economic activities.²

“The concept may apply to different situations and terms, depending on the Member States, and EU law does not create any obligation to designate formally a task or a service as being of general economic interest, except when such obligation is laid out in Union legislation (e.g., universal service in the postal and telecommunication sectors). If the content of an SGEI—i.e., public service obligations—is clearly identified, it is not necessary for the service in question to be designated ‘SGEI’. The same is true of the concept of social services of general interest (SSGIs) that are economic in nature” (European Commission, 2013, p. 22).

It is worth noting that Member States have few limits in defining services that are of general interest, but “*the Commission must ensure that public funding granted for the provision of such services does not unduly distort competition in the Internal Market*”.³ Concerning the funding, the EC Communication prescribes that the “*amount of compensation must not exceed what is necessary to cover the net cost of discharging the public service obligations, including a reasonable profit*” (§21). It clearly emerges that, to be compatible with State aid rules, compensation has to cover the net cost of delivering the SGEI including a reasonable profit. A compensation which is more than the sum of net costs plus a reasonable profit is unlawful and

¹ European Commission, Communication from the Commission European Union framework for State aid in the form of public service compensation (2011) (2012/C 8/03).

² European Court of Justice, Case C-179/90 *Merci convenzionali porto di Genova* [1991] ECR I-5889, paragraph 27; Case C-242/95 *GT-Link A/S* [1997] ECR I-4449, paragraph 53; and Case C-266/96, *Corsica Ferries France SA* [1998] ECR I-3949, paragraph 45.

³ European Commission, Press Release, State aid: Commission adopts new rules on services of general economic interest (SGEI), 20/12/2011.

distorts competition as it gives an undue economic advantage to the SGEI's provider. In reverse, a compensation which is lower than the net cost and a reasonable profit is an uncompetitive financial burden. Only a level of compensation compliant with the §21 can guarantee a fair level playing field in the market concerned. The EC Communication contains a framework for State aid in the form of public service compensation based on the net avoided cost methodology for providing an SGEI. It is to be 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*” (§25). Furthermore, the calculation has to include “*the benefits, including intangible benefits as far as possible, to the SGEI provider*” (§25). The reasonable profit is set as the “*rate of return on capital that would be required by a typical company considering whether or not to provide*” the SGEI (§33), considering the duration of entrustment and an appropriate level of risk linked to the sector, the kind of service provided and the compensation mechanism (Russo et al., 2022, p. 185).

3 Bpost's SGEIs

The Belgian USP is an interesting example because of the specific characteristics of the compensation agreement related to its SGEI. The SGEIs include the Press Distribution⁴ SGEI, the Retail Network SGEI, Day to Day SGEIs, and an ad hoc SGEIs. Bpost was entrusted of universal service by law until the end of December 2018, then on the basis of a management contract, which ends at the end of 2023, Bpost has continued to provide the universal service (BIPT website). The other SGEIs are entrusted on the basis of the 6th Management Contract for the period 2016–2020, and the management contract has been prolonged for one year, the 2021, in the context of the COVID-19 pandemic. The retail network SGEI foresees that the USP has to provide a retail network denser and more widespread than what the universal service requires and also beyond what would be commercially profitable. Day to Day SGEIs require cash availability at counter services and the home delivery of pensions. The first SGEI is dedicated to foster affordable cash services, the second one provides delivery of pension at home to old people or people with a limited mobility at no additional charge. Ad hoc SGEIs are quite heterogeneous, in fact they are the delivery of addressed or unaddressed election printed items, the delivery of postal items sent by associations at special price, the delivery of letter post items that fall within the

⁴ The Press distribution SGEI is the provision of the distribution in the early morning of newspapers and the distribution of periodicals within definite time laps, at reduced tariffs. These publishing materials must have some features to be included in the SGEI. The features are the frequency of publication and the content, for example, newspapers must be published minimum 5 times a week. The SGEI foresees that Bpost has to deliver the publishing materials on the whole territory including the remote areas and each publisher can choose another operator for the whole or part of the territory. Publishers may also set up their own distribution channel. European Commission, State Aid SA.56448 (2021/NN)—Belgium Prolongation of Bpost's concession over 2021 and 2022.

Table 1 Bpost Compensation cap 2016–2020

Compensation cap excluding inflation (mln €)	2016	2017	2018	2019	2020
Retail network—Day to Day SGEIs—Ad hoc SGEIs	90.1	90.5	92.8	93.2	91.8

Source European Commission, State Aid SA.42366 (2016/N), 2016, §99

freepost system, the management of fishing permits (printing, sale, reimbursement, replace, and exchange of them), the social role of postman. Briefly describing them, the social role of the postmen is linked to services for poor and lonely people; the delivery of addressed and unaddressed election printed items is related to the distribution of election material at reduced tariffs; the delivery of postal items sent by associations concerns the delivery of postal items at special price; the delivery of letter post items within the freepost system is relative to the delivery of items free of charge addressed/originating from the King and from Public Institutions; the management of fishing permits is the printing, sale, reimbursement, replacement, and exchange of fishing permits. Retail Network SGEIs, Day to Day SGEIs, and ad hoc SGEIs are all compensated, but the compensation has a ceiling which means that the compensation is capped. Bpost will receive the full compensation within the maximum compensation set.⁵ The amount of compensation is estimated using the net avoidable cost (NAC) methodology required by State aid rules (adjustment mechanisms about quality and efficiency are also applied to Retail Network SGEI and Day to Day SGEIs). Bpost receives early payments calculated using the NAC methodology then the Board of Auditors check ex post the compensation amount. If the amount of compensation is over the early payment and less than the cap, Bpost receives the difference from the State.⁶ If the compensation is less than the early payment Bpost has to reimburse the difference to the State. If the cap is lower than the compensation, the cap becomes the compensation. Table 1 shows the compensation cap, which is the ceiling that Bpost can receive for the years 2016–2020.

From an ex-ante perspective, for the period 2016–2020, the ex-ante NAC calculation corresponded precisely to the compensation cap.⁷ The Belgian Authorities calculated the NAC ex post, which from the years from 2016 until 2020, exceeded the cap. In this way, the cap (which is equal to the ex-ante calculation of the compensation) has become the compensation for the years considered. In July 2021, the Belgian government has approved the seventh management contract with Bpost, which will provide for the same SGEIs included in the previous contract plus a digital public services (Bpost, 2021 press release, European Commission, 2021b) with the aim of reducing the digital gap.

⁵ Ibidem.

⁶ European Commission, State Aid SA.42366 (2016/N)—Belgium State compensations to Bpost for the delivery of public services over 2016–2020; §89 §96, §97, §98, §101.

⁷ Ibidem.; §320.

4 Local Public Transport in Germany

The Contract Obligation and Tendering Principles Local Public Transportation in Germany follows European Regulation (European Union, 2007 and 2009), which requires a Public Service Contract, to be awarded in principle by competitive bidding but with some exceptions allowing a direct award. In this section we will first analyze the general regulatory framework and then a specific local service as a concrete application case study.

The German Public Transportation Law defines processes for the interaction of the two public authorities regulating this sector: the regulatory authority for authorization (Genehmigungsbehörde) and the public transport authority for financing and contracting (PTA, Aufgabenträger) (GIZ, KCW, 2016, pp. 17–18).

Increasingly commercial transportation companies compete for tendered services with financial compensation, but City Transportation is mainly assigned by direct award to a municipal operator. The Contract between the municipal operator and the local authority awarding the contract rules the relationship between the parties and the service parameters and the compensation is defined *ex ante*. Concerning the parameters, the trend in Germany, concerning local transportation, is to move from classical incentive and control mechanism based on market incentives such as revenues and ridership and bonus/malus (penalty) schemes such as reliability and punctuality toward the use of more modern incentives. The latter ones concern also transparency (publication of key performance indicators) and customer service charters (GIZ, KCW, 2017, pp. 33–36).

With respect to financing, the literature analyses two types of contracts: Net Cost Contract (NCC) and Gross Cost Contract (GCC). In the NCC model costs are covered by fare revenue and contractual payment and the revenue risk is borne by the transport operator. In the GCC the cost of the municipal operator is covered by contractual payment and the revenue risk is borne by the authority which receives the fares but remunerates the operator to cover the cost. In the NCC case, there are market incentives for operator initiatives based on good service and quality and lean management. Because GCC case, cost recovery guarantees do not provide these types of incentives (GIZ, KCW, 2016, pp. 12–14).

An interesting case study of Net Cost Contract, applied to a specific Lander, concerns draft regional law on the compensation of school bus and tram transport in the Land Rhineland-Palatinate.

On 8 December 2011, the Commission received a complaint by a German bus company concerning a draft regional law on the compensation of school bus and tram transport in the Land Rhineland-Palatinate. The case was registered under SA.34048. On 22 December 2011, Germany pre-notified the above-mentioned draft law. This case was registered under SA.34155 (European Commission, 2014, p. 1). After a thorough analysis the Commission concluded that the notified scheme was compatible with the internal market under Article 93 TFEU as well as under Article 107(2)(a) TFEU and accordingly decided to consider the aid (SA.34155) to be compatible with the internal market (European Commission, 2014, pp. 19–20).

More specifically, the regional law on the compensation for public service obligations concerns school bus and tram transport in the Land Rhineland-Palatinate and the implementing regulation aimed to ensure open access to education by providing cheap public transport tickets used to reach schools, universities, and training places by pupils, students, and trainees. Furthermore, the scheme pursued specific social aims by financially supporting families with children, as well as environmental objectives by supporting public transport motor car transport. The measure imposed a public service obligation on all bus and tram undertakings in the Land Rhineland-Palatinate, obliging them to offer reduced rates to pupils, students, and trainees. This reduction must amount to at least 15% of the standard rate for adults.

In return for discharging this public service obligation, the undertakings were entitled to compensation corresponding to the difference between the reduced rate and the standard rate for adults (European Commission, 2014, p. 3).

In order to exclude over-compensation, it was decided that all compensations were limited to a maximum amount to be established in accordance with the implementing regulation which has the mission to ensure that the amount of this second requirement to the compensation is calculated in accordance with the rules laid down in Regulation (EC) 1370/2007. In any case, the compensation must not exceed an amount corresponding to the net financial effect of compliance with the public service obligation. An *ex post* over-compensation control is carried out to ensure that no transport undertaking receives compensation exceeding the amount of this second requirement.

The undertakings have to establish their cost structure based on the guidelines for the determination of prices on the basis of net costs (*Leitsätze für die Preisermittlung aufgrund von Selbstkosten*—“LSP”). The LSP, which is generally used for the determination of prices in public contracts, provides a cost-based price calculation method based on established accounting standards taking into consideration all relevant cost categories.

An important issue is linked to efficiency. According to recital 4(2) of the LSP, only costs resulting from the discharge of services in an economical and efficient way are to be considered.

Concerning the revenues side of the equation, it is possible to include all commercial revenues either from revenue sharing agreements of transport associations or direct sale of tickets outside a transport association as well as other forms of revenues such as advertising revenues. Furthermore, the revenues include compensation received from other schemes as well as any kind of grants from the State, transport associations, or other public entities. The calculation takes into account a reasonable profit. In synthesis, the cap is calculated as follows: $\text{cost} + \text{reasonable profit} - \text{revenues}$ (European Commission, 2014, p. 4).

5 Lessons to Be Learned for the Financing of the Postal USO

From the two cases above it is clear that the framework governing of SGEIs and more specifically their financing has been applied similarly across different sectors at local and national level, taking into account also the different methods of public tendering.

Furthermore, it emerges that the full financing of the net cost and of a small profit for investment purpose has been applied in the examples mentioned above. This reinforces the arguments raised in defense of this methodology by the association of European Postal operators (PostEurop) in a position paper published on March 2nd, 2022.

In that position paper, two points strongly emerge. The first is that State financing should fully cover the increasing net cost of the universal service (PostEurop, 2022, pp. 4–5). The second is that the PSD must allow Member States the flexibility to adjust the USO scope and service level to national circumstances in order to balance service requirements with the need for funding (PostEurop, 2022, pp. 3–4).

As stated by the EC in the last Report on the application of the PSD: *“The provision of universal services entails a net cost. The net cost of the universal service obligation represents the difference between the cost for a designated universal service provider of operating with the universal service obligation and the cost for the same postal service provider operating without the universal service obligation. The net cost of universal service provision can be substantial. If the universal service provider had to bear such costs on its own, it would put that provider in a disadvantaged position vis-à-vis its competitors”* (European Commission, 2021a, p. 8).

Therefore, considering the dramatic drop of mail volumes, one of the key policies for the postal sector is to ensure its long-term sustainability and, within this context, the issue of financing the universal service has become crucial.

This issue, however, is not sufficiently covered by the Report, where the EC simply states that the so called *“compensation fund is not working”* so *“[t]his may also explain why Member States very rarely use this way of funding the net costs of universal service provision”* (European Commission, 2021a, p. 8).

Therefore, how the USO in the postal sector may be funded is still a challenging question that deserves further consideration. Indeed, concerning the compensation fund, the EC in the Report also points out that *“There are weaknesses in relation to how compensation funds operate. Providers’ contribution to the fund is often not sufficient to cover the entire cost, especially as the cost is growing in a declining letter mail market and the universal service providers have a strong position. In these situations, State aid funding is also required to finance the costs [..]”* (European Commission, 2021a, p. 8).

Against this background, PostEurop position paper (PostEurop, 2022) underlines the importance of state funding and the non-distortive nature of this option, which proves to be the most efficient compensation scheme. Firstly, because competition in the market is unlikely to be distorted once competing firms do not have to assume

(directly) the USO burden. Secondly, because State funding may raise transparency in relation to the way costs are calculated and funds are administered. Finally, because this mechanism has already proven to be particularly suited to countries where the USO burden is high compared with the funds that could be raised, for example, from fees imposed on operators or their customers.

In any case, to obtain sustainability it is fundamental that State resources are generated to fully cover the USO burden in order to continue providing universal service. Besides, as correctly observed by PostEurop, state funding procedures should be shorter and less burdensome, as in their current form universal service providers are experiencing financial difficulties due to the long time await to receive state compensation (European Commission, 2021a, p. 5). Furthermore, to balance service requirements with the need for funding, the regulatory framework should also allow Member States sufficient flexibility to adjust the USO scope and service level to national circumstances.

Along the same lines, PostEurop's position paper (PostEurop, 2022) also points out that *"given the importance of the economies of scale in the postal sector, and the shrinking volume trend, tendering geographic parts of the USO would make the cost of the service too high and question the sustainability of the service."* Therefore, tendering the basic services within USO, especially in low-density areas or outermost regions where distribution costs are particularly disproportionate would be self-defeating. The Commission seems to only partially agree when it states that *"On the other hand, tendering of Services of General Economic Interest could be useful in specific cases, as it has been proven in some countries"* (European Commission, 2021a, p. 5).

Thus, considering the evolution of postal markets the issue of sustainability is of primary importance leading to the need that the USO burden must be fully covered and the best mean, emerging from the analysis of the European Commission (European Commission, 2021a), seems to be state financing.

6 Conclusion

From the two cases we have discussed above that of Bpost, and the discounts applied in the Local Transportation in the Rhineland-Palatinate Land, it emerges that the European "architecture" of the Services of General Economic Interest, together with the approach on State aid, have been a useful tool to manage remuneration of net cost generated by different types of services of public interest.

The lessons to be learned for postal services are multiple, first, it is worth noting that the SGEI framework helps to clarify the calculation of the compensation for the provision of net cost and should be the starting point also for sectorial regulation. Second, it is also important to point out that the compensation should be full, taking into account the investments needed to update the quality of service provided and to avoid inappropriate service levels and/or limited provision of the services. Lastly, as

emerged clearly from the Rhineland-Palatinate Land's case, it is important to keep state funding procedures simple, short, less burdensome, and less subject to different interpretations.

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E-commerce and Parcel Delivery: Environmental Policy with Green Consumers



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1 Introduction

Consumers' environmental awareness (CEA) has been increasing considerably over recent decades. It appears to affect their demand behavior in essentially all sectors. CEA was documented in recent surveys¹ in which individuals declare being more conscious about the impact of their purchasing behavior on environment. Most of them, especially those under 35 years of age, would like to modify their behavior accordingly. Being more conscious means that individuals clearly identify and are more sensitive to new characteristics for the goods such as environmental brand responsibility, ethical labor, if repair is feasible (and so reducing raw materials exploitation), and transparency. This will translate into deciding to refuse consuming goods or to reduce the consumption of these goods that would not be compliant with their tastes in regard to environment. This could also translate into refusing to

¹ OpinionWay questionnaire run on 1000 French persons over 18 years old, online sept. 2021; Retail X 2021 report. Sustainability (<https://internetretailing.net/sustainable-e-commerce/sustainability-report-2021-23962/>).

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buy imported goods and being willing to pay more for goods satisfying these new characteristics.²

E-commerce and its environmental impact have drawn significant attention in the public debate. Appeals for policy intervention have become increasingly pressing as e-commerce has been expanding. (See for instance, the French report for a sustainable development of e-commerce [France Stratégie, 2021] or the European Commission on-going study to assess and analyze the impact of e-commerce-driven transport and parcel delivery on air pollution and CO₂ emissions [Prognos, 2022]). E-commerce has been particularly expanding during the last two years because of the Covid epidemic, and the attention devoted to the environmental footprint of the sector has risen accordingly. One can of course expect CEA to encourage retailers and last-mile parcel delivery operators to adopt cleaner production technologies.³ For instance, the use of electric vehicles or cargobikes for urban delivery may be appealing for environmentally conscious customers, enhance their demands, and provide the last-mile delivery operator with a competitive edge. While one may doubt that this mechanism might be sufficient to achieve an adequate level of emission reduction, one can certainly expect CEA to affect the appropriate environmental policy design.

In this chapter, we study how CEA could affect the design of environmental policy in the e-commerce sector. We study the appropriate design of taxes at the different levels of the value chain under CEA. We also examine if there is a need for regulation requiring last-mile delivery operators to reveal the environmental footprint of their activity. While the production, the long-haul transport, and the retail activities also generate emissions, we will concentrate on the environmental impact of last-mile delivery.

To deal with those issues, we consider a model which is based on Borsenberger et al. (2022a). There are two retailers/producers who sell a differentiated product and two last-mile parcel delivery operators. The last-mile delivery of these goods generates CO₂ emissions. The total level of these emissions creates a global (atmospheric) externality which is a potential source of global warming and climate change. We assume that the last-mile delivery cost decreases with the level of emissions, at least up to some level. In other words, it is more expensive for the last-mile parcel delivery operator to use “green” technologies. Because of CEA, consumers’ utility decreases with the environmental externalities associated with the product they buy. Specifically, they are willing to pay to reduce the level of emissions generated by its delivery. When this level of emissions is not revealed by the last-mile parcel delivery operator, consumers assume that it uses a dirty technology. In a first step, we assume that willingness to pay to reduce environmental costs is the same for all consumers, but

² However, nowadays there appears to exist a gap between consumers’ attitude toward environment and their behavior. One interpretation is the fact that information on environmental effects is difficult for consumers to get. Some policy makers suggest that a label system such as that used for energy consumption could be used.

³ The idea that CEA may mitigate a negative externality has been pointed out by Brennan (2006). He considers a setting where production technology is exogenous so that there is a one-to-one link between output and pollution. He also allows for endogenous “green” preferences so that shaping them may provide an extra regulatory instrument to the government.

we also consider the case where consumers differ in their environmental awareness or preferences.

We consider different scenarios reflecting the type of competition and the vertical structure of the industry. In a reference scenario, we will consider “pseudo” perfect competition à la Mussa and Rosen (1978) in which retailers and last-mile parcel delivery operators are independent and behave competitively so that all prices and delivery rates, including the price of environmental quality, reflect marginal cost. Then, we will consider a setting where all firms remain independent but where there is imperfect competition that involves strategic interaction in a two-stage game where operators choose environmental quality in a first stage and then compete in delivery rates. We will study the (subgame perfect) Nash equilibrium. In another scenario, we assume that there is vertical integration between one of the retailers and one of the last-mile parcel delivery operators.

We study the different equilibria, implying different levels of emissions and outputs, yielded by those different scenarios and the impact of CEA on the optimal environmental policy under the different market structures. Finally, we examine if operators find it profitable to reveal their levels of emissions to consumers.

2 Model

Consider an e-commerce sector with two products $i = 1, 2$ which are substitutes and differentiated by their environmental impact. For simplicity, we assume that this impact is determined by the emissions of the last-mile parcel delivery operator.⁴ There are two operators, delivering each a single product, so that the index $i = 1, 2$ can also be used for of last-mile parcel delivery operators. There are two retailers, indexed A and B , which sell both products.

Preferences are represented by

$$u(x_1, x_2) = p_1 x_1 + p_2 x_2 - \sigma x_1 e_1 - \sigma x_2 e_2, \quad (1)$$

where x_1 and x_2 denote consumption of the two goods, p_1 and p_2 the prices charged by the retailers, while e_1 and e_2 are the (per unit) emissions associated with their delivery. Environmental concern, CEA, is expressed in monetary terms, with σ representing the perceived cost of one unit of emissions. Maximizing (1) yields the demand functions $x_1(q_1, q_2)$ and $x_2(q_1, q_2)$, which are determined by

$$u'_1(x_1, x_2) = p_1 + \sigma e_1 = q_1, \quad (2)$$

$$u'_2(x_1, x_2) = p_2 + \sigma e_2 = q_2, \quad (3)$$

⁴ In reality, the retail activity will of course also generate emissions. Following Borsenberger et al. (2022a, 2022b) one could easily generalize our model to account for these extra emissions. This would complicate the analysis but not affect our main results.

where

$$u'_j = \frac{\partial u}{\partial x_j}, \quad j = 1, 2,$$

and q_j denotes the “full price” including environmental damage.

Costs of retailers $j = A, B$, for goods $i = 1, 2$ are given by $y_{ji}k$, where k is their marginal cost and y_{ji} the quantity of good i they sell. In words, we assume that marginal costs are constant, equal across retailers, and the same for the two products.

The costs of last-mile parcel delivery operator $i = 1, 2$ are given by $c_i(z_i, e_i)$, where z_i is the number of parcels delivered and e_i is emissions per parcel delivered. Each operator delivers a single good. Assume for simplicity that:

$$c_i(z_i, e_i) = C_i(z_i) - \gamma_i(e_i)z_i, \quad (4)$$

where $\gamma_i''(e_i) < 0$ and

$$\gamma_i'(e_i) > 0 \quad \text{for } e_i < \bar{e}_i \quad \text{and} \quad \gamma_i'(e_i) = 0 \quad \text{for } e_i \geq \bar{e}_i. \quad (5)$$

Intuitively, assumption (5) implies that delivering in a less polluting way is more costly. Further, we assume that for any level of e we have

$$\gamma_1'(e) < \gamma_2'(e)$$

so that last-mile parcel delivery operator 1 is cleaner: we have $\bar{e}_1 < \bar{e}_2$ and when $\gamma_1'(e_1) = \gamma_2'(e_2)$ we have $e_1 < e_2$. It will become clear below that this assumption implies that in equilibrium last-mile parcel delivery operator 1 will use the cleaner technology and thus have a lower level of e .

Market clearing requires that for each good i , the total amount sold by both retailers $y_{Ai} + y_{Bi}$ is equal to demand x_i and to the amount delivered z_i . Formally we have

$$y_{A1} + y_{B1} = x_1 = z_1,$$

$$y_{A2} + y_{B2} = x_2 = z_2.$$

Total emissions, E , have a social cost $\psi(E)$ and they are given by

$$E = x_1e_1 + x_2e_2.$$

This definition fits CO₂ emissions, which are global and additive.

3 First Best

We start by characterizing the first-best (FB) allocation. To define social welfare, we follow the by now standard approach initially advocated by Hammond (1987) and Harsanyi (1995) and do not include the CEA term in welfare.⁵ This is commonly referred to as “laundering out” the altruistic or warm glow term.

With this objective function, the FB allocation solves the following problem

$$\begin{aligned} \max_{x_i, e_i} SWF = & u(x_1, x_2) - kx_1 - kx_2 \\ & - C_1(y_1) + y_1\gamma_1(e_1) \\ & - C_2(y_2) + y_2\gamma_2(e_2) \\ & - \psi(E) \end{aligned} \quad (6)$$

The FOCs are:

$$\gamma_i'(e_i^*) = \psi'(E^*) \quad (7)$$

$$u'_1(x_1, x_2) = k + C'_1(x_1^*) - \gamma_1(e_1^*) + e_1^*\psi'(E^*) \quad (8)$$

$$u'_2(x_1, x_2) = k + C'_2(x_2^*) - \gamma_2(e_2^*) + e_2^*\psi'(E^*) \quad (9)$$

We assume throughout the paper that $\sigma < \psi'(E^*)$. In words, the (marginal and average) environmental cost perceived by the consumer is smaller than the full social marginal damage.

We now turn to the *laissez-faire* and study the equilibrium allocation.

4 Equilibrium When Consumers Observe Emissions

Assume for the time being that emissions associated with the last-mile delivery of the two products are observable to consumers. This may be the case because there is a regulatory requirement for retailers and/or last-mile parcel delivery operators to report the level of emissions or because the firms decide to reveal their levels of emissions.

As a reference consider outcome which is (pseudo)-competitive following Mussa and Rosen (1978). This implies the usual price marginal cost pricing concerning quantity, but also concerning (environmental) quality e .

⁵ See Cremer and Pestieau (2006) for a more detailed discussion. Hammond (1987) pleads in favor of excluding all external preferences, even benevolent ones, from our social utility function. The reason is that including this term would amount to count the externality twice.

Prices and delivery rates $p(e)$ and $r(e)$ are then functions of environmental quality, so that $p_i = p(e_i)$ and $r_i = r(e_i)$. For future reference, we consider the possibility that last-mile parcel delivery operators are subject to an emission tax τ . Setting this tax to zero then yields the *laissez-faire*. Furthermore, we can use the equilibrium expressions to study the FB implementation and in particular the required level of the emissions tax.

Retailers solve

$$\max_{e_j, y_j} \pi_j = p(e_1)y_{j1} - ky_{j1} - r(e_1)y_{j1} + p(e_2)y_{j2} - ky_{j2} - r(e_2)y_{j2},$$

which yields

$$p_i = k + r_i, \quad (10)$$

$$p'(e_i) = r'(e_i). \quad (11)$$

Demand is obtained by maximizing utility

$$\max_{x_i, e_i} u(x_1, x_2) - x_1 p(e_1) - x_2 p(e_2) - \sigma x_1 e_1 - \sigma x_2 e_2$$

which yields

$$u'_i(x_1, x_2) = p_i + \sigma e_i \quad (12)$$

$$p'(e_i) = -\sigma \quad (13)$$

for $i = 1, 2$.

Supply functions of last-mile parcel delivery operators are obtained by

$$\max_{z_i, e_i} \pi = r(e_i)z_i - C_i(z_i) + \gamma_i(e_i)z_i - \tau e_i z_i$$

which yields

$$r(e_i) = C'_i - \gamma_i + \tau e_i \quad (14)$$

$$r'(e_i) = -\gamma'_i(e_i) + \tau. \quad (15)$$

Substitution (10) and (14) into (12) and using the market clearing conditions yields

$$u'_i(x_1, x_2) = k + C'_i - \gamma_i + \sigma e_i + \tau e_i, \quad (16)$$

while combining (11), (13), and (15) shows that in equilibrium we have

$$\gamma_i'(e_i) = \sigma + \tau.$$

When $\tau = 0$ we obtain the *laissez-faire* characterized by

$$\gamma_i'(e_i) = \sigma, \quad (17)$$

$$u_i'(x_1, x_2) = k + C_i' - \gamma_i + \sigma e_i = p_i. \quad (18)$$

Consequently, we have $e_1 < e_2$ and $e_i < \bar{e}_i$ as long as $\sigma > 0$. Absent of CEA that is when $\sigma = 0$ both last-mile parcel delivery operators set $e_i = \bar{e}_i$ to minimize their delivery cost while neglecting any environmental consideration. Not surprisingly, CEA will lead to lower levels of emissions but as long as $\sigma < \psi'(E^*)$, emissions will be greater than optimal. Condition (18) shows that prices reflect marginal cost, but environmental costs are only included to the extent that they are perceived by consumers. Consequently, in spite of the CEA, equilibrium consumption levels will be larger than when the full environmental cost is accounted for.

Let us now turn to the FB implementation. In order to respect equality between (8) and (16), the emissions tax must satisfy

$$\tau = \psi'(E^*) - \sigma. \quad (19)$$

When $\sigma = 0$ we obtain the traditional Pigouvian rule stating that the tax must reflect the marginal social damage. With CEA the rule is amended and now requires that the tax reflects the part of the marginal social damage which is not perceived by consumers.

Substitution of (11) and (13) in (15) shows that (7) is also satisfied with such a tax. In other words, the linear tax on emissions via its impact on the last-mile parcel delivery operator's marginal cost and the consumer price is sufficient to implement the FB. Consumption levels will also be at their FB levels. This shows that the result obtained by Borsenberger et al. (2022a, 2022b) remains valid when CEA is considered.

Note that while the emissions tax is nominally imposed on the last-mile parcel delivery operators part of it will in general be shifted to consumers. The extent of this shifting depends on the elasticity of demand and on the last-mile parcel delivery operator's cost functions.

5 Observability of Emissions

In the previous section, we have assumed that the levels of emissions e_i are observable. When they are not observable we return to an equilibrium with $e_i = \bar{e}_i$; since e_i is not observed by consumers their willingness to pay is zero. Consequently, there is no incentive for last-mile parcel delivery operators to reduce emissions. This leads

of course to a lower level of welfare. Consequently, a regulation requiring last-mile parcel delivery operators and/or retailers to reveal the level of emissions is welfare improving.

This observation in turn raises the question if firms will spontaneously have an incentive to reveal e_i . In the considered scenario where all firms are price takers the answer is obviously affirmative and this follows from basic microeconomic theory. Last-mile parcel delivery operators want to communicate their e , because this shifts the inverse demand curve upward so that (with increasing marginal costs) equilibrium profits will increase. This suggests that no regulation is necessary. However, absent of a certifying authority it is not clear if the operators can credibly announce their e_i , especially since there is a clear incentive to announce a lower level than the actual one.

6 Imperfect Competition in the Last-Mile Parcel Delivery Sector: Independent Firms

6.1 The Game

We assume that last-mile parcel delivery operators move first and play a two-stage game: first they choose e and then r . The retailers continue to set prices at marginal costs. We first determine the subgame perfect equilibrium of the last-mile parcel delivery operator's game assuming that they anticipate the retailers' behavior. Then we examine how the first best (which does not change) can be implemented by imposing a tax on delivery of δ_i per unit and a tax on emissions, at rate τ_i . For the time being, we assume that consumers know the emission levels associated with their consumption. We revisit this issue in Sect. 9.

Demand functions $x_i(q_1, q_2)$ continue to be determined by Eqs. (2) and (3). Furthermore, marginal cost pricing by retailers implies that

$$p_i = k + r_i \tag{20}$$

remains valid.

6.2 Equilibrium

To avoid repetitions, we introduce the tax instruments from the outset. This gives us the expressions we need for the FB implementation, while we can easily obtain the *laissez-faire* (LF) by setting both taxes at zero. We solve the model by backward induction.

6.2.1 Stage 2: Determination of Delivery Rates r_i

Last-mile parcel delivery operator i chooses r_i by solving:

$$\max_{r_i} \pi_i = (r_i + \gamma_i(e_i) - \delta_i - \tau_i e_i) x_i(q_1, q_2) - C_i(x_i(q_1, q_2))$$

where from (2) and (3) and (20) we have $q_i = k + r_i + \sigma$. The FOCs are:

$$x_i(q_1, q_2) + \frac{\partial x_i(q_1, q_2)}{\partial q_i} [r_i + \gamma_i(e_i) - \delta_i - \tau_i e_i - C'_i(x_i(q_1, q_2))] = 0 \quad (21)$$

for $i = 1, 2$. This defines $r_i^e(e_1, e_2)$ and demands

$$x_i^e = x_i(k + r_1^e(e_1, e_2) + \sigma e_1, k + r_2^e(e_1, e_2) + \sigma e_2). \quad (22)$$

6.2.2 Stage 1: Determination of Emission Levels e_i

Last-mile parcel delivery operators choose e_i anticipating the induced equilibrium levels of (r_1^e, r_2^e) and the retailers' pricing behavior. They solve

$$\max_{e_i} \pi_i = (r_i^e(e_1, e_2) + \gamma_i(e_i) - \delta_i - \tau_i e_i) x_i^e - C_i(x_i^e),$$

where demand levels are given by (22).

Using the envelop theorem, the first-order conditions are

$$\begin{aligned} & (\gamma'_i(e_i) - \tau_i) x_i^e \\ & + \left(\sigma \frac{\partial x_i(q_1, q_2)}{\partial q_i} + \frac{\partial x_i(q_1, q_2)}{\partial q_j} \frac{\partial r_j^e}{\partial e_i} \right) [r_i^e + \gamma_i(e_i) - \delta_i - \tau_i e_i - C'_i(x_i^e)] = 0, \end{aligned} \quad (23)$$

for $i = 1, 2$.

These expressions evaluated at $\tau_i = 0$ and $\delta_i = 0$ determine the LF. Since now we have imperfect competition on top of the externality generated by emissions, we cannot expect the equilibrium to be efficient. However, comparing the FB and the LF is now much more complex than in the pseudo-competitive scenario considered in Sect. 4.

Some results concerning emission levels are established in Borsenberger et al. (2022b). We show that under standard conditions, when $\sigma = 0$, emissions continue to be set at their maximum levels $e_i = \bar{e}_i$, exactly like in the competitive scenario considered in Sect. 4. In other words absent of CEA, emissions are too large and at their maximum levels. Intuitively, when $\sigma = 0$, emissions have no impact on demand

and firms simply set them to minimize their cost.⁶ Furthermore, a positive value of σ (the presence of CEA) tends to mitigate this inefficiency and we *may* get smaller emission levels and an interior solution provided that σ is large enough. In that case, e has also an effect on demand which induces last-mile parcel delivery operators to limit their emissions.

6.3 Implementation of the First Best

Using (2), (3), and (20), the operators' marginal profit $[r_i + \gamma_i(e_i) - \delta_i - \tau_i e_i - C'_i]$ which appears in expressions (21) and (23) can be rewritten as

$$\begin{aligned} & r_i + \gamma_i(e_i) - \delta_i - \tau_i e_i - C'_i(x_i) \\ &= u'_i - k - \sigma e_i + \gamma_i(e_i) - \delta_i - \tau_i e_i - C'_i(x_i) \end{aligned} \quad (24)$$

Using (8) and (9) the RHS of (24) can be further rearranged as

$$\begin{aligned} & u'_i - k - \sigma e_i + \gamma_i(e_i) - \delta_i - \tau_i e_i - C'_i(x_i) \\ &= (e_i(\psi'(E^*) - \sigma) - \delta_i - \tau_i e_i) \end{aligned} \quad (25)$$

Substituting this expression into (21) and (23) shows that the levels of δ_i and τ_i that implement the FB must satisfy the following system of equations

$$x_i^* + \frac{\partial x_i}{\partial q_i}(e_i^*(\psi'(E^*) - \sigma) - \delta_i - \tau_i e_i^*) = 0 \quad (26)$$

$$(\psi'(E^*) - \tau_i)x_i^* + \left(\sigma \frac{\partial x_i}{\partial q_i} + \frac{\partial x_i}{\partial q_j} \frac{\partial r_j}{\partial e_i} \right) (e_i^*(\psi'(E^*) - \sigma) - \delta_i - \tau_i e_i^*) = 0 \quad (27)$$

We show in Borsenberger et al. (2022b) that these equations can be rearranged to yield the following expressions for the implementing taxes

⁶ This is true as long as the so called "cost paradox" does not apply; see for instance, Amir et al. (2014, 2017) or Anderson et al. (2001). In a setting with strategic complements and observable costs, the strategic effect of a decrease in own cost on the rival's price could lead, in principle, to a profit loss that is higher than the profit gain from the direct effect of such a decrease. In this case, a firm would not have a unilateral incentive to decrease its own cost. However, this is unlikely to happen in practice as it requires quite extreme assumptions on the demand elasticities; Anderson et al. (2001), Proposition 3.

$$\tau_i = \psi'(E^*) - \sigma - \frac{\frac{\partial x_i}{\partial q_j} \frac{\partial r_j}{\partial e_i}}{\left(\frac{\partial x_i}{\partial q_i}\right)}, \quad (28)$$

$$\delta_i + \tau_i e_i = \frac{x_i}{\frac{\partial x_i}{\partial q_i}} + e_i (\psi'(E^*) - \sigma). \quad (29)$$

where $\partial x_i / \partial q_i < 0$ and $\partial x_i / \partial q_j > 0$. Consequently, τ_i will in general differ from $\psi'(E^*)$ so that the straight Pigouvian rule that applied under perfect competition has to be amended. Furthermore, the sign of the adjustment depends on $\partial r_j / \partial e_i$ that is the impact of an increase in the competitor's emissions on an operator's equilibrium delivery rate. More precisely we have

$$\delta r_j / \delta e_i < 0 \iff \tau_i < \psi'(E^*) - \sigma.$$

Studying the sign of $\partial r_j / \partial e_i$ is complicated at this level of generality. We show in Borsenberger et al. (2022b) that $\partial r_j / \partial e_i$ has the same sign as $\sigma - \gamma'_i$ (as long as $\partial^2 x_i / \partial q_i \partial q_j \geq 0$).⁷ Intuitively, when $\sigma = 0$, so that there is no CEA, e_i has no impact on demand but only on costs and we have $\partial r_j / \partial e_i < 0$. When $\sigma > 0$, e_i reflects quality to that there is also a product differentiation effect which goes in the opposite direction. We show in Borsenberger et al. (2022b) that the absolute value of $\partial r_j / \partial e_i$ decreases as σ increases but that $\partial r_j / \partial e_i$ remains negative. To see this recall that in the first best we have $\gamma'_i(e_i^*) = \psi'(E^*)$ and by our assumption $\sigma < \psi'(E^*)$ we thus have $\sigma - \gamma'_i < 0$. To sum up, under imperfect competition, the emissions tax is always lower than $\psi'(E^*) - \sigma$ (its counterpart under perfect competition) but the wedge decreases as σ increases.⁸

Turning to Eq. (26), it shows that the total tax per unit of output is given by

$$\delta_i + \tau_i e_i = \frac{x_i}{\frac{\partial x_i}{\partial q_i}} + e_i (\psi'(E^*) - \sigma).$$

While the first term in the RHS is negative, the second is positive given our assumption that $\psi'(E^*) - \sigma > 0$. Consequently, the sign of the total tax per output is ambiguous.

⁷ This property holds for separable preferences and for many conventionally considered utility functions like Cobb-Douglas or CES.

⁸ Imperfect competition brings us to a second-best setting. Consequently, it is not surprising that the taxation rule differs from the first-best one.

7 Vertical Integration Between Operator 2 and Retailer B

We now assume that retailer B and last-mile parcel delivery operator 2 are integrated. We use the index $2B$ for this firm. The game is as follows: in Stage 1, last-mile parcel delivery operator 1 and firm $2B$ choose their levels of e . In Stage 2, last-mile parcel delivery operator 1 chooses its delivery price r_1 and the firm $2B$ chooses p_{2B} . As in the previous section, we consider a tax on delivery volume of δ_i per unit and tax on emissions at rate τ_i .

First, observe that there will be foreclosure: firm $2B$ has no incentive to deliver product 2 for retailer A . That way it can maintain a monopoly of this product. The price of good 1 continues to be given by its marginal cost

$$p_1 = r_1 + k,$$

With these assumptions, we have $q_1 = r_1 + k + \sigma e_1$ and $q_2 = p_{2B} + \sigma e_2$ so that demands can be rewritten as $x_i(r_1 + k + \sigma e_1, p_{2B} + \sigma e_2)$ for $i = 1, 2B$.

We solve the game by backward induction, starting with Stage 2. The problem of last-mile parcel delivery operator 1 is

$$\max_{r_1} \pi_1 = (r_1 + \gamma_1(e_1) - \delta_1 - \tau_1 e_1)x_1 - C(x_1).$$

The FOC is

$$x_1 + (r_1 + \gamma_1(e_1) - \delta_1 - \tau_1 e_1 - C'(x_1)) \frac{\partial x_1}{\partial q_1} = 0 \quad (30)$$

The problem of firm $2B$ is

$$\max_{p_{2B}} \pi_{2B} = (p_{2B} + \gamma_2(e_2) - k - \delta_2 - \tau_2 e_2)x_2 - C(x_2).$$

The FOC is

$$x_2 + (p_{2B} + \gamma_2(e_2) - k - \delta_2 - \tau_2 e_2 - C'(x_2)) \frac{\partial x_2}{\partial q_{2B}} = 0 \quad (31)$$

Equations (30) and (31) define $r_1(e_1, e_2)$ and $p_{2B}(e_1, e_2)$ so that demands are given by $x_1(r_1(e_1, e_2) + k + \sigma e_1, p_{2B}(e_1, e_2) + \sigma e_2)$ and $x_2(r_1(e_1, e_2) + k + \sigma e_1, p_{2B}(e_1, e_2) + \sigma e_2)$.

Turning to Stage 1, the problem of last-mile parcel delivery operator 1 is:

$$\max_{e_1} \pi_1 = (r_1 + \gamma_1(e_1) - \delta_1 - \tau_1 e_1)x_1 - C(x_1)$$

Using the envelop theorem (that is, making use of expression 30) the FOC can be written as

$$(\gamma'_1(e_1) - \tau_1)x_1 + (r_1 + \gamma_1(e_1) - \delta_1 - \tau_1 e_1 - C'(x_1)) \left(\sigma \frac{\partial x_1}{\partial q_1} + \frac{\partial x_1}{\partial q_2} \frac{\partial r_2}{\partial e_1} \right) = 0. \quad (32)$$

The problem of firm 2 is

$$\max_{e_2} \pi_{2B} = (p_{2B} + \gamma_2(e_2) - k - \delta_2 - \tau_2 e_2)x_2 - C(x_2)$$

Using the envelop theorem (using expression 31), the FOC is given by:

$$(\gamma'_2(e_2) - \tau_2)x_2 + (p_{2B} + \gamma_2(e_2) - k - \delta_2 - \tau_2 e_2) \left(\sigma \frac{\partial x_2}{\partial q_2} + \frac{\partial x_2}{\partial q_1} \frac{\partial r_1}{\partial e_2} \right) = 0. \quad (33)$$

These expressions evaluated at $\tau_i = 0$ and $\delta_i = 0$ determine the LF, which with the combination of the externality and imperfect competition will again not be efficient. Interestingly, the properties of this equilibrium regarding emissions are similar to those obtained for independent firms. In particular, we establish in Borsenberger et al. (2022b) that when $\sigma = 0$ we continue to have maximum emissions with $e_i = \bar{e}_i$. Furthermore, and not surprisingly, the presence of CEA with $\sigma > 0$ will mitigate this inefficiency.

7.1 Implementation of the First Best

We now examine how the FB can be achieved by the two considered tax instruments. In Borsenberger et al. (2022b) we show that this requires

$$\tau_i = \psi'(E^*) - \sigma - \frac{\frac{\partial x_i}{\partial q_j} \frac{\partial r_j}{\partial e_i}}{\left(\frac{\partial x_i}{\partial q_i} \right)} \text{ for } i = 1, 2B. \quad (34)$$

$$\delta_i + \tau_i e_i = \frac{x_i}{\frac{\partial x_i}{\partial q_i}} + e_i (\psi'(E^*) - \sigma) \quad (35)$$

Interestingly, the expressions are the same as their counterparts in the case of independent firms, that is (28) and (29) and the discussion provided there continues to apply. However, while the *rules* are the same, the *levels* will differ because equilibrium levels differ.

8 Heterogeneity in the Level of Environmental Concern

A main finding of the model so far is that the tax required to compensate for the environmental impact of the last-mile parcel delivery is reduced (from its Pigouvian level) by the monetary equivalent of the consumers' environmental concern. This simple rule applies when all consumers have the same CEA. We now examine how it has to be amended when consumers differ in their valuation for the environment. To do so, we consider heterogenous consumers who differ only in their σ 's. For simplicity, assume that a proportion μ of the total population of consumers values the environment at $\sigma > 0$ while the remaining part, $1 - \mu$ has no concern for the environment ($\sigma = 0$).

The preferences of the consumers of type E , who care about the environment are

$$u(x_1, x_2) - p_1x_1 - p_2x_2 - \sigma x_1e_1 - \sigma x_2e_2,$$

while the preferences of the consumers of type O who are not concerned about environmental issues are

$$u(x_1, x_2) - p_1x_1 - p_2x_2.$$

We continue to consider demand levels as function of *full* prices which include environmental concern, if any. We can thus define

$$q_i^E = p_i + \sigma,$$

$$q_i^O = p_i,$$

and denote demand levels by

$$x_i^E(q_1^E, q_2^E),$$

$$x_i^O(q_1^O, q_2^O).$$

They are obtained as shown in expressions (2)–(3), with the q_i 's properly redefined. We can then define aggregate demands as

$$X_1(p_1, p_2) = (1 - \mu)x_1^O + \mu x_1^E,$$

$$X_2(p_1, p_2) = (1 - \mu)x_2^O + \mu x_2^E.$$

For the delivery stage, the market clearing conditions are now:

$$y_{A1} + y_{B1} = X_1 = (1 - \mu)x_1^O + \mu x_1^E = z_1,$$

$$y_{A2} + y_{B2} = X_2 = (1 - \mu)x_2^O + \mu x_2^E = z_2.$$

Total emissions are determined in the same way as before and so is social welfare, which continues to be given by (6). Recall that the CEA terms are not included in social welfare. Consequently, the first-best solution does not change.

Defining the (pseudo) competitive equilibrium in this setting is complicated and raises some conceptual issues. Consequently, it loses its attractiveness as a simple benchmark scenario. For the sake of illustration, we thus concentrate on the imperfect competition setting with independent firms, which is not more complex when consumers are heterogenous. In particular, one easily checks that the equilibrium conditions derived in Sect. 6 remain valid, except that x_1 and x_2 have to be replaced by X_1 and X_2 . In other words, with homogenous consumers there was no need to distinguish between individual and aggregate demand, but now this distinction becomes relevant and it is the level of aggregate demand that matters for the retailers and the last-mile parcel delivery operators. For the rest, the properties of the equilibrium discussed there continue to apply. In particular, when $\mu = 0$ we return to maximum emissions in the *laissez-faire*.⁹ Furthermore, CEA will continue to mitigate the level of emissions except that now both μ and σ will be relevant.

Implementing the FB is now more problematic, because it requires personalized taxes, which depend on an individual's σ . These are feasible only when individual σ 's are observable. Assume for the time being that they are. Then a simple way to achieve the FB is to impose first of all per unit taxes at rates σe_1 and σe_2 on the consumers who do not have any environmental concern. This brings us back to the model considered in Sect. 6 and the results obtained there continue to apply. To be more precise the taxes on "dirty" consumers come on top of the instruments considered in Sect. 6 and emissions and output taxes continue to be given by (28) and (29).

9 Revelation of Emissions Levels

Let us now revisit this issue within the context of imperfect competition. Recall that we have shown in Sect. 5 that under perfect competition last-mile parcel delivery operators find it beneficial to reveal their emissions, assuming of course that they can credibly do this. As regulatory intervention is thus in principle not necessary, except that it may help conveying reliable information on emission levels.

For simplicity, we concentrate on the scenario with independent firms. The most natural way to deal with this issue is then to introduce an extra stage into our game. Specifically, assume, that in Stage 0, last-mile parcel delivery operators simultaneously decide whether they reveal their level of e_i or not. If both of them decide to reveal their emissions they play the game considered in Sect. 6. If either one or both

⁹ As long as $\partial^2 X_i / \partial q_i \partial q_j \geq 0$.

operators decide not to reveal their emissions, the Stage 1 of the game is amended. For non revealing operators there is no incentive to reduce their levels of emissions; consequently, they choose maximum emission $e_i = \bar{e}_i$ to minimize their cost. The revealing operator i , if any, will play its best reply to the other operator's strategy, namely \bar{e}_j . Once e_i 's are chosen the game proceeds with Stage 2, exactly as in Sect. 6.

Since no action is taken and no information revealed between the added Stage 0 and Stage 1, for an operator not revealing its emissions is equivalent to choosing maximum emissions in Stage 1. But this option already existed in the original game and we have shown that as long as σ is large enough it will not be relevant in equilibrium. Consequently, the equilibrium in Stage 0 involves revelation of emissions by both operators.¹⁰

To sum up, the result obtained in Sect. 5 for the competitive scenario continues to apply under imperfect competition when emission levels are chosen in a strategic way.

10 Concluding Comments

We have shown that as can be expected, CEA mitigates the inefficiency of the equilibrium by bringing the level of emissions closer to its optimal level. This is true under perfect competition but it also remains true under imperfect competition both in the independent firms and the vertical integration scenarios.

This efficiency enhancing effect of CEA also affects the design of the appropriate emissions tax, which leads to an amended Pigouvian rule. Under perfect competition the tax is reduced by exactly the monetary level of CEA, σ . Under imperfect competition the taxation rule is more complicated and the reduction exceeds σ but the extra adjustment decreases as the CEA increases.

When consumers differ in their CEA the design of environmental taxes is more complicated. To achieve a first best, personalized taxes are required but they are feasible only when a consumer's degree of CEA is observable. When this is not the case, a uniform tax can only achieve a second-best solution. The characterization of this uniform policy is tedious and left for future research. However, one can expect that the required adjustment from the Pigouvian rule is some weighted average of the individual's levels of CEA.

All these results rely on the assumption that consumers are aware of the levels of emission associated with the product they consume. We show that in our setting last-mile parcel delivery operators will find it beneficial to reveal their level of emissions but in practice it may be difficult to do this in a credible way. Consequently, a regulatory intervention associated with some kind of certification is certainly desirable. This regulatory intervention in turn raises a number of interesting questions. First,

¹⁰ When σ is close to zero, the equilibrium in Stage 1 involves maximum emissions. In that case, the outcome is the same irrespective of the decision made in Stage 0. Consequently, revelation by both operators continues to be an equilibrium in that case.

the regulator must be able to verify the emissions levels reported by the last-mile parcel delivery operators. Second, the regulator's announcements or certifications must be perceived as sufficiently credible by consumers. We leave these issues for future research.

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Using Pricing as a Tool to Achieve Carbon Neutrality: Implications for the United States Postal Service



V. Ian Stanford, Lawrence Buc, Adam Houck, and Ethan Jost

Abstract As governments, firms, and consumers have become more sensitive to concerns surrounding an impending climate crisis, the “green economy” has experienced rapid growth. Postal and delivery companies in many parts of the world have already begun implementing a variety of sustainability initiatives, many of which are specifically aimed at climate change mitigation through reductions or offsets of emissions. While the U.S. Postal Service (USPS) has achieved some of its emissions reduction goals, the increasing urgency of addressing climate change calls for governments and firms to continue increasing their efforts to meet the existing challenge. Given the ability of prices to send signals about desired behavior, this paper explores how pricing and product design can potentially be used by USPS as a strategy to reduce greenhouse gas emissions and achieve carbon neutrality.

Keywords Postal · Sustainability · Carbon neutral · Mail · Packages · Climate · Public policy · Regulation · Environment

1 Introduction

The “green economy” has grown recently, as companies and consumers have become more sensitive to concerns surrounding an impending climate crisis. The Intergovernmental Panel on Climate Change’s (IPCC, 2022) recently released Sixth Assessment Report (AR6) has added urgency to discussions around ways in which the global community can mitigate the risks of climate change and rising global temperatures.

The views presented in this paper are those of the authors and do not necessarily represent those of any organization or employer.

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The risks associated with climate change have never been more glaring, highlighted in the “high confidence” ratings given nearly across the board for both near- and long-term impacts on human society. The report states, “Any further delay in concerted anticipatory global action on adaptation and mitigation will miss a brief and rapidly closing window of opportunity to secure a livable and sustainable future for all,” (IPCC, 2022, p. 33).

Postal and delivery companies in many parts of the world have already begun implementing a variety of sustainability initiatives, many of which are specifically aimed at climate change mitigation through reductions or offsets of greenhouse gas (GHG) emissions (International Postal Corporation [IPC], 2018; Borsenberger and Joram, 2021). This includes sustainability efforts by the United States Postal Service (USPS), including providing carbon accounting for its large business customers and giving them the information necessary to offset their own emissions from mailing and shipping activities.

However, AR6 makes abundantly clear that governments, firms, and individuals should be doing everything they reasonably can to reduce GHG emissions. While many foreign Postal Operators (POs) began moving toward carbon neutrality throughout the 2010s, the ability of USPS to invest in decarbonizing technology has been hindered by the organization’s financial difficulties. While this year USPS placed an order for approximately 10,000 electric delivery vehicles, the scale of this investment is likely not commensurate to the challenge posed by climate change.

This paper explores how pricing can potentially be used by USPS as a strategy to reduce carbon emissions. Economists generally agree that prices are a good tool to send signals about preferred behavior. While the pricing flexibility of USPS is regulated by the Postal Regulatory Commission (PRC), a recent expansion of the price cap for Market Dominant products also provides a window of opportunity for USPS to explore options to reset some of its existing prices or create new products with carbon neutrality as a key feature.

This paper will serve as a jumping-off point to begin comparing various pricing strategies that might be available to USPS. Following this introduction, it will consist of the following subsections. Section 2 will explore extant literature on carbon intensity in the mailing and package delivery industry and specific information on the carbon intensity of USPS’s operations. Section 3 will analyze factors affecting the demand for carbon neutrality in the Postal and Delivery sector. Section 4 will describe strategies that other postal and delivery sector operators are using to reduce or offset their GHG emissions. Section 5 will compare different pricing approaches USPS could adopt, along with opportunities and challenges associated with each. In particular, this section will consider existing legal and regulatory constraints that could limit USPS’s ability to adopt some of these approaches. Finally, Sect. 6 will provide conclusions and considerations for further research in this area.

2 Literature Review

2.1 *Emissions Intensity of Mail and Package Delivery*

Given its reliance on physical infrastructure and transportation, delivery of mail and packages is often assumed to be very emissions intensive. However, there is a robust debate on how much the industry contributes to overall global emissions relative to the next-best alternative.

In the case of business-to-consumer e-commerce package delivery, the proper comparison would be individual trips to retail outlets. One study of small package delivery in the United Kingdom (Edwards and McKinnon, 2009) compared carbon emissions between the last mile of home package delivery and customer trips to the store and found that in many cases, home delivery is less carbon-intensive than the behavior it replaces. The study found that the average shopping trip generated between 12 and 31 times as much CO₂, depending on the size and fuel efficiency of the vehicle, when compared to home delivery. This study accounted for several complicating factors, specifically the activities that constitute a “typical” online or in-person shopping trip and also “trip chaining,” which is the combination of multiple stops in a single in-person shopping trip.

When it comes to mail, the story becomes slightly different. Research into the emissions generated by letter mail often focuses attention on letter processing and delivery. However, Pitney Bowes’s (2008) review of extant research on the lifecycle emissions of letters notes that there are at least 6 different life cycle stages: mail design, paper and envelope manufacturing, letter production, distribution (processing and delivery), use, and disposal. While email and online bill payments are likely less carbon intensive than using mail during the distribution phase, the difference between them may not be as large as most people assume across the other phases of production. Digital communications and transactions require manufacturing, distribution, and updating of electronic devices, digital storage infrastructure, and electronic systems running 24 hours per day to be ready to meet customer access demands.

Additionally, the mail is often used as a targeted communication medium for advertising and customer outreach. A study conducted by Buc and Soyka (2009) compared a variety of emissions reduction strategies related to all mail-related GHG-producing activities of one large corporation. They determined that, among all abatement strategies, reducing the use of marketing mail was the least cost-effective approach to reducing emissions. This result flowed from the comparatively high unit cost of non-mail customer contact and the relatively low amount of carbon emissions reduced by eliminating mail.

Several other recent studies have examined challenges and considerations related to the sustainability of mail and package delivery. Boldron et al. (2011) analyzed the tradeoff between environmental protection and the provision of universal service. The authors suggested that extending the time to deliver under the universal service obligation could result in POs using less emissions-intensive transportation methods

and more efficient use of transportation resources. Nieto and Houck (2013) estimated the CO₂ emission reduction that would come from a shrinking of USPS's mail processing network as mail volumes continue to decline. Finally, Borsenberger and Joram (2021) summarized some of the challenges and opportunities of addressing climate change in the delivery and logistics industries. While the authors noted that POs alone cannot impact emissions at a society-wide level, the article did summarize the approaches that various POs have taken to reduce emissions in an effort to address their individualized climate impacts.

The thread that unites this research is that postal policy decisions are increasingly inextricably linked to climate change policy. The emissions intensity of the mail and package delivery sector is a key consideration for researchers and policymakers. The next section evaluates the emissions intensity of USPS operations and efforts the agency has already undergone to address those emissions.

2.2 USPS GHG Emissions

Public data show that USPS's annual emissions inventory was approximately 13 million metric tons of carbon dioxide equivalent (MTCO₂e) in 2020 (USPS, 2021). As shown in Table 1, emissions have remained roughly constant even as mail volumes have been trending downward over this time period, in part because a steady growth in packages has offset some of the effects of declining letter and flat mail volumes and also because some major emissions sources, like those from carrier vehicles, are only weakly related to mail volumes.

Looking a little bit closer, USPS's annual sustainability report for fiscal year (FY) 2021 showed that the agency directly emitted 6.06 million MTCO₂e from operations and approximately 49 thousand MTCO₂e from biogenic sources across Scope 1, 2, and 3 emissions sources (USPS, 2021, p. 13); see Fig. 1 for descriptions. Additionally, indirect Scope 3 emissions from contract transportation and buildings with fully serviced leases totaled 7.25 million MTCO₂e. Figure 1 describes the differences between each emissions scope and some examples of emissions sources for each.

According to the U.S. Environmental Protection Agency (EPA, 2020), total U.S. greenhouse gas emissions (after accounting for sinks) were 5.22 billion MTCO₂e in 2020. This makes the USPS's emissions about 0.26 percent of the U.S. total. In comparison to other package delivery competitors, FedEx's (2020) emissions across all scopes were 19.5 million MTCO₂e while UPS's (2020) emissions were

Table 1 USPS historical GHG emissions

	2011	2012	2013	2014	2015	2020
MTCO ₂ eq (millions)	12.1	12.1	11.8	11.5	11.7	13.3
Mail pieces (billions)	168.3	159.8	158.2	155.4	154.2	129.2

Source <https://about.usps.com/what/corporate-social-responsibility/sustainability/>

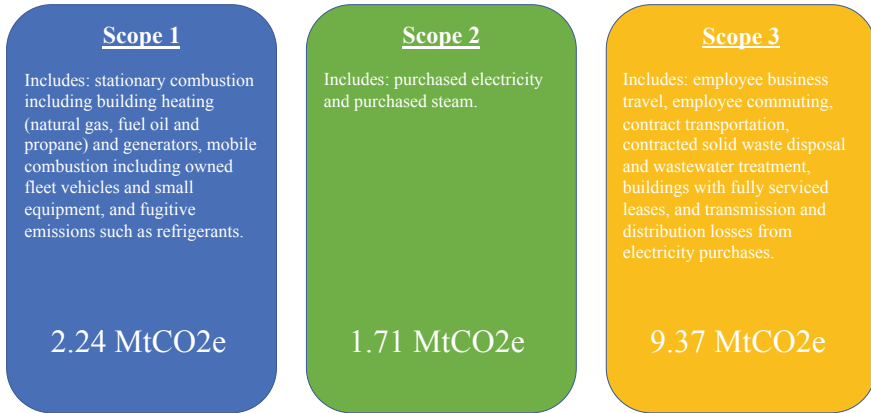


Fig. 1 USPS emissions inventory by scopes 1, 2, and 3 for FY 2021 (Source USPS 2021 Sustainability Report—<https://about.usps.com/what/corporate-social-responsibility/sustainability-report/2021/usps-annual-sustainability-report.pdf>)

21.8 million MTCO₂e in its domestic business and 36 million when its international business is included. Of course, for the figures to be comparable, the operational boundaries of the organizations must be similar. Without more detailed public information about accounting methodologies, it is difficult to determine whether this is so. One thing we do know from the companies' sustainability reports is that both USPS and UPS include employee commuting in their inventories while FedEx does not.

For product-level carbon accounting, USPS starts with its total emissions inventory and allocates it on a causal basis to products and price points. But because the inventory is generally based on combustion emissions ("tank-to-wheel"), USPS first adjusts them to also include the emissions from the activities necessary to produce the combustion fuel ("well-to-wheel") before allocating them to products and price points. These unit emissions are combined with mailer-specific volumes and mail/package characteristics to produce mailer-specific carbon product emissions for use in a mailer/shipper's Scope 3 emissions.

Based on this product-level carbon accounting, USPS offers a service called the USPS Blue Earth Carbon Accounting Program. This service is available for mailers through the USPS's Business Customer Gateway (BCG) and shows the total emissions that USPS incurs for all of the customer's mailing and shipping activity so that they can report it in their own organizational carbon accounting and purchase offsets.

A critical limitation of this program is that it relies on USPS customers to request an emissions inventory and seek out their own emissions offsets. As a result, it is unclear how many offsets this program has actually produced over time. This limitation, combined with the relative annual stability of USPS emissions, suggests that other USPS efforts to reduce emissions could be useful.

USPS does engage in a variety of emissions reductions strategies and reports on its progress toward achieving emissions reductions targets each year. In FY 2021,

USPS reported that it exceeded its goal to reduce Scope 1 and 2 emissions by 25 percent compared to an FY 2008 baseline. As a result, it initiated a new goal of reducing these direct emissions by another 25 percent by FY 2030 compared to an FY 2019 baseline. USPS also tracks progress on direct Scope 3 emissions reductions and reports a goal of achieving a 30 percent reduction by FY 2025 compared to an FY 2008 baseline. By FY 2021, USPS had achieved a 25.2 percent reduction in these emissions. Though they are calculated and tracked, USPS does not include indirect Scope 3 emissions in its goals as the organization has little direct control over these emissions sources.

3 Demand for Carbon-Neutral Postal Services

3.1 Consumer Demand

Evidence suggests firms have begun to realize the competitive advantage to be gained from carbon-neutral products, green branding, and eco-minded operations. Several surveys have found a majority of consumers—between 70 and 80 percent—value sustainability while a smaller but still meaningful cohort—between 50 and 70 percent—express a willingness to pay more for brands and products that are environmentally friendly (Haller et al., 2020; Granskoget al., 2021). Some research also has indicated increased alignment between consumer preferences and spending. UK consumers are twice as likely to have purchased products from companies that explicitly address climate change versus those that do not (Templeton & Reid, 2019).

Meanwhile, products marketed as “sustainable” grew in sales by 29 percent from 2013 to 2018, a rate 5.6 times faster in terms of compound annual growth rate than conventionally marketed products (Kronthal-Sacco & Whelan, 2019). This research covered 36 product types representing 40 percent of the U.S. consumer goods market, 33 of which exhibited this trend, suggesting that this trend applies rather broadly. In general, green-marketed products seem to be increasingly attractive to consumers, even when they cost more than conventionally marketed alternatives.

Homing in on the postal and delivery industry, 91 percent of survey respondents desired an eco-friendly shipping option, with 57 percent stating their willingness to pay a 10 percent surcharge (Sporrer, 2021). In a similar survey with weaker results, Omnitracs (2021) showed that 40 percent of consumers would like to have environmentally friendly options for deliveries, with 32 percent of respondents agreeing that they would worry about the impact on costs. A study by the USPS Office of Inspector General (OIG) found that majorities of respondents would be willing to pay up to 5 cents extra for a letter (56 percent) and up to 32 cents extra for a package (52 percent) to offset emissions (USPS OIG, 2020, p. 7). While direct-to-consumer businesses may struggle to accommodate this demand on their own, posts and delivery companies should see this paradigm shift as an opportunity for collaboration and growth.

3.2 Demand Related to Corporate and Regulatory Risk Mitigation

Increasing regulatory agency activity creates risks and obligations for private and public sector operators. For example, the U.S. Securities and Exchange Commission (SEC) recently proposed a set of rules that would require registrants to disclose their emissions by GHG type for Scope 1, 2, and 3, arguing that fair and efficient capital markets need information on climate transition risk (Clifford, 2022). The USPS would be required to comply with these reporting rules if they are promulgated and survive judicial challenges. And of course, USPS GHG emissions for products comprise part of the Scope 3 of organizations that use USPS to deliver mail and packages. USPS could potentially provide value to its corporate customers by reducing or offsetting as much of its emissions as is reasonably feasible.

4 Existing Carbon Emissions Reduction Strategies of Postal Operators

There are three common strategies that POs use to address their GHG emissions: emissions reporting, emissions offsets, and decarbonization. Many POs publicly report their organization's GHG emissions in annual reports and some have offered customers of different sizes additional, direct transparency into the GHGs produced by their mailing and shipping activities. For example, Royal Mail provides a public carbon calculator, which any customer can use to determine their own carbon footprint. Ostensibly, this calculator is intended be used by a large company to add up the carbon emission from its total mailing portfolio, but it could also be used by a household to sum up the total carbon emissions from mail and packages they receive. In either case, the information can be used to purchase offsets on the open market, for which Royal Mail provides several vetted alternatives.

Some POs have also begun factoring the cost of offsetting emissions into their pricing and product decisions. Beginning as early as 2007, Royal Mail began offsetting some of its carbon emissions (Post and Parcel, 2007). In 2012, France's La Poste became the first major PO in the world to make its mail and package delivery products carbon neutral through a mix of offsets and planned emissions reductions, including replacing traditional internal combustion delivery vehicles with low- and no-emissions alternatives (Post and Parcel, 2012).

The predominant trend among postal operators in developed countries has been toward complete offsetting of emissions. However, some POs have attempted an alternative approach of creating separate carbon-neutral products that provide a premium-priced option for consumers. For example, Swiss Post and Deutsche Post offered customers a choice between purchasing traditional products or carbon-neutral shipping products, which were generally the same except that the price of the "green" products was higher to cover the cost of emissions offsets. However, in 2020 both of

these operators altered their approaches by making most, if not all, of their mailing and shipping products carbon neutral and eliminating extra charges for the offsetting of GHG emissions.

Private-sector package delivery companies also engage in a variety of carbon reporting and reduction activities. In March 2021, FedEx announced a series of decarbonization initiatives, including a goal to replace all delivery vehicles with zero-emissions electric vehicles by 2040 (FedEx, 2021). Around the same time, DHL (2021) introduced their Expedited Max product, a carbon-neutral package product that includes emissions offsets.

5 Potential Pricing and Product Design Strategies for Achieving Carbon Neutrality

As we have established throughout this paper, there is an extant demand among postal customers for carbon-neutral products and several potential pathways provided by foreign POs that USPS can potentially use as a template to follow. However, it is important to note that USPS faces constraints and limitations that are unique. In this section, we will explore three potential pricing and product design strategies that would move USPS toward carbon neutrality, each with a set of advantages and disadvantages. While these three strategies are distinct, they are not necessarily mutually exclusive.

5.1 All-In Pricing

As mentioned above, the most common strategy among foreign POs to achieve carbon neutrality is to include the cost of emissions offsets into the underlying cost of the product. This is also the simplest and most direct way to achieve carbon neutrality, particularly with a large and varied product line. Several POs that have adopted this strategy have accepted the higher cost without raising their retail prices. If a PO decides to stick to this commitment to not pass on the cost of emissions offsets to the consumer through higher rates, then this may create an incentive for the firm to invest in zero-carbon technologies, which would reduce total emissions over time and steadily lower recurring offset payments. The strength of this incentive would depend on the market price of emissions offsets and the total cost of offsets based on a PO's actual emissions. In the case of USPS, the total cost to offset all emissions in 2020 at the average global price (see Fig. 2) would have been approximately \$73 million.¹

¹ USPS FY 2020 emissions were 13.3 million MTCO₂e. Average global offset price in 2020 was \$5.50 per MTCO₂e.

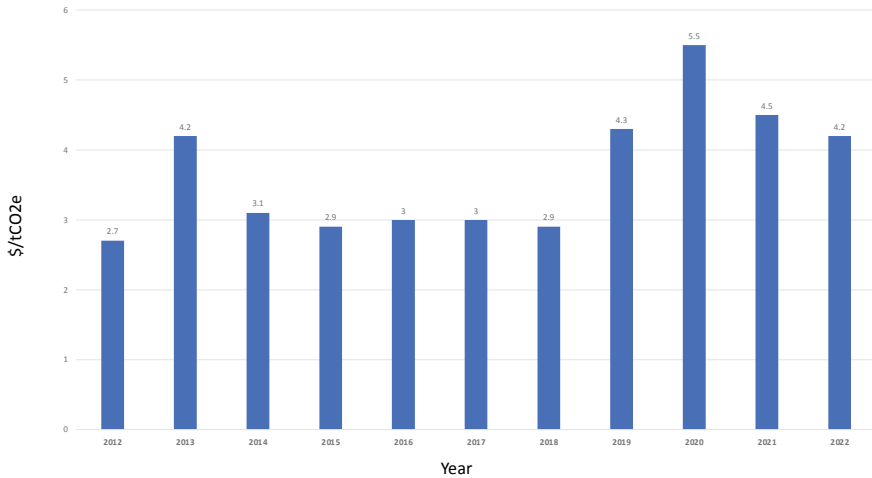


Fig. 2 Average global price of carbon offsets over time, 2012–2022 (Source Trove Research, <https://trove-research.com/wp-content/uploads/2021/06/Trove-Research-Carbon-Credit-Demand-Supply-and-Prices-1-June-2021.pdf>, p. 9)

On the other hand, if the PO did decide to pass through the cost of emissions offsets to the consumer, then at least the new, slightly higher price would more accurately communicate the cost of emissions to customers, which they could factor into their ultimate purchasing decisions. Additionally, this carbon-neutral feature can also be seen as a potential competitive advantage. Despite increasing costs and reducing profit margin, it could also attract environmentally interested buyers from competitors, providing the opportunity for increased total revenue and profits.

However, some features of this approach would make it difficult for USPS to adopt, at least in the near term. First of all, USPS remains in a precarious financial position. It has sustained operational losses in 7 of the last 10 years and lost \$2.4 billion in FY 2021 alone. Subsuming this additional expense without passing the cost on to customers would negatively impact USPS's balance sheet while years of collective losses have left it with few resources to invest in zero-emissions technologies. Although the Postal Service Reform Act, which was signed into law in April 2022, will provide some needed financial relief, it is unlikely that the law will immediately put USPS in a financial position where it can invest large sums of money on capital expenditures.

Another limitation of this approach involves the regulator. But to understand the role of the regulator, it is important to clarify how pricing regulation works in the U.S. context. According to the statute, USPS offers two categories of products. The first is known as Market Dominant, which includes products such as letters, advertising mail, and magazines, over which USPS either maintains an explicit delivery monopoly or possesses such a high market share that it could set prices substantially above cost without the fear of losing business. For these products, U.S. postal regulation includes a price cap to protect consumers. On the other hand, USPS also has a group

of products known as Competitive, which includes most of its parcel products and is subject to competition from other firms. Contrary to the price cap for Market Dominant products, Competitive products have a series of price floors that prevent the Postal Service from unfairly setting rates below cost to outcompete its rivals in the market. While these products must cover their underlying costs, USPS may have more flexibility to increase these prices, subject to competition and market conditions.

Although this strategy does not require a price change, meaning that the Market Dominant price cap would not necessarily be implicated, the PRC could find a Market Dominant product legally out of regulatory compliance if it fails to cover its costs by large margins. Considering that several Market Dominant products already fail to cover their costs and that increasing their costs, even by a small amount would make that cost coverage worse, it is unlikely that adopting this strategy would be politically, financially, or regulatorily feasible for every Market Dominant product, at least under current conditions. Where Competitive products are concerned, subsuming the costs associated with emissions offsets without raising prices could cause some products' cost coverage to go below 100 percent, violating the law. These regulatory barriers make this strategy difficult to implement for all USPS products.

5.2 *Premium Pricing Strategy*

As indicated in Sect. 3, a number of surveys establish that there is a proportion of postal customers that would be willing to pay a price premium so their mail is carbon neutral. There are also customers who have no interest in paying to offset emissions or are extremely price sensitive and prefer the lowest-priced product available. Given this reality, USPS could potentially employ a premium pricing strategy, where it introduces a “green” version of each of its products priced so that it covers the cost of emissions offsets for each mail piece or package.² Depending on the customer's willingness to pay, the premium price could be used only to cover the cost of emissions offsets or as a way to raise additional funds that could be invested in zero- or low-emissions capital investments.

By compensating USPS for the additional cost it incurs purchasing carbon offsets, charging higher prices for “green” versions sidesteps the issue of cost coverage present in the all-in approach. Moreover, it enhances customer choice by meeting the demand for carbon-neutral products by some customer segments while preserving the existing products for other segments.

This strategy is not without its drawbacks. First, it would not maximize emissions offsetting because of the limited size of the customer segment willing to pay a

² This voluntary carbon-neutral pricing approach could be executed in one of the two ways. USPS could introduce it as an ancillary service, allowing it to be attached to any mail or package purchase, whether individual or bulk. Alternatively, USPS could create carbon-neutral versions of each existing mail and package product.

premium price. There is also often a difference between customers' expressed preferences in a survey and revealed preferences when it comes time to pay for a product. It is likely that estimates of customers' willingness to pay could be inflated resulting in less revenue than expected.

Finally, because it would create a higher-priced, carbon-neutral version of USPS's current Market Dominant product line, this approach would implicate pricing regulations. While these prices would eventually be included in the price cap calculation, this impact could be delayed if USPS introduced this new product as a Market Test. The regulations for a Market Test would also allow USPS up to 3 years to target different geographic markets, experiment with different price levels and marketing strategies, and generate revenue with no price cap impact. Using this strategy for Competitive package products would be simpler, as prices are not constrained by a price cap and some USPS competitors have already begun offering such carbon-neutral products.

The question remains, how does USPS select the optimal price for carbon-neutral products? Price should be constrained by two factors: the marginal rate of substitution among shippers offering similar products and cross-price elasticities between the carbon-neutral and traditional pricing options. This will help USPS avoid setting the price of the carbon-neutral product so high that it loses substantial business to competitors or that customers shift their use of mail and package products toward the traditional options. USPS should determine the value of the added utility brought by purchasing a carbon-neutral shipping product through extensive, customer-focused market research. This information would inform whether USPS would limit its price to just enough to cover the cost of offsets or whether it could potentially price these premium products enough above cost to use them to raise revenue for investments in USPS's own decarbonization efforts, such as purchasing electric vehicles, charging infrastructure, or distributed renewable electricity generation.

This strategy is known as "insetting" as opposed to offsetting. The advantage of insetting is clear; by decarbonizing operations, a firm can reduce offset costs over time. This is critical in the medium- to long-term. Although the market price of carbon offsets is currently low, as demand for them increases, the price will be expected to rise. Bloomberg NEF (2022) notes that carbon offsets will continue to experience upward pressure on prices through at least 2050. Relative to a scenario where the purchase of carbon offsets remains completely voluntary, a scenario where governments require firms to offset their emissions shows the largest and most immediate impact on the price of emissions offsets. Figure 2 shows that the actual average global price of emissions offsets has been on an upward trajectory in recent years, though nowhere near the price of scenarios envisioned by Bloomberg NEF.

5.3 *Discount Pricing*

In economics, prices are often used to communicate signals about desired behavior. Unfortunately, the premium price scenario creates a situation where the price communicates a muddled message about the desired behavior by placing a higher price on the carbon-neutral mail and packages. Its success rests on the hope that the strong demand for carbon-neutral products would overwhelm the assumed price signals (or perhaps more accurately, that the business incentive for social signaling brings more utility than lower cost, though this is difficult to illustrate in any quantitatively reliable way). Instead, USPS could use its pricing authority to develop a discount for mailers that reduce their own carbon emissions from mail creation, preparation, and transportation. The value of such a discount could be set at or near the cost USPS would avoid either offsetting or decarbonizing its own operations.

In the past, USPS has employed a similar strategy to encourage mailers to adopt various mailing innovations. For example, USPS offered discounts to mailers to adopt Intelligent Mail Barcodes, which involved expensive technology investment by mailers. If the goal of USPS is to use its public position to maximize emissions reductions in the entire mail and delivery sector, then it could offer an incentive in the form of a rate discount for mailers that provide verification of their own emissions reductions in the production, preparation, and transportation of mail. Much like the introduction of a Market Test, the PRC's regulations allow USPS to introduce a temporary, promotional rate incentive, so long as the incentive is available to all similarly situated mailers. During this period, USPS could research different discount levels to find the right price differential between the discounted price and the base product price that would effectively incentivize emission reductions by mailers. Furthermore, the introduction of a permanent discount would be equivalent to a rate reduction and would generate additional price cap space that USPS could use to adjust the price difference between the discount and the base price, potentially increasing the attractiveness of the discount.

The main challenge to this approach would be verifying mailers' actual emission reductions. There is reason to believe that this would not be insurmountable. As mentioned previously, increased regulatory activity in the U.S. includes requirements for accurate emissions reporting. This additional price discount could be the extra nudge mailers need to undertake decarbonizing investments. Additionally, the ubiquity of high-quality carbon emissions accounting and reporting means that comparing and verifying emissions reductions between USPS's operations and a private sector partner would be realistic to accomplish.

There are also several limitations to this approach. As a per-piece discount, the largest benefit will accrue to the largest mailers, meaning that many smaller shippers may not generate enough volume to make the emissions avoidance discount a strong enough pricing signal to undertake their own decarbonization investments. And certainly, this type of carbon-neutral pricing completely overlooks mail and package recipients who may want to reduce emissions from their deliveries but do not purchase postage. Additionally, without an increase to the base rate paid by

mailers that did not qualify for the low-emissions discount, this strategy would likely reduce total and unit revenue, which could place USPS under increased financial and political pressure.

6 Conclusion

The purpose of this paper is to conceptually explore how pricing strategies could be used as tools to accelerate USPS's efforts to address the impacts of climate change and to achieve its emissions reduction targets. Certainly, pricing strategies are not the only pathway toward carbon neutrality, and the time has come for USPS and other players in this industry to use all the tools at their disposal. Additionally, the purpose of this research was not to find the optimal strategy, but instead to describe the key differences and regulatory concerns associated with each pricing strategy. USPS's efforts to achieve emissions reductions and carbon neutrality could be enhanced with intervention from Congress that could provide funds for investment in zero-carbon technologies or specifically direct USPS to take certain actions, like incorporating emissions offsets into its attributable and institutional costs. As research in this area continues, researchers should explore the actual revenue and emission reduction potential from each of these strategies to provide a quantitative-based approach that could help USPS or other POs select the optimal strategy for their emissions reduction goals.

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The Environmental Footprint of Home and Out-of-Home Parcels Delivery



Muriel Barnéoud, Claire Borsenberger, and Antoine Doussaint

Abstract Out-of-home parcels deliveries have often described as “greener” than deliveries at home. The argument is based on the empirical but biased observation that fewer vans are mobilized and fewer kilometers traveled by delivery operators when they deliver parcels in parcel lockers or relay points compared to home delivery, “all other things being equal”. But other things are not equal, as recipients need to travel to collect their parcels. Clearly, the balance between the environmental footprint of home and out-of-home delivery solutions depends on the way the consumer would pick up his parcel at the delivery point and one cannot say that one solution is always better than the other. This is why home and out-of-home delivery solutions must not be chosen a priori; a complex analysis is required.

Keywords E-commerce · Parcels delivery · Environmental footprint · CO₂ emissions

1 Introduction

E-commerce has experienced significant growth for several years, and the Covid-19 epidemic has accelerated this trend. Its expansion has raised many regulatory issues including competition policy to profit transfer issues in connection with the vertical

The views expressed in this paper are personal and do not necessarily represent the position of the institution to which the authors belong.

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integration strategies of some e-merchants or marketplaces that invest in their own logistics infrastructure and develop their own parcels delivery networks.

In addition to these problems, the environmental impact of e-commerce, at all stages of its value chain, is under increasing scrutiny. Given the acceleration of climate change and the urgency to mitigate it, we must find effective ways to make retailing in general, and e-commerce in particular, more environmentally friendly. In this context, one frequently hears the claim that out-of-home (OOH) deliveries, and more specifically, deliveries in parcels lockers stations¹ are better for the environment than deliveries to the home.

Many studies have compared the environmental footprint of brick-and-mortar vs. electronic retailing, focusing on the last-mile segment which is the main difference between both forms of retail (Buldeo Rai 2021; Fernandez et al. 2021). In this chapter, we compare the environmental impact (primarily regarding CO₂ emissions) of home vs. OOH deliveries. Based on a survey of the findings of academic papers, we show that one cannot claim that a given parcels delivery method is better for the environment. The environmental footprint of OOH vs. home deliveries depends in particular on consumers' behavior. This implies that the best way to implement the most sustainable delivery mode is to allow consumers to make an informed choice, based on a precise evaluation of the environmental footprint (or at least on the CO₂ emissions) that the different delivery modes would generate, given the specific case under scrutiny. Promoting both types of deliveries, without any unjustified a priori, would allow consumers to choose the best one, taking environmental effects into account.

The paper is organized as follows. Section 2 deals with the impacts of the Covid-19 crisis on e-commerce and last-mile parcels delivery activity and underlines the development of parcels lockers stations. Section 3 focuses on various arguments put forward to promote the expansion of parcels lockers and in particular on the claim that such delivery mode is “greener” than home delivery, by collecting and comparing the findings of academic research on this topic. Section 4 presents some thoughts to help the end consumer, who should be the core decider, to make the better choice. Section 5 concludes.

¹ Parcels lockers stations are automated machines consisting of compartments that fulfill the role of providing a safe and reliable delivery point. In this paper, we do not consider parcels lockers installed in the lobbies of residential buildings that work as mailboxes and allow “home” delivery of packages that are too big to be delivered in a mailbox. Instead, we consider parcels lockers stations located in open public spaces (accessible 24 h/24, 7 d/7) that work as out-of-home parcels delivery points.

2 The Impacts of the Covid-19 Crisis on E-commerce and Last-Mile Parcels Delivery Activity

2.1 A Strong Increase in Online Purchases and Parcels Volumes

For more than a decade, parcels volumes have been growing, pushed by the development of e-commerce. According to the World Economic Forum (2020), e-commerce sales ratios nearly tripled between 2014 and 2019. The recent Covid-19 crisis acted as a catalyst, increasing the speed of change in the ways producers sell and consumers do shopping. With citizens stuck at home and retailers putting up the shutters, e-commerce rocketed during lockdowns. Many consumers bought online for the first time, while others did much more than usual. A lot of SMEs that were previously solidly brick-and-mortar-based shifted sales online in a matter of days (OECD 2020). Eurostat (2022) reported that the share of internet users who made online purchases from the 12 months prior to the survey increased from 68% in 2019 to 73% in 2020 and 74% in 2021 in the European Union (EU-27). In this context, in 2021, retail e-commerce sales accounted for an estimated 19.6% of retail sales worldwide and this figure is forecast to grow to 25% by 2025 (Statista 2022).

Consequently, according to the 2021 Pitney Bowes' Parcel Shipping Index report, featuring 2020 data from 13 markets around the world, global parcels volumes reached 131.2 billion in 2020 compared to 103.2 billion in 2019—an increase of 27% in one year. This is equivalent to 4,160 parcels shipped per second compared to 3,248 in 2019 or 34 parcels on average generated per person per year in these countries, up from 12 in 2014. Looking ahead, parcels volumes could reach 266 billion in 2026, with an average annual growth rate of 11% from 2021 to 2026 (Pitney Bowes 2021).

2.2 An Increase in the Popularity of Out-of-Home Delivery Leading to Investments in Parcels Lockers Stations

The Covid-19 crisis has not only anchored the use of e-commerce in consumers' habits but also the request for convenience in the way parcels are delivered. Even if, as before the Covid-19, the home would likely remain the most common location for parcels delivery in the near future,² in some countries several parcels carriers and postal operators bet on the development of OOH delivery solutions and in particular of parcels lockers stations, expecting consumers will use parcels lockers more often in the post-Covid world.

² According to International Post Corporation (2022), the most commonly used location was delivery to the home (66%; at the door, in the mailbox or in another safe place), followed by delivery to a post office (9%), a postal service point (6%) and a parcels lockers station (5%).

According to International Post Corporation (2021), parcels lockers terminals managed by posts have more than tripled in number over the last five years, and many posts have committed to future investments. For instance, Slovenska Posta added 20 new terminals to its network in 2020 and saw volumes delivered to its lockers rise by 210%. Deutsche Post DHL plans to raise the number of parcels lockers stations from its current size of over 9,000 to 15,000 by 2023. Pickup, a subsidiary of La Poste Group, operates a network of 600 lockers in France and plans to significantly increase its park in the two next years to reach 2,000 units in 2023.

3 Out-of-Home (OOH) Deliveries: More Sustainable Solutions Than Deliveries at Home?

The reasons for the expansion of OOH delivery solutions in general, and parcels lockers in particular, in many countries, are varied. Some are indisputable, and others more problematic.

3.1 Arguments in Favor of OOH Deliveries

From the carriers' point of view, OOH solutions present several benefits. They maximize the likelihood of delivery success at the first attempt, increase the consolidation rate (i.e., the number of parcels delivered to the same point), and decrease the number of stops during a delivery round and the number of kilometers traveled. All these features reduce operating costs. Delivery to a drop-off point is estimated to be 10–20% less expensive than home delivery. These lower costs allow carriers to offer discounts for delivery to pick-up or drop-off points to e-retailers or e-consumers. In 2020, around one-fifth of posts offered such a discounted rate (International Post Corporation 2021). Consequently, from the e-retailers' point of view, OOH delivery solutions mean a reduction in transport costs that they can partially pass through on to their customers and the possibility to offer them a larger range of delivery options. For end consumers, OOH delivery means potentially lower costs and convenient drop-off solution at locations that are close to home or on the daily commute route, with no risk of delivery failure, no waiting time at home, and in the case of lockers, all-around-the-clock access to collect and drop off their parcels.

However, one also hears less supportable argument for OOH solutions based on their presumed better environmental footprint. The main argument by OOH delivery proponents is that delivering several parcels in the same location lessens the number of kilometers traveled by last mile delivery operators and consequently reduces CO₂ emissions per parcel and traffic congestion. For instance, Niederprüm and van Lienden (2021) argue that by shortening the distance that carriers have to travel between delivery points, thereby reducing their CO₂ emissions, parcels lockers

stations could also present a more environmentally friendly delivery option. Fewer and shorter trips by delivery vans would be expected to have a positive environmental impact as it reduces CO₂ emissions of the carriers.

Even if reduced numbers of stops and kilometers traveled in optimized delivery routes entail a positive environmental impact for the delivery operator, one should remember that end consumers must collect and drop off their parcels, i.e., make a round trip to the collection point. As rightly emphasized by Möller-Boivie et al. (2023), the net effect can be higher emissions if the consumers increase emissions more when driving to pick up their parcels at lockers than the operator reduces emissions by only dropping off parcels at lockers instead of delivering to the home.

3.2 *Lessons from Academic Literature*

As in the case of the comparison of the environmental footprint of e-commerce versus brick-and-mortar retail, one cannot say generally that one delivery solution is better for the environment than the other. It is an empirical question that depends in particular on consumers' behavior.

(a) *A brief review of the environmental footprint of e-commerce versus brick-and-mortar*

The first studies on the impact of e-commerce on the environment, and notably the debate over its greenhouse gas emissions in comparison with those of brick-and-mortar retail, concluded that online shopping was less polluting than offline since this former kind of purchase allows to consolidate and optimize delivery of various physical goods to the final consumers, reducing the number of vehicle-kilometers per purchase traveled and consequently, fuel consumption and GHG emissions.

However, as emphasized by Buldeo Rai (2021), these studies implicitly presumed that several individual trips made by consumers to purchase a given good in stores were replaced by one efficient, consolidated home delivery round, all other things being equal. This is what Buldeo Rai calls the "substitution hypothesis", i.e., the assumption that online retail channels replace physical retail ones without any other effects on individuals' or households' travel patterns. But, in reality, "other things" are seldom "equal". On the contrary, the development of e-commerce has modified consumers' habits. Some may travel to see a good and get advice in a brick-and-mortar shop, then order it online, and finally pick it up in relay point; others tend to "over-order" online knowing that they will send some of it back, and so on. As stated by Buldeo Rai et al. (2019), taking into account the pre- and post-purchase behavior is crucial when investigating the carbon footprint of e-commerce. Some behaviors, like the one described above, have negative effects on the environment as they multiply the number of trips made for a single purchase.

As stressed by Matustik and Koci (2020), neither online shopping nor conventional retail significantly outcompete the other; it crucially depends on consumer

preferences. The same conclusion holds when comparing the environmental footprint of OOH vs. home deliveries, because consumer actions determine the carbon footprint of OOH deliveries.

(b) *A survey of the literature on the environmental footprint of delivery solutions*

The first studies that compared the environmental impacts of OOH and home delivery (see, for instance, Edwards et al. 2010) considered collection points as an alternative to several failed home delivery attempts, thus forcing the customer to make a personal trip to the carrier's depot. In this specific context, the environmental impact assessment favors collection points when the carrier's depot is located far away from the recipients' home—the recipient must make a dedicated trip by car to reach it—whereas a significant number of people walk to the local collection point to drop-off their parcels when they choose the OOH solution. The first condition clearly maximizes the GHG emissions attributed to (failed) home deliveries, whereas the second one minimizes the GHG emissions attributed to OOH deliveries.

More recently, Carotenuto et al. (2018) compared direct delivery to end users and delivery to city collection centers or lockers and concluded that CO₂ emissions decrease by more than 21% when the former is used. However, the authors recognized that their model had two main limits. They assumed that parcels delivery providers operate with petrol-powered motor vehicles, whereas the current trends in transport policy are increasingly oriented towards the use of electric vehicles in city centers with zero CO₂ emissions locally. They also did not take into consideration CO₂ emissions related to users-to-lockers movements; emissions generated by consumers' trips to and from collection points could potentially outweigh the environmental gains of reduced vehicle kilometers on the delivery side.

As with much prior research, Carotenuto et al. (2018) lacked comprehensive information on consumers' trips—the mode of transportation they use, their chaining trip behavior, and so on. Studies assessing the environmental impact of collection points often rely on strong and simplified assumptions to incorporate the consumers' part of the last mile. For instance, Zhang et al. (2018) assumed that consumers walk from their homes to collection points along the shortest distance—which clearly minimizes the carbon footprint of OOH deliveries—whereas Arnold et al. (2018) found in favor of home deliveries in a model where customers are assumed to travel by car to the OOH delivery point to pick-up their parcels.

Between these two extreme cases, Buldeo Rai et al. (2019) concluded that collection points are more favorable than home deliveries when consumers' collection trips are walked or biked, whereas the reverse conclusion holds when consumers use polluting transportation modes to collect their parcels. The survey by Buldeo Rai et al. (2020) elicited information from 385 consumers interviewed in the streets of Brussels-Capital Region on the way they use collection points and how they travel to and from these points. Less than one-third (27.9%) of consumers selected collection point delivery when they made their online order; for 72.2% of consumers who visited a collection point, this visit was a constrained choice, following a failed delivery at home. Even among consumers that selected a collection point as the delivery location when they made their purchase online, a significant share declared that this is

nevertheless the second best. Nearly 10.3% would have preferred home delivery and 6.5% at work, but these options were not available to them.

In terms of travel behavior, the survey shows that almost half of consumers (47%) traveled by car to and from the collection point. Around one-fifth (22.3%) used public transport, another fifth (21.6%) traveled on foot and a minority cycled (9.1%). The majority of consumers (69.4%) who prefer collection points over deliveries at home or at work combined other activities to the collection point visit. “Tripchainers” are more likely to take cars and public transport, instead of walking or biking. Among consumers that chained several activities in one trip, almost half (47.2%) indicated that the collection point was located on the fastest route from their previous destination to their next destination, while 52.8% stated that they had made a detour. Another survey conducted by CSA Research (2022) on behalf of La Poste on the modes of traveling of a sample of 7,000 users of OOH delivery solutions showed that 75% of French people make a dedicated travel to collect a parcel over an average distance of 6 km, and on average, at the national level, 52% of them use a fossil-fuel powered vehicle (25% in the Paris region and 82% for towns of less than 2,000 inhabitants).

Previously mentioned studies also consider the last-mile issue only in urban areas and cities and are focused on CO₂ emissions. However, e-commerce does not concern solely urban areas, and the external costs of OOH deliveries (compared to home deliveries) are not restricted to CO₂ emissions. To our knowledge, Mommens et al. (2021) were the first to compare deliveries to homes and to stores serving as collection points in terms of transport-related external costs beyond CO₂ emissions, including air polluting emissions, accidents, noise nuisances, infrastructure and congestion, and explicitly accounting for differences in impact among consumers’ residences. This is crucial since consumers’ locations would affect not only their choice of delivery solutions when purchasing online but also how they travel to collect their parcels if they choose OOH delivery. Mommens et al. distinguished three areas with different demographic and collection point densities and found that in “rural” and “urbanized” areas,³ home deliveries lead to less environmental harm than collection point deliveries, whereas the opposite holds in “urban” areas.⁴

If this study goes beyond the traditional CO₂ emissions focus, the list of external costs linked to OOH deliveries remains partial. Indeed, OOH deliveries, and in particular parcels lockers stations, need specific physical infrastructures that have to be built (implying raw material extraction) and that occupy land (implying soil artificialization). These issues have not yet been addressed.

In summary, to compare the environmental footprint of home vs. OOH deliveries correctly, at minimum the following parameters must be taken into account: the

³ The urbanized area corresponds to the Flanders (at the North of Belgium) with 487 inhabitants/km² and a density of collection points of 0.021 collection points per km². The rural area corresponds to Wallonia (at the South of Belgium) with 216 inhabitants/km² and 0.008 collection points per km².

⁴ The urban area corresponds to the Brussels-Capital Region, centrally located, with 5,573 inhabitants/km² and the highest density of collection points (0.118 collection points per km²).

distance traveled and the type of vehicles used by the delivery operators⁵ and by the end consumers; the number of drops per delivery round (consolidation); the dedicated or non-dedicated (i.e., combined trips) feature of the trips made by the end consumers; the probability of success or failure of home delivery; the land footprint of parcels lockers stations and the natural resources needed to build them when dealing specifically with parcels lockers; the impact of delivery convenience and price on online purchase behavior (notably its frequency and the fragmentation of orders),⁶ and on other activities.⁷

Not taking into account all these factors leads to a partial view of the true environmental burden of delivery solutions and could lead to misguided delivery decisions and public policy. More research on consumers' shopping and delivery preferences, their attitudes towards environmental issues, and their reactions to various incentives or nudges retailers, logisticians or policy makers could implement to attempt to influence their consumption choices, is needed. This is all the more important but complex to assess, considering that consumers' preferences are heterogeneous across groups of respondents according to their socioeconomic characteristics (age, gender, education level), income, geographical location, and other factors.

4 How to Help End Consumers to Make the Better Choice?

As demonstrated above, the environmental footprint of OOH and home delivery solutions (and more generally of e-commerce) depends largely on the consumers' behavior. Moreover, Borsenberger et al. (2022) provide a model in which consumers' awareness of the negative externalities of their actions on the environment leads producers to offer more sustainable goods. On the contrary, when consumers are not able to observe the emissions generated by their choice, profit-maximizing economic actors with a limited time horizon have no incentive to adopt green technologies. Consequently, to maximize social welfare, the first thing to do is to inform consumers of the consequences of their acts and then let them make the right choice, potentially by influencing them if they have no environmental consciousness, by introducing financial or non-financial incentives (nudges).

⁵ In this regard, one must recall the efforts already made voluntarily by the sector to reduce GHG and air pollutant emissions. EU postal operators are among the forerunners on that issue regarding the development of alternative fleets of vehicles.

⁶ When a consumer opts for out-of-home delivery, because of risk of failure of home delivery, for instance, he may be tempted to fragment his purchases, notably if he moves on foot or by bike. The benefits of green mobility could be counterbalanced by a fragmentation of purchases and so the multiplication of deliver companies that travel to the pick-up points, of packages, and so on.

⁷ Other activities could include impulse purchases made when visiting a store to collect a parcel, the activities induced by the time saved when packages are delivered at home or, on the contrary, the activities not taken when they must stay at home to wait delivery.

These conclusions also apply to measures taken by different actors along the e-commerce value chain. Postal operators and logistics companies are making significant improvements in the way they carry out deliveries: they electrify their vehicles' fleets and optimize their processes of loading, routing and synchronizing with other stakeholders. See Borsenberger and Joram (2023) for a survey of the actions already implemented by postal operators to reduce their environmental impact. Some e-retailers have also initiated a movement towards a sustainable way of doing business by better informing their customers. For instance, Dutch grocery Albert Heijn allows customers to choose from among some 60 delivery time slots per week, each one with a different price tag, the more sustainable time slots being less expensive.

4.1 Consumers' Environmental Awareness and Willingness to Pay to Promote More Sustainable Solutions

The survey made by Buldeo Rai et al. (2019), among others, showed wide gaps in consumers' awareness of environmental issues and in their knowledge of sustainable solutions. Moreover, even when they are aware of the environmental challenge, consumers are not always ready to make efforts or to pay for distant, abstract, and uncertain benefits induced by presumed more sustainable behavior.

According to surveys conducted in the United States and in the UK in 2021, CO₂ neutral shipping is an important criterion for only 9% of American respondents and 12% of British ones. Free and fast shipping remains the most important criteria for respectively 72% and 64% of the American respondents and for respectively 69% and 54% of British ones. Moreover, to the question "Would you be willing to pay a surcharge if the retailer guarantees environmentally friendly shipping (e.g., climate neutral / CO₂ neutral) in return?", 33% of American respondents answered "No", 31% "Yes definitely" and 29% "Yes, but it depends on the amount of the surcharge". In the UK, the percentages were respectively 32%, 19% and 44% (Statista 2021).

According to a study carried out in France in 2019, less than 10% of online shoppers show systematic interest in the environmental impact of their online orders, while a third may be sensitive to the topic. Only 20–25% of consumers show interest in low-impact delivery options. And less than 10% are willing to pay any extra price or tax to compensate for the negative environmental impact of express delivery (Oliver Wyman 2019).

4.2 How to Best Inform Consumers?

Research on consumer's behavior recommends designing informative messages that are meaningful or tangible for consumers. Positively formulated messages increase consumers' perceived value, especially when it comes to consumers who are less

informed and less engaged towards solving environmental issues (Van De Velde et al. 2010). Displaying green labels is also a tool that e-retailers and delivery operators could use to steer consumers towards a more sustainable delivery option, as shown by Agatz et al. (2020) who conducted an experiment in which green labels indicated better environmental-friendly time windows for delivery.

Regarding parcels delivery, in a stated-preference survey, Ignat and Chankov (2020) displayed the environmental impacts of last-mile deliveries in terms of CO₂ emissions and concluded that information sharing leads to consumers being more likely to choose for sustainable delivery. Informing consumers on the environmental footprint of their choice about parcels delivery solutions (at home or OOH) presumes developed powerful and accurate eco-calculators to measure the emissions generated by each parcels delivery solution taking into account the relevant characteristics of the consumer: the location of her home and of the nearest potential pick-up point, her expected presence or absence at home during the time slot of delivery, her transportation mode (by foot, bike, public transport, or electric vs. thermic car) to go to the pick-up if OOH solution is chosen, the type of trip he could make to drop-off his parcel (dedicated vs. chained trip), and other relevant factors.

4.3 Once the Information on Emissions Is Available, How to Induce Consumers to Make the Most Sustainable Choice?

In addition to give consumers an accurate information on the environmental footprint of their choice, e-retailers could take some basic measures to guide all consumers, notably the less engaged or less concerned about the environmental safeguarding. An obvious basic measure could be to make the “greener” solution the default option.

Default options have proved to be an effective way to influence behavioral change: consumers often prefer to take the easy option and favor the “status quo”; they also perceive the default as an implicit recommendation (Trudel 2018). Considering sustainable e-commerce deliveries, consumers’ choice architecture can be changed by presenting the more sustainable delivery option first or by selecting the more sustainable delivery option as default.

Behavioral theory suggests also that people could change their attitude or behavior under the influence of others, or of “social norms” defined as unwritten codes and informal agreements that determine what we expect from others and what others expect from us (Young 2015). In this context, using social media to promote green behavior could be a powerful incentive to ease the transition towards more sustainable consumption. Few research exists on this topic, but one can mention the work of Buldeo Rai et al. (2021). They showed that enabling consumers to share their choice for environmental-friendly time windows for delivery on social media strengthens their motivation to do so.

5 Conclusion

Out-of-home (OOH) parcels deliveries (in parcels lockers, in relay points, and so on) are often described as “greener” than deliveries at home. The environmental argument of the proponents of OOH delivery is based on the observation that fewer vans are mobilized and fewer kilometers traveled by delivery operators when they deliver parcels in lockers or relay points compared to the home delivery alternative, “all other things equal”. But other things are not equal. Indeed, these findings failed to recognize the need for recipients to travel to collect their parcels, the fact that a significant part of individuals would make a dedicated (not mutualized) travel by (fossil fuel powered) car—whereas more and more parcels delivery providers use “green” transportation vehicles and mutualize collection and delivery of postal items, playing the role of “parcels buses”.

The balance sheet between the environmental footprint of home and OOH delivery solutions depends on the way the consumer would pick up her parcel at the delivery point and one cannot say once and for all that a solution is better than the other. Claiming that one delivery option is better than the other from an environmental point of view in absolute terms is therefore misleading. Home and OOH delivery models must not be opposed. The best solution to minimize the environmental impact of parcels deliveries is to allow each consumer to make an informed choice. No rule or regulation will create better configurations than the informed choice of the recipient based on their personal circumstances.

This does not preclude the use of financial (prices-based) or non-financial incentives (nudges) to induce consumers with low environmental consciousness to make a more sustainable choice for the “common good”. This strategy, however, presumes collecting more data on consumers’ preferences and doing more research to better understand and forecast their reactions to such nudges. From the point of view of delivery operators and e-retailers, the challenge is to better inform customers on the environmental impact of their choices. One way would be to create an “eco-score” on GHG emissions, comparing the environmental footprint of the different delivery options according to the answers given by the consumers to a relevant set of questions, in order to raise their awareness and guide their choice.

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Supporting Postal Services Through Location-Based Fees



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Abstract In Brennan (The postal and delivery contribution in hard times. Springer, New York, 2022), I found that the US Postal Rate Commission's (PRC) preferred method for adjusting postage for falling demand implied that the cost of postal service is a simple linear function of volume and the number of locations. Among the implications of this result is that adjusting postage for changes in volumes would be unnecessary. Based on this result, US postal data indicates a fee of about \$100 per year per location. However, the marginal cost per location likely differs between urban and rural areas, home delivery and neighborhood boxes and business and residential service. Location costs would have to be refined considerably before United States Postal Service (USPS) or any other postal operator could adopt location fees to address volume reductions. These difficulties suggest that the PRC's method of adjusting postage rates based on volumes per location needs to be reconsidered.

1 Introduction and Summary

The decline in mail volumes brought about by the substitution of electronic communication and economic downturns has threatened the financial viability of postal operators (POs). Brennan and Crew (2016) proposed a relatively simple mechanism for adjusting postage prices to mitigate the effects of this decline on postal sector viability. This mechanism was based on (annual) percentage change in volume, how much a change in volume would affect the average cost of service (elasticity of average cost with respect to volume) and, because an increase in prices would also

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The views expressed here do not necessarily reflect those of the Public Representative of the PRC.

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affect volumes, the elasticity of demand for the service. The elasticity of average cost with respect to volume turns out to be a negative of the ratio of fixed to total cost.

At the request of the Public Representative of the US Postal Regulatory Commission (PRC), Brennan (2017, 2018) submitted comments to the PRC as part of its statutorily mandated review of the mechanisms it had implemented in accordance with the 2006 Postal Accountability and Efficiency Act (PAEA)¹ used to set postal rates charged by the US Postal Service (USPS). The PRC (2020) adopted a somewhat similar mechanism, but with two differences. The first was that it chose not to incorporate the elasticity of demand, hence the effect of adjusting prices on volumes, into its analysis.

The second difference was that instead of basing adjustments on the percentage change in volume, the PRC based its adjustments on the percentage change in what it called “density”, which is the volume per location or, in US postal parlance, “delivery point”. Brennan (2022) examined some of the consequences of this. The most important finding for this paper is that the PRC’s (2020) density-based adjustment formula implies that the cost of providing postal service is the sum of two terms—the marginal cost of additional location times the number of locations, plus the marginal cost of an additional unit delivered times volume delivered. Section 2 of this paper summarizes the derivation of this term.

An implication of this result, also discussed in Brennan (2022), is that one could, in principle, recover the USPS’s cost through a two-part pricing scheme—a fixed cost paid by each delivery point and a fee equal to the marginal cost paid by each sender. With such a pricing scheme, one would not need to adjust PO rates for changing volumes. As volumes fall, a PO loses no net earnings, since the lost revenue per piece of mail just equals the marginal cost avoided by not delivering that piece of mail. However, because all locations get or are at least able to get mail, the fixed location-based charge would have to be assessed on all locations.

This raises the question of what this two-part scheme would look like. Section 3 provides a sample calculation based on recent USPS-reported cost data. The postage piece itself can be based on attributable cost per unit across service categories. Because all locations can get all postal products, however, the fixed fee can be based on USPS’s total institution cost, divided by the number of locations or delivery points. Section 3 describes these calculations. The estimated fixed fee calculation based on 2020 data gives \$103 per year per delivery point.

Despite being conceptually appealing, imposing such a fee would likely be controversial. Section 4 reviews controversies associated with the numerator and institutional cost associated with market-dominant products. That attribution in practice is the result of how market-dominant and competitive products are priced, rather than a specific attribution of institutional costs to market-dominant products.² Having a

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

² “Market-dominant” and “competitive” are statutorily defined in PAEA (n.2 *supra*), but essentially demarcate the set of USPS offerings with rates regulated by the PRC from those that are not. I do not discuss here whether any of the defined “market-dominant” services are sufficiently competitive to be deregulated, or the reverse.

separate fixed fee to support USPS is likely to inflame claims of cross-subsidization, as discussed in Brennan (2020).

Section 5 reviews controversies associated with the denominator in the calculation of the fixed fee and the number of delivery points. In adjusting prices on the basis of density, the PRC essentially assumes that all locations or delivery points have the same cost. A review of the official definition of “delivery point”, essentially a separate address to which mail would be sorted and delivered, suggests that this implicit assumption is unlikely to be satisfied. The PRC acknowledges some difficulties, in assuming that the mix of types of delivery points is relatively constant, but without providing evidence for that assumption. Problems can arise in at least two directions, with many delivery points at the same physical location and incentives to use one delivery point to serve multiple recipients. Section 5 discusses some potential responses, all of which complicate basing rate adjustments solely on density based on volume divided by implicitly homogeneous delivery points.

Section 6 discusses problems likely to be manifested in public resistance to a fixed fee that all locations must pay. One can expect that those who get relatively little mail to argue should not have to pay the same fee as those who get lots of mail. Such users might well be worse off continuing to receive mail while paying the fee than they would be without either mail or the fee.

Section 7 summarizes and concludes.

2 Deriving the Cost Relationship

The financial threat facing a PO when volumes fall arises because a postage rate sufficient to cover average cost exceeds marginal cost, creating losses at the margin when demand declines, whether from e-substitution or recessions. When demand is sufficient, postage rates that exceed marginal cost provide sufficient revenues to cover the PO’s total cost; it does not matter whether those costs are based only on the cost of providing the mail products or other costs associated with meeting universal service obligations or, as in the US, statutory requirements to raise funds to cover future health costs of employees after they retire. Because marginal cost is less than average cost, the average cost per unit delivered falls as volumes rise, and average costs rise when volumes fall.

One can maintain the financial viability of a PO by allowing a percentage increase postal rates ($\Delta P/P$) to increase to cover the increase in average costs per unit volume created when demand falls. The percentage increase in average costs will by definition be the elasticity of average cost with respect to volume (eAC) times the percentage by which volumes changed (Z), holding price constant. In and of itself, this may seem excessively complicated to be implemented by regulators, but Brennan and Crew (2016) showed that if the marginal cost (M) of volumes (Q) is constant, the elasticity of average cost with respect to volume is simply the negative of the ratio of fixed cost (F) to total cost ($C = F + MQ$). This would give the (relatively) simple

adjustment formula³:

$$\frac{\Delta P}{P} = \frac{-F}{C} Z,$$

If Z is negative, that is, demand falls, the formula would adjust prices upward, and vice versa, reducing rates if demand grew.

This however does not complete the story, since the increase in postal rates implied by the formula will further depress volumes. To take this effect into account, the above formula should be adjusted by the elasticity of demand.⁴ Without reproducing the derivation in Brennan and Crew (2016), that adjustment gives the formula:

$$\frac{\Delta P}{P} = \frac{-F}{C + Fe_D} Z.$$

This formula is still relatively manageable because it depends only on the ratio of fixed to total costs, the amount by which demand has declined, and the elasticity of demand. The first two are directly measured by POs and their regulators. The latter is harder to come by but may be available from either econometric studies or reasonable regulatory judgment to get a good estimate of how much postal rates should be adjusted.

The PRC adopted a similar adjustment formula to the above, but with two notable differences. One is that it chose not to include an adjustment based on the elasticity of demand. Within the framework above, that would be equivalent to assuming perfectly inelastic demand, that is, volumes may be affected by the availability of electronic communication or the state of the overall economy, but not by postage rates.

The difference of interest here, however, is that the PRC chose to base its adjustment not on the percentage change in volumes, but on the percentage change in what it called “density”, that is volume per “delivery point”, or what Brennan (2022) called “location”. (The need to be more precise about the definition of a delivery point is addressed below.) This may well be reasonable, in that holding volumes constant, an increase in locations to which mail would be delivered would presumably increase costs and vice versa. Brennan and Crew (2016) implicitly assumed that the number of locations was either fixed or that any change was negligible. The PRC’s (2020 at 79) adjustment formula was to adjust rates by

$$-1 * ICT/TCT * \% \Delta D [T - 1, T],$$

³ At the request of the PRC’s Public Representative, Brennan (2018) derived adjustments for different USPS mail products within the regulated “market-dominant” category. The PRC (2020) did not calculate separate adjustments for each of these products.

⁴ If the elasticity of demand is sufficiently high, adjusting postage rates upward will cause volumes to fall by so much that a PO would never be able to recover its costs. This is colloquially known as the “death spiral”. I assume here that demand for postal products, although having fallen, is still sufficiently inelastic to prevent this from happening. Brennan and Crew (2014) show that even if demand falls, elasticity of demand may not fall; in fact, demand may become *less* elastic.

where

T = most recently completed fiscal year;

$T - 1$ = fiscal year prior to year T ;

ICT = institutional cost in fiscal year T ;

TCT = total cost in fiscal year T ; and

$\% \Delta D[T - 1, T]$ = Percentage change in density from fiscal year $T - 1$ to fiscal year T .

My purpose here (or in Brennan 2022) is not to criticize the PRC's choice or to discuss its implications for how rates are adjusted, but to illuminate its implications for pricing.⁵ The PRC's adjustment formula implies that the average cost per unit volume does not change if density does not change. If Q is the volume of mail, N is the number of locations or delivery points and $k = Q/N$ density, we have that average cost $C(kN, N)/kN$ is independent of N . This implies that the derivative of average cost with respect to N , holding k fixed, must be zero. Brennan (2022) showed that this implies that the USPS cost function must be

$$C(Q, N) = QC_Q + NC_N,$$

where C_Q and C_N are respectively the marginal cost of Q and N .

We can go further. If we assume that marginal costs of volumes are constant, as is necessary for the simplification of elasticity of average cost into the ratio of fixed to total cost, and that marginal costs of locations (V) are identical and constant—the PRC does not differentiate locations into separate cost categories—then the cost function becomes just

$$C(Q, N) = MQ + VN.$$

There are now no fixed costs to recover. One could cover all of the USPS's cost by charging the marginal cost M for each piece of mail delivered, and charging each location a fee V for receiving mail. One could then reduce the postage in each market-dominant category down to its marginal cost. Not only would such rates be more efficient and create a benefit (direct to sender, indirect to receiver) at the margin from reduced per-unit postage. If volumes fall, the lost revenue just equals the lost incremental cost of sending those lost volumes, so no rate adjustment would be necessary.

⁵ For price adjustment itself, the percentage change in density is the percentage change in volumes minus the percentage change in delivery points. If volumes are falling and the number of delivery points is rising, the PRC's formula would give a greater adjustment to rates than the formula in Brennan and Crew (2016). That does not make the former wrong and the latter correct, or vice versa.

3 Computing the Location Price

The potential price of interest is V . Observing that $C(Q, N) - MQ$ is what the PRC calls “institutional cost” or ICT , V is given simply by

$$V = ICT/N.$$

To estimate V , we need to know ICT and N .

First consider ICT . Others are much more expert than I am in knowing and penetrating USPS cost accounts, so I apologize upfront for the crude aspect of this calculation. Still, approximations are informative. My estimate for ICT is based on data from the PRC (2021) financial analysis of the USPS for the 2020 fiscal year, which ran from October 1, 2019 through September 30, 2020. Two pieces of data are important for this estimate. The first is the PRC report for positive institutional cost contributions from market-dominant mail services. Since all locations receive all forms of mail, and V would cover all of that, there is no need to break out ICT by market-dominant mail product. These contributions to institutional cost were \$14.8 billion in the 2020 fiscal year (PRC 2021 at 45).

The PRC (2021 at 45) also reported that some market-dominant products failed to contribute to institutional costs during the 2020 fiscal year. The PRC reported the total shortfall as \$1.8 billion, most of which came from failures of the delivery of “marketing mail flats” and “periodicals outside county” to cover their attributable cost. Adding this \$1.8 billion failure to contribute to the \$14.8 billion that was contributed gives an estimate of ICT , derived from these PRC data, of \$16.6 billion.

The next step in computing the per-location fee is the N , the number of locations. USPS and the PRC used “delivery points” as the term for locations and in the density-based rate adjustments. According to USPS, the number of delivery points in the 2020 fiscal year was 161.4 million.⁶ Combining this with the \$16.6 billion estimate for institutional costs for market-dominant products gives a per location (per delivery point) fee of

$$V = \$16.6 \text{ billion} / 161.4 \text{ million} = \$102.85/\text{year} = \$8.57/\text{month}.$$

As a rough estimate, that may be reasonable. Acknowledging the many important differences that make this an “apples to oranges” comparison, the annual Amazon fee in the US for Prime free delivery (although with other benefits, such as access to the Prime video service) is \$139 per year. However, even without that consideration, there are many “devils in the details” in both the numerator and denominator, as discussed in the next two sections.

It may be worth noting the benefit side to the location fee—the potential for cutting per-unit postage. According to USPS (2021 at 7), roughly half of the first-class mail revenues (primarily single and presorted letters and cards) were contributions to

⁶ Calculated from USPS data at <https://facts.usps.com/delivery-points/> for fiscal year 2021 and the change from the prior year.

institutional costs. Were those covered by this location fee, the postage associated with these products could be cut in half. Residential users would see only some of this saving directly, to the extent they buy stamps to mail letters and cards. Most of the savings would likely go to commercial mailers, but one would normally expect that a fall in costs would be passed on to some extent to the residential users who eventually buy the products that commercial mailers sell. This brings out the likely political controversies associated with the adoption of a location-based fee to support USPS, discussed further below.

4 Numerator Controversy: Institutional Costs and Cross-Subsidization

The proposed location-based fee is based on the idea that there is such a thing as institutional cost specifically allocated to market-dominant services. That institutional cost would then be used to calculate the location fee. However, USPS (and most if not all other postal operators) are not restricted to services in which they face little direct competition. The most obvious and important example is parcel delivery, in which USPS faces competition from United Parcel Service (UPS), Federal Express, and, on a vertically integrated basis, Amazon's delivery of Amazon parcels.

Because USPS supplies both market-dominant and competitive products, sales of both typically cover its institutional costs. Accordingly, the institutional cost covered by market-dominant products is a function of the prices USPS charges for the different types of products; it is not an exogenous amount that market-dominant services are intended to cover. Brennan and Crew's (2016) adjustment mechanism, applied to individual market-dominant products in Brennan (2018), essentially finessed this point, by arguing that the point of the adjustment mechanism was to maintain the same contribution to institutional cost regardless of exogenous changes (down or up) in demand for market-dominant products, either in the aggregate or individually. In other words, the adjustment would insulate the solvency of USPS from changes in demand without regard to whether the contributions to institutional cost previously established were in any sense correct.

If market-dominant institutional costs are defined as USPS costs not covered by USPS revenues from competitive products, then any shortfall from USPS's competitive operations would end up increasing these location-based fees. As these fees would be mandatory—a point to which we return in Sect. 6—competitors to USPS in parcels and other non-market-dominant products could complain in this context that USPS could cross-subsidize their operations by setting low prices and covering the losses through increases in location-based fees.

There are two responses. One is that USPS should price its competitive offerings as if it were a competitive firm, matching the market price if it offers a perfect substitute to rivals and charging a price over marginal cost as would its rivals if products are differentiated (Brennan 2020). The second and more feasible response would be

to fix the location fee for market-dominant services, perhaps with adjustments for inflation and productivity, as with the current price cap for rates for market-dominant products. This does not solve the problem of calculating an appropriate contribution to institutional costs from market-dominant products, but it mitigates the risk of cross-subsidization, just as the current price-cap regulation method for overall postage rates without a location-based fee currently does in the US, because separating rates from reported costs takes away any reward from attributing costs of competitive services to those of regulated enterprises (Brennan 1989).

5 Denominator Controversy: Delivery Point Cost Variation

In basing rate adjustment on density, the PRC essentially says that average cost depends only on volumes per delivery point. If volumes increase by two percent and delivery points increase by two percent, the average cost does not change. This leads to costs being determined as the sum of two products—the marginal cost of volumes times volume and the marginal cost of delivery points per delivery point. This in turn says that costs could be covered by reducing postage rates for various products to the marginal cost of delivery, with the remaining revenue covered by a constant fee per delivery point.

This implies that the marginal cost per delivery point is the same across all delivery points. The definition of delivery point becomes crucial. It is not, as one might guess, the physical place where a postal carrier drops off mail. Rather, USPS defines a delivery point as

(1) A single mailbox or the other place to which mail is delivered. A street address does not necessarily represent a single delivery point because a street address such as one for an apartment building may have several delivery points. (2) A specific set of digits between 00 and 99 is assigned to every address that is combined with the ZIP+4 code to provide a unique identifier for every delivery address. The DP is encoded within the POSTNET or Intelligent Mail barcode.⁷

I include the full definition for completeness, but only the first is important here. As the second sentence in the first part makes clear, a delivery point is not a physical location, such as a street address. A delivery point is a distinct place where a carrier would drop off mail sorted to that place. An apartment building, as USPS says, typically has multiple delivery points, because there are separate points within the building to which mail can be delivered.

It is important to be clear on this (as it was not obvious to me).⁸ “100 delivery points” could mean 100 units in a single apartment building. It could mean a community delivery box in development with a slot for each of the 100 homes. It could mean

⁷ https://about.usps.com/publications/pub32/pub32_terms.htm.

⁸ I am grateful for those within the PRC who directed me toward this definition, as I could not find the definition in the PRC’s orders on rate adjustment. It is important that I immunize them from any views or conclusions expressed in this paper regarding delivery points or anything else.

100 houses in a neighborhood, each of which gets home delivery. It could mean 100 farmhouses, each of which sits on a farm of 25 hectares and is half a kilometer from its nearest neighbor, the next delivery point. It is difficult to imagine that each of these 100 delivery points in these four different contexts imposes the same additional cost on USPS or just happens to vary across types in such a way as to keep average delivery cost stable over time.

The situation is problematic in the other direction as well. A commercial or government office may be a single delivery point, in that the mail carrier does not deliver mail to separate mailboxes. Rather, it leaves that to the “mail room” in the commercial or government establishment. So just as one can have multiple delivery points in a physical destination, one may have multiple destinations for a given delivery point.

All of this suggests that the implicit assumption of equal marginal or average costs per delivery point, inherent in a density-based adjustment, is unjustified. The PRC seems to recognize this where it observed (PRC 2020 at Appendix A, 2–3):

One limitation of using the raw number of delivery points is that it does not capture differences in the cost of servicing different types of delivery points. However, in the current environment, the increase in the number of delivery points is driven mainly by population growth adding new nodes to the network. As long as this trend continues, the increasing cost of servicing the growing network will inevitably be spread over the remaining mail pieces, driving an increase in per-unit costs regardless of whether the new delivery points tend to have above average or below average costs to service. The Commission concludes that delivery points are the best measure of the number of network nodes for purposes of the density-based rate authority.

An accompanying footnote reiterates the point made here (PRC 2020 at Appendix A, n. 2):

For example, the Postal Service has estimated delivery costs to differ significantly between door delivery, curblin delivery, and the use of centralized delivery to cluster boxes to apartment buildings. See United States Government Accountability Office, U.S. Postal Service: Delivery Mode Conversions Could Yield Large Savings, but More Current Data Are Needed, May 2014, at 11, available at: <https://www.gao.gov/assets/670/663107.pdf>. [Reference included in footnotes.]

However, the PRC essentially assumes the mix of delivery points is constant, and that changes to the number of delivery points are driven by population growth.⁹ Nevertheless, without this assumption, the PRC’s view that average per-unit cost depends only on density falls apart, taking not only the idea of a location-based fee with it.

Before getting to the implications of different delivery costs to the feasibility of implementing a location or delivery point fee, note that the mix of delivery points could be affected by the fee structure. It may increase resistance in some communities to cluster or community boxes, on the premise that they should get home delivery

⁹ One could then presumably compute density-based rate adjustments on using volumes per person, and if the average cost of delivery is constant if volumes per person change, that would imply that the USPS cost function would be based on the marginal cost per person times the size of the population, and the subject of this paper would be a per person rather than per location (or delivery point) fee.

since they are paying the same fee that those who get home delivery pay. If each unit in an apartment is charged a delivery fee, the apartment may decide to become like a commercial office with just one delivery point and take on the burden of sorting for the residents.

This latter also illustrates a potentially important possibility about delivery costs—not all will be affected by distance. Some of those costs involve sorting mail by delivery point. If a commercial establishment is willing to undertake that sorting in its “mail room”, those are costs that USPS or a PO would avoid. What fraction of the marginal cost of a delivery point involves sorting, and what fraction involves the distance between delivery points, would obviously be significant in assessing the magnitude of this particular problem. The PRC’s decision offers no guidance on this.

6 Implementation Resistance

Along with the computational issues outlines above, there are a variety of factors likely to inhibit the adoption of this otherwise potentially efficient pricing scheme.

6.1 Equal Fee Per Location?

As noted above, one concern with an equal fee for each delivery point is that many who believe themselves to be at low-delivery cost locations will object to having to pay the same as those in high-delivery cost locations. Those in apartments or in developments with community cluster boxes may not be pleased to pay the same \$100 per year as those in large houses long distances from nearest neighbors.

There is some reason to think that this may not be an issue. Average pricing across geographic regions with disparate costs is already a feature of postal pricing. Mailers pay the same to send mail long distances, and to or from less populated regions, as do mailers who send mail between or within densely populated metropolitan areas. A new price divorced from location-specific cost may engender political opposition not fatal to the current pricing system. More generally, the price disputes that could arise under the current system are largely urban vs. rural, while disputes where apartment dwellers, townhouses with cluster boxes, and detached single family homes all pay the same delivery point fee could be harder politically to overcome.

6.2 Equal Delivery Point Fee Regardless of Mail Volume?

A concern related to the one above is public opposition to an equal fee per delivery point from those who do not get much mail at their address. Unlike geographic averaging, the current system does correlate spending with the quantity of mail one

sends, and perhaps indirectly (as the postage cost is rolled into the prices of products supplied by commercial mailers). To the extent that postage volume is correlated with income, moving to cost recovery in part through a fixed fee per location will also be regressive, that is, increasing the amount lower-income customers pay relative to their income.¹⁰

Moreover, there is precedent for public opposition to cost-based fixed location fees. Forty years ago, when wireline telephones were the only method for electronic communication, much of the fixed cost of running a line to a residential location—“non-traffic sensitive costs”, in the parlance of the day—was covered through surcharges on (then separately priced) long-distance telephone calls. This mispricing had enormous inefficiencies, as essentially an elastically demanded good, long-distance calling, was being in effect taxed to subsidize an inelastically demanded good, having a telephone line (Wenders 1987; Crandall and Waverman 1996).

Introducing competition into the telephone sector created pressure to align prices with costs and to avoid inefficient bypass of the telephone network, with lower long-distance fees and (appropriately) cost-based charges for a telephone line. Nevertheless, those who made few calls, especially long-distance calls, argued that they should not have to pay for their telephone lines because they did not use them much. One can expect similar opposition to delivery point fees from those who currently benefit from having a postal network but not paying much to support it.¹¹

6.3 *Dropping off the Grid*

One might mitigate these concerns if people were given the option to not pay the delivery point fee, in exchange for not getting mail. Those who do not get much mail, and can arrange for online billing and payment, may decide that mail is not for them¹²—especially if they avoid an annual delivery fee. The problem with this seemingly attractive option is that the value of a postal network to mailers depends

¹⁰ I thank Michael Scanlon for encouraging me to make this point explicitly. This assumes that although senders bear the direct cost of postage, the incidence of postal fees will fall significantly if not close to entirely on receivers, e.g., though higher prices for goods and services billed through letters.

¹¹ This problem is endemic to regulated industries that typically covered fixed connection costs through above-cost usage fees. Telecommunications and postal are not the only examples. In the US, the issue of whether to charge homeowners who install solar electricity panels, and thus reduce payments to support the grid through paying prices above costs for each unit of electricity they use, essentially arises because covering the fixed cost of the grid falls to those who do not install panels, who are also likely to have less income and not own homes with roofs on which panels could be placed. To the extent those with solar panels sell excess electricity into the grid, they in effect profit by the distortion of prices away from costs (Borenstein and Bushnell 2022).

¹² Some in the US may recall an episode of the long-running comedy *Seinfeld* in which Kramer, one of the characters, decides he is fed up with getting catalogs from a store he never uses and goes to a nearby post office to get himself taken off any delivery route. He ends up being convinced, not entirely gently, under interrogation by the Postmaster General. <https://youtu.be/On3cQ0sPvSY>.

on the number of potential recipients, and the value to recipients depends on the number of senders. In other words, postal systems possess network externalities. For USPS, the number of delivery points is the number of addresses that *can* get mail, not the number of addresses that *choose* to get mail.

This implies that the cost function implied by the PRC's density-based adjustment formula is one in which all delivery points get mail. It does not incorporate any (implicit) marginal cost of adding a delivery point when other nearby delivery points are already getting mail. One can imagine that having to sort out and discard mail sent to delivery points that have chosen not to get mail may increase USPS costs, and certainly reduce any cost savings from not delivering mail to a particular address.

In short, because of network externalities, low direct marginal costs of adding a delivery point to an existing delivery network, and the assumption of all delivery points getting mail in the PRC's density-based authority rate adjustment formula that implies the cost function that justifies delivery point fees, it is likely inefficient to make the delivery fee optional. This of course will make it that much more difficult to implement.

6.4 Might Price Caps for Delivery Fees Help?

It may appear that basing rates on a specific cost function necessitates a return to cost of service regulation, contrary to the statutory requirement that market-dominant rates employ price-cap regulation that is not based on costs. This appearance is not necessarily the case. As noted above, institutional costs covered by market-dominant services need not be specifically attributable to those services. One could base initial fees on the costs assumed by the adjustment formula, including both attributable costs for each market-dominant service and the aggregate institutional cost contributed by those services, and build in upward adjustments for inflation and falling demand, and downward adjustments based on expected cost savings and, if relevant, increasing demand.

A side benefit of having price-capped delivery point fees is that it gives USPS the incentive to reduce the costs of delivering to particular locations. For many, particularly if this involves a switch from home delivery to community cluster boxes, this would be a reduction in service quality. However, one could build into delivery point fees the expected savings from these cost reductions, perhaps reducing public aversion to instituting using fees to support USPS costs.

7 Conclusion

Throughout its history, USPS, like other regulated enterprises, has charged volumetric fees above marginal cost to cover fixed costs associated with serving a particular customer or location. Perhaps inadvertently, the PRC in choosing a density-based

rather than volume-based method for adjusting rates when demand falls, it has implicitly pointed out the ability of separate marginal (or average variable, more accurately) prices for each item delivered, with contributions to institutional cost based on per delivery point fees. A rough estimate of this fee shows that it is not too high to be absurd, on the order of \$100 per year.

However, both the numerator—contribution to institutional cost—and the denominator—number of delivery points—that lead to this fee are problematic. The former requires care in the design to avoid incentives for USPS to cross-subsidize competitive offerings, recognizing that the contributions to institutional cost are a function of prices, not vice versa. The latter is hard to justify when costs per delivery point can perhaps radically differ, as USPS treats as a single delivery point a mail slot in an apartment building and a farmhouse many kilometers from its nearest neighbor. Public controversies regarding the fairness of charging mandatory equal fees for all delivery points, regardless of volume, are likely to be great, with price-cap regulation likely to provide only minimal comfort.

A fair conclusion is that reviewing conceptual and practical difficulties in the implications of the PRC's density-based rate authority suggests that such authority may not be appropriate. That perhaps can be the subject of the next ten-year PAEA review.

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Allocating Fixed Costs of the Outdoor Delivery: A Cooperative Game Approach



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Abstract Cooperative game theory can be used to allocate outdoor delivery fixed costs to different services, either by taking into account the delivery speed of the products or by taking into account their formats. Delivery speed fixed costs could be allocated by using an airport game. It is also possible to allocate delivery fixed costs according to the format of the various products by using a classical cooperative game. For both types of allocation problems, we used the Shapley value because it satisfies several axioms relevant to postal costs allocation. The Shapley value is fair and may be useful to justify compliance with competition law. The allocation rules derived from game theory have the advantage of being systematic, operational and scientifically recognized.

1 Introduction

Outdoor delivery refers to all activities performed by the mail carrier during the delivery rounds, from the moment the mail carrier leaves the postal office until it returns. This includes the delivery of postal items and the provision of other services. Delivery costs are the most important component of the costs incurred by postal operators. Due to their importance, the costs associated with this activity had been the topic of different researches in the past, particularly, on their drivers and the way to allocate those costs.

Cohen and Chu (1997) studied economies of scale in the outdoor delivery costs of mail in the US. They split those costs into fixed and variable components and used econometric analysis to assess the variable part of some of those charges (which are considered to be partially variable). Cazals et al. (2001) analyzed the effect of the format of delivered items on the cost of outdoor delivery of La Poste. They

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used a sampling technique to obtain data on delivery time as a function of various characteristics, including the format and estimated different cost functions to provide a measure of the format's effects on the costs. Mautino et al. (2013) developed an approach to estimate long-run average incremental costs for the postal sector, with a particular focus on the economies of scale and scope within outdoor collection and delivery. De Donder et al. (2013) focused on the principles of cost allocation. They developed a model with welfare maximization by the universal service provider with separate goods, subject to a budget constraint where there are marginal, joint and fixed costs that take account of the economies of scale and scope in delivery. The European Regulators Group for Postal Services (2018) also took an interest in the measurement and the allocation of delivery costs.

All of these papers used mainly econometrics, accounting methods or economic models to study delivery costs. It can be interesting to use another approach to allocate fixed delivery costs: cooperative game theory. This approach has been used to calculate the cost of providing the postal service to all delivery points and find a round of minimal costs within a graph in Hamers et al. (1999). Nevertheless, cooperative game theory has never been used to allocate fixed costs of outdoor delivery between postal products, whereas many facility cost allocation problems have been solved by a cooperative game. Moreover, the allocation rules derived from game theory have the advantage of being systematic, pragmatic and scientifically recognized.

Faulhaber (1975) analyzed a pricing policy of a publicly owned water company in the presence of common costs through a cooperative game, finding the potential impossibility of an allocation without cross-subsidies. Young et al. (1982) allocated the joint costs of water supply projects among municipalities with a classical cost game and compare seven different allocation rules. Alternatively, Littlechild and Owen (1973) chose to construct a cooperative game with a specific structure to incorporate the key characteristics of the allocation problem. They addressed the question of how to distribute the cost of an airport runway among different types of aircrafts that need runways of different lengths. In order to do this, they developed a specific game adapted to the context, the airport game. The cost function of a coalition is equal to the cost associated with the largest facility needs in that coalition. After defining the airport game, the authors proposed a simple expression for the Shapley value to their specific game. The airport game is totally adapted to the facility context because it was created for it. An important literature based on airport games has been developed. Fragnelli et al. (1999) proposed an infrastructure access tariff in a cost allocation problem arising from the railway sector. For this purpose, they introduced the infrastructure cost game. It is a sum of an airport game and another type of game called a maintenance cost game. The costs associated with highway profit sharing were considered by Kuipers et al. (2013) and Sudhölter and Zarzuelo (2017). Several studies have addressed cost sharing for the problem of cleaning a polluted river (see, for instance, Ni and Wang 2007).

Like in these previous works, we apply a cooperative game to allocate the costs of infrastructure. Specifically, the question is how to allocate the delivery costs between the postal items by using cooperative game theory. Our main purpose is to find a cooperative game that can allocate the outdoor delivery fixed costs. We decided to

use mainly the Shapley value; it is the most well-known allocation rule. It has the advantage of being the single allocation rule that satisfies four desirable axioms. The first is efficiency; it ensures that the final allocation does not assign more than the total fixed costs. Secondly, equal treatment of equals ensures that if two postal products always have the same contribution to the fixed costs then they get the same allocation; it prevents any cross-subsidy between postal products. The axiom of null player implies that if a product is not distributed by the mail carrier, such as a temporarily stopped product, then it bears no fixed costs. The last axiom is additivity an allocation can be made once every two years instead of every year without changing the final costs attributed to the postal products. Moreover, the Shapley value is always concerned with all marginal contributions without exception. Consequently, the Shapley value can be considered “fair” and may be useful to justify compliance with competition law.

We first study outdoor delivery costs, their costs drivers and the current allocation rules implemented by La Poste in Sect. 2. Then, we analyze, in Sect. 3, existing cooperative games and test several games and allocations to find the most appropriate games for the outdoor delivery allocation problem. More precisely, Sect. 3.1 explains how to integrate the impact of product format on cost allocation, by using a classical cooperative game. Section 3.2 explains how to integrate the impact of delivery speed of products on the cost allocation by using an airport game. Finally, Sect. 4 presents the main conclusions, as well as possible developments for future research.

2 Allocation Rules of the Outdoor Delivery Fixed Costs of La Poste

Outdoor delivery refers to all activities performed by the mail carrier during the distribution rounds, from the moment the mail carrier leaves the postal office until it returns. This includes the delivery of postal items and the provision of other services described below. Delivery costs are the most important component of costs among postal operators.¹ For La Poste, those activities represent approximately one-third of the total costs.

La Poste’s delivery network is organized in order to visit all recipients’ addresses throughout its service territory six days a week, while optimizing the distance traveled by the mail carriers.

On its joint rounds,² the mail carrier distributes different traditional postal products (mail, parcels, newspapers, etc.) and provides services like home visits for the elderly or the delivery of food and medicines. Costs related to the worktime spent by the mail carrier to deposit a parcel in the mailbox or to hand over a letter upon signature (load time costs) are considered as direct and variable costs, because they can be directly

¹ NERA (2004). Economics of Postal Services. Report to the European Commission.

² There are also separate networks for parcels depending on regional conditions. But our focus is on the joint networks for letter and parcels, because of its cost characteristics.

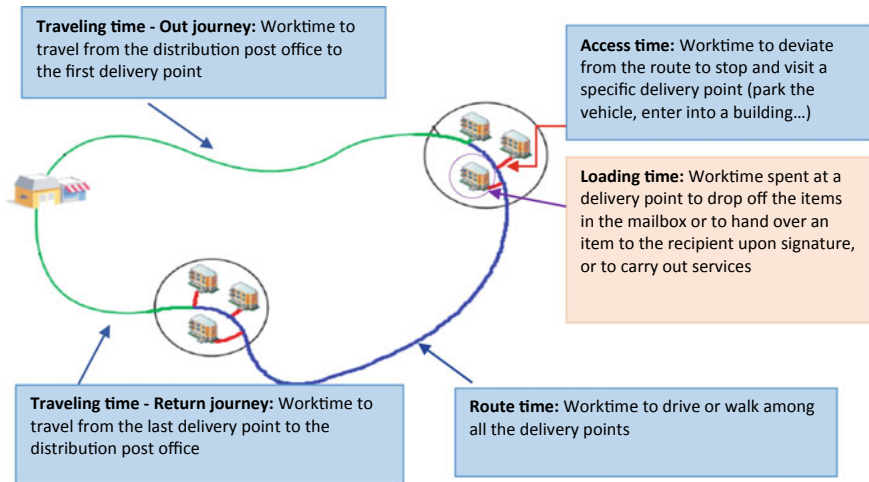


Fig. 1 Outdoor delivery activities

assigned to a particular product or service. In contrast, the costs associated with the time spent by the mail carrier to travel from the distribution post office to the first delivery point and return from the last delivery point to the post office (travel time costs), as well as the costs of traveling between delivery points (route time costs) and stopping at a particular delivery point (access time costs) are considered as common costs, because they cannot be assigned to a particular product or service. Those costs may be considered fixed, as they do not change over the short term, at least within a particular range of volume.

Figure 1 presents the activities carried out by the mail carrier during the outdoor delivery. The gray rectangles correspond to activities that generate common and fixed costs and the white rectangle to activities generating direct and variable costs.

In contrast to direct variable costs that can be unambiguously related to a product or service, common fixed costs require an allocation rule to be apportioned to products and services.

La Poste applies the rules defined by the National Regulatory Authority (ARCEP) to allocate outdoor delivery fixed costs. These rules are objective and take into account cost causality, to ensure that the allocations are exempt from cross-subsidies and do not distort price signals. For delivery fixed costs, this rule needs to take into account the relevant cost drivers. These rules are applied to the fixed costs of each distribution mode (pedestrian/bicycle and motorized rounds)³ and take into account two main cost drivers: the delivery speed and the format of a postal item.

³ Charges for pedestrian and motorized routes are isolated through the analytical accounting system of La Poste. The loading time costs are estimated by using an engineering model. The remaining charges are considered fixed and are allocated by using appropriate costs drivers.

2.1 The Delivery Speed of the Postal Items

Delivery fixed costs are allocated according to the delivery speed of the postal item. The delivery speed refers to the time period within which a particular postal item must be delivered, from the moment it is posted until its actual delivery at the customers' location choice. In France, three delivery speeds are considered to take into account their impact on distribution costs: D+1 for a delivery target on the 1st business day after posting, D+3 for a delivery target on the 3rd business day after posting and D+7 for a delivery target on the 7th business day after posting.

Delivery speed is a driver of the outdoor delivery fixed costs because it shapes the industrial organization of La Poste, particularly, the frequency of delivery. The rule prescribed by ARCEP⁴ considers both the stand-alone costs of each delivery speed and the economies of scope of the joint distribution of the three delivery speeds.

The stand-alone costs are evaluated by considering the number of days per week the delivery would take place if the D+1, D+3 and D+7 items were distributed separately: the D+1 items would need a delivery frequency of six days per week, the D+3 products would require a delivery frequency of three days per week and the D+7 items would need only one. So overall, a stand-alone distribution of these three categories of postal items would require 10 deliveries per week. The economies of scope are assessed by taking into account that a joint distribution of the three categories of items could be done with only 6 days per week. The joint distribution would allow to avoid the costs of 4 deliveries per week.

ARCEP's rule states that the share of the delivery costs allocated to each category of postal items characterized by various delivery speeds is estimated first by applying the stand-alone delivery frequency and then sharing the economies of scope of the joint distribution among the D+1, D+3 and D+7 items, proportionally to the stand-alone share. This method results in an allocation of 60% of the fixed delivery costs to D+1 items, 30% to D+3 items and 10% to D+7 items.

2.2 The Format of the Postal Items

Second, delivery fixed costs are allocated according to the format of the postal items. There are three format categories: "Small" for products of less than 50 g (SF), "Medium" for products with a weight between 50 and 250 g (MF) and "Large" for products of more than 250 g (LF). These categories reflect not only the weight but also the size of the postal items (e.g., products weighing more than 250 g are usually bulky). The format of postal items is a driver of outdoor delivery fixed costs because it impacts the resources used to carry out the distribution. The size and weight of the postal products have an influence on the delivery round's length and on the choice of vehicle, because larger, heavier objects use more load capacity, both of the mail carrier's bag and of the vehicle.

⁴ ARCEP's decision n° 2008-0165 of 12 February 2008.

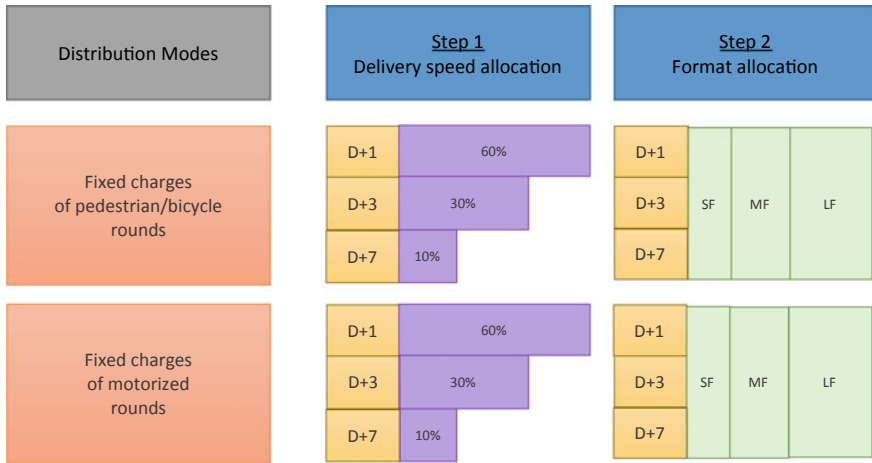


Fig. 2 Steps to allocate the outdoor delivery fixed costs

The rule prescribed by ARCEP in its decision⁵ specifies that the effect of format on the fixed distribution costs should be estimated by comparing the cost corresponding to the actual volumes of each format with a counterfactual situation where all items would be small. This comparison allows to calculate the additional costs of delivering medium and large products, independently of their delivery speed. Those additional costs are shared between medium and large products according to their incremental individual cost (with regard to small products). This method allows to calculate a ratio of the unit outdoor delivery cost of medium and large products with regard to the unit cost of small products.

Figure 2 shows the two steps implemented to allocate the outdoor delivery fixed joint costs, according to the NRA rules. For each distribution mode, the delivery costs are in the first step allocated according to the delivery speed of postal products. As a result, 60% of the outdoor delivery fixed costs are allocated to D+1 products, 30% to D+3 products and 10% to D+7 products. Then, a second step consists in allocating those three shares of costs among products according to their format: the medium and large products bear a higher unit cost than small products, and this additional unit cost remains the same, regardless of the distribution mode and the delivery speed.

⁵ ARCEP’s decisions n° 2017-1100 of 19 September 2017.

3 Allocating Fixed Costs of the Outdoor Delivery Through Cooperative Games

Now, we consider this allocation issue as a cooperative game in which the players are different postal items delivered during the same round. They are characterized by their delivery speed and their format.

The cost function of the delivery speed allocation is set according to the product which needs to be delivered the fastest in the coalition. This way of determining the costs of a group of products follows the same logic as the one followed in an airport game. In Littlechild and Owen (1973), a single facility is built and several types of aircraft use it. The players are types of aircraft grouped according to their facility needs. The cost function of a coalition is equal to the cost associated with the largest facility needing that coalition, as in the delivery speed allocation game. Consequently, allocating the fixed costs by the delivery speed can be modeled by an airport game.

For delivery fixed costs allocated according to the format of the postal items, we did not find in the cooperative game's literature a special game that is compatible with the specific allocation rules set by the French postal regulator. More specifically, there is no game that compares the cost corresponding to the actual volumes of each format with a counterfactual situation where all items would be small. Nevertheless, a classical cooperative game can always be applied.

The fixed costs allocation problem is currently processed sequentially. For ease of exposition, we will first introduce the format game and then the delivery speed game. The format game uses the classical framework of cooperative game which must be explained before introducing the delivery speed game using a specific game.

3.1 *Format Allocation Through a Classical Cooperative Game*

The format of products determines the number of products of a given size which can be included in the mail carrier's bag. More or fewer large bags could be used for pedestrian or bicycle routes and, according to the motorcycles' or cars' carrying capacity, for motorized routes.

3.1.1 The Format Game

Formally, a game is defined as a pair (N, v) where $N = \{1, \dots, n\}$ is the set of players. In the format game, the players are the postal products differentiated according to their format: Small, Medium and Large. Therefore, the set of players is $N = \{S, M, L\}$ and the number of players is $|N| = 3$.

Table 1 Cost function v

E	{S}	{M}	{L}	{S, M}	{S, L}	{M, L}	{S, M, L}
$v(E)$	100	120	140	200	230	250	320

A coalition E is any nonempty subset of players who cooperate. In this paper, a coalition is a set of products that are jointly distributed by the mail carrier. If they form one coalition containing all the products, we call this coalition the *grand coalition* N . The grand coalition represents the real situation where all products are distributed. Any other coalition E corresponding to a subset of N can be treated as a counterfactual scenario. These are hypothetical situations in which only some products are distributed by the mail carrier. For example, in the sub-coalition $\{S, M\}$, the mail carrier delivers only Small and Medium formats. We denote by $|E|$ the number of players in the coalition E .

The cost function on N is: $2^N \rightarrow \mathbb{R}$, which assigns to each coalition a worth $v(E) \in \mathbb{R}$ and satisfies $v(\emptyset) = 0$. It provides the best result that the players in a coalition E can achieve if they cooperate without the help of the other players. In the format game, the cost function gives the fixed costs generated by a coalition E . For example, $v(\{S, M\})$ is the lower fixed cost generated by the delivery of only the Small and Medium products.

We consider the hypothetical cost function presented in Table 1.

In this example, the joint distribution of all three formats of products allows to share costs and leads to a lower cost compared to a situation where each format would be distributed in a separate network: $v(\{S, M, L\}) < v(\{S\}) + v(\{M\}) + v(\{L\})$. After having defined the cooperative game, the total fixed costs (320) must be fully distributed among the postal products. To determine how to distribute the worth of the grand coalition among its members, cooperative game theory proposes several allocation rules, satisfying various desirable properties (or axioms).

3.1.2 The Shapley Value Applied to the Format Game

In cooperative game theory, the costs of the grand coalition are distributed among its members by an allocation rule. It is a function that gives to each product a part of the costs. We designate the collection of all cooperative games on player set N by V^N . Formally, an allocation rule f on V^N is defined by a function $f: V^N \rightarrow \mathbb{R}^N$ and associates with each cooperative game $(N, v) \in V^N$ an allocation $f(N, v) \in \mathbb{R}^N$.

The share of the total cost of each product $i \in N$ for its contribution to the format game (N, v) is the real number $f_i(N, v)$. The most well-known allocation rule is the Shapley value (Shapley 1953).

The Shapley value Sh_i for a product $i \in N$ is given by the following formula:

$$Sh_i(N, v) = \sum_{E \subseteq N \setminus \{i\}} \frac{|E|!(|N| - |E| - 1)!}{|N|!} (v(E \cup \{i\}) - v(E)).$$

The last part of this formula ($v(E \cup \{i\}) - v(E)$), corresponds to the marginal contribution of product i to the coalition E . The marginal contribution can be interpreted as an incremental cost, that is, the additional cost incurred by a coalition E if the product i joins it.

The Shapley value gives an allocation according to the incremental cost of the postal products. It appears that the Shapley value of a product is a weighted average of the product's contributions to the coalitions. The coefficient $|E|!(|N| - |E| - 1)! / |N|!$ indicates the weight of the coalition E in this average. It depends only on $|E|$. The best way to understand the Shapley value is to apply it. Recall that the set of players is given by $N = \{S, M, L\}$.

With Shapley's formula and Table 1, the fixed costs of Small are given by:

$$\begin{aligned} Sh_s(N, v) &= \frac{0!(3 - 0 - 1)!}{3!} (v(\{S\}) - v(\emptyset)) + \frac{1!(3 - 1 - 1)!}{3!} (v(\{S, L\}) - v(\{L\})) \\ &\quad + \frac{1!(3 - 1 - 1)!}{3!} (v(\{S, M\}) - v(\{M\})) \\ &\quad + \frac{2!(3 - 2 - 1)!}{3!} (v(\{S, L, M\}) - v(\{L, M\})) \end{aligned}$$

$$Sh_s(N, v) = \frac{1}{3}(100 - 0) + \frac{1}{6}(200 - 120) + \frac{1}{6}(230 - 140) + \frac{1}{3}(320 - 250) = 85.$$

In the same way, we obtain $Sh_M(N, v) = 105$ for the Medium and $Sh_L(N, v) = 130$ for the Large. The Large bears the greatest share of fixed costs and the Small the smallest one. This allocation takes into account all possible counterfactual scenarios, whereas the current allocation defined by the French postal regulator and implemented by La Poste (cf. Sect. 2.2) takes into account only the counterfactual scenarios in reference to the Small: $\{S\}$, $\{S, M\}$, $\{S, L\}$, $\{S, M, L\}$.

3.2 Delivery Speed Allocation Through an Airport Game

As explained below, the delivery speed allocation problem could be solved by using an airport game. In the last paragraph of this section, we will change the settings of the game to show the flexibility of such a model.

3.2.1 From Airport Game to Delivery Speed Game

To allocate the fixed costs of the outdoor delivery round, we will use an airport game renamed the delivery speed game (N, c) . The set of players is N . The players are the postal products differentiated by their delivery speed. The set of players is composed of several subsets $N = \cup_{i=1}^m N_i$. The subset N_i is the set of delivery speed products i with $N_i = \{1, \dots, m\}$. The number 1 corresponds to the set of the least expensive

Table 2 Cost function c

E	$\{D^7\}$	$\{D^3\}$	$\{D^1\}$	$\{D^7, D^3\}$	$\{D^7, D^1\}$	$\{D^3, D^1\}$	$\{D^7, D^3, D^1\}$
$c(E)$	1	3	6	3	6	6	6

products (regarding their delivery speed) and the number m to the set of the most expensive ones. The number of products in each subset is n_i hence the number of products in the delivery speed game is $n = \sum_{i=1}^m n_i$.

Currently, products are differentiated according to three levels of delivery speed $N = \{N_1, N_2, N_3\}$. The products delivered seven days after posting, D^7 , belong to the set N_1 , the products delivered three days after posting, D^3 , belong to the set N_2 and the products delivered one day before posting, D^1 , belong to the set N_3 . The D^7 products are the least expensive to distribute and the D^1 products are the most expensive.

The cost function $c(E)$ is equal to the delivery frequency required to comply with the highest delivery speed in the coalition E . If the postal operator organizes its delivery network for each product according to its level of delivery speed we have the following rounds:

- Delivery frequency of one day per week would be required to satisfy D^7 , the cost associated is $c_1 = 1$.
- Delivery frequency of one three days per week would be required to satisfy D^3 , the cost associated is $c_2 = 3$.
- Delivery frequency of six days per week would be required to satisfy D^1 , the cost associated is $c_3 = 6$.

In the counterfactual situation where the mail carrier delivers only the products D^7 and D^3 (coalition $\{D^7, D^3\}$), the cost is 3 because the product D^3 has the greatest need for delivery frequency.

In the same way, we obtain Table 2.

The 6 rounds per week, actually made by the mail carrier, must be well assigned among the three delivery speed levels.

3.2.2 Allocation Rules Applied to the Delivery Speed Game

To determine how to allocate the six rounds among the delivery speed levels, we will use a simplification of the Shapley value. We will also use the proportional rule to show its proximity to the current allocation.

(a) *The “simplification” of the Shapley value applied to the delivery speed game*

Littlechild and Owen (1973) proposed a simple expression for the Shapley value that applies to airport games. This formula has the advantage of being very easy to compute. The expression of the Shapley value $Sh_i^A(c)$ applied to an airport game is the following.

$$Sh_i^A(c) = \sum_{k=1}^i \frac{(c_k - c_{k-1})}{\sum_{i=k}^m n_i}.$$

Let c_k be the cost associated with the delivery speed level k and c_{k-1} the cost associated to the delivery speed level directly lower than k . By convention $c_0 = 0$. The difference $c_k - c_{k-1}$ can be interpreted as the incremental cost of delivering products with a higher speed level k . The first step is to equally split the fixed costs for the shortest delivery frequency among the number of postal products. Then, the incremental cost for the second shortest delivery frequency is equally split among the number of postal products except the number of postal products with the shortest delivery frequency. The process goes on until the incremental cost of the fastest delivery frequency is equally split among the number of postal products with the fastest delivery frequency. Using the data presented in Table 2, we obtain the following allocations:

$$Sh_1^A(c) = \frac{c_1}{n} = \frac{1}{3},$$

$$Sh_2^A(c) = \frac{c_1}{n} + \frac{(c_2 - c_1)}{(n_2 + n_3)},$$

$$Sh_2^A = \frac{1}{3} + \frac{(3 - 1)}{(1 + 1)} = \frac{1}{3} + \frac{2}{2} = \frac{4}{3},$$

$$Sh_3^A(c) = \frac{4}{3} + \frac{3}{1} = \frac{13}{3}.$$

The Shapley value allocates a share of the 6 weekly rounds to each delivery speed level i . Expressed as a percentage, the D^1 bears 72.22% of fixed costs, the D^3 bears 22.22% and the D^7 bears 5.56% of the fixed costs. Products with the greatest need of rounds, naturally, bear the largest share of the fixed costs.

Even if the allocation rule used is a simple expression for the Shapley value, its axioms still apply. All the fixed costs associated with 6 rounds are distributed among the postal products (efficiency). If two postal products have always the same needs in rounds then they get the same part of the fixed costs (equal treatment of equals). If a product is not delivered by the mail carrier, such as digital postal products, then it bears no fixed costs (null player). If the allocation is made every two years instead of every year there is no impact on the allocations (additivity).

(b) *The proportional rule applied to the delivery speed game*

It is possible to use other allocation rules such as the proportional rule. Formally, for delivery speed levels i and j belonging to the set of products N , the proportional rule PV_i is:

$$PV_i = \frac{c(\{i\})}{\sum_{j \in N} c(\{j\})} \times c(N),$$

with $c(\{i\})$ corresponding to the number of rounds needed to deliver products belonging to the category i and $c(N)$ the number of rounds needed for products belonging to the grand coalition. Applying this formula to the data in Table 2, we obtain the following allocations:

$$PV_1 = \frac{1}{10} \times 6 = 0.6$$

$$PV_2 = \frac{3}{10} \times 6 = 1.8$$

$$PV_3 = \frac{6}{10} \times 6 = 3.6.$$

The D^1 bears 60% of fixed costs, the D^3 bears 30% and the D^7 bears 10% of the fixed costs. The proportional rule gives the same percentage as the ARCEP's rule.

In the case of general cooperative problems, Amer et al. (2006) compared the proportional rule and the Shapley value. The proportional rule does not take into account most of the marginal contributions. *A contrario*, the Shapley value is always concerned with all marginal contributions without exception. The Shapley value shares the costs equitably, whereas the proportional rule shares it proportionally to the individual cost. The proportional rule satisfies the axioms of efficiency, null player and equal treatment of equals but it does not satisfy additivity. However, to use the Shapley value, all counterfactual scenarios must be available and they are not easy to get. Consequently, the proportional rule may be a good allocation rule. The simplicity of the proportional rule might also explain why it is often applied.

3.2.3 Changing the Game Settings

The use of a systematic and operational method such as the Shapley value allows to run several simulations by changing one setting. For instance, the number of products and the delivery speed target could be modified.

(a) *Modification of the number of products*

In our game, the number of products in each delivery speed level is implicitly equal to 1. Alternatively, one could take into account the volume of each category when they differ.

We consider hypothetical volumes in each delivery speed level:

$$n_1 = 300$$

$$n_2 = 350$$

$$n_3 = 280$$

$$n = 930.$$

Using the new settings, we obtain the following allocations:

$$Sh_{A_1}(c) = \frac{c_1}{n} = \frac{1}{930} = 0.001075,$$

$$Sh_{A_2}(c) = \frac{c_1}{n} + \frac{(c_2 - c_1)}{(n_2 + n_3)},$$

$$Sh_{A_2}(c) = \frac{1}{930} + \frac{2}{630} = 0.004249,$$

$$Sh_{A_3}(c) = \frac{c_1}{n} + \frac{(c_2 - c_1)}{(n_2 + n_3)} + \frac{(c_3 - c_2)}{n_3}$$

$$Sh_{A_3}(c) = \frac{1}{930} + \left(\frac{1}{930} + \frac{2}{630} \right) + \frac{3}{280} = 0.014964.$$

The following allocations are the share of the cost of the 6 rounds allocated to each product of a given delivery speed level. After multiplying the Shapley value with the volume, we obtain the share of the 6 rounds associated with each delivery speed type. The D^7 bears 0.32 of the 6 rounds, the D^3 bears 1.49 and the D^1 bears 4.19 of the 6 rounds. In percentages, the D^1 bears 70% of fixed costs, the D^3 bears 25% and the D^7 bears 5% of the fixed costs.

(b) *Modification of the delivery speed*

The Postal Directive⁶ requires that the collection/delivery of postal products belonging to the universal service scope must be done at least five working days each week and imposes minimal specifications on those products. However, each Member State is free to define the precise content of the catalogue of products belonging to the universal service, in particular in terms of delivery speed. For example, the Italian, Finnish and Danish governments no longer consider D^1 products as part of the universal service.

In our model, the removal of the D^1 products changes several elements of the game. There are now only two players, D^7 and D^3 . The cost function associated with each type of delivery speed is modified: 1 round is still required for D^7 and 3 rounds for D^3 . The maximum number of rounds per week is now 3. We assume that D^1 traffics is shifted to the delivery speed level with the shortest delivery speed. The demand for mail is assumed to be inelastic to the delivery speed, a change in delivery speed does not lead to a change in traffic. This is an assumption, made only

⁶ 97/67/EC amended by Directives 2002/39/EC and 2008/6/EC.

to see the effects of removing a delivery speed level in the costs allocation. The new elements of the game lead to the following allocations:

$$Sh_{A_1}(c) = \frac{c_1}{n} = \frac{1}{930} = 0.001075,$$

$$Sh_{A_2}(c) = \frac{c_1}{n} + \frac{(c_2 - c_1)}{n_2},$$

$$Sh_{A_2}(c) = \frac{1}{930} + \frac{2}{630} = 0.004249.$$

The share of the 3 rounds per products allocated to the D^7 and D^3 are the same because the rounds attached to each product did not change. However, the volumes and the total number of rounds change, thus the D^7 bears 0.32 of the 3 rounds and the D^3 bears 2.68 of the 3 rounds. In percentages, the D^7 bears 11% of fixed costs and the D^3 bears 89% of the fixed costs.

4 Conclusion

Cooperative game theory could be used to allocate the outdoor delivery fixed costs either by taking into account of the delivery speed of the products or by taking into account their formats. Delivery speed fixed costs could be allocated by using games similar to airport games. For airports, the length of the airstrip is determined by the largest aircraft; in the postal case, the size (and the cost) of the delivery infrastructure is determined by the fastest mail product present in the coalition. It is also possible to allocate delivery fixed costs according to the format of the various products delivered by using a classical cooperative game. It should be noted that it is not possible to combine these two games because their cost functions and players are different.

For both types of allocation problems, we used the Shapley value because it satisfies several axioms that can be interesting for postal cost allocation. The Shapley value is fair because it leads to each product does not incur a cost higher than they would pay by themselves, and may be useful to justify compliance with competition law. Furthermore, compared to the current allocations, the Shapley value has some advantages: it considers all existing counterfactual scenarios and takes into account incremental costs. The Shapley value allows to run several simulations by changing one setting like the number or the delivery speed of the products. In a general way, the allocation rules derived from game theory have the advantage of being systematic, operational and scientifically recognized. Nevertheless, the necessary data, as the counterfactuals, must be available.

In this work, we apply an airport game to allocate the delivery speed fixed costs. This was possible because the cost function of the airport game fits well with the logic behind the ARCEP's allocation rule. We applied two different allocation rules

to this game: the proportional rule and the Shapley value. The proportional rule gives the same results than the ARCEP's rule, and the Shapley value provides a different allocation, but both rules provide a cost allocation that ranks the three delivery speed categories in the same order: D+1 products bear a higher share of outdoor delivery fixed costs, while D+7 products bear a lower share of those costs. Each allocation rule has its advantages and disadvantages. The proportional rule does not take into account most of the marginal contributions, but it is relatively easy to apply. *A contrario*, the Shapley value takes into account all marginal contributions without exception, but it requires using all possible counterfactual scenarios for every combination of postal product categories, and they are not easy to get. The delivery speed game developed in this paper is based on a simple framework that could be enriched, in order to add delivery constraints. For example, the delivery issue of some postal products, such as newspapers or advertisements, on a specific day (at the beginning or end of a week) could be investigated in future work.

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On Efficient Rate Design



Edward S. Pearsall

Abstract The paper employs a form of algebra for treating certain linear integral equations to derive results that apply to the problem of designing efficient rates when demand and cost are continuous functions of a single hedonic property such as weight per piece. An efficient rate design for a category of mail yields a prescribed contribution to cover non-variable costs with the least sacrifice in social welfare. The paper applies algebra to derive two simple principles for calculating efficient rates and demand volumes as continuous functions of the hedonic property. The paper includes a worked-out example applying the principles to derive a function relating efficient rates to weight per piece for single-piece bound printed matter mail.

Keywords Efficient rates · Hedonic price equation · Rate design · Linear integral equations · Ramsey pricing

1 Introduction

Schedules relating rates to hedonic properties such as weight per piece, distance transported, speed of delivery and pre-sortation levels are standard features of postal tariffs.¹ At present U.S. Postal Service (USPS) tariffs are designed following rules of thumb relating the rates to the incremental costs of the hedonic properties. For example, the USPS tariff for bound printed matter (BPM) consists of schedules that appear to be step-wise approximations of linear equations relating marginal cost to

¹ The underlying structure of the U.S. postal tariff is that of a hedonic price equation (Fenster et al. 2006).

The author is an occasional consultant to the U.S. Postal Regulatory Commission (PRC), however, the views expressed in the paper are solely attributable to the author.

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piece weight. The approximations are scaled to produce a planned excess of revenue over the total attributable cost at predicted volumes.

But a rate schedule that efficiently recovers a given contribution to non-variable cost should also account for properties of demand that go beyond the net revenue that is generated. A rate design should be efficient in the sense that it yields the prescribed contribution with the least sacrifice in social welfare. Welfare from postal service includes the producer's surplus (the post's profit) and consumers' surplus (the area beneath the demand curve lying above the price paid). Schedules of rates based upon efficient designs will have the second-best properties of Ramsey/Boiteux prices.

In this paper rate designs are represented naturally as continuous functions of a hedonic property, and demand and cost are approximated as linear integral equations of the rate function and the property. Within this context, an efficient rate design will obey two simple principles. First, the efficient price function will be a weighted average of the marginal cost function and the zero-volume price function (the price function yielding zero demand at all levels of the hedonic property). And, second, the volumes for the efficient price function will be proportional to the volumes that would result from using marginal cost as the price function. These principles may be employed to quickly and easily design efficient postal rate schedules when the non-variable cost contribution is predetermined.

The principles are derived using algebraic methods that specifically apply to linear integral equations defined over the unit interval.² An Appendix summarizes the essential elements of the algebraic method which is more formally and completely described in Pearsall (2022). Section 2 presents the problem of finding the efficient price function as a classical problem from the calculus of variations. The efficient price function is shown to be the solution to a Euler equation that is a linear integral equation. In Sect. 3 the algebraic methods are used to solve the Euler equation to derive the two propositions describing the necessary properties of an efficient rate design. In Sect. 4 it is shown in principle how the propositions may be employed to design an efficient price function. An illustrative numerical application deriving rates as a function of weight per piece for single-piece bound printed matter (BPM) is presented in Sect. 5. The example demonstrates that the USPS practice of scaling marginal cost yields inefficient rate designs. Several observations regarding the general applicability of the mathematics are made in Sect. 6. Section 7 concludes the paper.

² Previously the algebra has been applied by Clendenin et al. (2018) to relate the demand for postal service in the U.S. to the business cycle.

2 Efficient Hedonic Pricing

The algebra of the Appendix is applied to maximize an integral following “classical” methods from the calculus of variations.³ We seek to maximize welfare subject to a net revenue condition for a category of services that differ only with respect to a single hedonic property. The classical method is to solve a Euler equation for a Lagrangian formed from integral equations for welfare and the revenue condition. The Euler equation itself turns out to be a linear integral equation in which the unknown one-variable function is a hedonic price equation. The solution to the Euler equation is a price function with Ramsey-Boiteux properties that continuously relates the postal rate to an index of the hedonic property.

We assume that suitable demand and cost models are available for the application. The models must be linear integral equations conforming to one of the forms of the “canonical” linear integral equation of the Appendix. The models may only employ real-valued one- and two-variable functions that are representable as linear and quadratic forms using a predetermined vector function $f(u)$. $f(u)$ is a column vector defined over the unit interval $[0,1]$ which is the transformed range of the allowable values of the hedonic property. The elements of $f(u)$ are elementary real-valued one-variable functions of u that are linearly independent. For example, $f(u)' = [1 \ u \ u^2 \ \dots \ u^n]$.⁴

A suitable general demand model is:

$$Q(u) = \alpha(u) - \beta \int_0^1 [I(u, v) - (\gamma/\beta)K(u, v)]P(v)dv \text{ for } u \in [0, 1]$$

The component functions are the demand volume $Q(u) = f(u)'q$, the equation intercept $\alpha(u) = f(u)'\alpha$, the “identity” function $I(u, v) = f(u)'C^{-1}f(v)$, the coefficient function $K(u, v) = f(u)'Kf(v)$, and the unknown hedonic price function $P(u) = f(u)'p$. q, α and p are real column vectors; K is a real symmetric matrix; and C is a positive definite matrix whose elements are composed of the definite integrals of the squares and cross-products of the elements of the vector function $f(u)$ taken over $u \in [0, 1]$.

The idea behind the demand model is to represent demand as being composed of three effects each represented by a term on the right-hand side of the demand equation. The intercept $\alpha(u)$ is the demand that would result from setting $P(u) = 0$ for all $u \in [0, 1]$. The term $-\beta \int_0^1 I(u, v)P(v)dv = -\beta P(u)$ is an “own-price” effect. It is the effect on the demand at u of the price at u . Normally, we would expect $\beta > 0$, a higher own-price will dampen demand for the specific service that is being purchased. The term $\int_0^1 \gamma K(u, v)P(v)dv$ is a combined “cross-price” effect. Services that differ just with respect to the amounts of the hedonic property represented by u and v are most likely to be substitutes for each other with a degree

³ A good short primer for economists on this subject is Lancaster (1968), Mathematical Review 11.

⁴ $f(u)'$ Denotes the row vector transpose of $f(u)$.

of substitutability depending upon the magnitude of the difference between u and v . With $\gamma > 0$, we have $K(u, v) > 0$ for substitutes and $K(u, v) < 0$ for complements. Finally, we would usually expect the own-price effect to be larger in magnitude than the cross-price effect, so that $0 < \gamma < \beta$.

The demand model may be multiplied by the scalar $-1/\beta$ and rearranged in the form of the canonical equation of the Appendix:

$$(-1/\beta)Q(u) - \int_0^1 [I(u, v) - (\gamma/\beta)K(u, v)]P(v)dv = (-1/\beta)\alpha(u) \text{ for } u \in [0, 1]$$

Note that, $I(u, v) - (\gamma/\beta)K(u, v)$, is a two-variable function of the form $I(u, v) - A(u, v)$ with an inverse function of the form $I(u, v) + B(u, v)$ as described in the Appendix. Also, the canonical equation has a non-zero scalar parameter $-1/\beta$.

The cost model for the category of mail is:

$$C = C_f + \int_0^1 M(u)Q(u)du.$$

C_f is the fixed component of the cost and may include a stipulated portion of the post's total non-variable cost. $M(u)$ is the marginal cost function for the category and is assumed to be representable as $f(u)'m$ with a real vector m . The integral is the variable cost attributable to the category of mail.

The inverse demand function is obtained by solving the demand model for the hedonic price function $P(u)$. We do this by multiplying the integral equation for $Q(u)$ by the inverse of the non-singular two-variable function $I(u, v) - A(u, v)$.

$$P(u) = (1/\beta) \int_0^1 [I(u, v) + B(u, v)][\alpha(v) - Q(v)]dv \text{ for } u \in [0, 1].$$

The inverse demand function with $Q(u) = 0$ gives us the "zero-volume" price function:

$$P_0(u) = (1/\beta) \int_0^1 [I(u, v) + B(u, v)]\alpha(v)dv \text{ for } u \in [0, 1].$$

Efficient Ramsey-Boiteux prices are derived by maximizing welfare subject to a zero-profit condition. Welfare is defined as the sum of the consumers' surplus and the producer's profit for a single category of mail. The consumers' surplus for a member of the category with a given amount u of the hedonic property is $Q(u)[P_0(u) - P(u)]/2$. To obtain the combined consumers' surplus for the entire category we integrate over all possible amounts of the hedonic property: $\int_0^1 Q(u)[P_0(u) - P(u)]du/2$. The producer's profit is $\int_0^1 Q(u)[P(u) - M(u)]du - C_f$. Therefore, welfare is the integral equation:

$$W = \int_0^1 Q(u)[P_0(u)/2 - P(u)/2]du + \int_0^1 Q(u)[P(u) - M(u)]du - C_f.$$

Collecting terms under the integral:

$$W = \int_0^1 Q(u)[P_0(u)/2 + P(u)/2 - M(u)]du - C_f.$$

We construct the Lagrangian for the Euler equation by subtracting from welfare the producer's profit times a multiplier θ :

$$W_\theta = \int_0^1 Q(u)[P_0(u)/2 + P(u)/2 - M(u)]du - \theta \int_0^1 Q(u)[P(u) - M(u)]du - (1 - \theta)C_f$$

After we have again collected terms under the integral, the Lagrangian is:

$$W_\theta = \int_0^1 Q(u)[P_0(u)/2 + (1 - 2\theta)P(u)/2 - (1 - \theta)M(u)]du - (1 - \theta)C_f.$$

The Euler equation for this application is just $dW_\theta/dP = 0$. Written out:

$$\int_0^1 \left[\frac{dQ}{dP} \right] [P_0(v)/2 + (1 - 2\theta)P(v)/2 - (1 - \theta)M(v)]dv + Q(u)(1 - 2\theta)/2 = 0 \text{ for } u \in [0, 1]$$

The derivative within the integral is $\left[\frac{dQ}{dP} \right] = -\beta[I(u, v) - A(u, v)]$. We also have $Q(u) = \alpha(u) - \beta \int_0^1 [I(u, v) - A(u, v)]P(v)dv$. Substituting these terms into the Euler equation:

$$-\beta \int_0^1 [I(u, v) - A(u, v)][P_0(v)/2 + (1 - 2\theta)P(v)/2 - (1 - \theta)M(v)]dv \text{ for } u \in [0, 1].$$

Again, combining terms within the integral:

$$-\beta \int_0^1 [I(u, v) - A(u, v)][P_0(v)/2 + (1 - 2\theta)P(v) - (1 - \theta)M(v)]dv + (1 - 2\theta)\alpha(u)/2 = 0 \text{ for } u \in [0, 1]$$

The efficient price function, $P(u)$, solves the Euler equation.

3 The Derivation of Propositions 1 and 2

The Euler equation is a linear integral equation that is amenable to the algebra of the Appendix. We apply the algebra to prove two propositions providing simple characterizations of the solution to the Euler equation.

Proposition 1 $P(u) = \mu M(u) + (1 - \mu)P_0(u)$, the Ramsey-Boiteux price function is a weighted average of the marginal cost function $M(u)$ and the zero-volume price function $P_0(u)$.

Proof Multiply the Euler equation by $(-1/\beta)[I(u, v) + B(u, v)]$ to obtain:

$$[P_0(u)/2 + (1 - 2\theta)P(u) - (1 - \theta)M(u)] \\ - (1/\beta) \int_0^1 [I(u, v) + B(u, v)]\alpha(v)dv(1 - 2\theta)/2 = 0$$

Recall that $P_0(u) = (1/\beta) \int_0^1 [I(u, v) + B(u, v)]\alpha(v)dv$ so the equation simplifies to:

$$[P_0(u)/2 + (1 - 2\theta)P(u) - (1 - \theta)M(u)] - (1 - 2\theta)P_0(u)/2 = 0.$$

Solve for $P(u) = [(1 - \theta)M(u) - \theta P_0(u)]/(1 - 2\theta)$. Set $\mu = (1 - \theta)/(1 - 2\theta)$ to obtain the equation $P(u) = \mu M(u) + (1 - \mu)P_0(u)$.

Proposition 2 $Q(u) = \mu Q_m(u)$, The Ramsey-Boiteux volume function is proportional to the demand function corresponding to marginal cost pricing, denoted $Q_m(u)$.

Proof Insert the Ramsey-Boiteux equation for $P(u)$ into the demand function to get:

$$Q(u) = \alpha(u) - \beta \int_0^1 [I(u, v) - A(u, v)]\{[(1 - \theta)M(v) - \theta P_0(v)]/(1 - 2\theta)\}dv.$$

For the demand function corresponding to marginal cost pricing:

$$Q_m(u) = \alpha(u) - \beta \int_0^1 [I(u, v) - A(u, v)]M(v)dv$$

and for the zero-volume price function:

$$0 = \alpha(u) - \beta \int_0^1 [I(u, v) - A(u, v)]P_0(v)dv.$$

Substituting both relations into the demand function and simplifying yields:

$$Q(u) = (1 - \theta)Q_m(u)/(1 - 2\theta),$$

which is $Q(u) = \mu Q_m(u)$ with $\mu = (1 - \theta)/(1 - 2\theta)$ as in Proposition 1.

4 Designing Efficient Prices

Propositions 1 and 2 reduce the problem of determining the efficient hedonic price function, $P(u)$, to finding a weight μ that yields net revenue just sufficient to cover a predetermined cost contribution, i.e., so that $\int_0^1 Q(u)[P(u) - M(u)]du - C_f = 0$. We may use the equations from Propositions 1 and 2 to substitute for the unknown functions $P(u)$ and $Q(u)$ to obtain an integral equation in which the only unknown is μ :

$$(1 - \mu)\mu \int_0^1 [P_0(u) - M(u)]Q_m(u)du - C_f = 0.$$

The functions $P_0(u) - M(u)$ and $Q_m(u)$ are both single-variable functions of the form $f(u)'a$ and $f(u)'b$. The integral is a multiplication together of two such functions that leaves a scalar result as shown in the Appendix.

Let $R_0 = \int_0^1 [P_0(u) - M(u)]Q_m(u)du$ denote the value of the integral, we then have: $(1 - \mu)\mu R_0 - C_f = 0$. This is a quadratic equation with two roots $\mu = 1/2 \pm (\sqrt{1 - 4C_f/R_0})/2$. If the roots are complex numbers, then there is no real-valued function $P(u)$ that will yield a net revenue sufficient to cover the cost contribution C_f . If the two roots are real, then the larger root maximizes welfare because it leads to a lower price throughout the range of u with $P_0(u) \geq M(u)$.

The multiplier θ would normally be expected to be a negative number. The corresponding range for μ is $1/2 \leq \mu \leq 1$. For $\theta = 0$, $\mu = 1$ and revenue just equals variable cost for the category. This is the outcome when there is no contribution to non-variable cost, i.e., $C_f = 0$. For $\theta < 0$, then $\mu < 1$ and the revenue generated by $P(u)$ is greater than the variable cost attributable to the category of mail. This outcome occurs when the cost contribution is positive, $C_f > 0$, and feasible. As θ goes to $-\infty$, $P(u)$ approaches $(P_0(u) + M(u))/2$ and the volume function $Q(u)$ approaches $Q_m(u)/2$. This outcome maximizes the cost contribution. A positive multiplier $\theta > 0$ will occur when the net revenue contribution from the category turns negative, i.e., for $C_f < 0$.

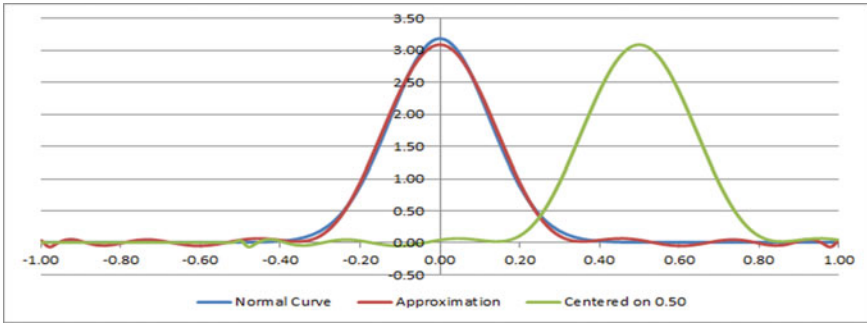


Fig. 1 Normal density approximation

5 Example: Weight Per Piece

Many of the rate schedules found in the USPS tariff relate a rate to the weight per piece for a category of mail such as single-piece BPM mail.⁵ The approximate USPS practice for designing these rates is to proportion the price function $P(u)$ to marginal cost so that net revenue just covers the cost contribution C_f .⁶ Here it is shown by example that this method will result in an inefficient rate design except in the special case of $C_f = 0$.

An actual application of the math from the prior sections must begin with the selection of a vector function $f(u)$ for performing the algebra described in Sects. 2 and 3. The object of the choice is an $f(u)$ that will accurately approximate the various one- and two-variable functions employed in the demand and cost models of Sect. 2. The selection “front ends” the calculation of integrals by predetermining the matrix C and its inverse C^{-1} . A satisfactory choice for this example is a vector of powers of u , $f(u)' = [1 \ u \ u^2 \ \dots \ u^{16}]$. C is then a 17 by 17 symmetric matrix with elements:

$$c_{ij} = \int_0^1 f_i(u) f_j(u) du = 1/(i + j - 1) \text{ for row/column } i, j = 1, \dots, 17$$

The function $K(u, v) = f(u)' K f(v)$ is chosen to approximate a normal density with a random variable u , a mean v , and a given standard deviation. The blue curve in Fig. 1 traces the normal density with a zero mean and a standard deviation of 0.125 for example. An approximation is obtained by making least-squares fit the normal density using elements of the vector $f(u)$ as explanatory variables. $f(u)' \hat{b}$ is the fitted function for the normal curve with a zero mean. The normal density is symmetric so it is only necessary to include in the fitted equation the elements of $f(u)$ that are even powers of u . The red curve in Fig. 1 is the fitted approximation. As we can see, the choice of $f(u)$ leads to a fit that is quite accurate far into the tails of the normal distribution.

⁵ Typically, there is a separate schedule for each geographic zone to which BPM mail might be sent. The demand functions for mail sent to destinations in different zones are treated as independent.

⁶ Some further adjustments are often made to rates for the lightest and heaviest pieces in order to avoid conflicts with other categories of mail.

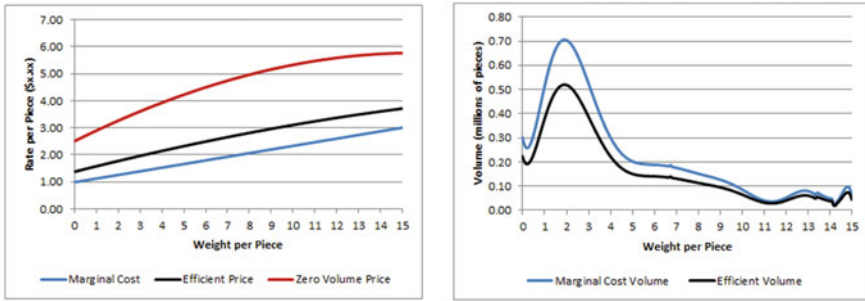


Fig. 2 (a) Rates and (b) volumes

Changes in v shift the normal curve along the horizontal axis of Fig. 1. The green curve shows the fitted function for $v = 0.5$. The normal density approximation with a non-zero mean v is $K(u, v) = f(u - v)'\hat{b}$. To obtain the matrix K so that $K(u, v) = f(u)'Kf(v)$ we expand $f(u - v)'\hat{b}$ and collect the coefficients of the product and cross-product terms in the corresponding cells of K . $K(u, v)$, fitted to the normal density, has the properties cited in Sect. 2 for representing cross-product effects. The cross-product effect between services with different weights per piece as indexed by u and v is positive (or very close to zero) for u, v in the range $[0, 1]$, the effect reaches a maximum where $u = v$, and the effect diminishes uniformly and symmetrically as the difference $u - v$ increases in magnitude.

The function $K(u, v)$ is embedded in the demand model for the application. The other components of the demand model are the parameters β and γ , and the intercept function $\alpha(u) = f(u)'\alpha$. The demand model for the example uses $\beta = 1$ and $\gamma = 0.5$. The parameter vector α of the intercept function was chosen to reproduce the general shape of plots of volumes versus weight per piece for single-piece BPM mail sent over varying distances at rates taken from a recent USPS tariff.

The assumed marginal cost function for example is linear: $M(u) = 1.0 + 2.0u$. The chosen cost contribution for the example is $C_f = 20.0$.

Before either proposition can be applied it is necessary to derive several more functions and parameters appearing in the algebra of the previous sections. These are:

$I(u, v) + B(u, v)$: The inverse of the two-variable function $I(u, v) - (\gamma/\beta)K(u, v)$ as it appears in the demand model. This inverse function was calculated according to the direct inversion method described in Pearsall (2022).

$P_0(u)$: the zero-volume price function. It is calculated from the equation for the inverse price function evaluated for $Q(u) = 0$. From before: $P_0(u) = (1/\beta)\int_0^1 [I(u, v) + B(u, v)]\alpha(v)dv$. The right-hand side of the equation is a two-variable by one-variable function multiplication using the algebra of the Appendix. $P_0(u)$ is the red curve in Fig. 2a.

$Q_m(u)$: the marginal cost volume function. From before: $Q_m(u) = \alpha(u) - \beta\int_0^1 [I(u, v) - (\gamma/\beta)K(u, v)]M(v)dv$. The right-hand side of this equation is

another one- by two-variable function multiplication. $Q_m(u)$ is the blue curve in Fig. 2b.

R_o : a scalar used to derive the weight μ . R_o is obtained by multiplying together two one-variable functions, i.e., $R_o = \int_0^1 [P_0(u) - M(u)] Q_m(u) du$. For the example, $R_o = 103.24$.

μ : the weight for Propositions 1 and 2. From before, $\mu = 1/2 + (\sqrt{1 - 4c_f/R_o})/2$. For the example, $\mu = 0.737$. The corresponding value for the Lagrangian multiplier is: $\theta = -0.554$.

Figure 2a illustrates the application of Proposition 1 to obtain the efficient price function. Figure 2b illustrates the application of Proposition 2 to derive the corresponding efficient volume function. For both graphs, weight per piece has been rescaled from the unit interval to pounds.

The equation for the efficient price function from Proposition 1 is $P(u) = \mu M(u) + (1 - \mu)P_0(u)$. $P(u)$ is the black curve graphed in Fig. 2a, $M(u)$ is the blue line, and $P_0(u)$ is the red curve. Figure 2a demonstrates that proportioning rates to marginal cost does not yield efficient rate designs. The marginal cost curve is a straight line but the graph of the efficient price function is visibly a concave curve.

The equation for the efficient volume function from Proposition 2 is $Q(u) = \mu Q_m(u)$. $Q(u)$ is the black curve graphed in Fig. 2b. $Q_m(u)$ is the blue curve showing the volumes that would occur if the marginal cost function was installed as the price function. The two curves roughly track the patterns of volume versus weight per piece for single-piece BPM mail with a peak at around 2 lbs. and an upper tail that diminishes almost to zero for weights above 10 lbs per piece.

6 Further Thoughts

The mathematics and example of the previous sections rely upon several assumptions that are essential for the algebraic method and its application to a postal tariff. How restrictive are these assumptions?

First, the demand and cost functions are assumed to be linear integral equations. However, the math remains valid for demand and cost functions that are approximated as linear integrals in the vicinity of the solution to the Euler equation of Sect. 2. Then, the Euler equation formed from linear approximations in the region of the solution remains a necessary condition for efficiency. Propositions 1 and 2 remain valid and may be used as described to derive the efficient price function. In practice, it should be possible to design efficient rates for non-linear demand and cost equations by iteratively recalculating linear approximations at interim solutions and repeating the calculations of Sects. 3 and 4.

A second limitation of the previous sections is the assumption that there is only a single hedonic property. Adding hedonic properties complicates the algebra but may not fundamentally alter the results of Sects. 3 and 4. That is, the generalized mathematics may yield multi-property versions of Propositions 1 and 2, and no

change in the formula for the multiplier μ . If this proves to be so, then designing rates for multi-property categories of mail is a straightforward extension of the method demonstrated in Sect. 5.

Third, it is noteworthy that the limitations the algebra of the Appendix imposes on the selection of the real vector function $f(u)$ are of little practical importance. They do not preclude the selection of elementary functional elements that enable satisfactory approximations of almost any continuous real-valued one- or two-variable function. In particular, they accommodate standard approximations such as Maclaurin's and Fourier series. Furthermore, $f(u)$ may be lengthened by adding elements to provide as much accuracy as is needed for applications.

Fourth, the fixed range $u \in [0, 1]$ is unimportant since a quantitative measure of an actual hedonic property with a finite range can always be linearly transformed into a real variable lying within $[0, 1]$.

Finally, the information requirements for efficient rate design are similar but technically more exacting than the requirements for USPS's apparent current practice. In principle, both require estimates of demand and cost as functions of a hedonic property for a specific category of mail. The mathematics performed in Sect. 2 to derive efficient rates presumes furthermore that the demand function conforms to a specific kind of linear integral equation, whereas USPS's rule makes no specific assumption about the form of the demand function. However, the demand function described in Sect. 2 is a general linear form that should be sufficiently adaptable to provide a basis for most actual postal applications.

7 Conclusion

An inefficient rate design leaves an uneaten free lunch in the form of a possible improvement in social welfare that may be gained with no sacrifice to a post's net income. The USPS tariff creates such opportunities because USPS designs rates without correctly accounting for demand. Basically, USPS' rate designs scale the marginal cost function to achieve a specified aggregate net revenue. The proven results and example of this paper demonstrate that this method will yield inefficient designs except under very special circumstances.

In any single instance, the free lunch left by the USPS method is likely to be meager, but the U.S. postal tariff includes a large number of such instances.

The paper employs a form of algebra for linear integral equations taken from Pearsall (2022) to derive several results that apply to the problem of designing efficient rates when demand and cost are continuous functions of a single hedonic property. The mathematics produces two simple principles denoted Propositions 1 and 2 for deriving efficient rates and demand volumes as functions of the hedonic property. The paper includes a worked-out example of the design of an efficient rate function for single-piece BPM mail.

Appendix: The Basics of the Algebraic Method

The algebra employs real-valued one- and two-variable functions that are representable as linear and quadratic forms using a predetermined column vector function $f(u)$ defined over the unit interval $u \in [0,1]$. The elements of $f(u)$ are elementary real-valued one-variable functions of u that are linearly independent in $[0,1]$. The transpose of $f(u)$ is a row vector function denoted $f(u)'$. For example, $f(u)' = [1 \ u \ u^2 \ \dots \ u^n]$. It is also required that the squares and cross-products of the elements of $f(u)$ be integrable over $[0,1]$. Depending upon the context, the single variable may be designated as t , u or v . An example of a linear form is the one-variable functional $f(u)'a$, a is a real column vector; an example of a quadratic form is the two-variable functional $f(u)'Af(v)$, A is a real square matrix.

The algebra consists of a set of basic operations applicable to linear integral equations that are analogous to those of matrix algebra. The operations of addition, subtraction and scalar multiplication are all defined in the usual way. The operation of multiplication for functions is defined as a definite integral taken over $[0,1]$. To multiply together two one-variable functions, say $f(u)'a$ and $f(u)'b$, we form $f(t)'af(t)'b$, integrate over $t \in [0, 1]$ and simplify to obtain the scalar result $a'Cb$ as follows:

$$\int_0^1 f(t)'af(t)'bdt = \int_0^1 a'f(t)f(t)'bdt = a' \left[\int_0^1 f(t)f(t)'dt \right] b = a'Cb.$$

C is a positive definite matrix whose elements are composed of the definite integrals of the squares and cross-products of the elements of the vector function $f(t)$ taken over $t \in [0, 1]$.

When we multiply a one-variable function, $f(t)'b$, by a two-variable function, $f(u)'Af(t)$, the result is another one-variable function that is also a linear form. Again, we form $f(u)'Af(t)f(t)'b$, take the definite integral and simplify:

$$\int_0^1 f(u)'Af(t)f(t)'bdt = f(u)'A \left[\int_0^1 f(t)f(t)'dt \right] b = f(u)'ACb.$$

ACb is a column vector so $f(u)'ACb$ is a one-variable function with a linear form.

Multiplication of a two-variable function, $f(t)'Bf(v)$, by another two-variable function, $f(u)'Af(t)$, results in a two-variable function that is also a quadratic form:

$$\int_0^1 f(u)'Af(t)f(t)'Bf(v)dt = f(u)'A \left[\int_0^1 f(t)f(t)'dt \right] Bf(v) = f(u)'ACBf(v).$$

ACB is a square matrix.

The two-variable function $I(u, v) = f(u)'C^{-1}f(v)$ is the *identity* function. When any one- or two-variable function is multiplied by the identity function the result of the operation is the same function:

$$\int_0^1 f(u)'C^{-1}f(t)f(t)'Bf(v)dt = f(u)'C^{-1}\left[\int_0^1 f(t)f(t)'dt\right]Bf(v) = f(u)'Bf(v).$$

Note that $I(u, v)$ is dependent upon the selection of $f(u)$.

A two-variable function $A(u, v)$ is *symmetric* if $A = A'$, i.e. if A is a symmetric matrix, then $A(u, v) = A(v, u)$. $A(u, v) = f(u)'Af(v)$ is *non-singular* if it has a non-singular A .

As with matrix algebra, the operation of division is defined as multiplication by an inverse. When a two-variable function is multiplied by its inverse the result is the identity function, $I(u, v)$.

The algebra is used to solve a one-dimensional linear integral equation defined over the unit interval. This “canonical” equation is:

$$\lambda y(u) - \int_0^1 f(u)'Kf(v)y(v)dv = f(u)'x, u \in [0, 1].$$

$y(u)$ is an unknown one-variable function, $f(u)'Kf(v)$ is a two-variable function called the “kernel” whose components are all predetermined, and $f(u)'x$ is a one-variable function that is also predetermined. All of the components of the canonical equation are real-valued in $[0,1]$. Also, depending upon the application, λ may be a real scalar or a variable. Any solution to the canonical equation must take the linear form $y(u) = f(u)'y$. So, solving the canonical equation reduces to finding a real vector y and, sometimes, λ .

We may think of the canonical equation as defining several possible relationships between an unknown dependent function, $y(u)$, and a known independent function $f(u)'x$. When λ is a scalar, we have a relationship that is analogous to a simple matrix equation with λ and $f(u)'Kf(v)$ serving as coefficients of $y(u)$. When λ is variable and we set $x = 0$ we have an eigenvalue problem whose solutions establish the behavioral properties of the linear model.⁷

In the particularly simple case of $\lambda = 0$ and K non-singular, the algebra applies directly. The canonical equation becomes:

$$-\int_0^1 f(u)'Kf(v)y(v)dv = f(u)'x \text{ for } u \in [0, 1].$$

We may solve the canonical equation by pre-multiplying each side by the inverse of the function $-f(u)'Kf(v)$. This inverse is $-f(u)'C^{-1}K^{-1}C^{-1}f(v)$. So:

$$y(u) = -f(u)'C^{-1}K^{-1}x = f(u)'y$$

with $y = -C^{-1}K^{-1}x$.

When $\lambda \neq 0$ is a scalar, some additional manipulation is needed to solve the canonical equation. We divide the equation through by λ and multiply $y(u)$ by the

⁷ The solution to the eigenvalue problem is described in Pearsall (2022).

identity function:

$$\int_0^1 f(u)'C^{-1}f(v)y(v)dv - (1/\lambda)\int_0^1 f(u)'Kf(v)y(v)dv = (1/\lambda)f(u)'x.$$

Collecting terms within the integral on the left-hand side:

$$\int_0^1 f(u)'[C^{-1} - (1/\lambda)K]f(v)y(v)dv = (1/\lambda)f(u)'x.$$

Let $A = (1/\lambda)K$. To solve this equation, we multiply both sides of the equation by the inverse of the function $f(u)'[C^{-1} - A]f(v)$. This is a two-variable function of the general form $I(u, v) - A(u, v)$. It is shown in Pearsall (2022) that the inverse function is of the form $I(u, v) + B(u, v)$. Specifically, the inverse function is $f(u)'[C^{-1} + A(I - CA)^{-1}]f(v)$. Therefore: $y(u) = f(u)'[I + BC]x = f(u)'y$ with $B = A(I - CA)^{-1}$.

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Measuring and Communicating a Universal Service Provider's Wider Economic Value: Swiss Post's Example



Felix Gottschalk and Alexandra Lehmann

Abstract Postal operators, particularly when providing Universal Services, generate wider economic value in various ways. This article discusses different approaches to measuring this wider economic value. It sets out a conceptual framework that makes sense of the economic value creation in general. Then, it presents different approaches to measuring Swiss Post's wider economic value in particular, these have been developed within the scope of an internal project at Swiss Post. Methods applied are input-output modelling, the combination of internal data and publicly available administrative data as well as graphical illustrations with map data. Further, the chapter explains how Swiss Post can benefit from using the results of these measurements for communicative purposes.

Keywords Universal service obligation · Diversification and new market strategies · Financial viability · Wider economic value · Input–output model

1 Introduction

Regulation exists because the societal benefits it generates are thought to outweigh its costs. From our experience, discussions about the regulatory framework of Universal Service Providers (USPs) seem to focus mainly on the cost imposed on USPs, taxpayers, or society, and regulatory economists have developed precise methods to measure them, e.g., net costs of universal service. Societal benefits of regulation are not that prominent in many discussions, perhaps because they are somewhat harder to measure than costs, which are usually concentrated (on the USP, for instance) while benefits are dispersed among many people—that is reflected in the term “wider economic benefit.” If lawmakers or regulators want to make good regulatory decisions for the postal sector and USPs, they need to be informed about both sides of the market. This will be especially important when new technologies and new markets develop in the digital age, and regulatory thinking needs to ask whether

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efficient downsizing of regulation in the market for mail delivery is the right way to go. Moreover, USPs are the first to be interested in understanding the societal value they generate. This can help them to obtain a more meaningful self-image, a better image in society—and ultimately makes discussions on the future of regulation involving stakeholders more fruitful.

In this paper, we present some of the aims, challenges, and results from a project at Swiss Post to quantify the societal value generated by Swiss Post's business activities. In Sect. 2, we review existing literature in the field of postal operator's wider economic value creation. Section 3 sets out a framework for making sense of the theoretical concept behind wider economic value creation. In Sect. 4, the methodology used as well as the results obtained in Swiss Post's internal project are discussed, also showing some examples of how and why these results have been communicated to the public. Section 5 concludes by recalling the main challenges that were encountered in the course of the project.

2 Literature Review

In a broad sense, this contribution is linked to the extensive literature on the economic justifications or benefits of a USO. Kleindorfer and Crew (1998) argued that the benefit of the USO lies in the combination of ubiquity and uniformity in prices, as these characteristics reduce transaction costs. Other important benefits often referred to are that the USO can be seen as an instrument to correct market inefficiencies in the presence of network externalities such as for rural development. It also usually includes redistributive elements (Cremer et al., 2008). According to Borsenberger (2020), the emergence of new technologies has extended the type of benefits (potentially) provided by postal operators through their network.

Many approaches have been used for trying to quantify this postal operator's wider economic value. First, there are many studies that examine the effects of postal services on economic development. Boldron et al. (2008) and Rogowski et al. (2021) show quantitatively that postal outlets in France and the USA, respectively, have played a crucial role in local economic development. Copenhagen Economics (2020) assessed the benefits of postal services on rural development by connecting e-sellers to peripheral regions. Gottschalk and Lehmann (2021), using an input–output model, argue that Swiss Post acted as an important enabler for the Swiss retail sector during two Covid-19-related shutdowns and could thus sustain about 2.5% of the Swiss BIP during the corresponding period.

Another popular approach to measuring the value of postal services from the consumer's point of view lies in identifying the consumers' willingness to pay and comparing it to what they actually have to pay (Ellison et al., 2016). Other studies identify the willingness to pay for specific postal services or dimensions of the USO (e.g., RAND Europe, 2011; Lindhjem and Pedersen, 2012). Ofcom (2022) used a conjoint analysis to quantify the loss in consumers' benefits when reducing a certain

USO dimension, and compared it to the financial saving for the USP allowed by this reduction.

To our knowledge, apart from this contribution there is only one study that assesses the wider economic value of a postal operator by identifying its direct and indirect economic contribution with the help of an input–output analysis, Deloitte (2018). The authors find that for every 1\$ in value-added Australia Post directly generates, it indirectly generates another 0.86\$ in other industries, and that for every full-time equivalent (FTE) worker directly employed, Australia Post creates almost another one in other industries.

Other than in Deloitte (2018) or in our contribution, input–output analysis is often used to estimate the economic contribution of a full sector rather than one single enterprise. There is a vast number of studies conducting input–output analyses for sectors other than the postal sector (see, e.g., Frontier Economics, 2015, for the express delivery sector, or as a recent example from Switzerland, Infrac, 2020, focusing on the transport sector).

Although our analysis of the wider economic value generated by Swiss Post also includes an input–output analysis, it goes beyond it by seeking a broader understanding of economic value.

3 Framework

Wider economic value creation is a broad concept and can be interpreted in many different ways. What we mean by wider economic value in this paper especially includes what Swiss Post contributes based on its universal service obligation and uniform pricing in excess of what an ordinary set of companies in the free market would do in the postal sector (Fig. 1). As you can see, one part of Swiss Post's economic contribution would be also generated in a free market. It is the “Extra” part on the right side of Fig. 1 which makes Swiss Post special and is the heart of its wider economic value creation. For Swiss Post, the “Extra” mainly consists of offering its high-quality services always and everywhere—that means nationwide and even in emergencies—under the same conditions. The basis for this value is also reflected in calculations of USO net costs, as these are calculated by identifying the difference between a status quo with USO and a counterfactual without USO. However, there the focus is on costs and not on the value generated by this difference. Moreover, the wider economic value may have also other sources than a USO.

The reason why Swiss Post does more than a hypothetical free-market benchmark is closely linked to its USO, which requires the provision of services that would not be offered by a free market, such as daily doorstep delivery in remote areas. Additionally, as Swiss Post is fully state-owned, the Swiss government determines strategical objectives for Swiss Post that go beyond market standards, concerning for example labor conditions, regionalism, or sustainability. For example, these strategical objectives engage Swiss Post to further reduce greenhouse gas emissions or provide labor

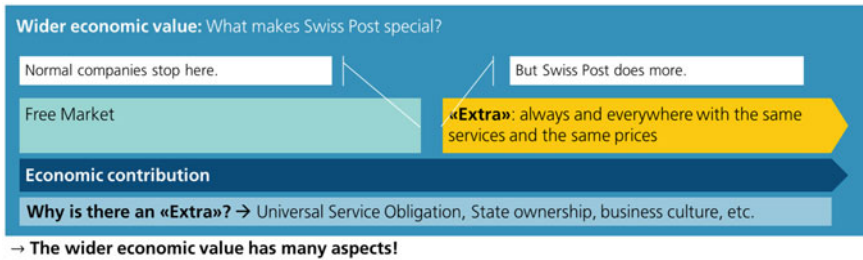


Fig. 1 What do we mean by wider economic value?

conditions that reconcile work and family.¹ However, Swiss Post’s “Extra” cannot be exclusively attributed to these legal requirements. State ownership and the corresponding public and political expectation—especially since Switzerland is a direct democracy—sometimes pushes Swiss Post to go beyond legal requirements.

The main objective of this paper is to find quantitative ways to show Swiss Post’s wider economic value creation—or in other words to identify its “normal” contribution and, especially, its “Extra.”

Why do we think this is important? From the regulator’s perspective, a good regulation’s societal benefits should exceed its societal costs.² Figure 2 shows the logic of such a cost–benefit analysis. A legal or political requirement such as the USO is generally implemented because it is expected to cause a certain societal benefit. The main economic reason behind a USO for postal services lies in the concept of network externalities and the reduction of transaction costs. But USOs usually also contain strong redistribution elements such as uniform prices. Another reason behind the introduction of a postal USO is security of supply (resilience), which is thought not to be guaranteed in the same way by a fragmented group of postal suppliers or even a sole private provider. On the other side, the USO implies some societal cost such as market distortions or the financial burden that arises for the USP or taxpayers.

But also, for USPs themselves, it might be beneficial to quantify the extra value they create. Communicating the wider economic value to the public or to political or regulatory stakeholders can raise awareness of their societal and economic importance. In discussions about the advancement of postal regulation, this can help to push back partial interests in favor of an integrated view.

Of course, it is not possible to precisely quantify the theoretical concept around the wider economic value outlined above. The main challenge lies in empirically identifying the “Extra” part of economic contribution, which would not be generated by a free market. For this reason, we have chosen an approach where we try to approximate Swiss Post’s wider economic value from different perspectives in a representative rather than a comprehensive approach.

¹ The full list of strategical objectives can be assessed *online*.

² There are several studies using this logic in order to identify the ideal size of the postal USO (see, e.g., Lindhjem and Pedersen, 2012; Houpis et al., 2015).

Fig. 2 The regulator’s view on wider economic value creation

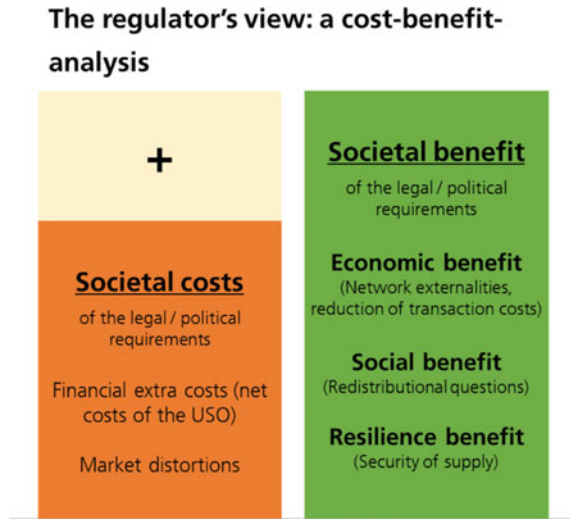


Figure 3 shows the story framework we created for measuring Swiss Post’s wider economic value. This framework has already been designed with a view to possible communicative use and has hence been kept as simple as possible. In the center of this framework, we have Swiss Post’s products. When they are produced, Swiss Post generates “classic” economic value as a producer of goods and services. This production perspective can be easily quantified, as we will see in Sect. 4.1, by measuring Swiss Post’s direct and indirect economic contribution in terms of value added and employment. The main problem here is that we cannot easily extract the “Extra” part from the economic contribution. We do not know what part of Swiss Post’s value added or employment would also be generated in a free market. Nevertheless, the total economic contribution figures are useful because they can give a quite impressive insight into Swiss Post’s importance for the national economy.

On the other side, all Swiss Post’s products are consumed (consumption perspective). In theory, the special value from consumption consists in the fact that the utility arising from the consumption of a product exceeds its price (consumer surplus), or because the consumption of the product causes positive effects for the general public (positive externalities). These theoretical concepts are quite difficult to measure in practice.³ We have chosen a different approach by graphically illustrating the scope of the consumption value of different aspects of the USO, for example the nationwide doorstep delivery of letters.

Beyond the production and consumption perspective, we have a superordinate dimension that we call “always and everywhere,” which can be applied on both the production and consumption side and helps identifying the “Extra.” Unlike most

³ There are some studies quantifying the consumer surplus by measuring the willingness to pay with surveys (see, e. g., Ellison et al., 2016; RAND Europe, 2011; Lindhjem and Pedersen, 2012).

Our framework story



Fig. 3 Framework story

private postal operators, Swiss Post offers its services always and everywhere—that means nationwide and even in emergencies—under the same conditions. The free-market benchmark is thus an obvious approach for empirically identifying the “Extra” Swiss Post generates with its ubiquity and uniformity of prices. In Sect. 4.2, we present some examples.

This framework was meant to give us a certain guidance when thinking about economic value creation, but of course, in practice, the resulting figures cannot always be clearly attributed to only one of the dimensions.

4 Results

4.1 *Input–Output Model*

Our analysis starts with an input–output analysis, measuring Swiss Post’s “economic footprint” in Switzerland’s economy.⁴ To calculate the economic footprint of Swiss Post concerning value added and employment, we calculate an input–output model based on data from the Swiss Federal Statistical Office (input–output Tables, employment data). In a second step, we apply the resulting multipliers to Swiss Post’s activities in different sectors. In a third step, we use cantonal employment data on a sectoral level to estimate the effects for every canton.

⁴ This is an established approach. For a methodological introduction we refer to Eurostat (2008).

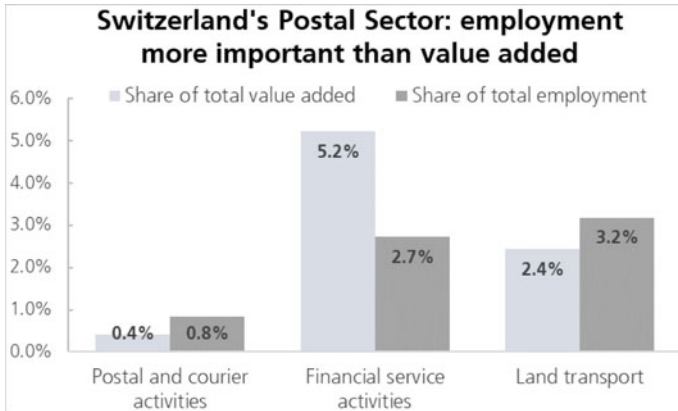


Fig. 4 Economic significance of the Swiss Post’s sectors of activity

4.1.1 Sector Statistics

Swiss Post’s activities are concentrated in three sectors of the economy: postal services, financial services, and public transport. Swiss Post plays a major role in the postal sector, but only minor roles in the other two sectors, albeit being one of the largest players in each sector.

Our input–output model reveals some basic information about the role these sectors play in Switzerland’s economy. Figure 4 shows how much these sectors contribute to Switzerland’s GDP (as measured in value added) and to Switzerland’s labor demand. The postal sector is relatively small, contributing 0.4% to the total GDP. In terms of employment, however, the sector’s share is twice as significant, contributing 0.8% to total employment in Switzerland. The financial service sector (without insurance) is much larger, and its significance in terms of GDP is almost twice as large as its significance in terms of employment. Land transport is also labor intensive, but to a lesser degree than the postal sector.

Figure 5 provides some additional insights on the role of labor in the three sectors. It shows the share of wages in value added per sector. With an estimated labor share of 85% in value added, the postal sector is much more labor intensive than Switzerland’s total economy (48%⁵) and the financial service sector (37%). In contrast to other network industries, the distribution infrastructure in postal sectors consists of people rather than of concrete and iron.

The essential factor for determining the economic footprint of an industry is its interdependence with upstream or intermediate industries. Figure 6 shows that the

⁵ Our model underestimates the total labor share of value added, which was 58% according to the national accounts (2017), because the Federal Statistical Office supplies only median wages for the sectors of the economy. Since wage distributions are usually right-screwed, it probably underestimates the wage sum especially in sectors with large variances in the wage distribution. We estimate this effect in the postal sector to be rather small.

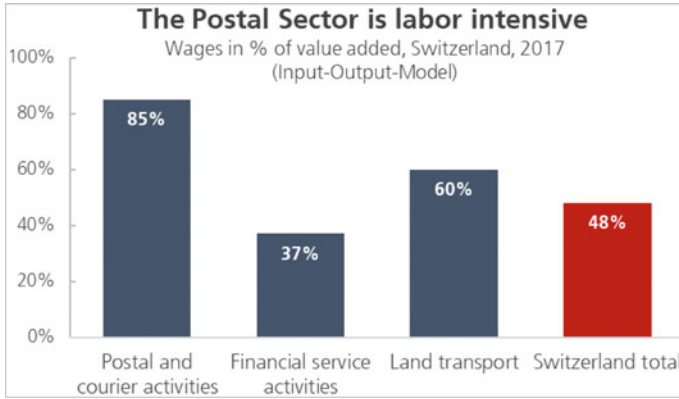


Fig. 5 The postal sector is labor intensive

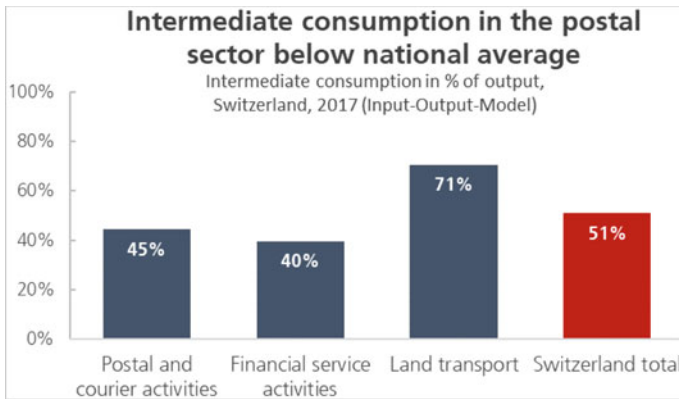


Fig. 6 Intermediate consumption in different sectors and the whole economy

proportion of intermediate inputs in the postal and financial sector are, respectively, 45% and 40%, and hence a bit lower than in the total economy (51%). The land transport sector, for instance, shows a larger dependency on intermediary inputs. We can hence expect that the economic footprint of this sector is larger than that of the other two sectors.

4.1.2 Multipliers and their Interpretation

Figure 7 shows the type-I multipliers of our input–output model. These multipliers summarize direct and indirect effects of the sector’s activities. The direct effects always equal 1; the respective indirect effects are equal to the value of the multipliers minus 1. The value-added multiplier for the postal sector is 1.59; this means that

	Type I Effects (direct and indirect)		
	Value Added	Employment	Output
Postal and courier activities	1.59	1.30	1.54
Financial service activities	1.47	1.84	1.63
Land transport	2.73	2.42	2.24

Fig. 7 Type-I multipliers of the input–output analysis

each unit of value added in this sector generates 0.59 units of value added in other sectors of the economy that are linked to postal services through the consumption of intermediary goods. The multiplier for employment is lower, at 1.3, meaning that one job in the postal sector is associated with another 0.3 jobs in other sectors. The low size of this multiplier is likely caused by the high labor intensity of the postal sector (remember Fig. 5). The figures are somewhat smaller than those calculated by Deloitte for the Australian Post (Deloitte, 2018)—where the authors found a value-added multiplier of 1.86 and an employment multiplier of 1.94.

We observe an opposite pattern in the financial services sector: here the value-added multiplier of 1.47 is similar to the multiplier of the postal sector (1.59), and the employment multiplier (1.84) is somewhat larger (postal sector: 1.30). The reason is the relatively low labor intensity in the banking sector (Fig. 5). The multipliers for land transport are above 2 for both value added and employment. The main reason for this result appears to be that transport shows a high dependency on intermediate products.

4.1.3 Multipliers Applied to Swiss Post

To apply the input–output model to Swiss Post, we need information on value added and employment generated by Swiss Post in the different sectors of the economy. We obtain this information from data provided by Swiss Post to the Federal Statistical Office each year as part of the national accounts survey. The results are summarized in Fig. 8.

Regarding value added, Swiss Post generates CHF 3.6 billion itself, and CHF 2.6 billion are generated upstream by intermediate industries (and their intermediate industries, and so on), linked to Swiss Post’s activities, totaling CHF 6.2 billion, which is almost 1.0% of national GDP. Regarding employment, Swiss Post, itself one of the largest employers in Switzerland with 33,400 full-time employees, also contributes to the creation of 14,700 jobs in other sectors of the economy, totaling 45,100, which is more than 1% of the Swiss workforce. This means that about 1 in 90 jobs in the economy is linked to Swiss Post. Of course, we have to be careful,

Swiss Post						
	Sector	Postal and courier activities	Financial service activities	Land transport	Other	Total
Value Added (CHF bil.)	direct	2.3	0.8	0.3	0.2	3.6
	indirect	1.4	0.4	0.6	0.2	2.6
		<i>3.7</i>	<i>1.2</i>	<i>0.9</i>	<i>0.4</i>	6.2
Employment (Full-time equivalents)	direct	22,900	3,200	2,900	1,400	33,400
	indirect	7,000	2,700	4,100	900	14,700
		<i>29,900</i>	<i>5,900</i>	<i>7,000</i>	<i>2,300</i>	45,100

Fig. 8 Input–output analysis applied to Swiss Post, 2021

not to interpret the indirect effect as causal. However, a point can be made, that especially in the postal and the transport sector—in which universal service (postal sector) or “service public” (transport sector⁶) are important determinants of Swiss Post’s activities—there is no simple substitute for Swiss Post, at least in the short run. Hence it could be argued that at least part of the indirect effects effectively depends on Swiss Post’s existence.

4.1.4 Cantonal Effects

We estimate cantonal effects of the direct and indirect effects to show the decentralized nature of Swiss Post’s economic footprint. Figure 9 shows the results with respect to value added for five small-to-medium-sized cantons selected as examples. Cantonal effects were calculate using cantonal sectoral employment data. To do that we use the sectoral indirect effects we have calculated for the whole country and distribute them to the cantons in relation to the sectoral employment share of each sector in each canton.

4.2 Other Approaches

In addition to the data coming from the input–output model, we also use some other data sources. In particular, we combine publicly available data from the Swiss Federal Statistical Office (FSO) with internal data and create a municipality-level dataset containing data for all 2,200 Swiss municipalities, with a focus on employment

⁶ Swiss Post’s public transport division PostBus is active in the Swiss Regional Passenger Transport. It is ordered and financed by the cantons and the federal government. It is organized by a competition-for-the-market approach, but due to low reimbursements, the supply is dominated by public transport companies (like PostBus) which operate without a return on investment in line with the rest of the market.

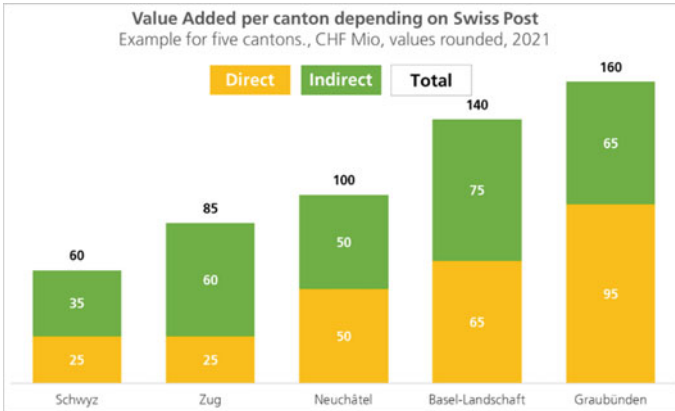


Fig. 9 Example for cantonal effects

and purchases of intermediary goods. The municipality level of the dataset is very helpful in characterizing Swiss Post’s nationwide economic importance as well as its great decentralization in employment and purchases. In addition to this municipality-level dataset, we also use several other internal data sources in order to visualize for example the benefits of Swiss Post’s nationwide delivery network. In this subsection, we will show some of the graphics we have created.

The municipality level of the dataset mentioned above allows us to extract economic figures for different geographical divisions such as specific cantons, language regions, or peripheral areas. This is particularly helpful for emphasizing Swiss Post’s economic importance for a specific region, for example when communicating with cantonal or communal authorities. Figure 10 shows an example of a so-called cantonal profile, a selection of cantonal-level economic figures, which can be easily extracted from our dataset and are often used in meetings with cantonal authorities or associations.

Swiss Post’s great decentralization is an integral part of its wider economic value. Unlike other large businesses, its production does not happen in one or a few centralized places, but throughout the whole country. Swiss Post employs people and buys products and services in all parts of Switzerland. Figure 11 shows how we graphically illustrate Swiss Post’s decentralization in employment and purchases with map data. In both maps, municipalities with employees or purchases of intermediary goods are colored in blue. The share of colored municipalities is 40% and 68%, respectively, which makes it very easy to see the outline of the Swiss map. As Swiss municipalities are often quite small (on average, they have around 4,000 inhabitants), we consider these numbers high.⁷

⁷ The discussion at the 30th conference on Postal and Delivery Economics revealed that these numbers are interpreted differently in different countries, which may—among USP-specific factors—be due to the different sizes of the municipalities in different countries.

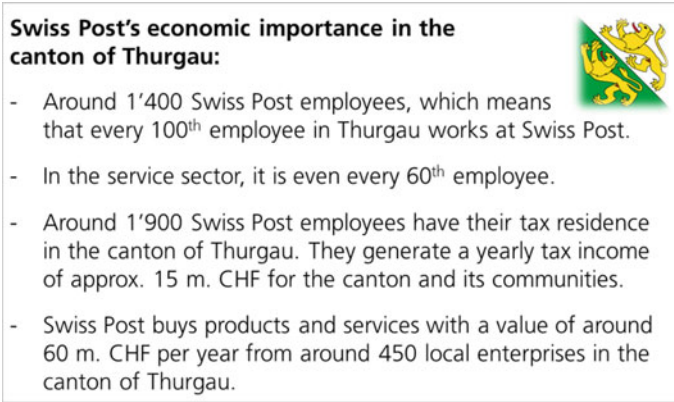


Fig. 10 An example of a cantonal profile (canton of Thurgau)

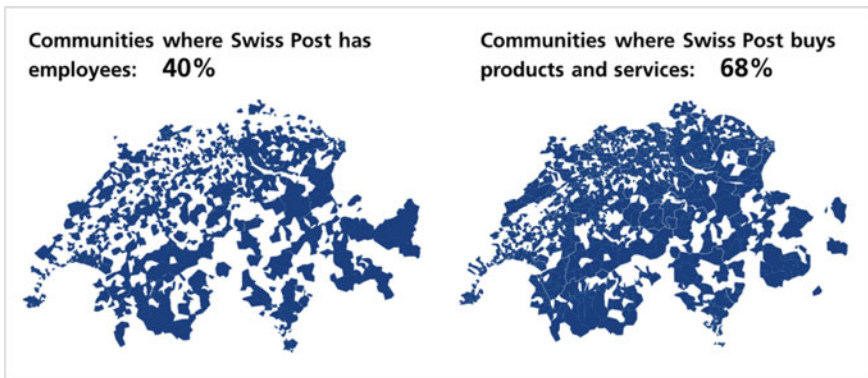


Fig. 11 Illustrations of Swiss Post’s decentralization in employment and purchases

As we have seen in Sect. 3, wider economic value often arises because USPs offer something that would not be offered in a free market. Thus, another approach to measuring Swiss Post’s wider economic value is comparing its services to what is offered by other, private postal operators. As this example is taken from a world with USO, it is arguably not the same as a non-USO counterfactual, but it provides indications for such a world. Figure 12 adopts this approach by showing—based on an analysis of Swiss Post’s competitors in the mail market—the share of addresses in each postal code area where Swiss Post is the only postal operator that delivers letters. The map provides a taste of what we could expect in a world without USO. Swiss Post provides value to the senders and receivers of mail at addresses that would not be served in such a world. Notably, not only remote areas are served only by Swiss Post, but more generally addresses with high delivery costs. For instance, the share of addresses where only Swiss Post delivers mail to is quite high in old city centers, which are characterized by winding and narrow streets.

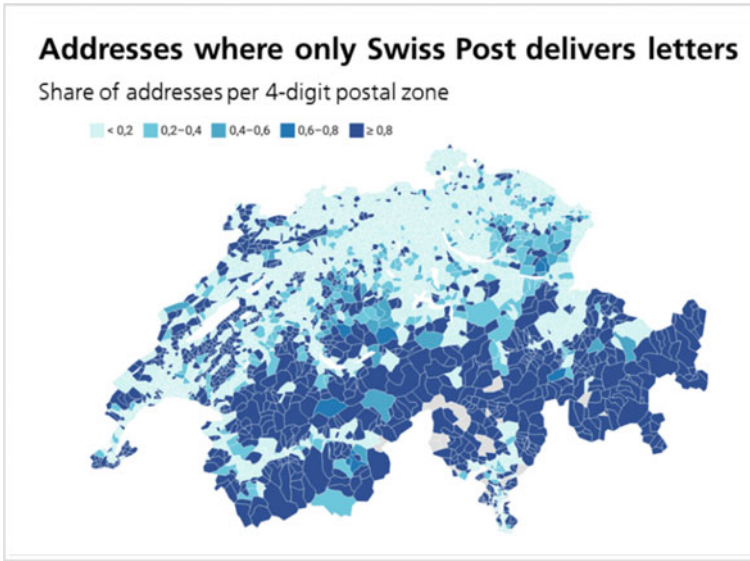


Fig. 12 Illustration of the value of Swiss Post’s nationwide letter delivery network

Swiss Post’s public transport division, PostBus, particularly operates in peripheral and mountain areas that cannot be reached by train. You can see in Fig. 13 that there are 578 municipalities (which represents 25% of all Swiss municipalities) that could not be reached by public transport at all without PostBus. Swiss Post generates wider economic value by enhancing the regional accessibility of public transport in Switzerland. By connecting these 578 municipalities to the rest of Switzerland, Swiss Post makes it easier, cheaper, and more sustainable for their residents to work or spend their free time in the surrounding areas. It has to be noted, that the operation of bus lines by Swiss Post is not regulated as part of the postal USO, nonetheless it is required by law that Swiss Post is active in this area.⁸

4.3 *Communicative Usage*

Since Swiss Post initiated its ambitions to quantify its wider economic value in 2020, the different results showed in Sects. 4.1 and 4.2 have been directly published or indirectly used for communicative purposes in different ways. Figure 14 summarizes the different types of communicative usage sorted by narrative depth.

⁸ See Federal Act on the Organisation of Swiss Post. <https://www.fedlex.admin.ch/eli/cc/2012/587/en>. From an economic perspective, the obligation to operate (unprofitable) bus lines comes close to a USO, although with flexible scope as there are many bus lines whose operation is regularly put out to tender in a competitive process.

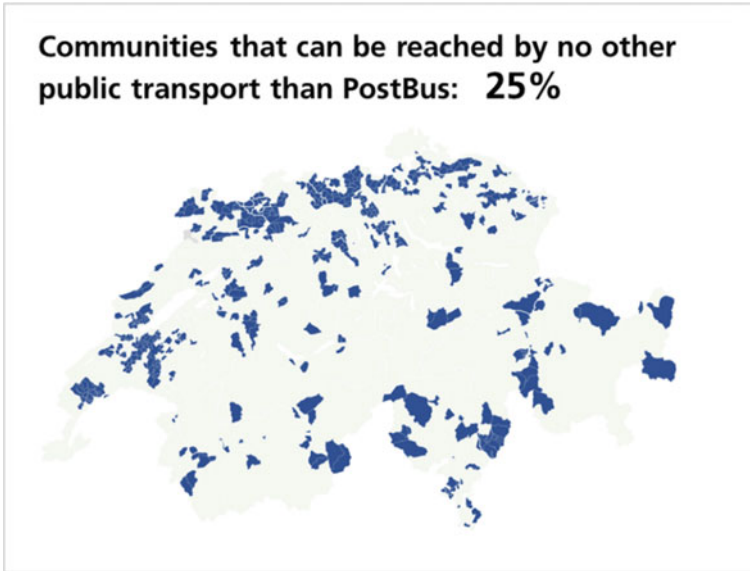


Fig. 13 Illustration of Swiss Post’s contribution to regional accessibility by public transport

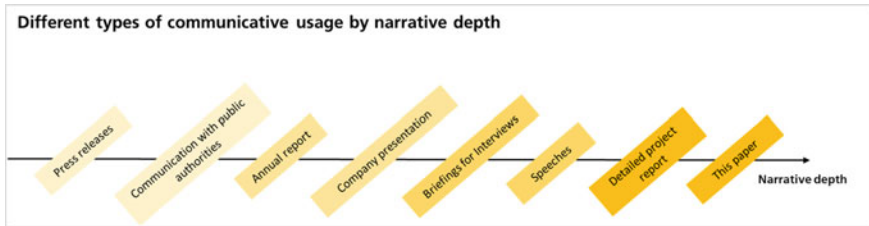


Fig. 14 Communicative usage of Swiss Post’s wider economic value

At the right end of the scale (maximal narrative depth), there is a very detailed project report, which presents all the results of the project and embeds them in a story framework around Swiss Post’s socioeconomic value generation. The report is for internal use only and serves as a broad pool of resources for Swiss Post’s communication department. Its narrative depth is almost comparable to this paper.

In accordance with its current corporate strategy, Swiss Post aspires to a strong universal service as one of its key value propositions. Thus, the project’s contents have occasionally entered in different speeches or interview briefings for Swiss Post’s CEO or other members of the executive board with the objective to spread the view of Swiss Post as an “institution” creating socioeconomic value that would be lost without Swiss Post.

Further, some of the results are part of Swiss Post’s web appearance as they are entered in the *annual report* as well as the *company presentation* which are

published on its website. Together with the annual report 2021, Swiss Post published a supplementary booklet under the title “*Swiss Post—a reliable asset for Switzerland*” which also included a selection of the project’s results.

The socioeconomic value figures are also often used in communications with public authorities or local populations. Due to the persistent growth in parcel volumes, Swiss Post has to significantly increase its sorting capacities. The great range of cantonal- or communal-level results is often used in meetings with cantonal or communal authorities when it comes to looking for new sites for parcel sorting centers. The figures can be very helpful for pointing out the benefits the building of a new sorting center can have for the regional economy.

Swiss Post does currently not get any state compensations for its USO. In order to secure the future financing of the USO in the view of shrinking letter margins, Swiss Posts wants to increase its competences in the digital communications market. It has recently undertaken considerable growth efforts in this area, including targeted acquisitions. This part of the growth strategy encounters growing criticism in Switzerland. Thus, it is particularly important for Swiss Post’s external communication to be able to explain the value generated by its operations. Some of the project’s results were used to illustrate Swiss Post’s role as an enabler of eCommerce during the Covid-19 pandemic (this has been documented in Gottschalk and Lehmann, 2021).

Finally, yet importantly, individual figures of the project occasionally complement press releases about different topics. There, the narrative depth is minimal, which is why this type of communicative use is located on the left end of the scale.

5 Conclusion

To obtain a holistic regulatory-economic picture of the impacts of the legal requirements of a universal service provider, the usual focus on the scope and costs of the USO requirements should be supplemented by the perspective of the economic value they generate. In the implementation of this endeavor, which was shown here using the example of a project at Swiss Post, we could show by means of an input–output model and other, more specific and case-oriented approaches, that Swiss Post is a highly decentralized, large company that offers services to at least some consumers that would most probably not be offered if Swiss Post was not there.

Our endeavor yielded problems and opportunities. First, every company in the economy, not just universal service providers, creates economic value and has a wider economic impact that goes beyond its balance sheet. Universal service providers are special in these dimensions due to their obligation to provide ubiquitous services. For a state-owned enterprise like Swiss Post, also the strategic objectives of the shareholder may set it further apart from a pure market-economy undertaking. Yet it remains a challenge to show how the economic value created by a—potentially state-owned—USP differs from the value that would be created by the market in absence of this company. This problem could often not be avoided in the project, and we had to content with surrounding our numbers and figures with explanations

and interpretations that pointed in the direction of the special value of Swiss Post, but could not fully substantiate them. We often used situation-specific explicit or implicit free-market benchmarks and at the same time embedded our results in an overarching narrative framework.

Another challenge is that wider economic value can be considered from many perspectives and measured by numerous numbers. Albeit this makes it hard to condense the topic and still present it in an understandable way, it also offers opportunities for communication. Ultimately, the effect of communication on the topic depends heavily on the recipient: the left-wing political spectrum is more happy about a large USP than the liberal one.

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How the COVID-19 Crisis is Impacting Postal Markets? A New Assessment One Year Later



Antonin Arlandis, Catherine Cazals, Eric Gautier, and Nour Meddahi

1 Introduction

In 2020, the COVID-19 crisis led to a decline in economic activity, which has resulted in larger than usual a decrease in mail volumes and revenues for postal operators. However, at the same time, parcel volumes and revenues of the main postal operators increased faster than usual. This could be explained, for example, by the multiple lockdown and curfew periods in the countries around the world encouraged the use of e-commerce. Arlandis et al. (2021) conducted an econometric analysis of the early impact of the COVID-19 crisis on the postal market in several developed countries.

Since then, large-scale vaccination and testing campaigns in many countries led economic activity to gradually recover, even when the pandemic resurged. The growth in parcel volumes slowed down somewhat in 2021 compared to 2020, and mail volumes appear to have stabilized in 2021 compared to 2020 in some countries (or at least have decreased less than in 2020 in other countries).

The purpose of this paper is to update the analysis introduced by Arlandis et al. in 2021.

The paper is organized as follows. Section 2 gives a general overview of the evolution of mail and parcel volumes and turnover for several postal operators in recent years, from 2015 to 2021. Section 3 presents the econometric analysis for

This paper represents the personal views of the authors and should not be taken to represent the position of La Poste Groupe.

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the postal operators in France, Germany, and the United States. Section 4 carries a counterfactual analysis of the mail and parcel volumes evolution if the COVID-19 crisis had not occurred. Section 5 concludes.

2 Some Figures on the Postal Sector

According to a 2021 study of IPC, from a panel of 53 postal operators, mail volumes decreased by an average of 15.9% in 2020 compared to 2019. In 2018 and 2019 mail volumes for all operators decreased by 6.3% and 7.6%, respectively. In 2020 the decline in mail volumes ranged from 0.5% for operator An Post to 59.8% for New Zealand Post. Total mail segment revenue of all operators decreased by an average of 4.9% in 2020 (compared to 0.6% in 2018 and 1.2% in 2019).

Because citizens were stranded in their homes and many retail businesses were forced to close, global e-commerce revenue grew by 25% in 2020 compared to 2019. Parcel volumes carried by the sampled postal operators grew by an average of 15.3% in 2020 compared to 4.9% in 2019.

With the increase in delivery demand, parcel segment revenue growth accelerated to 21% on average for all operators in 2020 (up from 7.1% in 2019). Postal operators' parcel segment revenue growth is driven by growth in parcel volumes. Sometimes this was magnified by acquisitions of alternative operators (allowing some postal incumbent operators to expand their markets).

Figure 1 shows the relationship between the % change in GDP on the horizontal axis and the change in mail volumes on the vertical axis for 38 postal operators. The COVID-19 crisis clearly shows that the decline in GDP has led to a decline in mail volumes. The 2020 data shows that the countries which GDP has been most heavily affected by the health crisis experienced a sharper decline in mail volumes.

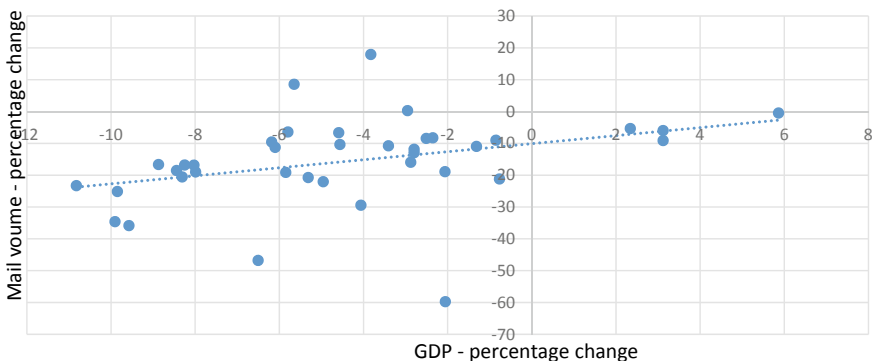


Fig. 1 : Relation between GDP and mail volumes in 2020 (in percentage change. Sources IMF for GDP and IPC for mail volumes)

Table 1 Average annual growth rates for mail and parcel volumes for 10 postal operators

	Mail volumes			Parcels volumes		
	Average annual growth rate 2015–2019	Annual growth rate 2019–2020	Annual growth rate 2020–2021	Average annual growth rate 2015–2019	Annual growth rate 2019–2020	Annual growth rate 2020–2021
CTT Portugal Post	−3.0%	−18.5%	0.6%	7.3%	41.0%	38.4%
Deutsche Post DHL	−4.7%	−10.4%	−0.3%	7.2%	14.1%	11.4%
La Poste Groupe	−6.8%	−21.7%	−2.4%	10.4%	30.8%	10.7%
Österreichische Post	−2.3%	−9.6%	−3.1%	1.6%	76.9%	58.3%
Posti	−27.2%	−15.9%	−7.2%	11.6%	27.4%	10.9%
PostNL	−7.7%	17.9%	−0.3%	16.1%	19.1%	13.9%
PostNord	−9.2%	−12.9%	−9.6%	7.2%	13.8%	14.1%
Royal Mail	−4.8%	−25.1%	−3.7%	6.1%	30.0%	3.6%
Swiss Post	−4.2%	−8.5%	−0.5%	6.3%	23.3%	9.6%
USPS	−2.3%	−10.8%	−0.1%	8.0%	18.8%	3.5%

Source IPC—postal operators' report

We also gathered annual volume and revenue data for several postal operators between 2015 and 2021. The pandemic confirms to have generated a decline (resp. increase) in mail (resp. parcel) volumes that exceeded the pre-COVID trend (see Table 1). In 2021 we see a slight stabilization or slowdown in the decline of mail volumes. Growth in parcel volumes continues to be above the pre-COVID trend for some operators and slower for others.

As Table 2 shows, the pandemic seems to have generated a decline in mail revenues that exceeded the pre-COVID trend for most operators. In 2021, the decline in mail market revenues has generally eased. Some operators have even seen mail market revenues increase. The pandemic seems to have resulted in an increase in parcel market revenues above the pre-COVID trend for all operators for which data are available.

Most operators registered an increase in total revenues in 2020 (see Table 3). Therefore, the positive effect of the pandemic on the parcel market appears to have offset the negative effects of the pandemic on the mail market for most operators of our sample. In 2021 the turnover of the 12 postal operators continued to grow.

Table 2 Average annual growth for mail and parcel revenues for 10 postal operators

	Mail revenue			Parcels revenue		
	Average annual growth rate 2015–2019	Annual growth rate 2019–2020	Annual growth rate 2020–2021	Average annual growth rate 2015–2019	Annual growth rate 2019–2020	Annual growth rate 2020–2021
bpost	−3.5%	−6.4%	−1.1%	18.9%	32.5%	0.3%
CTT Portugal Post	−4.1%	−10.6%	4.0%	4.9%	26.1%	31.6%
Deutsche Post DHL	−4.1%	−2.1%	−0.4%	8.5%	14.6%	22.5%
La Poste Groupe	1.6%	−25.5%	9.5%	7.3%	33.2%	17.7%
Österreichische Post	−1.1%	−7.6%	−0.2%	−8.8%	45.2%	35.6%
Posten Norge	−7.7%	−16.3%	−8.6%	2.0%	2.4%	7.4%
Posti	−5.4%	−5.5%	−5.6%	10.3%	17.3%	3.1%
PostNord	−8.7%	−7.0%	−5.3%	7.1%	6.5%	11.0%
Royal Mail	−2.6%	−12.5%	6.3%	9.3%	33.7%	8.1%
USPS	−2.6%	−7.8%	0.9%	10.9%	25.2%	12.2%

Source IPC—postal operators' report

Table 3 Average annual growth rates for operators' revenues

	Average annual growth rate 2015–2019	Annual growth rate 2019–2020	Annual growth rate 2020–2021
bpost	12.1%	8.9%	4.1%
CTT Portugal Post	−0.6%	−2.2%	12.6%
Deutsche Post DHL	1.7%	5.3%	22.5%
Le Groupe La Poste	3.0%	20.0%	11.0%
Österreichische Post	−4.2%	8.4%	14.9%
Posten Norge	−0.9%	−0.9%	3.0%
Posti	−1.3%	−0.6%	2.5%
PostNL	−4.8%	14.5%	6.5%
PostNord	−0.7%	1.2%	5.1%
Royal Mail	4.0%	16.6%	8.1%
Swiss Post	−3.5%	−8.8%	5.2%
USPS	0.8%	2.8%	5.3%

Source IPC—postal operators' report

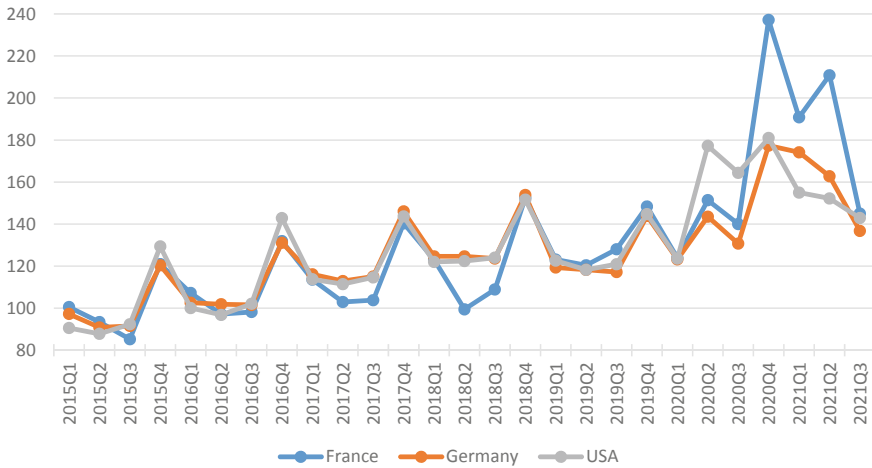


Fig. 2 Parcel volume index (2015 = base 100)

3 Econometric Analysis to Assess the Impact of COVID-19

The aim of this study is to analyze the impact of the COVID-19 crisis on the relationships between parcel and mail volumes and key drivers of these volumes. Rather than a prediction exercise we are interested in a causal analysis which requires to specify a structural model.

(a) Data and models specification

The data used in our econometric analysis are quarterly data for 3 countries: France, Germany, and the United States. The data for mail and parcel volumes come from the IPC database and internal data of Le Groupe La Poste. Data for mail and parcel volumes in the United States and Germany are those of USPS and Deutsche Post DHL. Figures 2 and 3 show the trends of mail and parcel volumes indices from 2015. In the three countries we notice an increasing trend for parcel volume and a decreasing trend for mail volume. During the COVID-19 period, from 2020, we observe an increase in parcel volume, more pronounced in France at the end of 2020 and beginning of 2021, and a decrease in mail volumes, mainly at the second quarter of 2020, at the time of the first “severe” lockdown.

Our models include GDP and e-commerce data as well. Data for GDP per capita come from the BEA,¹ Eurostat, and the World Bank. E-commerce sales come from the BEA, Eurostat, and INSEE.²

The model we consider for parcel volumes is:

$$\text{LnVparcel}_t = \alpha + \beta_1 \text{LnGDP}_t + \beta_2 \text{COVID}_t * \text{LnGDP}_t + \delta_1 \text{LnEcom}_t$$

¹ Bureau of economic analysis.

² Institut national de la statistique et des études économiques.

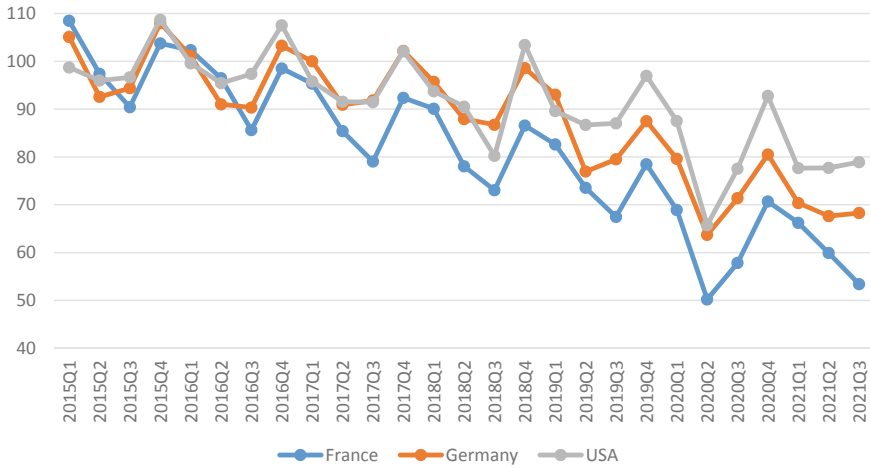


Fig. 3 Mail volume index (2015 = base 100)

$$+ \delta_2 \text{COVID}_t * \text{LnEcom}_t + \theta_1 Q_{1t} + \theta_2 Q_{2t} + \theta_3 Q_{3t} + \varepsilon_t,$$

where the dependent variable LnVparcel_t is the logarithm of parcel volumes. GDP is GDP per capita. The variable $Ecom$ represents e-commerce sales. These variables are in index form with 2015 as the base year (base 100³). COVID is a dummy variable equal to 1 from 2020Q₁ to 2021Q₃ (COVID-19 period) and zero before. Q_1 , Q_2 , and Q_3 are dummies for the quarter.

The model we consider for mail volumes is:

$$\begin{aligned} \text{LnVmail}_t = & \alpha + \beta_1 \text{LnGDP}_t + \beta_2 \text{COVID}_t * \text{LnGDP}_t + \delta_1 t \\ & + \delta_2 t * \text{COVID}_t + \theta_1 Q_{1t} + \theta_2 Q_{2t} + \theta_3 Q_{3t} + \varepsilon_t, \end{aligned}$$

where the dependent variable LnVmail_t is the logarithm of mail volumes (in index form) and t is a time trend variable.

We estimate separate models for each country using the same specification, hence obtain different sets of coefficients for the different countries. The interaction terms involving the dummy COVID are intended to capture structural breaks in the relation between volumes and the explanatory variables. This means that we allow the coefficients of these explanatory variables to change after COVID-19. Note that in the model for parcels we include the explanatory variable $Ecom$ on top of GDP while we use a trend (t) for the model for mail. This is because we do not have such a clear explanatory variable in our data and use *the trend* as a driver for the missing variable. We believe that it is a good proxy for e-substitution.

³ Taking log transformation has the advantage to have a direct interpretation of coefficients in terms of elasticities (or semi-elasticities when one variable is in level).

Table 4 Estimation of Eq. (1) for parcel volumes

Variable	France		Germany		United States	
	Coeff	Std. Error	Coeff	Std. Error	Coeff	Std. Error
Ln(GDP)	0.866*	0.454	1.470***	0.305	1.510	1.711
COVID*Ln(GDP)	-1.077***	0.237	-0.588***	0.202	-0.671	1.065
Ln(Ecom)	0.184**	0.071	0.458***	0.052	0.509***	0.147
COVID*Ln(Ecom)	1.036***	0.214	0.535***	0.181	0.610	0.945
Q_1	-0.102***	0.031	-0.052**	0.025	0.026	0.114
Q_2	-0.194***	0.031	-0.090***	0.025	-0.027	0.097
Q_3	-0.211***	0.032	-0.133***	0.025	-0.029	0.096
Const	-0.020	1.858	-4.168***	1.213	-4.730	7.293
R^2	0.935		0.976		0.880	
Observation period	2009 Q_1 –2021 Q_3		2009 Q_1 –2021 Q_3		2002 Q_1 –2021 Q_3	

***significant at 1%, **significant at 5%, *significant at 10%

These models should be interpreted as cointegrating relations (that is long-run relationships).⁴ We then proceeded to the estimation by using the Fully Modified Ordinary Least Squares method which is well suited for this type of model (see Phillips and Hansen 1990).

(b) Empirical results

Table 4 gives our estimation results for the model for parcel volumes.

We can first notice the good performance of these models, with large R^2 . For the United States, the R^2 is slightly lower but still high and suggests that the model is also performing well. Moreover, we notice in the model for the United States that several estimated standard errors that are large, relative to the value of estimated coefficients, leading to coefficients not statistically significant.

However, the signs of the estimated coefficients are as expected and the magnitude is similar to the one obtained in the others countries (more particularly in Germany). One possible explanation for large standard errors is that the COVID period is proportionally lower in the US case than in the French and German cases (the observation period is larger for the United States) which implies that, for instance Ln(GDP) and COVID*Ln(GDP) are more correlated in the US case than in the other cases. For stationary variables, this leads to a multicollinearity problem where the estimates and the fit are possibly reliable, but not the standard errors.

According to our estimations, the long-run elasticity of parcel volumes with respect to GDP per capita before COVID-19 is smaller than 1 for France and larger than 1 for Germany and the United States. In the three countries the coefficient

⁴ Different unit root tests and cointegration tests have been performed. However, it is difficult to conclude in a robust way, due to the presence of a structural break with few observations at the end of the period.

Table 5 Estimation of Eq. (2) for mail volumes

Variable	France		Germany		United States	
	Coeff	Std. Error	Coeff	Std. Error	Coeff	Std. Error
Ln(GDP)	0.702**	0.270	0.703***	0.245	1.988***	0.221
Q_1	0.036*	0.019	-0.026	0.016	-0.001	0.017
Q_2	-0.073***	0.020	-0.127***	0.017	-0.082***	0.015
Q_3	-0.128***	0.021	-0.131***	0.015	-0.077***	0.014
Ln(GDP)*COVID	0.060	0.192	-0.034	0.098	0.190	0.182
Const	2.397*	1.217	1.798	1.094	-3.745***	0.988
t *COVID	-0.005	0.011	0.001	0.008	-0.011	0.010
t	-0.016***	0.001	-0.010***	0.001	-0.012***	0.001
R_2	0.987		0.969		0.968	
Observation period	2009 Q_1 –2021 Q_3		2009 Q_1 –2021 Q_3		2002 Q_1 –2021 Q_3	

***significant at 1%, **significant at 5%, *significant at 10%

of the interaction term “COVID*Ln(GDP)” is negative. This means that the elasticities of parcel volumes with respect to GDP after COVID-19 are smaller than before COVID-19. For example, for Germany, the elasticity is 1.47 before COVID-19 and $1.47 - 0.59 = 0.88$ after COVID-19. The variable e-commerce is significant with an elasticity lower than 1 before COVID-19, and the coefficient of the interaction term “COVID*Ln(Ecom)” is positive, hence the elasticities of parcel volumes with respect to e-commerce after COVID-19 are larger than the elasticities before COVID-19 (around 1 for the three countries).

Table 5 gives estimation results for the model for mail volumes.

We can notice here again the good performance of these models, with large R^2 . The long-run elasticity of mail volumes with respect to GDP per capita before COVID-19 is smaller than 1 for France and Germany and larger than 1 for the United States.⁵ The coefficient for the trend, used as a proxy for e-substitution, is negative as expected and significant for the three countries, and can be interpreted as a negative effect of e-substitution on mail volume. The mail volume data outlined in Sect. 3.a is also decreasing. Over the period of analysis, households and businesses have become equipped with digital technologies and internet penetration has increased in all the countries studied. It is therefore logical that the trend, that we interpret as a proxy for e-substitution, has a negative impact on mail volumes.

According to our estimations, for the three countries, the coefficients of the interaction terms Ln(GDP)*COVID and t *COVID are not significant, hence our sample does not allow us to conclude a structural break in the relations of mail volumes with GDP and trend before and after COVID-19.

Indeed, we noticed previously, in our comments about the trend in mail volumes in Fig. 3, that COVID-19 seems to have only a transitory effect, mainly during the

⁵ It is possible that the differences stem from the fact that the period of analysis is different in the model for the United States than in the models for France and Germany.

second quarter of 2020. After this date, the trend of mail volumes seems to return to the one existing before that date. Our econometric results seem to confirm this transitory effect and suggest that there is no change in the relation between mail volumes, GDP, and trend.

4 What Would Have Happened Without COVID-19?

In this section, we perform a prediction exercise in order to assess what would have happened to mail and parcel volumes if the COVID-19 crisis had not occurred. To achieve this, we exogenously change the variable *COVID* from 1 to 0 in the estimated models for the time periods during COVID-19 and replace GDP and e-commerce with a prediction formed using the growth rate before COVID-19. We display in the two following graphs the ratio $100 * (\text{Vol}(1) - \text{Vol}(0)) / \text{Vol}(0)$, where *Vol*(1) is the observed volume during the COVID-19 period and *Vol*(0) is the counterfactual (predicted) volume without COVID-19 for the same period.

Figure 4 shows that France has suffered the highest loss in mail among the three countries in 2020. The second quarter of 2020 was the most harmful of all with losses above 30%. In 2021 the loss seems to have stabilized between 10 and 15%.

Figure 5 shows that France is the country for which the parcel volumes have increased the most reaching up to 70% in the second quarter of 2021. In the United States and Germany, the increase in parcel volumes of the operators USPS and Deutsche Post DHL was less strong. For USPS, the highest increase occurred in the second quarter of 2020 when (parcel volumes were 33% higher than the hypothetical

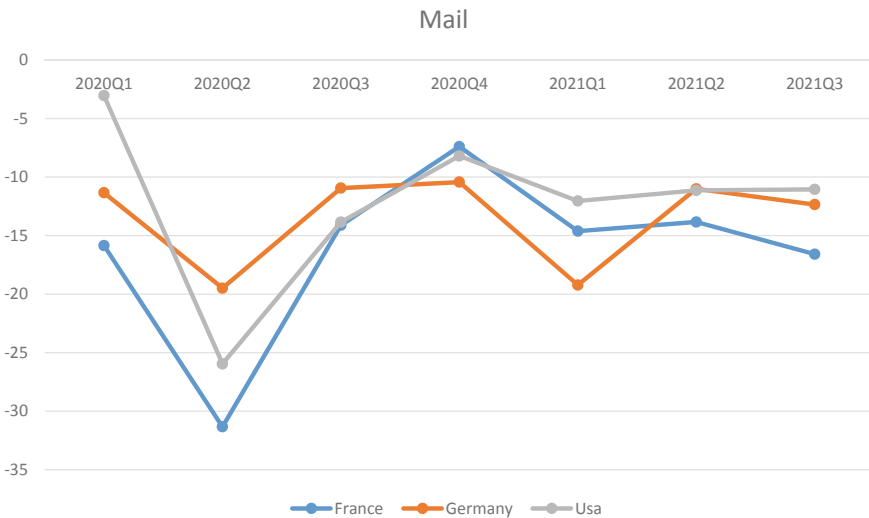


Fig. 4 Difference “observed vs no COVID” in % for mail volumes

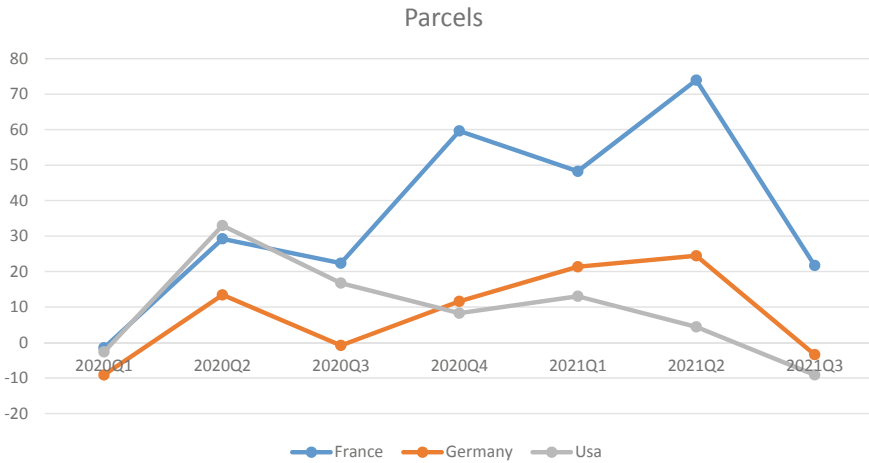


Fig. 5 Difference “observed vs no COVID” in % for parcel volumes

scenario in which the COVID-19 crisis would not have occurred). For Deutsche Post DHL, it occurred in the second quarter of 2021 (parcel volumes were 24% higher than the hypothetical scenario in which the COVID-19 crisis would not have occurred), as for La Poste in France.

5 Conclusion

In this study, we took the benefit of additional observations for the quarters of 2021 with COVID-19 compared to Arlandis et al. (2021) to investigate the effect of COVID-19 in terms of structural break. The estimation of the structural relations remains a difficult problem due to the small sample size (especially of the observations with COVID-19) and the point estimates of some coefficients remain uncertain. Our results seem to indicate that COVID-19 did not have an effect on the structural relation between mail volumes and GDP and trend (a proxy for e-substitution) but had an effect on the structural relation between parcel volumes and GDP and e-commerce.

The postal operators are interested to know if their gain in parcel volumes and loss in mail volumes during COVID-19 will persist in the future. Answering this question requires to know whether or not consumer behavior has changed due to this crisis. Is the increase in parcel volumes due to consumers shopping more via internet and therefore the observed acceleration in the growth of parcels, long-lasting? Did mail volumes decrease due to a long-lasting acceleration of e-substitution? We cannot offer a definitive answer to such questions at this stage.

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UK Parcel Market Trends in the Pre- and Post-COVID Environment: An Initial Assessment



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Abstract Due to the COVID crisis, the parcel market has undergone a significant increase in volumes over the last two years. Postal operators are facing a challenge in their organization to cope with this change. Therefore, understanding parcel market key trends and the magnitude of the post-COVID uplift in volumes play an important role in terms of influencing both short and long-term business decisions. In this paper, we examine domestic UK parcel volumes prior to and during the COVID crisis to assess the extent to which there has been a structural change in the demand for parcels. In particular, we examine the properties of an econometric time series model that accounts for parcel volume movements prior to COVID related effects, how this model performed during the pre-COVID crises and then go on to re-estimate the model using Google mobility data to better account for COVID-related impacts. By comparing the properties of the within-sample model predictions we obtain estimates of the extent to which COVID has impacted domestic UK parcel volumes.

Keywords COVID · UK parcel market · Time series model

1 Introduction

The coronavirus (COVID-19) pandemic, which emanated from Wuhan, China, in November 2019, is unfortunately still with us today, in May 2022. Over this period the virus has spread across national boundaries, evolved, mutated and had a profound negative effect on the general health and well-being of society and economies across the globe.

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National government reactions to the COVID virus included the imposition of lockdowns and curfews as well as encouraging individuals to maintain social distancing and, in countries fortunate enough to afford them, led to mass vaccination of the population. It therefore remains without question that the coronavirus pandemic has altered individuals' behaviours and will continue to do so for the foreseeable future. For example, mobility indicators in the UK have declined substantially relative to pre-COVID levels and many individuals and organizations have invested and upgraded their digital infrastructure to better facilitate working from home.

It is not clear what the post-COVID environment will eventually settle down to in terms of mobility, consumer behaviour and organizational work patterns. However, while the end point is highly uncertain the direction of movement is somewhat clearer: office-based employees will have greater (although not complete) choice with respect to the extent to which they will work from home; the acceleration in the use of digital technology and more home working is likely to reduce consumer mobility and employers are likely to reduce their demand for office space and high street presence.

The potential effects on national postal operators are not clear because evidence to date is limited. For example, Cazals et al. (2020) suggest that there was not an acceleration in the rate of digital substitution of letter mail in the UK during 2020 and the decline that was experienced was broadly in line with the historical relationship with economic activity and changes in other explanatory factors (such as price and quality of service movements). However, Arlandis et al. (2021) provide evidence to suggest that letter mail declined to a greater extent and parcel volumes to a higher extent than their pre-COVID trends would have suggested in Canada, the USA and a number of European countries.

This paper extends the UK findings to examine the impact of the coronavirus pandemic on parcel market volumes and undertakes an econometric study that is similar in scope to that undertaken by Arlandis et al. Section 2 contains an overview of the key drivers of parcel volumes. Section 3 undertakes an econometric assessment of the extent to which COVID-19 increased the demand for parcels relative to its pre-COVID trend, and Sect. 4 assesses the extent to which this is due to changes in e-commerce patterns and consumer mobility rates. Section 5 contains a summary and conclusion as well as a few thoughts on the potential outlook for parcel volumes in the UK.

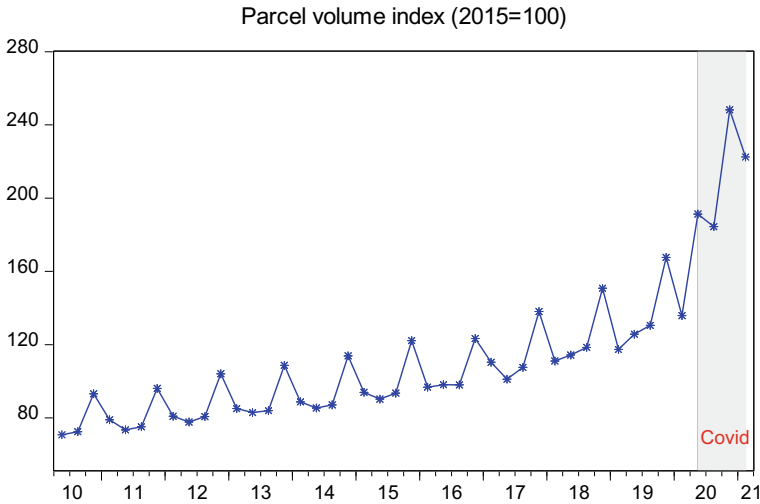


Fig. 1 UK domestic parcel market volumes, 2010 Q_2 to 2021 Q_1 (Source Ofcom and Royal Mail Group)

2 The Parcel Market, E-commerce and Post-COVID Consumer Trends

Data on domestic parcel market trends are available from the UK regulator Ofcom up to and including 2021 Q_1 and this information plus Royal Mail small parcel fulfilment products have been used to inform this study.¹ Figure 1 contains a times series plot for UK domestic parcel volumes which shows the long-term trend to be upward sloping and exhibit a high degree of seasonality, with the Christmas quarter, Q_4 , being much higher than other periods. Year-on-year growth rates show the pre-COVID lockdown period from 2010 Q_2 to 2020 Q_1 increased, on average, by 7% per annum,² with there being an uplift after 2017 to an average of over 10% per annum, prior to accelerating more than 50% during the first year of the pandemic.

The main driver of UK domestic parcel market growth over the past two decades has been the very substantial increase in e-commerce, and therefore, it is unsurprising to observe that internet-related and non-store retail sales excluding food and fuel (henceforth referred to as E-retail sales) have displayed a similar evolution, as can be seen in Fig. 2. For example, the profile of E-retail sales volumes exhibits, like Fig. 1,

¹ The additional items refer to Royal Mail’s fulfilment product range “RM 24/48” that meet the dimensions of a large letter format and which comprise smaller parcel items, of which a substantial number are sent by prominent online retailers and marketplace customers and in 2020 accounted for less than 10% of parcel volumes.

² Strictly speaking, the first UK wide national lockdown took effect from 23 March 2020 which means that 9 days were also impacted in 2020 Q_1 .

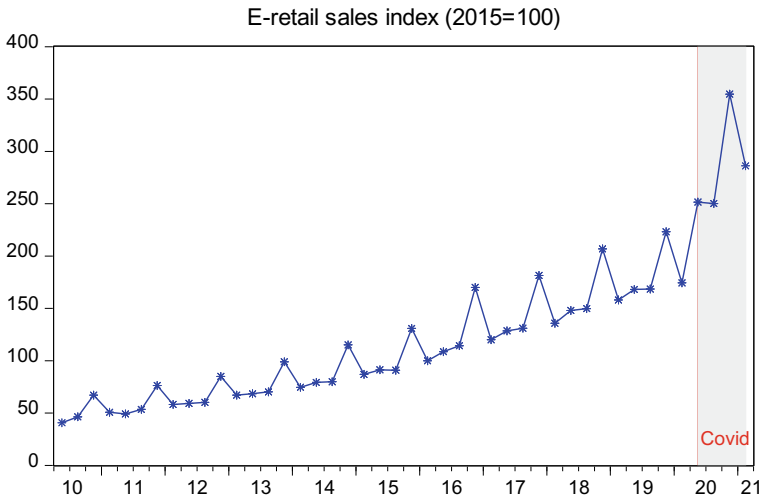


Fig. 2 UK E-retail sales volumes, 2010 Q_2 to 2021 Q_1 (Source Data from the Office for National Statistics, calculations by authors. Note E-retail sales refers to Office for National Statistics' average weekly Internet non-food store and non-store sales in value, not seasonally adjusted data. As corresponding volume data is not readily available, a retail sales excluding food and fuel price deflator was applied to generate a volume, or constant price, series)

a clear upward trend with a strong seasonality effect around Christmas time (which seems to become more pronounced after 2017) and a very substantial increase during the COVID crisis.

However, a further point to note about the E-retail sales profile is that it has tended to increase more quickly than parcel traffic (for example, increasing on average by 15% per year between 2010 Q_2 and 2020 Q_1) due to E-retail sales containing expenditure on many items that do not require sending a parcel, such as items that are picked up in-store and tickets for entertainment venues and travelling which in the past were mainly sent via letter mail and more recently via electronic media.

In addition to E-retail sales increasing very substantially in the post-COVID period an additional observation by parcel delivery operators was that many more individuals were starting to buy goods online than was the case pre-COVID and consumers who were previously making online purchases were now tending to do so to a greater extent. Initially this was due to stores being closed due to lockdown restrictions, but even when these were partially and fully lifted there was a reluctance, by individuals to physically return to in-store shopping due to social distancing and health concerns. This behaviour is neatly captured by the Google retail mobility measure of the percentage change in the number of visits to retail and recreation sites since the beginning of the COVID crisis. This data shows that retail mobility was slightly lower in 2020 Q_1 than the previous quarter, which is to be expected as this only included 9 days of the first national COVID lockdown, and then declined severely in the second quarter, by almost 70%, as this period was impacted by the national lockdown and social distancing measures to a greater degree. Thereafter, as lockdown restrictions

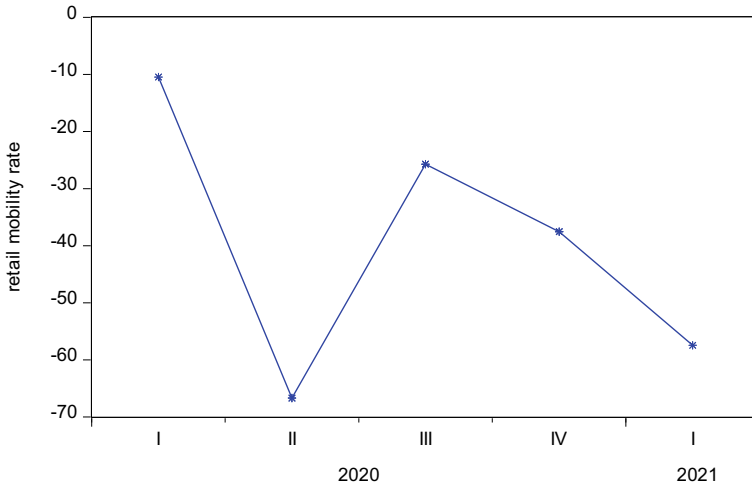


Fig. 3 Retail mobility rates (RMR) relative to pre-COVID period, 2019Q₄ = 0 (Source Google mobility data for change in the number of visits to retail and recreation sites since the beginning of the COVID crisis. “Google LLC Google COVID-19 Community Mobility Reports”. <https://www.google.com/COVID19/mobility/> Accessed: 03/03/2022. Note All values prior to February 2020 set equal to zero and values thereafter as per reported data)

were eased, retail mobility rates rebounded in the two last quarters of 2020 before declining substantially again as stricter COVID measures were re-introduced just before Christmas 2020 and resulted in a decrease in mobility rates of almost 60% in the first quarter of 2021 (Fig. 3).

3 Time Series Analysis and Econometric Modelling of Parcel Market Trends

In this section, we first estimate an ARIMA model for parcel market volumes up to the final pre-COVID quarter (assumed to be 2020Q₁ in the UK) and use it to generate forecasts for the period 2020Q₂ until 2021Q₁, which can be interpreted as counterfactual predictions of the level of parcel volumes that would have materialized in the absence of COVID. This empirical analysis then allows us to obtain an estimate of the post-COVID uplift in parcel volumes by taking the difference between the parcel volumes that occurred and the counterfactual predictions.

Second, we undertake a more structural econometric analysis of UK domestic parcel market volumes using the most up-to-date data available (that is, up to 2021Q₁) and the two additional variables, E-retail sales and Google retail mobility rates, that were referred to in Sect. 2. In particular, we are interested in examining the dynamic and long-run properties of these models and the extent to which E-retail sales and retail mobility rates impact parcel market volumes and conclude this section by evaluating their contribution to the post-COVID increase in parcel volumes.

Table 1 Parcel market volume estimated ARIMA(2,1,0) model, 2010Q₂ to 2020Q₁

Dependent variable $\Delta \text{Ln} P_t$				
	Coeff	SE	t-statistic	p value
Constant	0.2629	0.0103	25.4138	0.0000
Q ₁	-0.2781	0.0438	-6.3446	0.0000
Q ₂	-0.3195	0.0445	-7.1774	0.0000
Q ₃	-0.3221	0.0362	-8.8931	0.0000
$\Delta \text{Ln} P_{t-1}$	-0.6741	0.1670	-4.0358	0.0003
$\Delta \text{Ln} P_{t-2}$	-0.3799	0.1670	-2.2748	0.0300

$R^2 = 0.975$. Breusch–Godfrey statistic (for serial correlation): 0.677 (p value: 0.515)

3.1 Time Series Analysis and Estimates of the Post-COVID Uplift in Parcel Volumes

An ARIMA time series modelling exercise was undertaken for the pre-COVID period 2010Q₂ to 2020Q₁. Many time series models were considered and following an extensive examination of a number of statistical criteria.³ The preferred model was of the form ARIMA(2, 1, 0) in which seasonality is considered to be deterministic and takes the form:

$$\Delta \text{Ln} P_t = \alpha_0 + \alpha_1 \Delta \text{Ln} P_{t-1} + \alpha_2 \Delta \text{Ln} P_{t-2} + \delta_1 Q_{1t} + \delta_2 Q_{2t} + \delta_3 Q_{3t} + \varepsilon_t \quad (1)$$

where P_t denotes parcel volumes at date t (in index format), Q_{jt} are seasonal dummies for quarters $j = 1, 2$ and 3 and $\Delta \text{Ln} P_t = \text{Ln} P_t - \text{Ln} P_{t-1}$. Table 1 reports the estimated coefficients, standard errors, t-statistics and P-values corresponding to expression (1).

The estimated ARIMA model was then used to generate counterfactual forecasts for parcel volumes from 2020Q₂ to 2021Q₁ to predict the path of parcel market volumes in the absence of COVID. Figure 4 reports the counterfactual forecast values with 95% confidence intervals and the actual parcel volumes.

As expected a large and widening gap is observed between the actual volume of parcels that took place and the ARIMA counterfactual predictions for the post-COVID period 2020Q₂ to 2020Q₁, with the difference between the two suggesting that during the first year of the pandemic UK parcel volumes increased, on average by around 40%, with individual quarters in the range 30–55%, above their pre-COVID trend.

³ In particular, AIC and BIC statistical information criteria and within sample forecast performance indicators such as RMSE and MAE were examined to determine the form of an ARIMA (p, d, q) model. Where ARIMA models, which stand for autoregressive integrated moving average models, are fairly standard statistical time series models that are commonly used to generate short-term forecasts. Such models are generally denoted as ARIMA (p, d, q) where parameters p, d , and q are non-negative integers, p is the order (number of time lags) of the autoregressive model, d is the degree of differencing and q is the order of the moving-average model for technical details see for example, Box et al. (2015), Pesaran (2015) and Hamilton (1994).

Parcel volumes = 100 in 2015

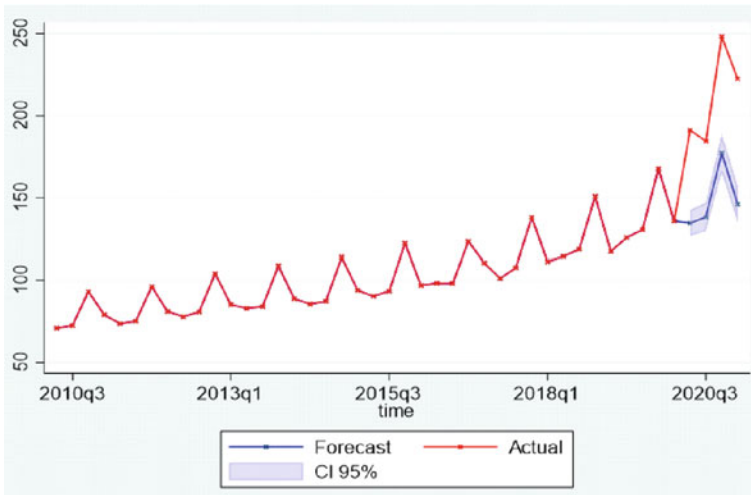


Fig. 4 ARIMA parcel market volume forecasts and actual output data (Source Data from Ofcom and Royal Mail Group and author within sample forecasts)

3.2 An Econometric Analysis of the Demand for Parcels

This sub-section reports the findings from a different and richer econometric model for parcel volumes. In addition to the deterministic variables included in the ARIMA modelling exercise, the variables E-retail sales (*R*) and retail mobility rates (RMR) referred to in Sect. 2 were included to explicitly account for the uplift in parcel volumes during the post-COVID period and hence, in contrast to the previous sub-section, the modelling covered the full data period available to us, namely 2010Q₂ to 2021Q₁.

An auto regressive distributed lag (ARDL) modelling strategy was adopted, which can be reparameterized and expressed as an error correction model (ECM) to allow us to more easily explore the estimated long-term relationship between parcel volume and E-retail sales and retail mobility rates.⁴ In particular, the modelling strategy adopted a general ARDL model of the form:

$$\begin{aligned}
 \text{Ln}P_t = & \alpha_0 + \sum_{i=1}^4 \alpha_i \text{Ln}P_{t-i} + \sum_{i=0}^4 \beta_i \text{Ln}R_{t-i} + \gamma_1 D_{1t} * \text{Ln}R_t + \gamma_2 D_{2t} * \text{Ln}R_t \\
 & + \sum_{i=0}^4 \theta_i \text{RMR}_{t-i} + \sum_{j=1}^3 \delta_j Q_{jt} + \varepsilon_t,
 \end{aligned}
 \tag{2}$$

⁴ For technical details about ARDL and ECM models see for example, Pesaran (2015), Pesaran et al. (2001), Pesaran and Shin (1999) and Engle and Granger (1987).

where $\alpha, \beta, \gamma, \delta$ and θ denote coefficients to be estimated and ε refers to a random disturbance term. The terms D_1 and D_2 refer to dummy variables that account for potential changes in the structural relationship between retail sales and parcel volumes in the pre-COVID period starting in 2019 Q_2 and the post-COVID period 2020 Q_2 , respectively.⁵

Like the ARIMA modelling, a general to specific modelling testing procedure was adopted using various statistical criteria to obtain a more parsimonious relationship between parcel volumes, E-retail sales, retail mobility rates and the deterministic variables which yielded the following ARDL model⁶:

$$\begin{aligned} \text{Ln}P_t = & \alpha_0 + \alpha_1\text{Ln}P_{t-1} + \beta_1\text{Ln}R_t + \beta_2\text{Ln}R_{t-1} + \gamma_1 D_{1t} * \text{Ln}R_t \\ & + \gamma_2 D_{2t} * \text{Ln}R_t + \theta_1 \text{RMR}_t + \sum_{j=1}^3 \delta_j Q_{jt} + \varepsilon_t \end{aligned} \tag{3}$$

The ARDL model can also be specified in terms of an error correction model (ECM) as follows:

$$\Delta \text{Ln}P_t = \alpha'_1 \text{ECT}_{t-1} + \beta_1 \Delta \text{Ln}R_t + \sum_{j=1}^3 \delta_j Q_{jt} + \varepsilon_t \tag{4}$$

where ECT_{t-1} is the long-run error correction term consistent with the ARDL model and takes the form:

$$\begin{aligned} \text{ECT}_{t-1} = & \text{Ln}P_{t-1} - a_0 - b_1 \text{Ln}R_{t-1} - c_1 D_{1,t-1} * \text{Ln}R_{t-1} \\ & - c_2 D_{2,t-1} * \text{Ln}R_{t-1} - d_1 \text{RMR}_{t-1} \end{aligned} \tag{5}$$

The long-term relationship between parcel volumes, E-retail sales and retail mobility variables are contained within the ECT expression in (5) and the parameter α'_1 in expression (4) represents the speed of adjustment towards it. The other coefficients

⁵ For clarification, D_1 is a dummy variable equal to zero up to 2019 Q_1 and equal to one from 2019 Q_2 onwards that was included to account for a structural break in the parcel volume and E-retail sales relationship from 2019 Q_2 onwards. In particular, following a visual inspection of the data in Fig. 1, we suspected that a structural break in the parcel volume relationship may have occurred at some point from 2017 onwards and a number of dummy variable tests were undertaken which suggested (on the basis of statistical information criteria) the most plausible commencement date for such a break occurred in 2019 Q_2 .

The D_2 dummy variable is equal to zero up to 2020 Q_1 and equal to one from 2020 Q_2 onwards and was included to test for changes in the parcel and E-retail sales relationship post-COVID.

⁶ The general to specific model reduction strategy commenced with expression (2) which required the estimation of 20 coefficients and then proceeded to eliminate variables on the basis of low t -statistics and improving AIC and BIC statistical information criteria which yielded a more parsimonious model containing 10 estimated parameters, as per expression (3). The advantage of adopting such an approach is mainly two-fold: first, it results in a substantial increase in the number of degrees of freedom relative to our sample size of, at most, 44 observations (2010 Q_2 to 2021 Q_1) and second, the focus of the model reduction process on statistical information criteria provides a better and more scientific way to balance the trade-offs associated with overfitting versus underfitting the model.

in expression (4), δ_j and β_1 account for the impact of seasonality and short-run dynamic effects stemming from changes in E-retail sales, respectively.

Table 2 reports the estimated results for the ARDL and ECM model specifications.

The models reported in Table 2 contain very high goodness of fit statistics, as measured by the near unity values for the R^2 figures, which is a desirable property when models of this type are to be used for forecasting purposes. A noticeable feature of the ARDL model estimates is the relatively low t -statistics for the E-retail sales variables R_t and R_{t-1} (0.65 and 1.59, respectively) in contrast to the much higher t -statistics reported for the ECM long-run estimate for E-retail sales (20.22) and fairly reasonable estimate for the short-term dynamic impact (1.59). Such observations are not uncommon when comparing ARDL and ECM results as issues relating to multicollinearity tend to reduce when using the ECM specification, as the variable reparameterizations automatically reduce the number of trending variables included in the estimation process.

The high absolute values of the ECM estimated t -values for the E-retail sales and retail mobility rate variables contained in the error correction relationship (reported in the lower right-hand side of Table 2) provide some re-assurance that a valid long-run relationship exists between these variables and the UK parcel volumes. Furthermore, the very high absolute value of the estimated t -statistic for the error correction term (ECT_{t-1}) reported in Table 2 (-12.2) provides additional evidence to support this.

On the basis that the ARDL and ECM estimated parameters are reasonably reliable the results contained in Table 2 suggest that prior to 2019 Q_2 the long-run demand for parcel elasticity with respect to E-retail sales was positive and around 0.38. Thereafter there is some evidence of a structural break occurring in the relation between parcel volumes and E-retail sales with the estimated elasticity increasing to almost 0.40 from 2019 Q_2 onwards and then increasing again in the post-COVID period (that is from 2020 Q_2 onwards) to a little over 0.41.⁷

In contrast, the estimated effect of the impact of retail mobility rates (RMR) variable reported in Table 2 is negative and its order of magnitude suggests that in the long run, each one percentage point reduction in mobility rates, holding all other factors constant, will, on average, increase parcel volumes by 0.46%. This estimate therefore reflects the extent to which changes in retail mobility rates impact parcel volumes independently of the scale of E-retail sales, which, most likely, is due to changes in consumers' online purchasing behaviour in terms of the type of goods purchased and frequency of transactions.

⁷ The long-run-estimated elasticity for E-retail sales up to 2019 Q_1 is reported in the lower right hand side of Table 2 and equal to the estimated coefficient $b_1 = 0.3812$. In 2019 Q_2 this is estimated to increase to equal the sum of the estimated coefficients $b_1 + c_1 = 0.3983$. Similarly, in 2020 Q_2 it is estimated to increase again to equal the sum of the estimated coefficients $b_1 + c_1 + c_2 = 0.4111$.

Table 2 Parcel market volume econometric models, 2010Q₂ to 2021Q₁

ARDL model estimates using expression 3		ECM model estimates using expressions 4 and 5					
Dependent var: Ln P_t	Coefficient	t-statistic	p-value	Dependent var: $\Delta \text{Ln} P_t$	Coefficient	t-statistic	p-value
Ln P_{t-1}	$\alpha_1 = 0.0953$	0.8428	0.4054	ECT _{t-1}	$\alpha'_1 = -0.9047$ $= 1 - \alpha_1$	-12.1773	0.0000
Ln R	$\beta_1 = 0.0893$	0.6511	0.5195	$\Delta \text{Ln} R_t$	$\beta_1 = 0.0893$	1.5906	0.1212
Ln R_{t-1}	$\beta_2 = 0.2555$	1.5930	0.1207	Q_1	$\delta_1 = -0.2872$	-11.0750	0.0000
$D_1 * \text{Ln} R_t$	$\gamma_1 = 0.0155$	3.9722	0.0004	Q_2	$\delta_2 = -0.2279$	-13.6647	0.0000
$D_2 * \text{Ln} R_t$	$\gamma_2 = 0.0116$	1.6885	0.1007	Q_3	$\delta_3 = -0.2090$	-11.4007	0.0000
RMR _t	$\theta_1 = -0.0041$	-5.3212	0.0000	$R^2 = 0.986$ Breusch-Godfrey statistic (for serial correlation): 0.925 (P-value: 0.4072)			
Q_1	$\delta_1 = -0.2872$	-3.9470	0.0004				
Q_2	$\delta_2 = -0.2279$	-6.1438	0.0000	With estimated long-run error correction relationship			
Q_3	$\delta_3 = -0.2090$	-4.8983	0.0000	Dependent var: Ln P_t	Coefficient	t-statistic	p-value
Constant	$\alpha_0 = 2.7693$	7.0687	0.0000	Ln R_t	$b_1 = 0.3812$ $= (\beta_1 + \beta_2)$ $/(1 - \alpha_1)$	20.2214	0.0000
$R^2 = 0.995$				$D_1 * \text{Ln} R_t$	$c_1 = 0.0171$ $= \gamma_1 / (1 - \alpha_1)$	5.4163	0.0000
Breusch-Godfrey statistic (for serial correlation): 0.925 (p-value: 0.4072)				$D_2 * \text{Ln} R_t$	$c_2 = 0.0128$ $= \gamma_2 / (1 - \alpha_1)$	1.9609	0.0584
				RMR _t	$d_1 = 0.0046$ $\theta_1 / (1 - \alpha_1)$	-4.8648	0.0000
				Constant	$a_0 = 3.0610 = a_0 / (1 - \alpha_1)$	33.8475	0.0000

4 An Initial Assessment of the Impact of COVID on UK Parcel Volumes

In the light of the large movements in E-retail sales, retail mobility rates and parcel volumes that have occurred since the pandemic started, this section further examines the goodness of fit properties of the estimated models reported in Sect. 3 and assesses the contribution of these variables in explaining the post-COVID uplift in parcel volumes.

More specifically, we use the ARDL model reported in Table 2 to assess the extent to which individual variables have contributed to the boost in parcel market volumes that began in earnest when official lockdown and social distancing measures were introduced in the UK in early 2020. Table 3 contains the results of such an exercise.

In particular, it reports the predicted values for parcel market volumes (P) using different input variable values for the period 2020 Q_2 to 2021 Q_1 which are then used to isolate the impacts of individual variables and shown graphically in Fig. 5.

Column C1 in Table 3 reports fitted values for P using the estimated ARDL model reported in Table 2. Whereas column C2 reports counterfactual forecast values for P computed by the time series ARIMA model reported in Table 1 whose values predict parcel volumes in the absence of COVID. Similarly, column C3, uses the ARDL model to derive alternative counterfactual forecasts by firstly setting the values of the retail mobility rate variable (RMR) and post-COVID retail sales dummy variable (D_2) equal to zero and, secondly, setting the year-on-year growth rates for E-retail sales (R) in the period 2020 Q_2 onwards equal to those that occurred in the previous pre-COVID year (that is, between 2018 and 2019). It is noticeable and somewhat reassuring to observe that these values are very close to those obtained using the ARIMA model in column C2 and therefore supportive of the results reported in Sect. 3.1.

Table 3 Parcel volume predicted values using different E-retail and COVID assumptions

	C1	C2	C3	C4	C5
	ARDL fitted P	ARIMA forecasts for P	ARDL predicted P assuming E-retail sales equal pre-COVID year growth and absence of COVID ($D_2 = RMR = 0$)	ARDL predicted P assuming outturn E-retail sales data and absence of COVID ($=D_2 = RMR = 0$)	ARDL predicted P assuming E-retail sales equal pre-COVID year growth and post-COVID environment ($RMR =$ outturn data and $D_2 = 1$ from 2020 Q_2 onwards)
2020 Q_2	190.1	134.5	131.4	135.3	184.1
2020 Q_3	185.4	138.3	141.5	156.3	167.3
2020 Q_4	248.7	177.2	177.8	198.9	221.4
2021 Q_1	222.3	146.1	143.4	164.1	193.5

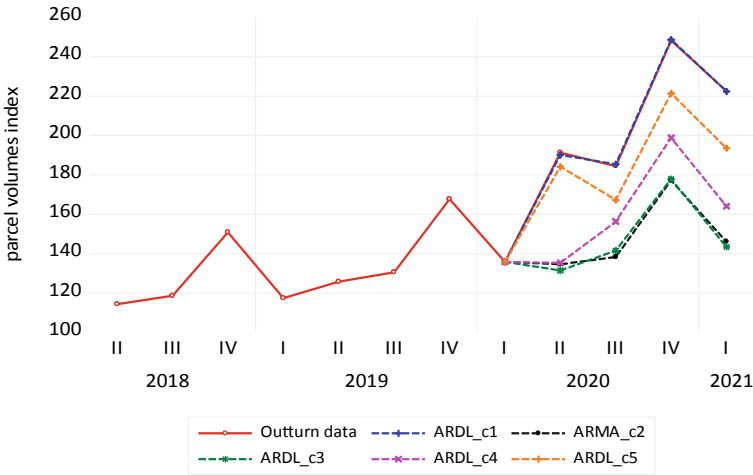


Fig. 5 ARDL parcel volumes forecast during the COVID period, using different scenarios

Column C4 reports the predicted values for P using the ARDL model with outturn values for E-retail sales for the whole period and assuming the absence of the impact of COVID by setting the values of the retail mobility rate variable (RMR) and post-COVID retail sales dummy variable (D_2) equal to zero. These values are close to those contained in C3 at the very beginning of the crisis (2020 Q_2) but quickly diverge thereafter (as clearly shown in Fig. 5), with the difference between the two providing an estimate of the extent to which higher retail sales solely contributed to the post-COVID uplift in parcel volumes. Estimates for the 2021 Q_1 (the latest data available to us) suggest that the evolution of E-retail sales accounts for around a quarter of the post-COVID parcel increase.⁸

Finally, column C5 reports the predicted values for P using the ARDL model by: first, setting the annual increase in E-retail sales (R) for the period 2020 Q_2 onwards to equal those that occurred in the previous pre-COVID year and second, assuming post-COVID environment conditions exist, such that the retail mobility rate variable (RMR) is set equal to its post-COVID outturn level and the E-retail sales post-COVID dummy variable (D_2) is set equal to one from 2020 Q_2 onwards. These values very quickly diverge to those contained in C3, with the difference between them suggesting that post-COVID changes in consumer behaviour could be explaining almost two-thirds of the uplift in parcel volumes in 2021 Q_1 .⁹

Our econometric results therefore suggest that the individual, or isolated, impact of E-retail sales and changes in consumer behaviour in the post-COVID environment accounted for around 90% of the uplift in post-COVID parcel volumes in 2021 Q_1 .

⁸ A more precise estimate can be obtained using the results reported in the final row of Table 3 and equals $(164.1-143.4)/(222.3-143.4) = 26.2\%$.

⁹ Similarly, a more precise estimate can be obtained using the figures $(193.5-143.4)/(222.3-143.4) = 63.5\%$.

In terms of the remaining 10%, the very close fit of the ARDL model to the actual outturn data, as shown in Fig. 5, shows that when we simultaneously include the effects of higher E-retail sales (R) and changes in consumer behaviour in our econometric model (via RMR and D_2) we can almost fully account for the uplift in parcel volumes during the post-COVID environment, suggesting that most of the remaining difference is due to non-linear interaction effects amongst these variables.

5 Summary and Conclusion

The impact of COVID has had a profound effect on society in many ways. In terms of the impact on UK parcel volumes up to 2020 Q_1 (the most up-to-date data available to us), our ARIMA and econometric analyses suggest there has been a substantial post-COVID increase, possibly of the order of around 40% above its pre-COVID trend.

The more structural econometric model analysis suggests that this uplift is likely to be due to three factors. First, the implementation of COVID lockdown periods and strict social distancing rules, in addition to general public health concerns, led to a substantial shift in consumer behaviour towards online E-retail sales which our ARDL model analysis suggests may account for approximately a quarter of the boost in post-COVID parcel volumes. Second, changes in retail mobility rates are likely to be reflecting changes in the number of transactions and type of goods bought online for any given level of E-retail spend, especially in the post-COVID period, which have had an additional positive impact on parcel volumes and which our econometric results suggest could explain a further two-thirds of the uplift. Third, most of the remaining difference is due to the joint effects (or in technical terms, non-linear effects) resulting from the interactions of increasing E-retail sales and changes in consumer behaviour in the post-COVID environment.

With regard to what our econometric results could potentially mean for the future, most employers, organizations and employees believe the post-COVID environment will result in a permanent increase in online sales and the extent to which people will work from home. If such views prove to be correct, then our results suggest that parcel volumes in the post-COVID environment will be higher than they would have been in the absence of the pandemic.

However, since the post-COVID path for both E-retail sales and retail mobility rates remain highly uncertain and potentially subject to further unpredictable pandemic-related shocks, the scale of any such uplift cannot be quantified with any real certainty. Under such circumstances, our results suggest that the business environment for postal and parcel operators over the near to medium term will require a greater focus on delivering more parcels than previous trends would suggest in a potentially more volatile environment.

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Exploring the Use of Control Theory to Describe and Assess the UK's Postal Regulatory Framework, Including Lessons That Can Be Learnt and Applied from This Tool for Regulation



Matthew R. Thomas and Philip Groves

Abstract Control theory can be defined as a dynamic system where system inputs can be controlled to give a desired output, potentially by using feedback loops that characterize a 'closed' system. The aim of the paper is threefold: first, to use control theory to develop a model which describes the UK's postal regulatory framework, with reference to other regulatory frameworks such as telecommunications; second, to investigate how such a model can be used to help design, evaluate, and communicate how postal regulatory frameworks work; and third, to identify strengths and weaknesses of such an approach. The findings of this paper suggest that it is an effective analytical, design, and communication tool that can be applied to both postal regulation and other sectors. It also notes that control theory should be seen as complimentary to existing methods of regulation rather than as a replacement. Finally, the paper sets out a number of potential areas for future work.

Keywords Control theory · Regulatory framework · Design · Communication · Analysis · Systems thinking

1 Introduction

Control theory can be defined as a dynamic system where system inputs can be controlled to give a desired output, potentially by using feedback loops that characterize a 'closed' system. It originally came to the fore during the industrial revolution and is used regularly to understand and model systems such as mechanical and electronic systems found in, for example, manufacturing.

The aim of the paper is threefold: first, to use this theory to develop a model which describes the UK's postal regulatory framework, with reference to other regulatory

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frameworks such as telecommunications; second, to investigate how such a model can be used to help design, evaluate, and communicate how postal regulatory frameworks work; and third, to identify strengths and weaknesses of such an approach. This framework could then provide the basis for a future paper to study the effects of specific regulatory tools used in the UK and another countries. For example, its potential usefulness could be assessed for understanding postal efficiency or sustainability (profitability) targets.

To meet these aims, Sect. 2 examines the definition of control theory and how it has traditionally been applied using simple examples such as heating a house. Section 3 examines areas where control theory was applied in a macro-economic context to guide policymaking and includes lessons that may be learnt from this. Using a heuristic approach, Sect. 4 develops a control model to reflect the way in which the UK postal regulatory framework works today, together with a description of its key elements, and also considers its potential application to other industries—specifically the UK’s telecommunications regulatory framework. Finally, Sect. 5 presents conclusions on using control theory to model aspects of postal regulation, discussing how it can be most usefully applied, potential strengths and weaknesses, and areas for future work.

2 Control Theory

In this section, we look at the definition of control theory and give some simple worked examples to illustrate how it works in practice. We also deal with some of the practical shortcomings of control theory, and how a control model may be designed to incorporate an element of self-learning.

2.1 Definition(s) of Control Theory and Its Purpose

Control theory can usefully be defined as the study of the way in which the input of a dynamic system can be controlled to give a desired output. A closed system involves feedback which uses the observed outputs to modify the inputs to give the desired state as compared with an open system which has no direct feedback. For this paper, we are interested in closed feedback systems, i.e., systems which involve feedback to control dynamic systems.

This relationship between inputs and outputs is illustrated in the diagram below. The ‘error detector’ element regularly compares the measurement of the actual output with the desired output (or desired outcome) and identifies the gap between the desired output and observed output (the error). This gap is then addressed, using a control signal, to alter the behavior of the system, which uses these control signal inputs to deliver the outputs and to minimize the ‘error’.

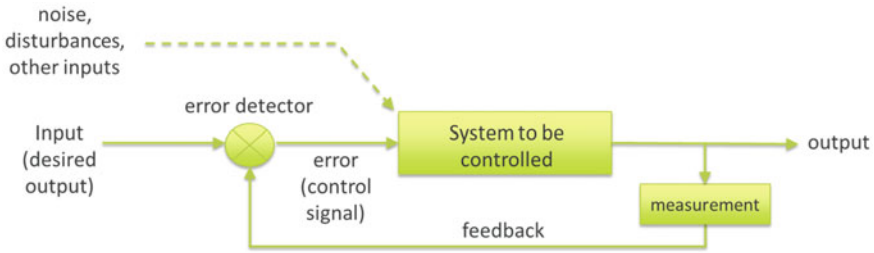


Fig. 1 Illustration of a simple closed loop control system for delivering a desired output

The dotted line in Fig. 1 illustrates that the system may be subject to other inputs, such as noise and unexpected disturbances. Such unintended additional (extraneous) control signals may compete with the intended control signals of the system being studied. We discuss this effect later in the paper.

2.2 *Practical Realities*

Making simplifications allows a problem to be understood conceptually and facilitates its assessment analytically—an approach this paper adopts when considering the application of control theory to regulation. In real-life situations, it may not be possible mathematically to define and model a system—for example, the modeling of human behavior. In these cases, the system may be treated as a black box,¹ with more general assumptions and hypotheses having to be made about the link between cause (input into the system) and effect (output). It is this ‘black box’ approach that we take in this paper.

One of the challenges, when designing control systems, is deciding on how often data is collected (sampling frequency)—this also applies to regulatory systems such as when collecting quality of service information. Collecting data too infrequently (the Nyquist limit) can miss fluctuations in the signal and lead to a failure in the control system—rapid changes in the signal are simply missed. At the same time, collecting data too often can result in too much data which can be expensive to collect (such as carrying out large surveys regularly) without yielding additional useful information (from a control point of view), and (from a process control point of view) potentially leads to false alarms (QualityMag.com 2019) which can in turn lead to the risk of (regulatory) over control and/or system instability.

¹ Black box—in engineering generally, and in this context, it means an operation that acts as part of the mechanism without any clear indication of how it is working.

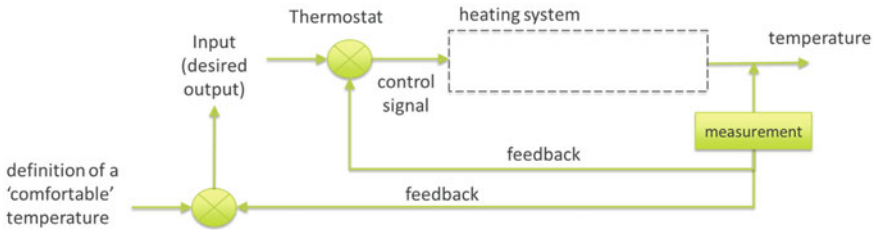


Fig. 2 Illustration of a domestic heating system with a second/additional feedback loop

2.3 Control Theory—Extending the Simple Worked Example to Include Two or More Feedback Loops

In practice, an additional feedback loops may incorporate factors (guiding principles or policy) that may be revisited either on a planned basis (e.g., every 5 years for a regulatory review), or when there is a significant change in one of the factors. A double feedback loop is used in organizational behavior modeling and is a form of self-learning or double loop learning (Argyris 1977; Infed.org 2012) (Fig. 2).

It is possible to add additional ‘nested’ feedback loops, with each additional loop having a longer response time. For example, there may be a longer-term review of the boiler system’s effectiveness near the end of its life, or where there is a change in the framework for gas installations (such as the use of the mandated use of heat pumps or the requirement to use condensing boilers). We will examine the application of multiple feedback loops to postal regulation later in the paper.

3 Application to Regulation and Economic Theory

In this section, as useful context, we examine the application of how control theory has been applied to the development of policies to address macro-economic issues to help regulate the broader economy. Although macro-economics is different from the application of control theory to micro-economic policy (that is to individuals and companies), it provides useful context for understanding why control theory can complement economic theory when solving complex control problems such as the regulation of industries and/or companies, including post.

3.1 1930’s

The application of control theory to economic policy is relatively recent, originating during the Great Depression of the 1930s and then accelerating after the Second

World War. Control theory provided a means of measuring and calibrating the impact of different policy levers used by the Government on the overall economy. This presupposed the ability to model the economy as a closed control system and to achieve a desired state, such as economic stability, via decisions on how to apply different economic levers.

After the Second World War, Tustin (1953) pioneered attempts to apply control engineering and control techniques to economic problems. Tustin saw economic policy as a 'closed loop' system control and made analogies between economic models and technical systems. He sought to apply traditional methods of electrical engineering to economics since to achieve a stable system by modifying the internal design (inputs and relationships) of the system. The key difference he saw was that *engineers can modify the system using feedback loops whereas economists cannot influence their systems' internal relations as directly.*

3.2 1970s

In the 1970s, economists turned their attention to stochastic² control theory to try to provide insights related to addressing various policy questions such as stabilization, optimal growth, and planning. Prescott (1977) noted that for some time policymakers had looked at the current state of the economy and used an implicit law of motion to evaluate the consequences of alternative decisions on output, employment, and prices. He advocated control theory being used instead in a formal way via a simplified version of the 'Fed-MIT' model, used by the Federal Reserve System and designed for policy evaluations.

Friedman (1953) argued that economists were far from having a detailed and tested theory (such as the 'Fed-MIT' model) to predict the timing and effects of monetary policy, and that fine-tuning should therefore not be attempted. He argued instead for the use of macro models and control theory methods. In contrast, Lucas (1976) argued that the structure of the econometric model (using control theory) is worthless in assessing policy scenarios. Instead, he advocated that only economic theory should be used to predict how the economy will perform under different policy rules.

Prescott considered that econometricians had not been very successful in finding stable relationships over time from the operation of control theory, pointing to findings which confirmed this even for the Fed-MIT model. He therefore concluded that 'optimal control is an increasingly powerful tool for controlling systems... *there is no question that modern control theory should be used for macro planning*'.

² Stochastic: 'having a random probability distribution or pattern that may be analysed statistically but *may not be predicted precisely*'.

This paper agrees with this view, and will show that it can also be applied to micro-economic planning such as the regulation of individual industries and/or companies within an industry.

4 Application to Postal Regulation

In this section, we explore the use of control theory to describe and assess the UK's postal legal and regulatory framework, including lessons that can be learned and applied to existing and new regulatory frameworks. We start with the overall postal regulatory framework, and then look in more detail at how control theory can be used to understand specific aspects of regulation, such as service delivery performance.

4.1 Setting up and Reviewing Performance Standards

Figure 3 takes the elements of the postal regulatory framework and applies them to the control theory concepts and building blocks set out in Sect. 2. We start by examining the legal and regulatory framework (the outer feedback loop) which drives the expected standards against which Royal Mail performance is expected to deliver the desired outcomes.

The postal legal framework was set up with the intention of delivering several users and wider social benefits. The 2011 Postal Service Act (PSA 2011) sets out the requirement to secure a universal postal service which meets *'the reasonable needs of the users of those services'*. PSA 2011 is also specific in terms of the service being a national uniform service, setting minimum standards (such as six-day Monday-to-Saturday delivery of letters, large letters and packets, and five days Monday-to-Friday delivery for parcels) together with requirements for affordability, sustainability, and efficiency.

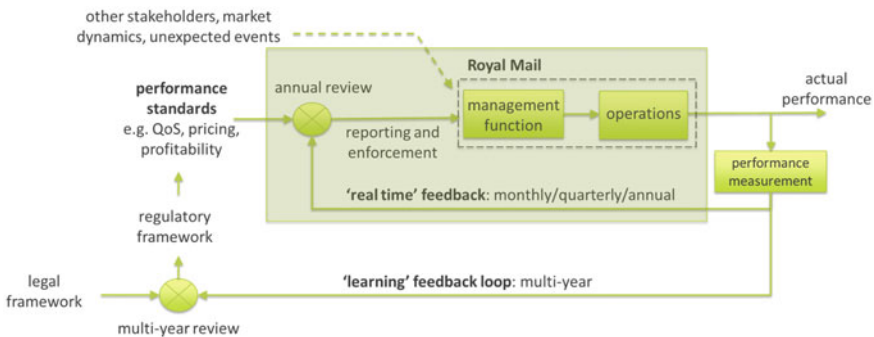


Fig. 3 An illustration of how UK postal regulation works using control theory concepts

The legal framework is then translated by Ofcom (the UK postal regulator) into specific requirements as part of a more detailed regulatory framework. This regulatory framework considers both the legal framework and the performance of the USO and whether it meets user needs (defined using, for example, consumer research). The framework then sets out specific requirements, both those set out in the legal framework and measures such as quality of service (QoS, e.g., service delivery performance), price control (e.g., safeguard caps), and expectations on efficiency and sustainability. These are set out in detail in the Designated Universal Service Provider (DUSP) conditions.³

The performance of the regulatory framework is then reviewed regularly—for example, a review has recently been completed by Ofcom, 5 years after the previous 2017 review. This examines the outcomes achieved in practice and considers whether the regulatory framework remains fit for purpose or whether any of its elements need to be removed or modified. From a control theory point of view, this is to remove the ‘error’ between the desired outcomes—with a forward ‘ex ante’ look—and outcomes achieved in practice—the feedback loop.

In addition to this secondary feedback loop, in post, there is also a longer-term review of the legal framework itself which acts as another feedback loop. For example, the last review of the legal framework for postal services began in 2007, resulting in two reports by Richard Hooper (2008, 2010) for the UK Government. This resulted in the PSA 2011, which in turn formed the basis for the regulatory framework initially published in 2012. The 2007–2012 update of the legal and regulatory framework reflected the commercial challenges Royal Mail was experiencing at that time.

These challenges related to delivering universal postal services at a time when letter volume decline had set in and accelerated, giving rise to a gap between what was expected—and observed through measurement—and the desired outcome of an affordable, financially sustainable universal postal service meeting the reasonable needs of users. We consider that future reviews of the legal framework are also likely to be driven by circumstances where delivery of a universal postal service is perceived as under threat, noting that the time required to carry out the review may span multiple years given that they involve assessing potentially significant changes and longer-term impacts.

4.2 Ensuring Performance Standards Are Delivered

The previous discussion provided an overview of how the regulatory framework is set up to provide desirable consumer outcomes (e.g., through service performance standards) that are reviewed on a multi-year basis. We will now look at the more detailed ‘inner’ control loop which aims to ensure performance standards are met in practice. This ‘inner’ control loop is illustrated in Fig. 4, which is similar to Fig. 3

³ Ofcom DUSP Condition 1: Service, access points, performance targets, notification and publication and contingency planning. As at 1 March 2017.

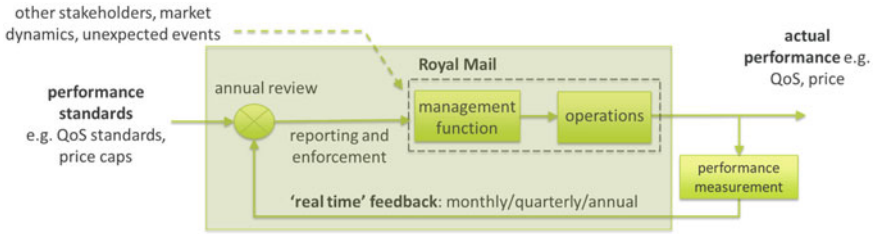


Fig. 4 Illustration of how service delivery performance is controlled annually

but with the ‘learning’ feedback loop removed. We will use quality of service to describe how this control loop works.

Royal Mail is required to deliver its service against a set of quality of service (QoS) performance standard targets, such as the percentage of first and class letters delivered to a set standard ($D + 1$ for first class, $D + 3$ for second class). There are also other annual performance targets which Royal Mail is obliged to report quarterly, such as postcode area delivery targets. Service performance is measured during the year (quarterly), and is assessed annually for compliance, taking into account any unexpected events beyond Royal Mail’s control. For example, in 2020–21, no regulatory enforcement action was taken for actual performance being below target, in part due to Government measures to combat the Covid-19 pandemic having an impact. This contrasts with 2020 when Ofcom fined Royal Mail £1.5 m for missing key targets in the 2018–2019 financial year.

Ofcom’s 2020 decision was an example of use of incentives, both financial and reputational—driven by the feedback loop of actual measured performance when compared against published targets—to deliver the wider aims of a reliable service that meets the reasonable needs of consumers. It is also an example of how other stakeholders, such as consumer advocacy bodies, provide reinforcing feedback (not shown for simplicity) using the published delivery performance information to call for improvements. Should any improvements be insufficient, the result can be a negative reputational impact on the regulated body as well as the regulator, given the latter’s duties in relation to ensuring a universal postal service meets the reasonable needs of users.

This model (Fig. 4) intentionally splits Royal Mail into a management and operational function, recognizing that the management function must consider and prioritize competing demands for potentially scarce resources (investment, people, assets) in delivering its services. One example of this is that the consequences of financial loss to the regulated company in the form of a fine, plus the reputational impact, are likely to be weighed against the additional costs, and potentially other effects, of ensuring quality of service targets are met to give the best financial outcome (i.e., to maximize shareholder returns). Regulatory actions need to take account of the different incentives on the regulated company in establishing the overall framework to improve and, where possible, optimize consumer outcomes. They may also need

to take into account factors outside Royal Mail's control, such as the recent Covid-19 pandemic (i.e., unexpected events as per Fig. 4).

5 Discussion and Findings

5.1 *Application of Control Theory in the Postal Sector*

The control model described in this paper focuses on regulation as being the primary control method for ensuring outcomes such as quality of service levels and affordable services. This is particularly useful when a company has significant market power or the legislation assumes this is the case, for example for the daily delivery of letters to households. In the parcels market, however, the same outcome may be achieved through other mechanisms such as competition—or market dynamics as illustrated by the 'dotted arrow' shown in Figs. 3 and 4. In this case, the formal regulation may fall away or be used as a complementary control mechanism such as consumer protection rules in the form of a complaints process. This model recognizes that when designing or reviewing a regulatory framework, other control mechanisms (competitors, consumers, government) need to be taken into consideration to avoid overregulation (Gov.uk 2003).⁴

A key assumption of control theory is that the control signals bring about a change in the outputs, which is true for engineering systems. However, in regulation, it does not always follow that the control signals or incentives acting on the system have a direct, timely, and effective impact on the systems' outputs. The design of regulation therefore needs to ensure that the regulatory action (or lever) will, even if delayed, lead to the desired outcomes. For example, when a charge control has breached this results in a fine and, although the fine is delayed until after the breach occurs (i.e., ex post), the fine's impact (financial and reputational) may be sufficient to result in the regulated body changing its prices in advance of a fine to ensure compliance and similarly alter its future behavior to prevent further sanctions. As a specific example, the opening of an investigation by Ofcom, following a complaint by Whistl, resulted in Royal Mail withdrawing a wholesale price rise some time ahead of a fine being ultimately imposed (Ofcom 2018). In practice therefore, the choice of lever to deliver the desired policy outcomes is often based on the accumulated regulatory experience of applying different levers, and corresponding results, to make a reasonable assessment of what lever, and at what level, and over what time period it is likely to be most effective.

Another less direct example of a regulatory lever would be the publication of information which may influence the behavior of the regulated company, either due to reputational impact or shareholder pressure to change strategy (or even leadership). In contrast, the use of fines where there is a serious failure to deliver specified service

⁴ This is in recognition that competition can be a better mechanism than regulation for delivering better consumer outcomes (whether it be price, service, product innovation) should be promoted where possible.

levels may be more effective and immediate due to the regulated company keen to avoid financial loss as well as reputational damage. The key learning points are: first, the chosen lever needs to be proportionate to the problem identified; and second, the choice and design of the regulatory lever need to be sufficiently effective in practice. This is sometimes difficult to assess until after the lever has been implemented. The risk of regulatory failure exists when the regulatory lever proves not to be effective ('ex post'), which can be mitigated through a secondary learning feedback loop such as the use of reviews of the regulatory framework to attempt to avoid a recurrence of the problem.

The example of quality-of-service standards used in this paper is an example of a single input/single output control model. It also demonstrates how largely independent variables (for example price caps vs. quality of service) can be modeled separately and independently with little need to model interdependencies. In the case of UK postal regulation, sustainability (using profit as a measure) is less straightforward to model and is affected by other regulatory measures such as quality of service (affecting costs), price caps (limiting revenues), and external market factors such as the decline in letters. The added complexity, although not impossible to model using control theory, means that sustainability may be more suitable to a systems thinking approach (Arnold and Wade 2015), which looks at the inter-relationship and dynamic nature of feedback between multiple elements within a system, to understand the impact of regulation. We consider this as a potential area to explore in Sect. 6, in future work.

One of the key elements of the control system is the ability to measure the outputs accurately. This can be difficult in practice where the measurement is being done by the organization that is being measured, generating a conflict of interest. The temptation (and incentive) to alter the measurement rather than fix an underlying problem can be great. On the assumption that the measurement reflects the outcome that is wanted (itself a challenge when designing a regulatory system), the next challenge is to assure its accuracy free from unwanted influence. For QoS measurements, this is achieved by using an independent organization (in the UK Kantar) to take statistically representative measurements (quarterly) which are then independently audited 'by an auditor appointed by Ofcom'.⁵

The wider problem of unwanted external influences adversely affecting other parts of the control system is understood in electronics, and effort is made to isolate (insulate) the system from external noise (e.g., placing the thermostat away from a heat source). To draw parallels with regulation, efforts are often taken to ensure the independence of the regulatory oversight to minimize distortion in regulation by stakeholders with vested interests—whether that be the organizations being regulated or other stakeholders. In the UK, Ofcom is set up as an independent regulatory body to minimize these risks while avoiding 'regulatory capture'.

In addition to taking the measurements, there is also the issue of how frequently measurements should be taken (the sampling frequency). The goal should be to

⁵ Royal Mail Quality of Service Reports, www.royalmailgroup.com/en/about-us/regulation/quality-of-service/.

sample often enough to identify unexpected changes and underlying changes in trends, but not so often as to create false alarms (Infinity QS 2022).⁶ Statistical process control (SPC) can provide useful guidance when working out the right measurement strategy. In the case of service delivery measurement, Royal Mail is required to provide measurements quarterly with the regulator's review of actual vs. target performance being carried out annually.

Another key element is setting the standards (a reference point) against which the actual performance of the system will be measured. It is this reference point which is compared with actual performance to decide if any regulatory action is needed—either directly in the form of (for example a fine) or as changes to the regulations and/or regulatory frameworks over time. In the case of pricing, this may be driven by user research to understand affordability (if that is a regulatory goal), benchmarking against other similar organizations (such as for quality of service), or using an econometric or financial model (such as for cost-based charge controls). As identified earlier, there is a risk that the regulated organization will unduly influence the setting of standards to minimize the impact (often financial) that regulation may have on their business.

In its December 2021 Consultation on the UK postal regulatory framework, Ofcom noted that Royal Mail's efficiency performance continued to be of concern and argued accordingly that a more transparent and simple way to track progress would be required. It proposed publication of Royal Mail's longer-term efficiency expectations would create a public benchmark against which its actual performance could be measured. This measure would also increase stakeholders' understanding of Royal Mail's progress on efficiency and provide a public reference point for future assessments of its progress here. We consider this as a potential area to investigate further (see Sect. 6).

The appropriateness of the annual frequency of regulatory reviews of actual quality of service reflects the time it takes for changes to be made to Royal Mail operations to delivering changes in performance and tracking the results, potentially six months to understand an underlying problem and to develop, trial, implement, and check a solution. Quarterly reporting allows trends in the performance, using a 12-month average—to minimize seasonal effects—together with a year-on-year comparison of the quarterly result to give an 'in flight' view, similar to approaches used in SPC. It can be tempting to increase the frequency of taking measurements aimed at speeding up an improvement in performance—however, the speed of change in output is limited by the ability of the system to change, rather than the frequency of measurement. So, increasing the frequency of measurement may give no advantage—while giving the appearance of action—since it can potentially divert attention (and resources) from the underlying issues that may need to be tackled.

Finally, a key difference between a regulatory control system and an industrial control system is the lack of direct control over the operational design and resource allocation of the organization being regulated, a limitation recognized by Tustin (see Sect. 3). Although it may be tempting for a regulator to 'micromanage' the

⁶ As set out in Sect. 2 on control theory, the sampling frequency needs to be twice the maximum frequency being measured (Nyquist criteria).

organization, in post in the UK, it was recognized that this was sub-optimal and led to the change to a revised legal framework and a lighter touch regulatory approach in 2011 and 2012, respectively. This assumed that, in the UK, Royal Mail has better access to information needed to optimize its performance, as well as holding the levers to manage that efficiently, compared with an external agent such as Ofcom.

5.2 Application of Control Theory in Other Regulated Sectors

It is useful to compare the regulatory approach used in UK fixed telecoms and UK postal services. In telecoms, Openreach (part of the BT group) sells leased line ethernet products which are regulated (where Openreach was found to have SMP). Several remedies exist including Quality of Service standards (such as time to repair) and price controls. In a similar way to postal regulation, the effectiveness of the remedies is monitored, reported, and where necessary, enforced—specifically against performance standards. This is illustrated in Fig. 5 which is almost identical to Fig. 4 for post.

The key difference between post and the fixed telecoms approaches is in the legal framework. For telecoms, the legal framework sets out the market review process derived from EU legislation which works in combination with the UK Communications Act which sets out the regulatory objectives. In contrast, for post, the legal framework sets out the desired outcomes, i.e., a postal service that meets the reasonable needs of users and is affordable. Unlike telecoms, it also sets minimum standards such as the frequency of delivery (6 days a week for letters, 5 days a week for parcels).

A disadvantage of the postal approach is that it may require a change in legislation to alter the minimum standards although some of the standards are within the remit of the regulator and could therefore be changed without new legislation. By contrast, for telecoms, the market approach is flexible enough to allow any of the standards to be altered as part of the regular multi-year review and is therefore less constrained by the legal framework. This more flexible approach is reflected in the UK Government’s

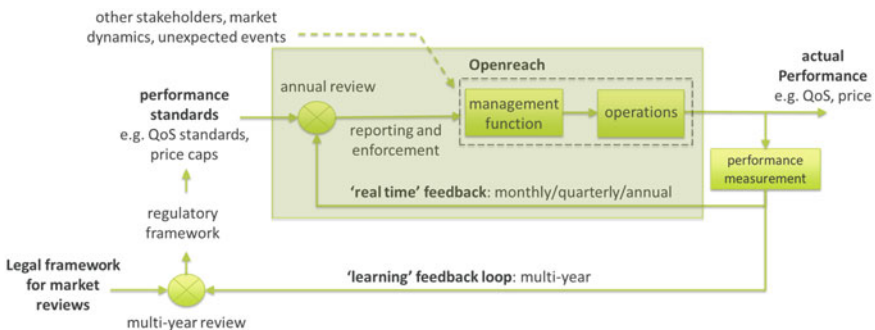


Fig. 5 Illustration of control theory applied to UK fixed telecoms

recent consultation on reforming competition and consumer policy (BEIS 2021, 2022) and is also being considered in the European Commission’s evaluation of the current postal services directive (Copenhagen Economics 2020).

6 Conclusions and Future Work

6.1 Conclusions

Figure 6 provides a simplified view of control theory applied to regulation, showing how the different elements build up to set the performance standards and then use incentives to drive performance to meet the desired outcomes. Key to this is the feedback loop to ensure that each element is reviewed at the appropriate time—this may be annually for reporting/enforcement, through to up to 20–30 years for a change to the legal framework.

This overview also recognizes that regulation does not work in isolation, but rather in combination with the environment in which it operates—from microenvironmental factors such as consumers, competitors, and investors, through to macro factors such as social, technological, political, legal, and environmental factors (‘PESTLE’).

A key strength and usefulness of this approach is its use as a design, diagnosis, and communication tool. By understanding the linkages, any gaps and weaknesses in the design can be identified. Once implemented, the approach can then be reviewed to identify first any specific elements which may be failing and second how the system can accordingly be strengthened. The approach is also useful as a communication tool to help explain the multiple layers and sequencing of regulation. Finally, it can re-enforce broader aims of regulation such as good consumer outcomes including transparency on their measurement. It is important to note that this approach should be complementary to existing regulatory tools and techniques, rather than a replacement for them. As Westcott points out (Sect. 3), control theory ‘can also be used to gain further insights into the model and economic system’.

Unlike engineering systems, this approach (when applied to regulation) does not lend itself to precise modeling of outcomes such as quality of service levels. This is due to the weaknesses in the model arising from considering the regulated company as being a ‘black box’, a necessary simplification given the complex factors influencing



Fig. 6 Simplified overview of control theory applied to regulation

its performance combined with the undesirability of the regulator seeking to ‘second-guess’ or ‘micromanage’ major management decisions made by the company. This approach requires informed reasonable assumptions, often based on accumulated regulatory experience, to be made around the effectiveness (and choice) of regulatory incentives/levers to deliver the desired outcomes taking into account of what may or may not have worked in the past.

6.2 Summary

The key areas identified in this paper to consider when designing new regulatory systems, or diagnosing shortcomings with existing regulatory systems include the need to ensure that the regulatory levers are both effective in providing a timely change in outputs to deliver the desired outcomes (such as quality of service, price levels) and also remain effective once the competing demands placed on the organization, such as other service targets or desired shareholders returns, are considered.

Any targets should allow performance (the outputs) to be measured and tracked, and for proportionate corrective measures to be taken quickly, free of undue influence by stakeholders, including avoiding regulatory ‘capture’. Any measurements therefore need to be both sufficiently accurate to be relied on to achieve the objective or output (while being not unduly influenced by the organization being regulated) and are taken sufficiently frequently to provide adequate warning of underlying changes to the system outputs (but not too frequently to create ‘false alarms’).

It is also important that any regulated organization has sufficient freedom to organize itself in the way it best sees fit to deliver the regulatory requirements in addition to its other demands, such as shareholder returns or meeting other company goals—this is another reason why ‘micromanagement’ by the regulator may not appropriate.

6.3 Future Work

During the preparation of this paper, we identified several areas we are considering investigating further. We have incorporated feedback from members at the conference both to improve this paper and have been encouraged to continue work in this area. As a result of the analysis set out in this paper, and from discussions with conference members, we have identified a number of useful areas to investigate.

Firstly, we aim to investigate the impact of step changes on the robustness of the UK’s postal regulatory framework. Covid has provided us with a unique opportunity to investigate this further.

Secondly, we will look to apply control theory to more complex problems and lessons we may be able to learn from and apply. Ofcom (2022) recent review of

regulation of efficiency and sustainability which interacts with costs of meeting quality of service and pricing constraints being a potentially useful case study.

Thirdly, we are keen to compare, contrast, and identify areas of commonality between the control theory approach set out in this paper with a systems thinking approach, by applying it to the sustainability of the postal service.

Fourthly, we see merit in demonstrating how control theory can be used to improve regulation in practice, using the recent Ofcom (2022) regulatory review consultation proposals to strengthen efficiency metrics as the example.

Finally, we would like to further explore the use of control theory to explore the relative merits of a market-based approach with the current postal regulatory framework which flows from the UK's legal framework for post.

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On the Prediction of the Postal Service's Marginal and Total Operating Costs



Lyudmila Y. Bzhilyanskaya, Margaret M. Cigno, and Soiliou D. Namoro

Abstract This chapter proposes an econometric framework aimed at predicting the United States Postal Service's (the Postal Service's) marginal and overall accrued (total operating) costs. The estimation is in part non-parametric in the sense that some of the parameters of interest are functional. It combines annual product-level data over the period 2000–2021 with aggregate annual data over the same period. The framework presented is suitable for simulating marginal and operating costs based on assumptions regarding volumes and network variables. The chapter adopts a reduced-form approach in the following sense: (i) The explanatory variables appearing in the equations are assumed to be exogenously determined while the dependent variables are assumed endogenous. (ii) The structures underlying these equations are more complex than reflected in the equations. This approach is justified in part by the fact that certain cost variables, e.g., marginal cost, which are part of the data underlying the estimation of the proposed econometric model, are themselves obtained from the econometric estimations that are performed upstream by the Postal Service (to causally link costs to their drivers while controlling for many relevant factors). So, it is important to caution that although the estimated links are suitable for making predictions and performing simulations, they are not necessarily causal.

Keywords Operating cost · Volume variable cost · Cost and revenue analysis · Kernel regularized least squares

The views expressed in this chapter are solely those of the authors and do not reflect the views of the Postal Regulatory Commission.

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1 Introduction

This chapter proposes a simple framework to predict the Postal Service's marginal and operating costs from any postulated configuration of volume and delivery points. While not intended to replace robust analysis of economic and market conditions for planning purposes, this technique can be useful in preliminary decision-making related to cost-saving initiatives, marketing campaigns, and volume retention programs. Although some of the data had to be disaggregated and reconstructed, the authors find that the sensibleness of the model provides an encouraging affirmation of the proposed technique.

The outcomes of the Postal Service's product costing methodology are reported in the Cost and Revenue Analysis (CRA) annual reports.¹ Therefore, some background information will help with the presentation of the proposed framework. The Postal Service's annual or quarterly reports include product-level costing data such as volume variable cost or attributable cost, and volume.² The Postal Service also reports network characteristics, including the number of delivery points, and different types of financial data. The Postal Regulatory Commission (PRC), the regulatory agency of the Postal Service, relies on these data when assessing the operator's (the Postal Service's) compliance with statutory rules.

In this chapter, we model the relationship over time between the Postal Service's costs and volumes and other predictors like mail mix and network characteristics. The goal of this exercise is to estimate the volume-weighted average marginal cost, which in turn allows to estimate the total volume variable cost and, finally, the Postal Service's overall operating costs. The modeling framework presented is suitable for simulating marginal and operating costs based on assumptions regarding volumes and network variables. Mail mix changes can impact volume variable cost, and volume declines impact the overall cost. Predicting cost fluctuations given volume and mail mix changes is useful for operational plans and ratemaking decisions. For example, using a predictive model allows for pre-implementation evaluation of the overall impact of initiatives aimed at specific products. It also allows for preliminary analysis of the cost impacts of volume trends and measures aimed at curtailing volume loss.

The chapter adopts a reduced-form modeling approach in the following sense. (i) The explanatory variables appearing in the equations are assumed to be exogenously determined while the dependent variables are assumed endogenous. (ii) The structures underlying these equations are more complex than reflected in the equations. This approach is justified in part by the fact that certain cost variables, e.g., marginal cost, which are part of the data underlying the estimation of the proposed econometric

¹ See, e.g., United States Postal Service Annual Compliance Report, December 29, 2021, p. 3, available at <https://www.prc.gov/docs/120/120596/FY21.ACR.pdf>.

² Unit volume variable cost that the Postal Service reports for each mail product "is in fact equal to its marginal cost." Summary Description, Costs by Segments and Components, FY2020, July 1, 2021, Appendix H, p. 2, available at <https://www.prc.gov/docs/119/119133/Summary%20Description%2C%20CSC%20%20FY2020.zip>.

model, are obtained from the econometric estimations that are performed upstream by the Postal Service (to causally link costs to their drivers while controlling for many relevant factors). So, it is important to caution that although the estimated links are suitable for making predictions and performing simulations, they are not necessarily causal.

The Postal Service uses a complex data generation process called the roll-forward model to estimate future costs and revenues and an equally complex model—the cost and revenue analysis (CRA) model—to attribute a portion of accrued (or total operating) costs to products. The roll-forward model estimates the effect on the total cost of projected cost level changes, projected mail volume levels, non-volume workload factors, the change in the number of workdays, the specification of the cost savings that will be realized from gains and improvements in total productivity, other program costs, and the workyear mix adjustment.³ Costs are itemized by major categories or cost segments and individual cost elements, or components, within cost segments. Using the CRA model, the accrued costs (actual or estimated) are allocated to products and services based on analyses of cost drivers.

The technique we propose in this chapter is considerably simpler than the roll-forward process, which includes inflationary measures, volume declines, cost-saving initiatives, labor cost changes, and other relevant factors. This technique instead relies on the following elementary fact: If one divides any part of the total operating cost (for example total volume variable cost) by the share of this part (in total operating cost), the result is equal to the total operating cost. Formally, if VVC and C denote total volume variable cost and total operating cost, respectively, then one has the equality

$$\frac{VVC}{\left(\frac{VVC}{C}\right)} = C \tag{1}$$

Hence, a separate estimation of VVC and the ratio $\frac{VVC}{C}$ is sufficient to estimate the operating cost.⁴ This statement does not mean that the operating cost is determined by the Postal Service in the suggested way. The present chapter seeks to provide a simple way of making an informed guess on the magnitude of future operating cost, based on past relevant data that are reported.

The chapter is organized as follows: Sect. 2 provides the econometric models and the proposed estimator of the costs. Section 3 presents the data and the estimation results. Section 4 concludes the chapter.

³ The *Roll Forward Model Programmer’s Manual* provides more details on the model and is available at <https://www.prc.gov/docs/43/43267/Programmer%27sManual.RFModel.pdf>.

⁴ Denoting the inverse of the share, i.e., $\frac{1}{(VVC/C)}$, by α , (1) can be written as αA , i.e., total operating cost is a scaled version of total volume variable cost, although it is important to mention that the scale parameter, α , may vary with volume and non-volume factors.

2 Model Building

2.1 Volume Variable Cost, Attributable Cost, and Institutional Cost

Assuming that there are N products in total, let Q_i and c_i denote, respectively, the volume and the marginal cost of product i , $1 \leq i \leq N$. Then the product $c_i Q_i$ is referred to in the postal costing terminology as product i 's volume variable cost. Total volume variable cost, denoted here by VVC , is obtained by summing the product-level volume variable costs, $VVC = \sum_{i=1}^N c_i Q_i$.

Several cost items must be added to the total volume variable cost to obtain the operating cost, which is the sum of the total attributable cost and institutional cost. First, at a product level, the attributable cost is obtained by adding volume variable cost and product-specific cost (which is fixed cost). Second, attributable cost at a class or group level now also includes a portion of "inframarginal cost" that meets the statutory criteria that govern cost attribution.⁵ Inframarginal costs measure "the differences in marginal costs that take place at different levels of production."⁶ If F_i and IM_i , respectively, denote product i 's specific fixed cost and the attributed part of its inframarginal cost then, product i 's attributable cost is given by the sum

$$A_i = c_i Q_i + F_i + IM_i \quad (2)$$

and total attributable cost is given by the equality

$$A = VVC + \sum_{i=1}^N F_i + \sum_{i=1}^N IM_i \quad (3)$$

Next, the residual part of operating cost that is not attributed to products is referred to in the Postal Service's terminology as the institutional cost. Hence, the difference, D , between total operating cost (calculated as the sum of total attributable and institutional cost) and total volume variable cost is determined as $D = \sum_{i=1}^N F_i + \sum_{i=1}^N IM_i + I_c$, where I_c denotes the institutional cost. Hence, the share forming the denominator in (1) can, equivalently, be written as the ratio $\frac{C-D}{C}$. This ratio is affected, therefore, by volume and non-volume factors like delivery points, but also

⁵ The definition of attributable cost had changed after the Commission issued Order No. 3506 in Docket No. RM2016-2 to include some inframarginal costs. See PRC Order 3506, September 9, 2016, p. 3, available at <https://www.prc.gov/docs/97/97114/order3506.pdf>.

⁶ Summary Description, Costs by Segments and Components, FY2020, July 1, 2021, Appendix I, p. 15, available at <https://www.prc.gov/docs/119/119133/Summary%20Description%2C%20CSC%20%20FY2020.zip>. One can also state that "The inframarginal costs of a product represent the difference between the incremental cost of the product and the sum of the volume variable and product specific costs of the product." <https://about.usps.com/what/financials/cost-revenue-analysis-reports/fy2021.pdf>.

by product-specific fixed cost, which, for most postal products, represents a very small part of the total cost.⁷

One way to apply formula (1) is to separately estimate the numerator, i.e., total volume variable cost, and the denominator, i.e., the share of the former in total operating cost. This chapter follows this strategy.

2.2 Constructing the Estimators

The prediction of the operating cost is obtained as a ratio of the predicted total volume variable cost to the predicted share of total volume variable cost in operating cost. This strategy requires the estimation of the numerator and the denominator of the ratio. Volume variable cost is first estimated in 2 versions. The first, denoted by \widetilde{VCC} , uses the *observed* marginal costs and it is also used to calculate the observed shares (the ratio of \widetilde{VCC} to observe operating cost). The second, denoted by \widehat{VVC} uses the predicted marginal costs (from volumes and delivery points). The predicted operating cost is calculated as the ratio of \widehat{VVC} to the predicted share. The latter is obtained from regressing the shares calculated with \widetilde{VCC} , on volume and delivery points. The calculation is described in the following chart, which will become clearer when Eqs. (8) and (10) are presented.

$$\text{(Volumes, Delivery Points)} \xrightarrow{\text{Equation (10)}} \text{Predicted Volume variable Cost (VVC)} \\ = \text{Numerator}$$

$$\text{(Volumes, Delivery Points)} \xrightarrow{\text{Equation (8)}} \text{Predicted Share of VVC in operating Cost} \\ = \text{Denominator}$$

$$\text{Predicted Operating Cost} = \text{Numerator/Denominator}$$

2.2.1 Volume Variable Cost

To estimate the total volume variable cost, we begin by assuming that we have complete information only on $n < N$ products. To provide a rationale for our first estimation of the volume variable cost, we multiply and divide its expression, VVC , by total volume, $V = \sum_{i=1}^N Q_i$ to obtain

⁷ See, e.g., U.S. Postal Service OIG (2012, p. 23).

$$VVC = \sum_{i=1}^N c_i Q_i \frac{\sum_{i=1}^N c_i Q_i}{\sum_{i=1}^N Q_i} \sum_{i=1}^N Q_i \tag{4}$$

The expression of the right-hand side of the second equality in (4) suggests an estimator of VVC that substitutes for the population average, $\frac{\sum_{i=1}^N c_i Q_i}{\sum_{i=1}^N Q_i}$, its sample counterpart, $\frac{\sum_{i=1}^n c_i Q_i}{\sum_{i=1}^n Q_i}$. The resulting estimator of VVC is⁸

$$V\tilde{V}C = \frac{\sum_{i=1}^n c_i Q_i}{\sum_{i=1}^n Q_i} \cdot \sum_{i=1}^N Q_i \tag{5}$$

The expression $\frac{\sum_{i=1}^n c_i Q_i}{\sum_{i=1}^n Q_i}$ is interpretable as the volume-weighted average marginal cost (AMC) in the sample. However, the c_i entering \widehat{VCC} are the observed marginal costs. A more volume-dependent estimator is obtained by linking the marginal costs to the volume bundle, $Q = (Q_1, \dots, Q_N)$. This is done by modeling the observed marginal cost, c_i , as a function of the volume corresponding to product i , Q_i , and other variables (volume and non-volume related), which we denote by W . Hence, we seek to econometrically express c_i as

$$c_i = \varphi_i(Q_i, W) + u_i \tag{6}$$

where $\varphi_i(\cdot, \cdot)$ is some unknown function of the couple (Q_i, W) , and u_i is an error term. We note here that if, as usually assumed, the error term is mean-zero given (Q_i, W) , then the expected marginal cost for i implied by (6) is $\varphi_i(Q_i, W)$. Hence, if φ_i is estimated from the available data as $\widehat{\varphi}_i$, then, by substituting this estimate in (5) for c_i , one obtains the following alternative estimator of total volume variable cost.

$$\widehat{VVC} = \frac{\sum_{i=1}^n \widehat{\varphi}_i(Q_i, W) Q_i}{\sum_{i=1}^n Q_i} \cdot \sum_{i=1}^N Q_i = \frac{\sum_{i=1}^n \widehat{\varphi}_i(Q_i, W) Q_i}{\sum_{i=1}^n Q_i} V = (\widehat{AMC})V \tag{7}$$

where $\widehat{AMC} = \frac{\sum_{i=1}^n \widehat{\varphi}_i(Q_i, W) Q_i}{\sum_{i=1}^n Q_i}$. Hence, \widehat{AMC} can be interpreted as the volume-weighted AMC predicted from the sample volume bundle. In the implementation of (1), the estimator \widehat{VVC} is what will come at the numerator.

It is worth noting that the prediction of marginal costs and the prediction of total volume variable cost are made simultaneously, i.e., once the first is estimated, the calculation of the latter does not require an additional econometric estimation. The only precision to be made in this regard is that the marginal costs are predicted for the products on which complete data are available. Nevertheless, the volume-weighted average of the predicted marginal costs, i.e., \widehat{AMC} , can be viewed as a reasonable

⁸ One may note the resemblance of this estimator to ratio estimators, where total volume plays the role of the auxiliary variable (Cochran 1977).

prediction of the population counterpart, namely if enough products are included in the average.

2.2.2 The Share of Volume Variable Cost in Operating Cost

The modeling of the share $s = \frac{VVC}{C}$ is guided by the assumption that it is influenced both by mail volume and network factors according to the econometric equation

$$s = \psi(V, W) + v \tag{8}$$

where v is an error term and ψ is a function to be estimated.⁹ Assuming that the estimator of ψ is $\hat{\psi}$, the predicted share is $\hat{s} = \hat{\psi}(V, W)$. The relation (1) then suggests that operating cost can be estimated as

$$\hat{C} = \frac{\widehat{VVC}}{\hat{s}} = \frac{\sum_{i=1}^n \hat{\varphi}_i(Q, W) Q_i}{\sum_{i=1}^n Q_i} V \tag{9}$$

To summarize, the econometric model to be estimated is the pair of Eqs. (6) and (8). They involve the parameters φ_i and ψ .¹⁰ Assuming that estimators are obtained for the parameters, they enable, together with the volume and network variables (Q, W), the prediction of the volume variable cost, \widehat{VVC} , as well as the prediction of the share, \hat{s} . The ratio of these provides a prediction of the operating cost.

3 Data and Estimation Results

3.1 Data Sources

3.1.1 Constructing the Data Set

Volume and volume variable cost data by product category were extracted from public versions of the annual CRA reports for FY 2000–FY 2021. However, due to the reclassification of products after implementation of the Postal Accountability and Enforcement Act (PAEA) in 2006, the product categories were not directly comparable from year to year. Specifically, matching cost data by product categories for the time periods before and after 2008 was challenging. For example, starting with FY 2008, First-Class Single-Piece Letters formed a separate product category.

⁹ V Is total mail pieces. These variables influencing the share are suggested by the discussion of a closely related ratio, the “variability ratio” offered by Cohen and Waller (2014).

¹⁰ The Eq. (6) is in fact a set of n equations. However, these equations will be combined later into one equation.

However, prior to FY 2008, First-Class Single-Piece Letters category included not only letters, but also Single-Piece flats and parcels.¹¹ To match volumes for FY 2008–FY 2021 with volumes for prior years we used very disaggregated volume data from Revenue, Pieces, and Weight (RPW) reports.

To match costs for product categories that changed after FY 2008, we used the following methodology. Prior to 2008, volume variable cost at the product level was available only for Periodicals and First-Class Mail cards. For other Market Dominant classes, prior to passage of the PAEA, such costs were available for subclasses or rate categories only. However, mail processing unit volume variable cost was available by product, but only for rate case years (FY 2000, 2003, 2004, and 2005). To estimate unit volume variable cost by product for these years we applied the following approach. First, the mail processing unit volume variable cost was subtracted from the CRA unit volume variable cost by subclass. Second, the remainder was then applied equally among the relevant rate categories in the subclass and added to the unit mail processing cost. Third, volume variable costs for product were estimated by multiplying the estimated unit volume variable cost by volume, and then adjusted using the actual volume variable cost data for class or subclass.¹²

For example, to estimate the FY 2000 per-unit volume variable cost for First-Class Single-Piece comparable to the product's unit volume variable costs in FY 2008, the mail processing unit volume variable cost by rate category was obtained from LR 2001-1, USPS-LR-J-81. The combined mail processing unit volume variable cost of 16.52 was subtracted from the CRA subclass-level unit volume variable cost of 23.9. The difference of 7.49 was then added to the mail processing volume variable unit cost for each rate category. The unit costs were then multiplied by volume by rate category to obtain total volume variable cost by rate category (comparable to products in FY 2008), and then slightly adjusted using volume variable costs by class or subclass. The procedure is illustrated in Table 6 in the Appendix.

Volume variable costs for product categories for other years before 2008 were estimated by predicting unit costs for these years and then multiplying them by actual volumes (obtained from the CRA and RPW reports). To obtain missing values of unit volume variable cost at a product category level we applied a growth trend function to the relevant unit costs for the years for which these unit costs were already known or estimated. Then for all years for which we predicted unit cost at the product category level, we multiplied these unit cost estimates by relevant volumes to obtain interim estimates of volume variable cost. These interim estimates were then adjusted using the actual sub-class or class-level volume variable cost totals for each year.

While the applied estimation techniques produce encouraging results, more accurate cost data will be needed if the proposed framework is used for practical rather than for illustrative purposes.

¹¹ See, e.g., United States Postal Service FY 2007 Annual Compliance Report, December 28, 2007, pp. 7–8, available at https://www.prc.gov/docs/58/58459/acr_fy2007_final.pdf.

¹² This technique was also used for First-Class Presort Letters, First-Class Flats, First-Class Parcels, Standard Regular Letters, Standard Regular Flats, and Standard Regular Parcels for fiscal years 2000, 2003, 2004, and 2005 using relevant library references from the rate cases. See Table 6 in Appendix.

3.1.2 Data Description and Summary Statistics

Before providing summary statistics of the data, a remark is in order to adapt the proposed estimator to the constraints imposed by the available data. These data are of two kinds: the aggregate and product-level data. The product-level data are annual observations that run over a relatively short time period, 22 fiscal years (FY), from 2000 to 2021. To circumvent the reduced length of the annual time series, we impose the constraint that the functional parameter φ_i does not depend on the index i in Eq. (6). The product-level time series are correspondingly stacked to form a panel data with the sample size equal to 330 (15 products observed over 22 years).

Hence, Eq. (6) becomes

$$c_{it} = \varphi(Q_{it}, W_{it}) + u_{it} \tag{10}$$

where c_{it} denotes product i ’s observed marginal cost in the fiscal year t , Q_{it} is product i ’s volume in the fiscal year t , and W_{it} is the vector of the other variables entering the equation. The *AMC* is then calculated by simply taking the volume-weighted average of the predicted marginal costs for each fiscal year. The data employed to estimate (10) are described in Table 1.

“Product_Share_of_Class_Vol” is the share by a product of its mail class of category total volume. “Class_Share_of_Total_Vol” is the share by a mail class of total (overall) volume.

The chapter considers 4 Market Dominant Mail classes, First-Class Mail, USPS Marketing Mail (previously called Standard Mail), Periodicals, Package Services, and two mail categories, Free Mail—blind, handicapped, & servicemen, and

Table 1 Description of the variables

Variable	Obs	Mean	Std. Dev	Min	Max
Marginal Cost (\$)	330	0.84	1.16	0.05	4.94
Volume (Million)	330	11,549.95	16,299.67	19.91	57,086.42
Product_Share_of_Class_Vol	330	0.39	0.36	0.000252	1.00
Class_Share_of_Total_Vol	330	0.29	0.22	0.000155	0.53
Delivery Points (Million)	330	150.14	7.94	134.50	163.10

Table 2 Estimation result for Eq. (6)

Marginal Cost	Avg	SE	t	P > t	P25	P50	P75
Volume	-0.0001	0.0000	-13.4	0.000	-0.00019	-0.0001	-0.0000
Delivery Points	0.0191	0.0047	4.1	0.000	-0.00395	0.01120	0.04160
Product_Share_of_Class_Vol	0.8787	0.2515	3.5	0.001	-0.85026	-0.3267	2.62441
Class_Share_of_Total_Vol	-2.7061	0.4062	-6.7	0.000	-12.6692	0.52766	5.12191
Product_std	0.0001	0.0000	10.1	0.000	0.00002	0.00004	0.00015

Competitive products. As noted above, for a given mail class, not all mail products or product categories falling into the class are included in the sample (we included only those for which data were available for all 22 years and only if they stayed in the same class over this time period). Also, competitive products are all grouped into a single mail category. The delivery point data were collected from a Postal Service website.¹³ Table 5 in the Appendix displays the mail products, the mail classes, and the categories included in the study.

The aggregate data are also annual, and they cover the fiscal period from 2000 to 2021. They are used to estimate Eq. (8). Given the shortness of the corresponding time series (22 observations) the function ψ is estimated by running a nonlinear logistic regression of the share of \widetilde{VCC} , as defined in (5), on the number of delivery points, total volume, and the interaction between the two. The corresponding predicted shares are the ones that enter the denominator of (1) in the estimation of the operating cost.

3.2 Estimation Results

The estimation of model (10) is performed using the machine learning technique known as the kernel regularized least squares, which we describe in the Appendix. It includes as explanatory variables, Volume, Product_Share_of_Class_Vol, Class_Share_of_Total_Vol, Delivery Points. We also control for product-specific standard deviations to account for the heterogeneity between products.¹⁴ The regression result is presented in Table 2.

In Table 2, “Avg.” denotes the (sample) average pointwise marginal effects. Unlike in linear regression, the marginal effect varies along the predicted curve. These average marginal effects are given along with their standard deviation and the corresponding p-values. The last 3 columns, P25, P50, and P75, respectively, display the 1st quartile, the median, and the 3rd quartile of the pointwise marginal effects. Figure 1 displays the actual and predicted AMC. In the figure, the observed AMC is the yearly volume-weighted average of the *observed* marginal cost. The predicted AMC is the yearly volume-weighted average of the marginal costs *predicted* from the estimation of Eq. (10).

In the logistic regression that is run to estimate Eq. (8), the dependent variable is the share of \widetilde{VCC} in the operating cost. The explanatory variables are total volume, the

¹³ <https://about.usps.com/who/profile/history/delivery-points-since-1905.htm>.

¹⁴ This decision may seem unusual because it is the cluster mean that is often included in the equation to control for unobserved heterogeneity (for example in a Mundlak-type estimation of panel data models. See, for example, Baltagi (2005). However, product-specific mean volume proved to have no explanation power in the estimation (as measured by the p-value attached to the average pointwise marginal effect), contrarily to product-specific standard deviation. The sample correlation between the 2 variables is quite high. The Pearson correlation coefficient and the Spearman rank correlation coefficient are, respectively, equal to 74.5% and 94.2%.

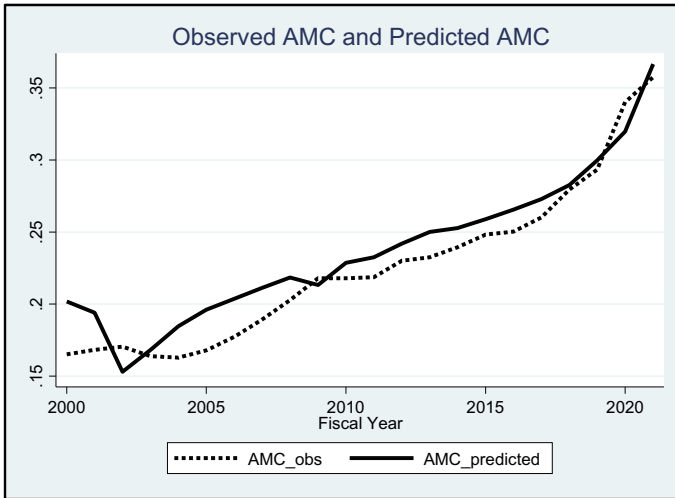


Fig. 1 Predicted and observed AMC

Table 3 Logistic regression

Share	Coef.	Robust Std. Err.	t	P > t	[95% Conf. Interval	
Delivery Points	0.0585106	0.023	2.550	0.020	0.010	0.107
Total Volume	0.0000449	0.000	2.550	0.020	0.000	0.000
Interaction	-2.90e-07	0.000	-2.630	0.017	0.000	0.000
Const	-9.009326	3.675	-2.450	0.025	-16.730	-1.288

number of delivery points, and the interaction between the two. The estimation results are shown in Table 3. Due to the inclusion of the interaction variable, the marginal effect of the number of delivery points on the expected share of total volume variable cost in operating cost depends on total volume. Likewise, the marginal effect of total volume on the share depends on the number of delivery points.

The corresponding estimates of the operating cost for 2009–2021 are displayed in Table 4. This table shows that the in-sample predictions error for the last 13 fiscal years is within about 5%, with an average of 3.36%, and a median of 4.69%.

To summarize the proposed methodology, the volume-weighted AMC and, hence, the total volume variable cost, can be predicted, using the expression of \widehat{VVC} , from any assumed volume bundle and number of delivery points. We note that any assumed volume bundle has a corresponding total volume, as well as its mix, i.e., the shares of product-level volumes in corresponding mail classes, and the share of the mail classes in total volume. The sought operating cost is obtained by dividing the predicted volume variable cost by the predicted shares. The procedure allows the updating of the estimates of φ and ψ , as more data become available.

Table 4 Operating cost: observed and predicted

Fiscal year	Observed OC	Predicted OC	Error (%)
2009	71,912.0	75,287.5	4.69
2010	75,582.0	77,817.0	2.96
2011	70,805.6	77,780.2	9.85
2012	81,153.3	76,910.9	-5.23
2013	72,318.9	78,377.8	8.38
2014	73,361.9	77,285.1	5.35
2015	74,010.9	77,975.9	5.36
2016	77,121.1	79,501.1	3.09
2017	72,436.3	78,355.4	8.17
2018	74,696.0	78,619.5	5.25
2019	80,119.0	80,185.8	0.08
2020	82,400.0	75,673.2	-8.16
2021	81,998.1	85,161.0	3.86
Average			3.36
Median			4.69
Average of Absolute Values			5.42
Median of Absolute Values			5.25

It is worth asking what happens to the proposed framework under full information, i.e., if the available data is complete for all products. In that case, because all products would be included in the estimation of (10), one would have $n = N$, $V = \sum_{i=1}^n Q_i = \sum_{i=1}^N Q_i$,

and $\sum_{i=1}^n \hat{\varphi}_i(Q_i, W)Q_i = \sum_{i=1}^N \hat{\varphi}_i(Q_i, W)Q_i$. The estimator (7) of the total volume variable cost would take the form

$$\widetilde{VVC} \frac{\sum_{i=1}^N \hat{\varphi}_i(Q_i, W)Q_i}{\sum_{i=1}^N Q_i} \sum_{i=1}^N Q_i = \sum_{i=1}^N \hat{\varphi}_i(Q_i, W)Q_i \tag{11}$$

In other words, the estimation of the total volume variable cost would be direct in the sense that the intermediate sample average, $\widehat{AMC} = \frac{\sum_{i=1}^n \hat{\varphi}_i(Q_i, W)Q_i}{\sum_{i=1}^n Q_i}$, would no longer be needed in the estimation. As for Eq. (8), it would continue to be estimated as described above. The unsurprising conclusion is that the proposed method for predicting the operating cost would become more precise compared to the case in which the product-level data is incomplete. This conclusion also stresses the importance of including as many products as possible in the estimator \widehat{AMC} .

4 Conclusion

This chapter proposes a simple framework that allows prediction of marginal costs, and total operating costs from any postulated volume configuration, and an assumed number of delivery points. The framework involves two econometric estimations. In the first, a product-level marginal costs function is estimated, and the corresponding volume-weighted average marginal cost (AMC) is predicted. The latter is then multiplied by the total mail pieces to predict the total volume variable cost. In the second estimation, the share of the total volume variable cost (in the operating cost) is predicted from total mail pieces and the number of delivery points. Operating cost is then obtained as a ratio of the predicted volume variable cost to the predicted share.

The procedure can accommodate the inclusion into the prediction of product-level marginal costs of other control variables not taken into account in our estimation. The data set that we used is somewhat incomplete, however, and was employed mainly for illustrative purposes. We leave the estimation of the model with more complete data and the simulation exercises for future projects.

Appendix A: Additional Tables

See Tables 5 and 6.

Table 5 Mail products, classes, and categories included in the study

Market Dominant Products					
First-Class Mail:	USPS Marketing Mail:	Periodicals:			
Single-Piece Letters	Enhanced Carrier Route	In County			
Single-Piece Postcards	Letters	Outside County			
Presort Letters	Flats				
Presort Cards	Parcels				
Flats					
Package Services:	Free Mail—blind, handicapped, and servicemen				
Bound Printed Matter Flats and Parcels					
Media and Library Mail					
COMPETITIVE PRODUCTS					

Table 6 Estimation of volume variable cost by product for first-class single-piece mail in FY 2000

	CRA R2000-1 BY	MP R2000 BY	All other costs dist. equal	Total Est Unit cost	Volume	Total Costs
	23.9	16.41	7.49			
SP letters		12.93	7.49	20.42	47,448,109	9,688,986
SP Flats		42.59	7.49	50.08	4,305,741	2,156,299
SP Parcels		91.00	7.49	98.49	615,684	606,380
					52,369,535	12,451,665

Appendix B: The Kernel Regulated Least Squares Estimation

The estimation procedure for φ will consist in (i) defining, *on the basis of the available data sample*, the set of candidate functions that will fit the data, and (ii) choosing the best function from the set of candidate functions, based on a loss function (which is defined so as to penalize those functions that have too many parameters, hence are too complex).

A clarification concerning the word “kernel” is needed to avoid any confusion between the regularized least squares method used here and the traditional weighted local estimation called the kernel regression. While both approaches (KRLS and kernel regression) use mathematical kernels, the KRLS method uses a kernel to define (from the sample observations on the explanatory variables) the set of candidate functions that can be used to fit the data.¹⁵ This amounts to defining the candidate right-hand side variables in a linear ridge regression equation. In that sense, regularized least squares methods are generalized ridge regression methods in which the estimate function is chosen from some suitable space of functions defined on the basis of the available sample. The objective is to minimize some given loss function over the defined space of functions. A penalization term (the “regularizer”) is added to the loss function to control the complexity of the optimally chosen function. A trade-off between model fit and function complexity is realized through a positive multiplicative coefficient, say λ , to the regularizer.¹⁶ A larger value of the coefficient λ is synonymous with a heavier penalty imposed to more complex functions.¹⁷ In the specific method considered, the suitable class of candidate functions is all kernel-expansion functions φ of the form

¹⁵ Mathematically, a given kernel gives rise to a class of kernel-expansion types of functions that can be organized into a reproducing kernel Hilbert space (RKHS). The “representer theorem” is a set of results according to which a large class of optimization problems with RKHS regularizers have solutions that can be expressed as kernel expansions in terms of the sample. See, e.g., Scholkopf et al. (2001).

¹⁶ See Hainmueller et al. (2014 [2011]).

¹⁷ Ibid.

$$\varphi(.) = \sum_l c_l k(., x_l) \tag{12}$$

where l denotes the observation index, x_l is the vector of the values of the explanatory variables appearing in observation l , and c_1, \dots, c_N are coefficients to be estimated along with λ . The function $k(\dots)$ is some suitable kernel function chosen by the modeler, e.g., the Gaussian kernel function $(x_i, x_j; \delta) = e^{-\left(\frac{\|x_i - x_j\|^2}{\delta}\right)}$, where δ is the dimension of x_i and $\|\cdot\|$ is the Euclidean norm.

Formally, the problem to be resolved is a version of the so-called Tikhonov Regularization Problem:

$$\text{Argmin}_{\varphi \in \Phi} \sum_l (y_l - \varphi(x_l))^2 + \lambda \|\varphi\|^2 \tag{13}$$

where $\|\cdot\|$ is the norm corresponding to the Reproducing Kernel Hilbert Spaces defined by the chosen kernel,¹⁸ and y_l is the value of the dependent variable in the l -th observation.

The estimation consists in optimally choosing the coefficients c_1, \dots, c_N, λ , and the variance σ^2 of the error term u in the regression equation $y = \sum_l c_l k(., x_l) + u$, where y is the dependent variable. Homoskedasticity is implicitly assumed (but is not necessary) in the presentation.

Hainmueller and Hazlett (2014) summarize some of the properties of the KRLS estimator as follows.

First, it is worth noting that for a given $\lambda > 0$, problem (16) has the unique solution $c^* = (K + \lambda I)^{-1}y$,¹⁹ where

$$K = \begin{bmatrix} k(Q_1, Q_1) & \dots & k(Q_1, Q_N) \\ \vdots & \ddots & \vdots \\ k(Q_N, Q_1) & \dots & k(Q_N, Q_N) \end{bmatrix} \tag{14}$$

Under the assumption that the unknown function is of the form (12), but y is observed with an error u of zero conditional expectation, $E(u|Q) = 0$, the estimator, \hat{c} , of the vector $c = (c_1, \dots, c_N)$ (which is simply of the same form as (14), with the particularity that the observed y is noisy), is unbiased in the sense: $E(\hat{c}|Q, \lambda) = c$, where λ is included in the condition to emphasize the dependence of the optimal solution on it. Likewise, the predicted marginal cost function, $\hat{\varphi}(x)$, is pointwise unbiased, conditional on volume, i.e.,²⁰

$$E(\hat{\varphi}(x)|Q, \lambda) = \varphi(x) \forall x \tag{15}$$

¹⁸ See Hainmueller and Hazlett (2014, p. 149).

¹⁹ Ibid.

²⁰ Recall that ridge estimator is biased but has lower variance than the OLS estimator. So, the untestable assumption that the unknown function is in the choice set is crucial for the unbiasedness.

Regarding the small-sample properties of the KRLS, Hainmueller and Hazlett (2014) provide evidence, from simulations, of the not-so-bad small-sample performance of the kernel regularized least squares method.²¹

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²¹ See also Finch and Finch (2017).

Logistics Constraints for International E-commerce



Mauro Boffa

Abstract The paper examines the impact of logistics inefficiencies on international e-commerce. By exploiting data from flight schedules and time stamps for tracked postal items, the study quantifies bilateral inefficiencies in logistics as the difference between flight times and the lapse of time postal items take from leaving the origin office of exchange until the destination office of exchange. Using information on bilateral postal tonnage as a proxy for international e-commerce, the paper finds that logistics inefficiencies act as supplementary trade costs. In particular, a 1% reduction of bilateral logistics inefficiencies is correlated with a 0.25% increase in bilateral mail flows. The frequency of departing flights is also estimated to matter just as much.

Keywords E-commerce · International logistics · Air transport · Universal Postal Union

JEL classification F14 · L87

1 Introduction

Retail e-commerce increasingly accounts for greater shares of total retail sales (Hortaçsu and Syverson 2015). In the United States, according to the US Census Bureau, approximately 14% of total retail sales went through an online channel in 2021. COVID-19 has exacerbated this trend, as shown by Cavallo et al. (2022) using MasterCard data for 47 economies. Their evidence suggests that, as the pandemic struck, lockdowns limited the physical mobility of consumers leading to a surge of electronic retail.

Disclaimer: The views represented here constitute research in progress of an informational character for which no guarantees or assurances are provided; in this regard, it shall not be deemed to represent the official position or opinions of the UPU or its staff members or of UPU member countries.

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However, despite many advantages, digital retail sales transactions lack immediacy. A lag between purchase and delivery acts as a trade cost, as described by Hummels and Schaur (2013). The rapid development of fast transport (Hummels and Schaur 2010) has attempted to narrow this gap by bringing consumers and producers closer together. Nowadays, expectations of both e-retailers and consumers have incited logistics operators and traditional postal operators to become both faster and more reliable in the delivery of physical goods.

Faster delivery times imply that transport by air, whenever economically feasible, has become the norm, in particular for cross-border deliveries.¹ Given the limited space available on aircrafts and the frequency of scheduled plane departures, e-commerce poses an important logistics challenge for international exchanges. Understanding and responding to the challenge is a key success factor for airport strategies (Van Asch et al. 2020).

Despite rapid growth in recent years, international mail deliveries remain relatively modest in comparison to domestic deliveries, according to key postal aggregates. The Universal Postal Union (UPU) statistics show that in comparison, 2020 global international parcels (>2 kg) were 0.76% of domestic equivalent parcels, while international letters and small packets (<2 kg) represented 1.2% of their domestic equivalents. By contrast to these small percentages, World Bank Development indicators show that international trade accounted for 52% of global domestic GDP in 2020 (World Bank 2022). Given these stark differences, analyzing trade costs along the international postal supply chain may bring to the surface useful insights to understand international deliveries.

As discussed by Moisé and Le Bris (2013), transport infrastructure and logistics costs are oftentimes considered more taxing on trade than tariff themselves. The paper explores the role of international logistics in the development of bilateral e-commerce trade for physical goods. In the study, logistics inefficiencies are measured as the deviation between bilateral flight times and the actual delivery time measured from the origin office of exchange to its destination in another country. The study uses as a proxy for international e-commerce flows international volumes of mail exchanged between designated postal operators of the Universal Postal Union (UPU).²

The contribution's importance is threefold. First, the COVID-19 pandemic has redefined the behavior of consumers. E-commerce has proven to be instrumental in realizing public health strategies in many countries, where consumers were either encouraged or induced to stay at home for prolonged periods. The paper provides a quantification of how much delivery times may deter consumers from purchasing retail goods online. Therefore, the paper provides firsthand evidence on consumers' preference structure vis-à-vis delivery times.

Second, during the pandemic international mobility has been deeply disrupted. Travel restrictions generated a consequent drop in international scheduled flights.

¹ As shown by Hummels and Schaur (2010), this phenomenon is not exclusively linked to e-commerce or to light logistics. Air cargo already represented 36% of US imports (in value) in the year 2000.

² Postal operators using the UPU network exchange Electronic Data Interchange (EDI) messages in the servers provided by (UPU). In the paper, these EDI messages are used to calculate international mail flows and determine bilateral delivery times.

While these interruptions have been punctual, supply chain problems have persisted through most of 2021 and in the first half of 2022. Given the current state of geopolitical tensions, it would not be surprising to observe more changes to scheduled flights in the coming months. The study shows how mail volumes and scheduled flights are correlated and provides useful elasticities to quantify this relationship.

Third, given the importance of environmental concerns surrounding e-commerce and the postal delivery industry (see Mangiaracina et al. 2015), it is important to understand if an efficient use of the current air-cargo capacity could help decrease plane departures and thus contribute to the overall reduction of greenhouse gas emissions. The paper provides preliminary estimates that could be exploited to that effect.

The research project faced two main challenges in estimating the effects of international inefficiencies on e-commerce. First, bilateral data on e-commerce is scarce, for both micro-level logistics and international postal volumes. Second, there is no clear framework to define what logistics inefficiencies are and how to estimate their impact on bilateral postal flows.

The first challenge was solved by using postal data collected by the Postal Technology Centre (PTC) of the UPU combined with flight schedules from the International Civil Aviation Organization (ICAO). In particular, the study focuses on two types of data collected by the PTC. First, time stamps that track registered postal items along the postal supply chain. The time stamps, discussed by Ansón et al. (2020), allow for the computation of international transit time between offices of exchange. Comparing transit time to flight times yields an indicator of international transport efficiency between the offices of exchange of two different countries.

The paper models the effects of logistics inefficiencies by employing the framework of the gravity equation to bilateral postal flows. The gravity equation is the tool of option to analyze the impact of trade costs in international trade (Anderson and Wincoop 2004) and this paper is no exception.

The estimates give rise to two sets of results. First, logistics inefficiencies have a significant effect on cross-border flows that is only imperfectly captured by geodesic distance alone. According to the analysis, a 1% reduction of these inefficiencies is correlated with a 0.25% increase in bilateral postal flows, measured in tonnage. Second, the number of plane departures seems to be almost equally important. In fact, increasing the bilateral frequency of flights by 1% is associated with a 0.21% increase in bilateral postal flows.

The remainder of the chapter is structured as follows: Sect. 2 showcases the data set on bilateral postal volumes and shipping times, Sect. 3 presents the econometric model, Sect. 4 discusses the empirical results, and Sect. 5 concludes.

2 The Data Set

In order to determine international inefficiencies, data were gathered on both flight times and handling times between postal offices of exchange. To measure these two durations, the study needs to combine two databases.

First, flight schedules are constructed from a bilateral database obtained from the International Civil Aviation Organization (ICAO), which provides information on the frequency of plane departures and the average flying time between airports. Second, cross-border postal volumes and shipping times are approximated by mail flows captured by the tracking systems of the Universal Postal Union (UPU). The UPU gathers and consolidates Electronic Data Interchange (EDI) messages between designated postal operators around the world.³ EDIs are standard and thus perfectly comparable across regions. Delivery times were computed for three mail types: letters (up to 2 kg), parcels (from 2 to 30 kg), and express mail service (EMS). The information at the item level provides a clear picture of delivery times between the origin office of exchange of the sender country and the destination office of exchange of the recipient country. Mail volumes were computed using the pre-advice of dispatch messages, another UPU standard that designated operators to use in order to track the tonnage of bilaterally exchanged dispatches of mail.⁴

Figure 1 shows the distribution of average shipping times by pooling together all country pairs. The figure immediately shows that shipping times are roughly log-normally distributed. It is readily apparent that express items are the ones where the density is more concentrated around the mean, followed by letters. Parcels exhibit the highest variability. This occurs because of the actual logistic challenge of moving these different items. In fact, the three mail categories are routed through the same channel while they only differ in size and content. The distribution of parcels shows that it is difficult to ship at the same speed large items and small ones without paying a significant price premium (as for express items).

In contrast to delivery times, bilateral (log) flight times are skewed to the right, the distribution being close to bimodal (Fig. 2).

The (log) departures of airplanes between countries tends to be close to normally distributed (see Fig. 3), although the likelihood of a small number of departures is higher than the probability of a large number of departures. In 2017, there were 12.3 million international plane departures followed by 12.6 million departures in 2018. This number peaked in 2019 at 15.8 million. As the COVID-19 pandemic struck, the number of international flights dropped dramatically to as few as 3.9 million in 2020. During the same period, 2017–2020, the combined tonnage of all international mail items (letters, parcels, and express) steeply declined.⁵ As shown in Fig. 4, annual mail volumes have been stable in recent years. In terms of tonnage, the UPU observed 671,000 tons in 2017, followed by 726,000 in 2018, and 740,000 in 2019. In 2020, the volumes recorded by the PTC, dropped significantly to 592,000 tons.

³ A designated postal operator is an operator established in and authorized by a Member State to provide the international services governed by the Universal Postal Union Convention currently in force.

⁴ A detailed overview of the two UPU databases is available in Ansón et al. (2020).

⁵ The international mail items in consideration pertain only to the UPU's designated postal operators.

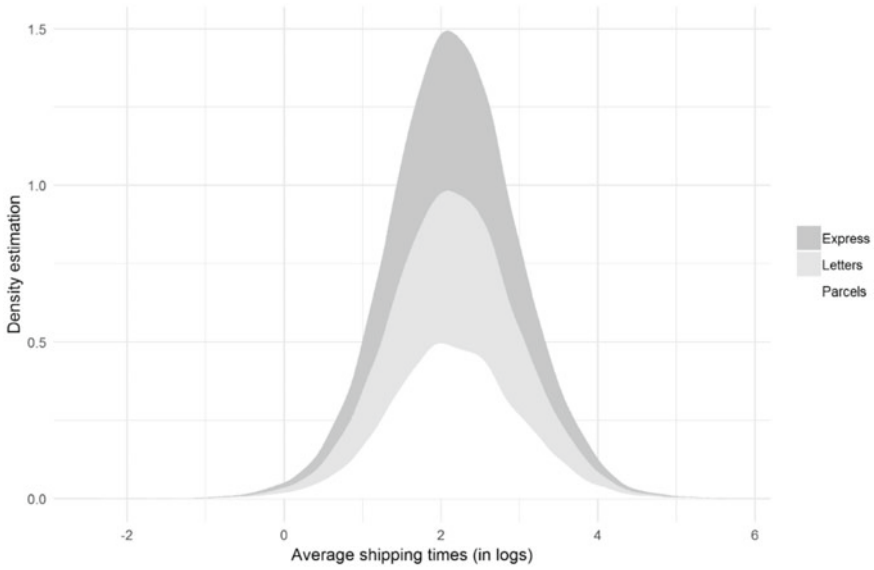


Fig. 1 Distribution of shipping times (in logs) for letters, parcels, and express (Note The density estimates represent the average shipping times in logs. For every given country pair, the average was calculated between the tracking events of entering the office of exchange in the departing country and exiting the office of exchange in the destination country. Source UPU EDIs)

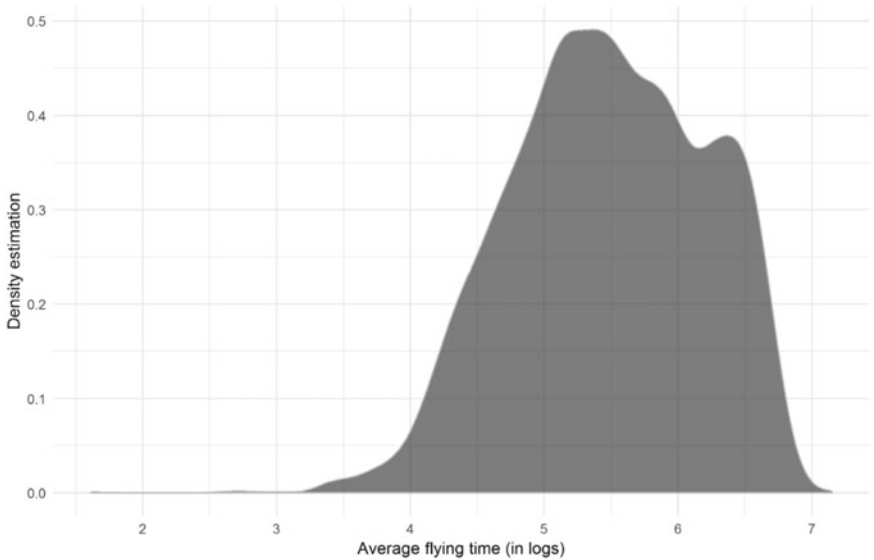


Fig. 2 Distribution of bilateral flying times (in logs) (Note The density estimate represents the average flying time between two countries by pooling together all airports in log-minutes. Source ICAO)

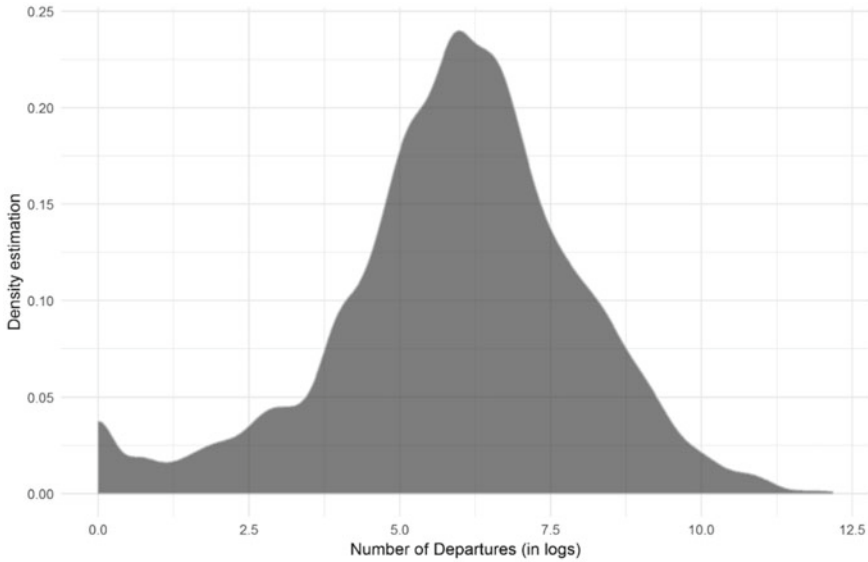


Fig. 3 Distribution of the number of plane departures (in logs) (*Note* The density estimate represents the average flying time between two countries by pooling together all airports in log-minutes. *Source* ICAO)

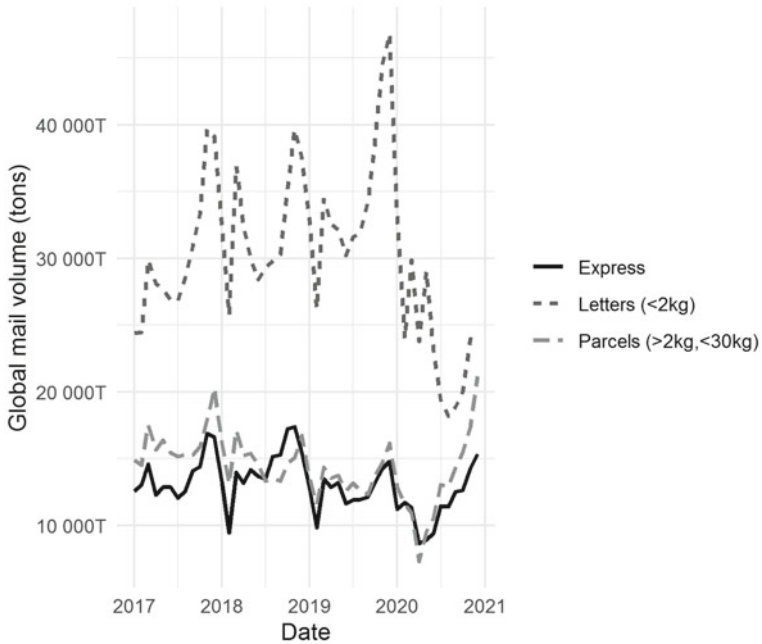


Fig. 4 Evolution of international mail volumes of letters, parcels, and express (2017–2020) mail volumes (*Source* UPU)

3 Econometric Specification

The gravity equation is a standard tool to analyze the impact of flow variables in international trade, see Head and Mayer (2014). Therefore, the paper takes this methodological approach to quantify the effects of logistics inefficiencies on bilateral postal flows. Hypothetically, the fastest possible way to move a mail item between two airports would amount to the actual flying time of the transporting plane. Still, the fastest time can never be achieved for a variety of reasons: plane departures are discrete, mail items need to be sorted at the airport's office of exchange and loaded into dispatch bags, customs need to be cleared, and tracked items need to be scanned. However, bilateral agreements that minimize storage times in airports should be considered relatively more efficient than the rest.

Logistics inefficiencies, LI_{ijt} , for a given sender, I , destination j , and time t are defined as:

$$LI_{ijt} = PostalTime_{ijt} - FlightTime_{ijt} \quad (1)$$

Postal volumes between connected countries tend to be proportional to their respective sizes and the strength of their connectivity. The standard tool to estimate how costs impede the realization of expected volumes is the gravity equation. In our case, the postal volumes between two countries, X_{ij} , are modeled through the following relationship:

$$\ln X_{ijt} = \alpha + \beta_1 \ln LI_{ijt} + \gamma \ln \phi_{ij} + u_i + v_j + \tau_t + \varepsilon_{ij} \quad (2)$$

where α is a constant, u_i and v_j are country fixed effects that capture all country specific characteristics, τ_t is a year fixed effect, and ε_{ijt} is a stochastic error term. The coefficient of interest is β_1 . It can be interpreted as an elasticity. It yields the effect of a 1 percent increase in logistics inefficiencies on postal volumes. ϕ_{ij} is a time-invariant vector of country pair variables common in gravity analysis (geodesic distance, common language, and common colonizer).

4 Empirical Results

Equation (2) is estimated using a linear model for high dimensional fixed effects, with the algorithm developed by Guimaraes and Portugal (2010). This is done for four different sets of covariates and two possible dependent variables, namely postal volumes in weight and the number of registered postal items exported.

Through postal EDIs, the first dependent variable, postal tonnage, is calculated by total weight of dispatch bags containing mail items. The bags can contain only one mail class (letters, parcels, or express) but may contain both track-and-trace mail items and non-tracked items. Therefore, the second dependent variable is a simple count of the number of track-and-trace postal items by mail class.

Table 1 Gravity equation, postal tonnage, estimation results

	Dep. Variable: Postal volumes, kg (in logs)			
	(1)	(2)	(3)	(4)
Logistics Inefficiency (in logs)	-0.281*** (0.013)	-0.253*** (0.014)	-0.248*** (0.014)	
Distance, km (in logs)			-0.087*** (0.019)	-0.522*** (0.015)
Number of departures (in logs)	0.230*** (0.005)	0.224*** (0.005)	0.206*** (0.007)	
Common colonizer	0.833*** (0.052)	0.832*** (0.052)	0.878*** (0.053)	1.114*** (0.054)
Common border	0.346*** (0.033)	0.360*** (0.033)	0.297*** (0.036)	0.244*** (0.037)
Common official language	1.040*** (0.029)	1.054*** (0.029)	1.054*** (0.029)	1.245*** (0.029)
Mail Class FE	Yes	Yes	Yes	Yes
Origin country FE	Yes	Yes	Yes	Yes
Destination country FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	Yes
Observations	42,031	42,031	42,031	42,031
R ²	0.659	0.660	0.660	0.648
Adjusted R ²	0.656	0.657	0.657	0.645
Residual Std. Error	1.674	1.673	1.672	1.702

Note Significance levels expressed as follows
 * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The database covers the period between 2017 and 2020. The estimates are presented in Tables 1 and 2, where each column represents a different specification. In the first two specifications, the geodesic distance is omitted. In Table 1, the coefficient of interest is negative and significant in the three relevant specifications. Taking column (3) as the baseline one observes that logistics inefficiencies are strongly correlated with cross-border mail flows, and that effect is only imperfectly captured by the geodesic distance alone. According to the estimate, a 1% reduction in logistics inefficiencies would be associated with a 0.25% increase in bilateral mail tonnage. In the same specification, the availability of flights appears to play a similar role and is also strongly correlated to bilateral mail tonnage flows. In particular, a 1% increase in bilateral departures is correlated with a 0.22% increase in bilateral mail tonnage. The model is consistent with the evolution of postal volumes following the observed departures drop in 2020.⁶

⁶ In 2020, the observed elasticity for mail volumes with respect to plane departures was 0.26. In fact, plane departures drop by 75.3% while postal volumes fell by 20%.

Table 2 Gravity equation, registered items, estimation results

	Dep. Variable: Registered postal items (in logs)			
	(1)	(2)	(3)	(4)
Logistics Inefficiency (in logs)	-0.268***	-0.247***	-0.238***	
	(0.013)	(0.013)	(0.013)	
Distance, km (in logs)			-0.149***	-0.607***
			(0.018)	(0.015)
Number of departures (in logs)	0.257***	0.252***	0.221***	
	(0.005)	(0.005)	(0.006)	
Common colonizer	0.737***	0.737***	0.815***	1.062***
	(0.051)	(0.051)	(0.052)	(0.052)
Common border	0.503***	0.514***	0.405***	0.345***
	(0.032)	(0.032)	(0.035)	(0.036)
Common official language	0.965***	0.976***	0.977***	1.177***
	(0.028)	(0.028)	(0.028)	(0.028)
Mail Class FE	Yes	Yes	Yes	Yes
Origin country FE	Yes	Yes	Yes	Yes
Destination country FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	Yes
Observations	41,107	41,107	41,107	41,107
R^2	0.698	0.699	0.699	0.686
Adjusted R^2	0.695	0.696	0.696	0.683
Residual Std. Error	1.600	1.599	1.598	1.631

Note Significance levels expressed as follows

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 2 exploits the fact that the database measures also the number of registered mail items contained within dispatch bags. While this number does not capture all mail items contained in a given flight, it does provide another indicator on which the same hypothesis can be tested. Table 2 provides both quantitatively and qualitatively similar results, thus reinforcing Table 1's findings.

5 Conclusion

Despite booming e-commerce transactions in recent years, international postal exchanges only account for a small fraction of domestic deliveries. The paper looks at a particular type of trade costs, airport-level logistics inefficiencies, which may be at play in depressing bilateral postal trade. By combining data from UPU and ICAO, the paper quantifies the effect of these inefficiencies on bilateral mail exchanges.

The analysis finds that logistics inefficiencies matter. In particular, reducing the airport logistics time by 1% is correlated with a 0.25% increase in bilateral postal flows. In addition, the increase of plane departures by 1% is correlated with an increase of cross-border postal flows of 0.22%. The result may have relevant economic policy implications. The two estimated elasticities suggest that improving airport logistics has an effect which is similar in magnitude to increasing plane schedules.

Conditional on sufficient plane cargo capacity, an optimization of postal logistics processes could eventually lead to a reduction of plane schedules without prejudice to bilateral postal exchanges. Since environmental considerations play an important part in policymakers' agendas, it is important to consider that better logistics are "greener" logistics. Improving the postal supply chain at the airport level may not only stimulate bilateral e-commerce flows, but may also yield substantial gains in terms of reducing fuel consumption and therefore greenhouse gas emissions generated by the postal sector.

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Transparency Initiatives in the Belgian Postal Sector



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Abstract The Belgian postal market is undergoing a radical change as the sector is shifting from a letter-centric landscape to a parcel-centric one. This has led to changing consumer needs regarding transparency. This paper starts with the legal framework regarding transparency. Next, the rise in e-commerce and the transparency needed toward consumers are discussed. After this, some examples of transparency instruments experimented at national level are provided.

Keywords Transparency · E-commerce · Sustainability · Tariffs · Regulatory instrument

1 Introduction

Many postal markets are undergoing a radical change as the sector shifts from a letter-centric landscape to a parcel-centric one. In Belgium, the revenue in the parcel segment has outgrown the revenue in the letter segment since 2017. Indeed, the delivery market has, driven by e-commerce, evolved to such an extent that it is not easy to keep track of the evolution of its many facets.

Consumers may not always fully realize which changes have improved the quality of service, nor monitor what price differences have arisen (BIPT 2018). For regulators, transparency is needed to have a clear picture of the market players and market evolutions, which may not be obvious in this rapidly changing market.

In this chapter, we attempt to illustrate with examples from practice and regulation the current challenges with regard to price and service transparency. After this introduction, Sect. 2 lays out the European legal framework. Section 3 displays the impact of the rise in e-commerce. Section 4 discusses transparency toward

Belgian National Regulatory Authority, BIPT. The views expressed in this paper are personal and do not necessarily represent the positions of the institutions to which the authors belong.

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consumers. Section 5 provides a toolbox for improving transparency conditions. Section 6 proposes a general analysis. The paper ends with a conclusion in Sect. 7.

2 Definition and Legal Framework

Transparency, a general principle of EU law, is reflected in objectives pursued through European consumer protection legislation, as well as in sectoral European postal legislation. The postal sector is at the crossroads of the communication and e-commerce sectors, which results in the joint applicability of general and sectoral regulations (Alloo 2018).

2.1 European General Rules

The Consumer Rights Directive and other directives, such as the Directive on contracts for the sales of goods and the Services Directive, include transparency rules on the delivery and return of goods.¹ The “Omnibus” Directive 2019/2161 of 27 November 2019 imposes on “online marketplaces” the identification of the trader (provider or postal operator) responsible for the compliance with the contract-related customer rights such as the right of withdrawal or legal guarantee.² A new online entry point enables consumers to access information about their European Union consumer rights.³

¹ Directive 2011/83 of the European Parliament and of the Council of 25 October 2011 on consumer rights, amending Council Directive 93/13/EEC and Directive 1999/44/EC of the European Parliament and of the Council and repealing Council Directive 85/577/EEC and Directive 97/7/EC of the European Parliament and of the Council; Directive 2019/771 of 20 May 2019 on certain aspects concerning contracts for the sale of goods, amending Regulation (EU) 2017/2394 and Directive 2009/22/EC and repealing Directive 1999/44/EC.

² Directive 2019/2161 of the European Parliament and of the Council of 27 November 2019 amending Council Directive 93/13/EEC and Directives 98/6/EC, 2005/29/EC and 2011/83/EU of the European Parliament and of the Council as regards the better enforcement and modernization of Union consumer protection rules (OJ 2019 L 328, p. 7). An “*online marketplace*” is defined as “*a service provider which allows consumers to conclude online contracts with traders and consumers on the online marketplace’s online interface.*”

³ According to article 5 of Directive 2019/2161 the Commission shall ensure that citizens seeking information on their consumer rights or on out-of-court dispute resolution benefit from an online entry point, through the single digital gateway established by Regulation (EU) 2018/1724 of the European Parliament and of the Council.

2.2 *European Postal Legislation*

The Postal Services Directive (PSD)⁴ imposes a series of specific transparency obligations on universal service providers. For example, the universal postal service is generally subject to different transparency obligations, specifically regarding tariffs (and terminal dues) and quality. Access to postal work and to the components of the postal infrastructure within the scope of universal service is also subjected to transparency requirements. In order to ensure compliance with essential basic rules in the postal market and therefore to increase transparency on the market players, Member States can subject postal operators to general authorizations to enter the market.⁵

To increase transparency in the EU parcel delivery market, the Commission adopted the Regulation on cross-border parcel delivery services in 2018 (hereafter: CBPR)⁶ to establish rules necessary to improve regulatory oversight in relation to parcel delivery services, to improve transparency of single-piece tariffs for cross-border parcel delivery services and to give information to consumers on prices concerning cross-border parcel delivery services.⁷ The objectives of this Regulation, including increasing the transparency of publicly listed tariffs for certain single-piece parcels, require parcel delivery service providers to report certain key information about their activities to the national regulatory authority (hereafter: NRA).⁸ As this obligation did not previously exist, the CBPR extends the cross-border regulatory oversight of NRAs and increases transparency for users of single-piece, non-negotiated, parcel services.⁹

Transparency is a pre-requisite for efficient regulation, as it enables the NRA to monitor effectively the market. Based on their experiences, NRAs deemed transparency as a suitable and effective instrument for the regulation of the postal sector according to the ERGP report on the suitability of regulatory tools to promote competition (ERGP 2020, p. 36). This ERGP report showed the suitability of different regulatory tools and shows that basic principles like transparency, non-discrimination and cost orientation are essential to support competition.

Realization of transparency lies in the first place in the implementation and supervision by regulators of these transparency obligations. In addition, initiatives can be taken with a view to creating further transparency on the postal market. Here we

⁴ 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 (OJ 1998 L 15, p. 14), as amended by Directive 2008/6/EC of the European Parliament and of the Council of 20 February 2008 (OJ 2008 L 52, p. 3).

⁵ Artt. 6, 9 11, 11bis 12, 13 PSD.

⁶ Regulation (EU) 2018/644 of the European Parliament and of the Council of 18 April 2018 on cross-border parcel delivery services, OJ L 112, 2.5.2018, pp. 19–28.

⁷ Rectical 36 CBPR.

⁸ Art. 4 CBPR.

⁹ Artt. 5–6 CBPR.

describe some concrete examples on how the creation and use of different transparency tools can further contribute to the creation of transparency on the supply (Sect. 3) and demand (Sect. 4) sides of the postal sector.

3 The Rise in E-Commerce

The postal sector has changed significantly during the recent years, and more particularly in the parcel segment. The COVID-19 health crisis, which significantly limited physical interactions and provoked the temporary closure of non-essential brick-and-mortar stores in many countries, has encouraged the massive use of e-commerce by citizens and sped up the digital transformation. People shopped more online, and more people shopped online. More merchants have developed new approaches toward e-commerce. Moreover, online purchases have spread out toward new types of products, involving more everyday necessities and items of unusual size or weight (De Standaard 2020). McKinsey stated “we have covered a ‘decade in days’ in adoption of digital: for online shopping, 10 years in 8 weeks” (McKinsey 2020, p. 1).

This new reality impacts the supply side of the market, leading to different tariff levels. Below we see as an example the 2 kg parcel single-piece tariffs from Belgium to its neighbor, the Netherlands. Postal operators active in the high time-sensitive express segment, charge a supplement for this speedy delivery. But also among other operators we see large differences, up to 134% in this case. This can sometimes be explained by differing characteristics such as a higher maximum weight, faster delivery times, or included insurance. It can nonetheless be important for consumers to carefully check the offers and see which goes best with their needs. Therefore, transparency, facilitating comparisons, is necessary to raise the awareness about the available options (Fig. 1).

Additionally, the explosion of parcel delivery services has created more transparency needs regarding customs formalities information. In a 2018 opinion, BIPT highlighted a “*lack of transparency in customs charges and customs formalities*” and recommended to “*raise transparency by collecting information and through publication*” (e.g. via a deliberation platform/comparison site) and indicated that “*Numerous users are not aware of the clearance costs to be paid at the delivery of the e-commerce mail item when goods, exceeding a certain amount, are imported from a country outside the European Union, and that they can choose a company to execute the clearance*” (BIPT 2018).

4 Transparency Toward the Consumer

In a fast-paced changing sector such as the postal sector, new products and product characteristics should be clearly communicated to the customer. A pressing demand for transparency that is increasingly coming to the fore is the need for insight into the

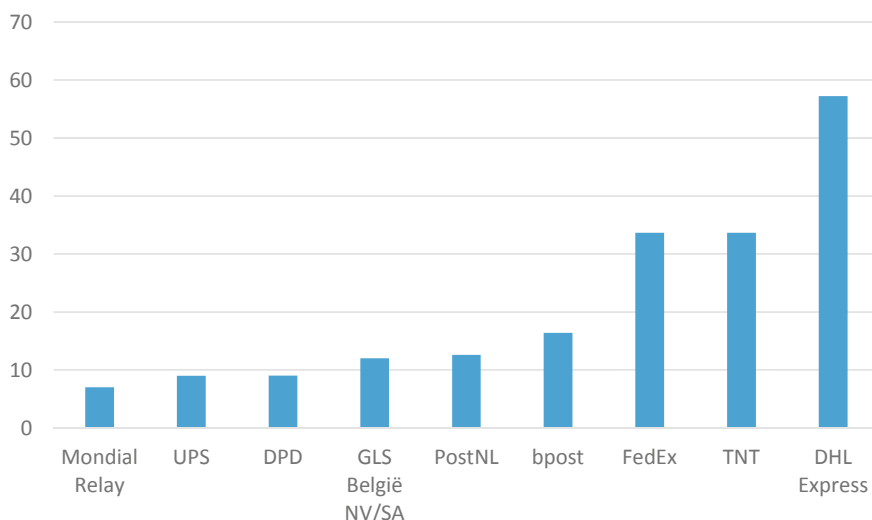


Fig. 1 2021 cross-border tariffs for a 2 kg parcel from Belgium toward the Netherlands (Source BIPT/EC)

ecological impact of postal deliveries. Various delivery methods have very different environmental impacts (Mommens et al. 2021). The reduction of delivery times can increase the CO₂ and particulate emissions (Jaller 2020). Measures to increase transparency could allow comparisons among the services offered and the operators concerned. Belgian residential end users understand that traditional fast deliveries of parcels are not necessarily sustainable, and they are open to alternative solutions. However, they are not willing to pay a supplementary fee to make faster delivery more sustainable (BIPT 2021).

Yet, private individuals are open to the fact that parcels are grouped with those of neighbors, so that delivery can be done more efficiently and so more sustainably, provided that the delay is maximum of three working days. The example considered was a longer routing time so that parcel could be bundled in a better way.¹⁰ What makes the situation more complex, however, is the fact that for the moment only a minority of professional end users is open to a more sustainable but slower parcel delivery, because they fear that this would cause a competitive disadvantage. Therefore, the BIPT study recommended to further examine the sustainability of the last-mile delivery with the various stakeholders. Initiatives such as Bewust Bezorgd, in the Netherlands, can provide sustainability transparency to end users.¹¹

Furthermore the addressee may be confronted with limitations in terms of extra-contractual liability of the postal service provider. The lack of mandatory refund rules

¹⁰ Sustainable delivery was presented to the respondents as follows: “Your parcels are bundled with those of other neighbours in order to send postal vehicles on their way as fully loaded as possible. This may cause the routing time to be extended by X day(s).”

¹¹ <https://bewustbezorgd.org/>.

and clear standards for the processing of appeals, impede the efficiency of complaint procedures. The provision of delivery services, as regards platforms, implies the involvement of players who are responsible, to varying degrees, pursuant to various regulations, which may give rise to some confusion.

5 Transparency Toolbox in Belgium

As the volumes of cross-border e-commerce deliveries continue to rise, the need for information and transparency on the tariffs for parcel delivery may become increasingly relevant.¹² The postal market has become more complex, driven by the huge growth of the e-commerce segment and the emergence of new operators and services. This further increases the need for transparency, not only for consumers but also for legislators, regulators, the operators themselves and more generally for all stakeholders. Not only the EC but also regulators and even sometimes even operators have started projects aimed at increasing transparency.

5.1 Market Overview

In order to provide a clear view of the sector, the largest players, innovations and evolution, a yearly market monitor, the so-called “observatory,” is published by BIPT. This yearly report provides not only a list of the largest operators, with indication and description of the fields they’re active in, but also discusses the letter, press distribution and parcel segments in detail. The focus is not only on volumes, revenue and tariffs but also on market shares, investments, employment and postal networks. Transparent statistics regarding the evolving sector are of use not only to the regulator and policymakers but also to operators themselves, other stakeholders and postal users, both directly and, at least in certain circumstances by fostering competition. This observatory also forms the basis for answering surveys from the EC, UPU and ERGP, all aimed at international comparisons and aggregations.

5.2 CO₂ Calculator

On 19 April 2022, the Belgian postal operator BD Logistics and the University of Antwerp launched their CO₂ calculator (BD Logistics 2022). This unique and innovative tool allows e-commerce or logistics players to display the total CO₂ emissions of its urban activities via a calibrated scientific measurement method. By means of

¹² COM(2021) 674 final Report from the Commission on the application of the Postal Services Directive, p. 6 (Commission 2021).

this tool, an e-commerce or logistics player can calculate the CO₂ savings achieved through the urban concept and compare it with the impact of last-mile deliveries in the traditional way. The innovative part of this tool, compared to other CO₂ calculators, is that it covers the complete delivery from first to last mile, and this is for all large operators in Belgium. The result is therefore not simply an average, but a specific amount of CO₂ (per parcel) going from one selected city in Belgium to another. Thanks to this tool, an e-retailer can now correctly take CO₂ emission into account when choosing a postal service provider.

5.3 Postal Networks and Tariffs

5.3.1 Postal Network Tool

On 21 December 2017 BIPT launched www.postalpoint.be. This webtool shows the data for all postal operators' postal points on an online map of Belgium. Searching for a postal point is possible based on the geolocation or based on a postal code or the name of a municipality and/or street name. It is possible to specify which kind of service (letters, parcels or express) or even which postal operator you are looking for. Information provided is not limited to the location (address) of the different points in the selected neighborhood, but also the services offered at this postal point, opening hours, annual leave and accessibility for disabled persons are shown. To improve awareness of this tool, BIPT launched campaigns on social media in 2021.

5.3.2 Tariff Tool

Following the work on the webtool www.postalpoint.be regarding postal networks, BIPT is currently completing the tool with an overview and indication of prices.¹³ The purpose of such a tariff comparison tool, as with the online map, is to increase transparency for the small user. These initiatives enable the BIPT to show consumers how to better compare market prices in the booming segment of parcel and express delivery. Providing users with information on postal services, such as whether and to which extent this or that parcel tariff contains insurance, will reduce the obstacles to the use of postal services and foster competition in the market. Indeed, the C2X segment, where small users sending items are only about 6% of the total volume, has a strong growth potential especially due to the popularity of channels to sell secondhand goods.

The BIPT tariff comparison tool, available on the BIPT website, is based on tariff information from the website of the European Commission concerning the CBPR.

¹³ While initiative like this already exist, for instance <https://www.parcelmonkey.com/>, <https://www.eurekali.com/> and <https://parcelinternational.com/>, they do not display the full range of services on offer in Belgium.

However, that web page of the European Commission, launched in 2019, is still little-known among Belgian small users of postal services. Moreover, for a more complete comparison, it would be necessary to add more information regarding the services of the various operators.

With this tariff comparison tool, BIPT wanted to solve that problem. In consultation with the operators, a set of additional (meta) data concerning the services was defined. The choice was made to focus on the 2 kg parcel, a common choice in e-commerce environment or sales of secondhand items. The additional data this comparison tool provides to customers contain, among other things, estimated delivery time in workdays, basic insurance, track & trace and dimensions and weight (minimum and maximum). In 2022, these data will be transformed into a more user-friendly webtool and be added to www.postalpoint.be.

6 Toward European Harmonization?

The examples in Sects. 4 and 5 show that the demand for transparency exceeds what is offered as a result of the implementation of the current legal transparency obligations. These examples are not fully exhaustive. As the existing European regulatory framework raises questions in terms of scope and legal certainty, there seems to be a margin for more transparency in the European postal market.

This is, as explained below, especially the case in the field of (1) the information on services offered by operators outside the universal service, (2) the information regarding consumer rights and (3) the provision of information related to delivery services provided by online platforms.

On transparency, the PSD Directive goes further than the Consumer Rights Directive.¹⁴ It is more precise in the type of information that should be given, focuses on the quality of the services, and addresses a wider scope of beneficiaries of the transparency requirement, not only for consumers but for all postal users. The PSD also goes further than the Services Directive as it imposes, and not merely encourages, that quality standards are set and measured (Dieke et al. 2021). At the same time, the transparency requirements of the PSD refer only to universal services in article 6. For postal services outside the universal services, the European postal legal framework does not lay down an obligation to provide information on the features of the services, prices, quality standards or other information. Consumers therefore have a different information for the universal service and for other postal services. As a consequence, the ERGP report on Key Consumer Issues (ERGP 2020, pp. 34, 52) stated that for consumers of these other services, or who interact with postal service providers other than the universal service provider, it may be difficult to be fully informed about services, features and prices.

¹⁴ Directive 2011/83 of the European Parliament and of the Council of 25 October 2011 on consumer rights, OJ [2011] L 304/64.

The ERGP has frequently pointed out some shortcomings of the regulations with regard to transparency. According to its report on key consumer issues (ERGP 2020, p. 35), it believes that the list of information requirements of article 6 PSD could be expanded to include simple and easily accessible information on liability and compensation, transit times and complaint procedures. The ERGP report on the contractual situation of consumers of postal services (ERGP 2021b, p. 37) also emphasized that it would be necessary to establish new specific rights for consumers, ensuring that addressees have the right to receive transparent and concrete information about their rights in the delivery process. This includes the right to receive clear pre-contractual communication and transparent general conditions. Addressees must be informed about the status of the mail item they are to receive.

Concerning the provision of delivery services by online platforms, the ERGP report on online platforms and e-retailers (ERGP 2021a, p. 20) stated that the general European consumer protection mechanisms are not always sufficient to prevent and resolve certain issues specific to the postal sector, specifically transparency in the terms of services and contracts, so that a clarification of the European legal framework seems desirable. This report recommended adopting clear rules regarding consumer protection in terms of tariffs transparency, quality of service and information on additional services, like track and trace. Increased transparency of tariffs and postal services should help to reinforce market competition, improve consumer's confidence and help to develop e-commerce (ERGP 2021a, p. 21).

These shortcomings have prompted transparency initiatives from member states or from stakeholders that go beyond the strict European legal framework. To avoid that a diversity of such national or private initiatives would emerge in an attempt to bring more transparency regarding the above topics, further harmonization could be done at the European level. In addition to adapting the legal framework, further initiatives and tools could be developed on a European scale, such as, for example, regarding European benchmarks of tariffs. As recognized in the EC application report, the Commission and national regulatory authorities should pursue their efforts to promote the Commission's web-based transparency tool and improve its user-friendliness by demonstrating its added value compared to other price comparison tools currently available.

7 Conclusion

NRAs have affirmed their use of transparency as a regulatory instrument. Together with the sharp increase in parcel volumes, a larger diversity of market players appeared. Some concrete examples were given on how transparency tools can further contribute to transparency on the supply side of the market, by monitoring the market and players, mapping out the postal networks and uncovering price differences. The explosion of parcel delivery services will keep transparency needs evolving. These needs are not always addressed by existing postal regulation, nor fully captured by

current regulatory or other transparency initiatives. However, certain national initiatives, in part illustrated in this article, could be developed on a European scale in the interest of improving postal markets.

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