

An Integer Programming Model for Delivery Price Optimisation in Luxury Fashion E-commerce

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Abstract

The luxury fashion industry has been integrating electronic commerce in order to achieve both new markets and distinct customer segments. Along with exponential growth, some relevant concerns emerge, namely the order shipment, which holds a dominant role as it contributes to the completion of purchasing processes. Therefore, available shipping methods and delivery prices are crucial to ensure successful transactions, positive online customer experiences, and good company performance. The present project entails the optimisation of delivery fees at Farfetch (the leading global platform for the market under scrutiny), together with the implementation of the Standard service on international routes that only feature the Express method (faster and more expensive). As a result, there will be a flexible offer and the consumer will benefit from freedom of choice.

At first, the in-depth study of the business aims to assemble all the essential information and tools for the subsequent strategy design. In addition, historical data evaluation not only helped data standardisation but also enabled the investigation of customer behaviour within the two shipping services aforementioned. In turn, an Integer Programming Model was developed as a means to maximise delivery revenue by discovering the optimal prices for each shipping service and for each critical destination country. Besides demand forecast, the model encompasses guidelines, in particular a set of scenarios by type of price variation, as well as a set of constraints limiting those variations so as not to significantly impact the predicted client distribution. Following the employment of the new shipping fees for Hong Kong, Australia, and Japan, the approval of those prices represents the next step. Through a benchmarking analysis with the competition, it was confirmed that Farfetch remains well positioned in its industry with regard to transport charges. Even though there were slight differences between the real and predicted customers' redistribution, overall gains were accomplished regardless of the geography so that Hong Kong and Japan presented an earning of around 3 dollars per order, while Australia had roughly 1 dollar per order. At last, there was no adverse effect on the number of consumers who actually validated an order when compared to the number of visitors to the Checkout page. Hence, the new delivery-pricing strategy has unveiled satisfactory results so far. However, it is important to perform an assessment over a longer period of time.

In a nutshell, the project has contributed to the enhancement of the international parcel delivery service both at the company and customer levels. Although the average price increases, it does not necessarily have negative outcomes on customer satisfaction because the service expansion in terms of delivery options gives more flexibility to meet customers' needs and preferences.

Resumo

A indústria da moda de luxo tem vindo a inserir-se no comércio eletrónico para que novos mercados e diferentes segmentos de consumidores sejam atingidos. Juntamente com o crescimento exponencial surgem algumas questões de relevo, nomeadamente a expedição de encomendas que tem um papel preponderante, na medida em que contribui para a finalização do processo de compra. Assim sendo, os métodos de envio disponíveis e os respetivos preços de entrega são cruciais para assegurar o sucesso das transações, uma boa experiência do cliente e uma boa performance da empresa. Desta forma, o projeto exposto na presente dissertação consiste na otimização dos preços de entrega da *Farfetch* (plataforma líder do mercado em questão), juntamente com a implementação do serviço *Standard* em rotas internacionais que apresentam unicamente o método *Express* (mais rápido e dispendioso). Deste modo, há flexibilidade na oferta e o consumidor ganha liberdade de escolha.

Primeiramente, o estudo aprofundado do negócio visa recolher todas as informações e ferramentas necessárias para a posterior execução da estratégia de preços. Adicionalmente, a análise de dados históricos não só possibilitou o estudo do comportamento dos clientes perante os dois serviços de entrega mencionados, como também viabilizou a padronização desses mesmos dados. Por sua vez, o desenvolvimento de um Modelo de Programação Inteira, com o intuito principal de maximizar a receita, permitiu a descoberta dos preços ótimos para cada serviço de entrega e para cada país de destino considerado crítico. Para além da previsão da procura, o algoritmo teve em consideração uma série de diretrizes, especialmente um conjunto de cenários a discriminar o tipo de variação que os preços podem exibir, bem como um conjunto de restrições que limitam essas mesmas variações de maneira a não impactar significativamente a distribuição de consumidores prevista. Após a implementação dos preços de entrega obtidos para Hong Kong, Austrália e Japão e posterior recolha de dados, a fase seguinte recaiu na validação dos novos preços. Através de uma análise de *benchmarking* com a concorrência, aferiu-se que a entidade sob análise continua bem posicionada na indústria relativamente às taxas de transporte. Além disso, apesar de ter havido ligeiras divergências na redistribuição dos clientes face às previsões, nos três países verificaram-se ganhos de aproximadamente 3 dólares por encomenda em Hong Kong e no Japão, e de 1 dólar por encomenda na Austrália. Por fim, não se observou um efeito negativo na quantidade de consumidores que efetivamente validaram uma encomenda quando comparada com o número de visitantes da página *Checkout*. Assim sendo, a nova estratégia de preços implementada demonstrou bons resultados até ao momento. Todavia, recomenda-se a realização de uma análise com um período temporal mais alargado.

Em suma, o projeto contribuiu para a melhoria do serviço internacional de expedição de encomendas tanto ao nível da empresa como ao nível do cliente. Embora haja aumentos médios do preço de entrega, isso não implica necessariamente consequências negativas na satisfação dos consumidores, uma vez que a expansão do serviço em termos de opções de entrega proporciona mais flexibilidade para satisfazer as necessidades e preferências dos clientes.

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"People don't know what they want until you show it to them."

Steve Jobs

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Acronyms and Symbols

AOV	Average Order Value
ATV	Actual Transaction Value
AWB	Air-Way Bill
BO	Boutique Order
CR	Conversion Rate
EU	European Union
FS	Free Shipping
GMV	Gross Merchandise Value
GTV	Gross Transaction Value
KPI	Key Performance Indicator
NPS	Net Promoter Score
NTV	Net Transaction Value
PC	Private Client
PO	Portal Order
pp	Percentage Points
RCR	Review Conversion Rate
RTO	Return to Origin
SI	Shipping Income
UAE	United Arab Emirates
UK	United Kingdom
USA	United States of America

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Chapter 1

Introduction

Electronic retailers must continuously reformulate their business strategies so as to remain active and competitive in the ever-expanding technological environment. It is predicted that, by 2025, up to one-third of all sales for luxury goods will be made through the internet (Forbes, 2021). As a matter of fact, customers are pursuing the best offers and opportunities while assessing the inherent expenses in most sectors of activity, and the online luxury fashion industry is no exception.

Indeed, an e-tailer's delivery service is the key element of the business since order fulfilment relies exclusively on it. Its flexibility, quality, and related-shipping fees influence clients' behaviour throughout the decision-making process of purchasing both in the present and in the future. Buyers have diverse needs and preferences, inasmuch as some are more concerned with the speed of transport methods, while others prioritise cost savings. In this line of thought, e-sellers try to present diversified shipping alternatives with meaningful value in order to target as many customer segments as possible (Huang et al., 2013). Therefore, delivery-pricing strategies have sparked a lot of debate among researchers and corporations (Yao and Zhang, 2012), and analytical approaches are becoming more and more acknowledged as efficient techniques to streamline prices (Hannak et al., 2014). Moreover, consumer satisfaction, retention, and acquisition are all coupled to those charges and to the way shoppers perceive them.

Farfetch is an e-commerce marketplace for luxury fashion, and the present dissertation will focus on enhancing the online experience of Farfetch's clientele by widening the available shipping options and optimising the pricing system concerned. Hence, this study intends to contribute to this area of knowledge by investigating the impact of price changes on financial performance and customer satisfaction.

1.1 Farfetch

Farfetch was built on the concept of being the global online platform for luxury fashion, connecting creators, curators, and consumers. In particular, this British-Portuguese company was founded in 2008 because José Neves – founder and CEO of Farfetch – saw a great opportunity in presenting the virtual environment to the high-end fashion industry. As an e-tailer, Farfetch is an intermediary

between more than 3 million active customers, in over 190 countries, and more than 1 400 luxury sellers, including brands and boutiques¹, from over 50 countries – this large quantity of partners contributes to the existence of economies of scale. The company started by selling products from 25 boutiques in 5 countries, so it has been showing enviable growth (Farfetch, 2018a). Being the first firm with Portuguese DNA to become a unicorn², Farfetch had a market capitalisation of 5.78 billion dollars and a share price of 15.16 dollars, at the beginning of April 2022 (Farfetch, 2022b).

On the other hand, a set of values were created to allow international expansion based on a steady and well-defined base. Those values are: Be Revolutionary, Think Global, Be Human, Be Brilliant, *Todos Juntos* and Amaze Customers (Farfetch, 2018a).

The Farfetch business model encompasses revenue from commissions and a drop-shipping method, more precisely, a retail fulfilment practice where the retailer (Farfetch) does not store inventory – normally, the merchandise showcased in the marketplace belongs to the merchants³, then it is housed in their infrastructures and shipped directly to the client with the help of carriers, which are third-party providers used to ensure order transportation. Consequently, the company benefits from having no storage costs while presenting a wide spectrum of products to fashion shoppers. This assortment is a significant competitive advantage. Nevertheless, it increases stock-out risk and it becomes harder to manage the fulfilment process and to ensure a similar experience for all buyers. In such context, the Farfetch service includes everything from photographing products for the catalogue to providing post-sale customer assistance, whereas the partners' job focuses only on packaging the items.

However, it is relevant to underline the existence of Farfetch's warehouses with the main purpose of diminishing costs around duties and taxes that arise from crossing country borders. Thus, depots' role is not to hold stock for sale, but to be a mediator between a merchant and a customer whenever customs expenses are too high. Currently, there is a warehouse in Netherlands, Shanghai and New Jersey, two in Italy, and it is expected to have one more in Hong Kong.

In light of these facts, it is possible to define three key players in the company's platform ecosystem: Controllers – it includes all platform owners and shapers, such as customer and partner services, creative operations and content creators – Producers – it embraces merchants (like Dolce & Gabbana, Gucci and Prada) and third-party businesses (for example, DHL and FedEx) – and Consumers – which involves end-customers and tenants⁴ (such as Farfetch marketplace, Browns, Harrods, etc.).

In the course of time, the company has made investments in several businesses that are complementary to its core business. First, the Browns acquisition in May 2015, which is an iconic British fashion and luxury goods boutique, transformed Farfetch into a group, enhanced its trustworthiness, and provided an environment to test and develop innovations. Also in that year, Farfetch Platform Solutions, previously known as Farfetch Black & White, was announced to deliver

¹multi-brand retail spaces

²private start-up firm valued more than 1 billion US dollars

³brands and boutiques

⁴those who sell directly to their own customers using their own commerce solutions developed on top of the platform

white-labelled solutions to luxury fashion brands and retailers, providing the expertise and technology of the marketplace. As a result, partners can reach new customers, improve both virtual and physical shopping experiences, and expand their expertise (Farfetch, 2018a).

In April 2017, the company launched the Store of the Future business unit as a new retail innovation division and vision to enrich the customer experience in brick-and-mortar stores through the power of people and technology. Therefore, a bridge between the online and offline worlds was built, embracing each trend-setting fashion area (Gokal, 2019).

On September 5th, 2018, Farfetch became a publicly listed company on the New York Stock Exchange (NYSE) under the ticker symbol "FTCH". To this end, its first initial public offering included 37 503 501 Class A ordinary shares (Farfetch, 2018b). Furthermore, in 2018, Farfetch Group announced three new and remarkable entrants: Curiosity China, Stadium Goods, and New Guards Group (NGG). The ownership of Curiosity China enabled company partners to grow exponentially in China by providing a connection between premium digital services and cutting-edge technology (Farfetch, 2022a). On the other hand, the acquisition of the world's premier sneaker and streetwear marketplace, Stadium Goods, has heightened sales since its introduction (Farfetch, 2018a). Last but not least, the aim of the NGG platform proprietorship was to nurture and promote new and existing names, designers, and creative directors. Being the home of nine international world-renowned brands, it provided Farfetch with a creative and innovative mindset (Farfetch, 2018a; Alonso, 2019).

Moving forward, it was unveiled the Luxclusif acquisition in 2021, whose purpose was to foster and augment Farfetch Second Life – resale service (Farfetch, 2018a). Finally, the current and following investments rely on the beauty industry. In particular, the company has been working on launching "Beauty" on the Farfetch marketplace, for example, through the ownership of Violet Grey – a renowned luxury beauty retailer –, which enables customer base expansion and the supply of a curated selection of beauty products. In addition, customers will be able to receive insights from a variety of beauty professionals and communities (Farfetch, 2018a).

Regarding Farfetch's structure and dimension, more than 5 000 Farfetchers are spread all over the globe to guarantee an outstanding customer-focused experience. To be more precise, there are 14 offices – namely in Portugal, China, United Kingdom (UK), United States of America (USA), Russia, Brazil, Japan, India, and United Arab Emirates (UAE) – each with its own individuality and highlighting the fact that the London office is the headquarters. As a company that incorporates worldwide stakeholders, the supply chain – namely the delivery network – is highly complex because of the vast number of routes, and on top of that, there is a huge challenge in ensuring enterprise success in a multicultural environment. In such context, a hierarchical structure exists due to its dimension, and aside from teams being specialised, all are interconnected and reliant on each other.

The project under scrutiny was developed in Delivery Team which fits into the Logistics Department. This department belongs to a major Farfetch division called Operations, composed of 5 other departments beyond Logistics, called: Creative Operations, Payments and Fraud, Service Excellence, Operations Strategy, and Business Operations. In what concerns the Delivery Team,

its main role consists of continuously improving, controlling, and expanding the delivery service provided to the customers. To do so, the focus relies on a tireless pursuit of strategic solutions.

1.2 The Project: Motivation and Objectives

Once the business framework is already well-established, it is relevant to shed light on the main reasons for developing this project, as well as its primary goals. In line with the current changes in the market and business growth, it has become a priority to understand how the shipping price variation, the delivery options available, and the free shipping policy influence the Profit and Loss statement, Conversion Rate, and Retention Rate. Additionally, the customer region and competition's prices will shape the company's decisions.

More precisely, Farfetch started by offering the best home delivery alternative (Express service) and buyers would only have one shipping service presented and would not be able to choose how they wanted their purchases to be carried. At the beginning, this strategy made sense, but as time went by and as the company grew, such policy began to be seen as a hindrance rather than a benefit. Indeed, upgrading services may bring prominent and positive changes to the firm, and this technique is commonly used by several businesses nowadays (Guillet, 2020; Chen et al., 2022).

In such context, the scope of this work relates to broadening Farfetch's delivery services through the implementation of a Standard service and, consequently, the redefinition of the price the firm charges to consumers for shipping, also known as Shipping Income (SI). This value is added to the total sales price.

It is relevant to underline that order shipment plays a critical role in what concerns the Profit and Loss report of the company, as it represents a significant percentage of the total costs, not only because all fashion products do not belong to the online platform, so there are no production or storage expenses, but also because the complex delivery network entails high costs. Thus, streamlining the Shipping Income will help lower the impact of shipping expenditure by increasing generated revenue.

On the other hand, one of the primary goals of Farfetch relies on continuously improving customer journey and satisfaction by outweighing expectations and rethinking, reshaping, and innovating the fashion industry in both worlds. Note that, it all boils down to one of the values: Amaze Customers. To this end, a flawless performance needs to be insured, which is directly connected to the delivery service provided. Altogether, the study creates a win-win situation, in other words, both the customer and the company benefit from it.

The organisation has already implemented itself a strategy to optimise Shipping Income by adding a new shipping service (Standard option) for a few countries, namely United States of America and United Kingdom, and it has obtained positive outcomes insofar as customer satisfaction has not decreased. Therefore, the present dissertation will continue the strategy definition, implementation, and analysis for other countries.

In summary, the project's objectives are as follows:

- Holistic analysis of historical data related to shipping charges;

- Conceptual definition of the Shipping Income strategy in order to implement a new delivery option and to optimise delivery prices, and redefinition of the plan until a final approach is permanently identified;
- Implementation of the Shipping Income strategy to a set of countries;
- Evaluation of the plan of action considering records before and after the new strategy deployment, where the Review Conversion Rate is used as the primary variable to dictate the failure or success.

1.3 Methodology

The project's development is segregated into five stages, and Figure 1.1 presents those steps, as well as their duration and respective order.

	Weeks																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Business Understanding																		
Data Standardisation and AS-IS Analysis																		
Model Development																		
Strategy Implementation																		
Impact Analysis																		

Figure 1.1: Gantt chart for the main project stages

The earliest step, called business understanding, addresses the acquisition of analytical software know-how (Google *BigQuery* and *Looker*), together with a thorough study of the company's business model and the problem's context and purpose, with an emphasis on the whole delivery price structure. Afterwards, automatising and standardising Shipping Income reporting (and other pertinent variables) is imperative as a means to enable an effortless and immediate assessment of those charges. Moreover, this stage comprises an overall study of the current delivery-pricing approach. With all the fundamental tools and concepts learned and in order to accomplish the stated goals, the third phase encompasses the elaboration of a new strategy for the Shipping Income charged to the customers. Following the model's execution, the fourth step establishes deadlines and, subsequently, covers the deployment of the designed course of action. The final stage, also referred to as impact analysis, investigates the real Shipping Income gains obtained with the new approach, and the repercussions on customer satisfaction. Not to mention that it encloses a general review balancing new ideas and lessons learned.

1.4 Dissertation's Structure

The present dissertation is organised into five more chapters to fully illustrate the project's evolution. To begin with, Chapter 2 addresses a set of theoretical concepts and findings, first from a general perspective on what concerns e-retailing and online shopping experience, and then from a detailed point of view regarding price elasticity and delivery service. Not to mention the decoy effect, which considerably supports the scope of this dissertation. Chapter 3 encompasses the current scenario of Farfetch. To be more precise, order flows, pricing policy related to shipping, and delivery service features and limitations are described to advocate the project's relevance, together with a clear and detailed description of the underlying problem. Chapter 4 covers the methodology along with the pricing model developed to define new shipping prices for a set of countries. Chapter 5 reports and analyses the outcomes obtained, as a consequence of the proposed solution deployment, with a special focus on its impact on the Review Conversion Rate. Finally, Chapter 6 comprises the findings of the project and recommendations for future work.

Chapter 2

State of the Art

The present chapter encompasses the most appropriate and up-to-date literature that strengthens the project's scope. Firstly, the growing field of electronic retailers is discussed, along with a study of the online customer experience, especially in a luxury fashion environment. Thereafter, the pricing subject is explored with a particular focus on the laws of demand and supply, the elasticity, and the singularity of luxury fashion customers. The ensuing section covers an overview of the different strategies for delivery services, followed by research concerning online basket abandonment and its main drivers. Finally, an investigation of the decoy effect is mandatory to underpin some of the claims made.

2.1 E-Retailing

The business world is constantly and continuously evolving insofar as it must cope with technological advances, market shifts, changes in customer demands and expectations, worldwide competition, and adjustments in rules, regulations, and legislation. Consequently, electronic commerce arises from this environment and represents a different way of fulfilling citizens' needs and distributing products and services. With technology employment, more precisely via the internet and other proprietary networks, virtual commerce brings transparency (free flow of information), erases geographic and national barriers without additional expenses, and has triggered a transformation in the way industries are conducted (Bajaj and Nag, 2005).

Similarly, Burt and Sparks (2003) stated that e-commerce is a process innovation in retailing. Aside from being accessible 24 hours a day, e-retailing operates spontaneously on a global scale, and a larger market with more competition is presented.

Indeed, many are the changes and upgrades provided by electronic commerce considering all stages of a retail process. First, connections between buyers and suppliers become much easier to establish, which contributes to a more streamlined supply. Second, a very rich offering of information is verified along with a reduction in consumer search costs. Moreover, when compared with traditional stores, electronic retailers present lower costs in terms of stock ownership and

transactions, yet on the other hand, they have to bear picking and delivery costs. With web store-fronts, other challenges emerge, namely stock storage, product availability, brand building to gain customer trust, and loss of in-store environment such as human contact, smell, and touch (Burt and Sparks, 2003; Rose et al., 2011; Goldmanis et al., 2010). Finally, Burt and Sparks (2003) suggest a boost in the quality and presentation of physical stores in order to hold them in the market, for example through augmented reality technology (Har et al., 2022).

Another modification that can be generated by e-commerce is the disintermediation which corresponds to the removal of supply chains elements, in other words, reducing intermediaries between producers and consumers. This implies an increase in efficiency and a decline in expenditures (Delfmann et al., 2002; Alabi, 2017).

In terms of environmental footprint, CO₂ emissions in conventional retail are primarily due to infrastructures and buyer trips, whereas packaging is the main culprit in virtual commerce. In light of these facts, virtual stores present lower environmental costs when compared to physical ones. More precisely, in China, 124 million tons of CO₂ emitted was the difference between traditional and online commerce in 2016. Thus, e-retailing growth will contribute to an eco-friendlier retail industry (Zhao et al., 2019).

Over the years, e-tailing has suffered transformations due to changes in customers' perceptions and market evolution. With that in mind, it is possible to define three distinct periods. In the first period (2000-2005), choice and acceptance represented the major themes. In fact, the latter may be because internet technologies were a new concept at the time, and people were sceptical about it. Between 2006 and 2011, the driving forces changed, and loyalty and choice became critical concepts. Customer choice is included thanks to a rise in competition. Finally, satisfaction and distribution dimensions described the period from 2012 to 2017. Overall, the focus should be on customer satisfaction and commitment once e-tail systems were already well-established (Altıntaş et al., 2020).

In 2020, the world was experiencing an atypical situation - the COVID-19 Pandemic - which affected everyone and everything. Electronic commerce was no exception. Overall, this sector has faced significant growth because most people avoided dislocating themselves to brick-and-mortar stores. As an alternative, they began to opt for or give the online world a chance, so that their needs could be satisfied, both essential and non-essential. The expansion was different depending on the nature of the products. Logically, indispensable goods had a greater demand. On the other hand, this phenomenon became a challenge to businesses as it was difficult to fulfil the customers' demands while assuring a quality service, namely the accuracy of the expected delivery time. The struggle was caused not only by high demand but also by control movement within and between nations, which complicated distribution. (Chaudhary, 2020; Bhatti et al., 2020). When comparing 2020 with 2019, it shows the highest growth recorded (since 2014) of almost 1 trillion U.S dollars in sales. In 2021, global e-retailing sales reached 4.9 trillion U.S dollars, roughly, and this value is projected to increase by 50%, reaching 7.4 trillion U.S dollars by 2025 (Statista, 2022).

Currently, the retail industry stands in its fourth transformation – Retail 4.0 – where supply chains are customer-centric and technology is viewed as the main character (Har et al., 2022).

Luxury fashion industry has been following this development, embracing social media and e-commerce (Bjørn-Andersen and Hansen, 2011).

With that in mind, a new concept has been materialised in the retail field. Referred to as m-retailing, a mobile retail service increases customer base and creates a new market channel insofar as it improves service delivery process. Thus, publicly traded firms and retailers with online service skills and economies of scale are more inclined to implement m-retailing (Chou et al., 2016). As a matter of fact, m-commerce offers the mobility, accessibility, and ubiquity that connected desktop computers do not. Nevertheless, time criticality plays a vital role in the decision-making of m-retailing employment (Chou and Shao, 2021). Besides mobile retailing, artificial intelligence has transformed the consumer experience with chatbots¹. Hence, highly usable chatbots are linked to personalised and effective experiences with notable responsiveness that provide comfort and value (Chen et al., 2021). Beyond that, Internet of Things, can offer online tracking with real-time location data and order alerts, enhancing customer involvement. Finally, cloud computing unites e-commerce and traditional retail (Har et al., 2022).

2.2 Online Customer Experience

Although traditional luxury stores are being replaced by virtual ones, that does not mean they will become obsolete. Instead, a complex luxury customer experience arises where both the online and offline worlds are important players. As such, “the online channel is a part of most of all experiences leading to a luxury purchase (...) and customers perceive it as a part of the overall luxury customer experience” (Klaus, 2020).

With respect to online shopping experience in virtual retailing, a study conducted by Izogo and Jayawardhena (2018) identified seven belief factors and five key behavioural outcomes. Essentially, prices, complaint handling, product/service experience quality, convenience, website functionality, relational experience, and shopping enjoyment are the key drivers of customer satisfaction. Whereas online shopping effects encompass internal and external response to service failure, trust, regrets, and electronic word-of-mouth: opinion-seeking and opinion-giving. It is worth noting that the authors find that clients are more biased to talk about bad experiences than favourable ones. As so, good promotional activities, an easy-to-use website with high-quality, and on-time delivery will have a substantial and positive impact on clients’ purchase intentions. Individual aversion to sharing personal information, high-risk factor in the virtual environment and the ease of access to local and physical retail markets, in contrast, may have a negative effect (Altıntaş et al., 2020).

Adding up to the previous study mentioned, an online luxury experience can be categorised by three stages (pre-purchase, purchase, and post-purchase) and three possible luxury customer segments regarding the use frequency of online channels: purists, opportunists, and e-lux. Figure 2.1

¹ chatbot or virtual assistant is a computer program that mimics human conversation using natural language capabilities

presents a conceptual model that describes the motivations, benefits, and experiences considering each segment (Klaus, 2020).

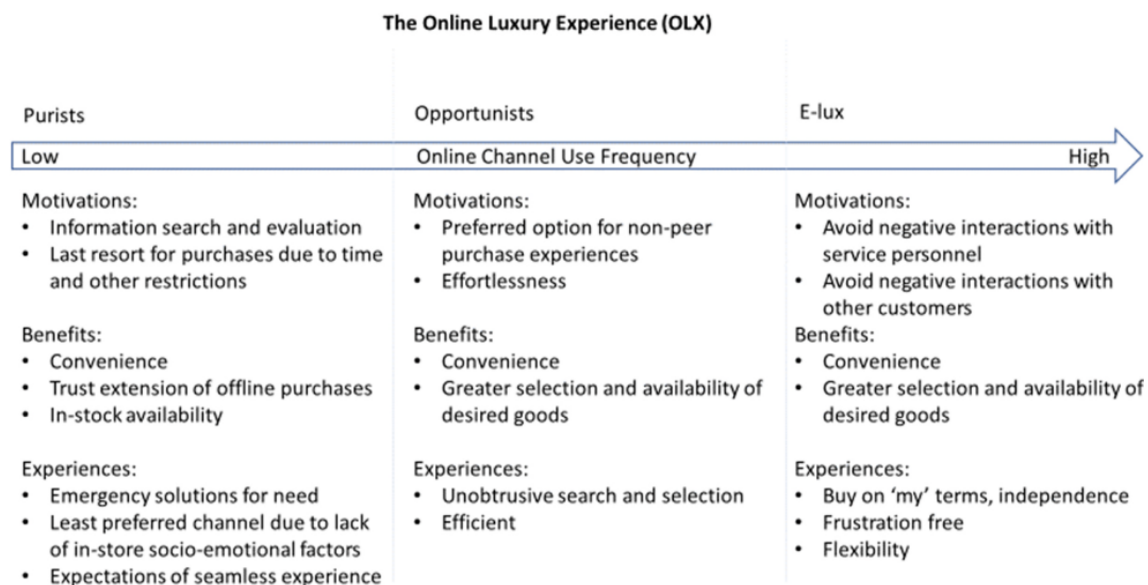


Figure 2.1: Conceptual model for online luxury experience (Klaus, 2020)

Regarding the stages, it is also important to notice that the incentives to participate in each one exhibit significant differences. In short, in the first phase, virtual channels are mainly used for information search and information evaluation due to their independence and flexibility. Plus, the act of purchasing can be driven by socio-emotional factors, cost reductions (cost of time), convenience, and larger selection and access. Finally, the way customers interact with the firm after shopping (e.g., for feedback) depends on how the company reacts and treats clients in distinct situations. At this stage, trust begins to be built or not (Klaus, 2020).

To address the customer trust factor, according to Walczuch and Lundgren (2004), its main determinants are perception-based factors, specifically reputation (word-of-mouth and information from friends and relatives), perceived investment, perceived similarity, perceived control and perceived familiarity. Therefore, people with no e-commerce experience may have low trust levels due to a lack of perceived familiarity with the Internet and e-commerce.

Customisation has also contributed to customer satisfaction, along with prominent customer service, economic value, and post-purchase experience (Jaiswal and Singh, 2020).

In such context, a theoretical model of consumer choice concluded that customers are more willing to shop online for low-risk products and services or from well-known brands. However, it is less expected that they shop online from lesser-known retailers who carry well-known brands than from respectable retailers, regardless of the brands they carry (Lee and Tan, 2003).

2.3 Pricing on Digital Platforms

The evolution of the digital world has fostered significant changes in pricing strategies due to its unique features (Laatikainen and Ojala, 2019). Indeed, the purchase power of customers has considerably increased, and the market power of retailers has decreased because of the internet. Now, consumers have the opportunity to easily compare prices on different websites and analyse reviews made by other buyers. Furthermore, with a wide competition available, sellers lose some control over their clients. To overcome this hardship, retailers must focus on service differentiation and use wisely the plethora of internet-based information (Daripa and Kapur, 2001; Ba et al., 2007).

Since digital products and services are poised in a high-velocity environment, some skills and competences are needed to not lose the thread, namely technological, technical, analytical, and negotiation skills. In addition, prioritise customers through good relationships, customisation, and emphasis on quality may develop firms' capability to set prices. Moreover, a know-how of the market is half the way to a successful pricing strategy (Laatikainen and Ojala, 2019). From another perspective, promotions, free options, and product/service recommendations are three viable approaches that could work in the online context to maximise income, once incremental expenses are low (Docters et al., 2011; Jiang et al., 2015).

2.4 Law of Demand, Law of Supply, and Elasticity

To better understand price definition in an online environment and the relationship between buyers and sellers, it is important to shed light on some critical economic concepts, such as demand, supply, and elasticity.

The law of demand states that customers are willing to buy more at lower prices, and it is represented by the demand curve (with a negative slope), which indicates the quantity demanded of a product or service for different prices, *ceteris paribus*. Demand curves are mainly affected by changes in the market, population, preferences, related-goods, expectations, and income level of consumers. Whereas the law of supply confirms a rise in the total amount of a good that suppliers are willing to sell when prices increase, *ceteris paribus*. Technology, competition, taxes, and production costs are some of the determinants of supply curve changes. Compared with the demand curve, the supply curve has a positive slope (Morcillo, 2006; Marquez, 1990).

By combining these laws (Figure 2.2), an economic equilibrium is achieved insofar as both the quantities offered and demanded are the same. Normally, prices and quantities are steered to equilibrium by the actions of buyers and sellers in such a way that in an excess of demand, the price rises, forcing the quantity demanded to decrease, and vice versa (Gale, 1955). In a balanced market, all interveners are satisfied, and there is no necessity to change any behaviour in terms of price or quantity (Costa, 2019).

Regarding the price elasticity of demand, it measures how an economic variable – demand – responds to changes in another economic variable – price (Equation 2.1). This indicator is

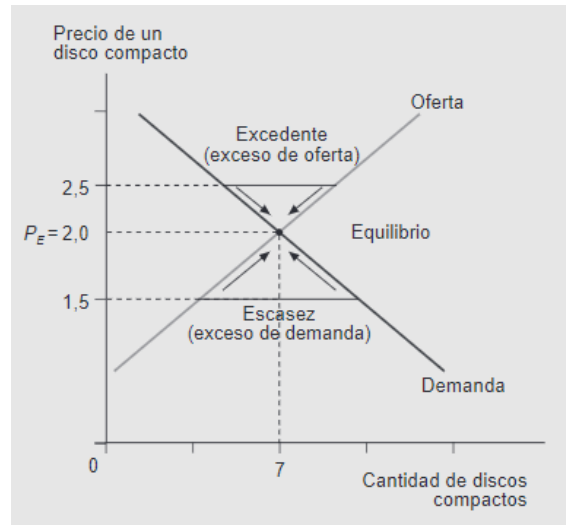


Figure 2.2: Market equilibrium (Morcillo, 2006)

critical to business pricing strategies. As such, an inaccurate estimate can cause wrong pricing decisions and, consequently, additional expenses. One way to avoid this is to determine elasticity in a geography-product combination (Kalla et al., 2017).

$$\varepsilon_{Q,P} = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} = \frac{\% \Delta Q}{\% \Delta P} = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} \quad (2.1)$$

where P corresponds to the price and Q to the quantity demanded.

Essentially, the price elasticity of demand indicates how sensitive a good's demand is to price variations, and it is affected by several factors, as previously mentioned. Whenever this measure is greater than 1 (in absolute terms), there is elastic demand, which means higher prices result in lower total revenue. On the other hand, demand is inelastic when elasticity is lower than 1 (in absolute terms), so a low sensitivity grants a bigger overall revenue when prices increase. Finally, a value of 1 or -1 indicates that a given percentage change in price leads to an equal percentage change in quantity demanded (Morcillo, 2006). Figure 2.3 illustrates the aforementioned behaviours. For instance, the existence of substitute items creates a more elastic demand since customers can easily replace one product/service for another. Additionally, in the short-term, demand tends to be inelastic because buyers do not have enough time to change their preferences in response to price changes. Also, luxury goods are not essential, and if a customer really wants to purchase a specific product there will be a more inelastic demand (Costa, 2019).

Moreover, other concepts such as cross-price elasticity of demand, price elasticity of supply, cross-price elasticity of supply, and income elasticity of demand can be important to analyse depending on the context. In a luxury fashion context, it is worth noting the latter, which measures the response of demand to changes in consumer income. As shown in Figure 2.4, normal goods are those whose income elasticity is positive (higher yield, higher demand), while inferior goods have a negative value (higher yield, lower demand). Depending on whether the income elasticity

is greater or less than unity, goods are either luxurious or essential (Morcillo, 2006).

Note that it is not possible to know the exact amount that customers are willing to buy for each possible price, so understanding consumer behaviour and the determinants that impact elasticity is crucial. Therefore, a well-known business that distinguishes from the competition has more control over the prices they charge (Costa, 2019).

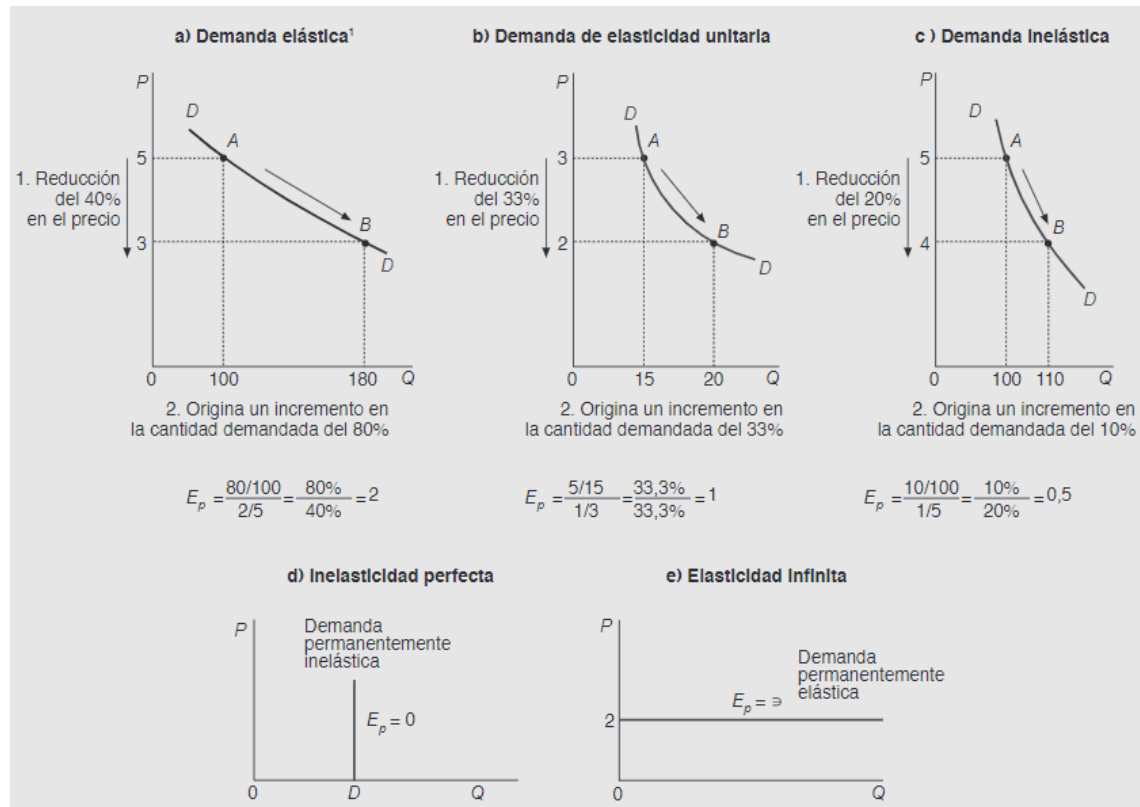


Figure 2.3: Different types of the price elasticity of demand, where a) elastic demand; b) unitary elastic demand; c) inelastic demand; d) perfectly inelastic demand; e) perfectly elastic demand (Morcillo, 2006)

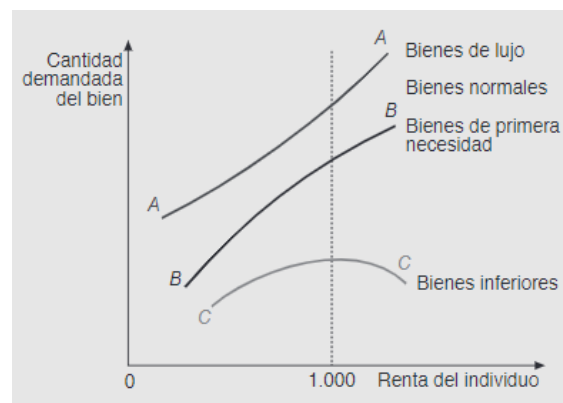


Figure 2.4: Typology of goods according to the demand-income relationship, where A) luxury goods; B) essential goods; C) inferior goods (Morcillo, 2006)

2.5 Luxury Fashion Customers

The luxury fashion industry is a particular environment where customers can present distinct buying motivations compared with other markets. In fact, the luxurious nature of a business is associated with power, fortune, exclusiveness, ostentation, extravagance, appearance, and superfluity. Consequently, consumers purchase luxury goods to obtain status and prestige, in other words, to feel important and valued in their own eyes and in the eyes of others. Therefore, to increase customers' intentions to buy, luxury values are proven to be more important than previous experiences. For instance, not only do they need to feel a connection with the brand, feel pleasure and enrichment in life, but also consumers must have the need to be accepted by their own social group. In light of these facts, luxury fashion clients are willing to pay more to own such products, if necessary, thus higher prices do not negatively impact the demand as much (Eastman et al., 1997; Loureiro and de Araújo, 2014).

Finally, as stated by some research (Burnasheva et al., 2019; Soh et al., 2017), both millennials and generation Y are significant demographics in this market because of their power on social media.

2.6 Delivery Service

Internet-based commerce implies that customers and retailers are separated physically, so the delivery service is imperative to the orders' fulfilment. Besides the main price of products and services, e-tailers must specify strategies to define shipping fees insofar as a balance between attracting buyers and offsetting transportation expenses needs to be achieved. Hence, these charges are used as a competitive advantage by suppliers, making prices less comparable. Notably, the delivery price definition determines whether a business survives or is well-heeled once clients are very responsive to distribution payments and times (Yao and Zhang, 2012; Jiang et al., 2013). Indeed, the most important trait of the delivery process is the shipping price, nevertheless shoppers have different reactions to these charges.

Regarding shipment strategies, among the various alternatives that internet sellers have, it is worth noting the free shipping policy by entailing transportation costs. Additionally, online retailers can opt to charge part or all of the delivery expenses, so in the latter there is neither profit nor loss. Lastly, income can be made through shipping services by charging customers a price higher than the actual costs incurred. Yet, besides increasing profit, this strategy can be used to compensate for an item price reduction made to gain a competitive advantage. Thus, it is an asset if suppliers focus on a joint strategic definition of core and delivery prices along with different shipping methods available (Yao and Zhang, 2012).

Although consumers do not need to dislocate themselves to a physical store every time they want to buy something, distance barriers are not erased, and it takes time and resources for the buyers to actually receive their purchases (Kim et al., 2017). Additionally, delivery services can include anything from door-to-door order distribution to pick-up points (Agatz et al., 2008). Truly,

retailers can provide a variety of home shipping services to their clients given the price charged and the estimated shipping time.

Undertaking the existence of two delivery methods: Standard and Express, where the latter is faster, the disparity in shipping prices decreases (increases) with the time of the faster (slower) option. Moreover, a divergence of times results in a divergence of prices, and vice versa (Yao and Zhang, 2012). At the same time, shoppers are more (less) price-responsive and less (more) time-sensitive when it comes to the Standard (Express) shipping approach (Kim et al., 2017). From another perspective, when costs related to supplier-buyer distance and time increase, the demand tends to decrease, so sellers should try to diminish that distance in terms of time to gain international online customers. As a result, Express method has a favourable effect on the buyback rate (Kim et al., 2017).

In addition, Overnight delivery service (Hall, 1996), Same-day (Ulmer and Thomas, 2018) or Next-day (Yaman et al., 2012) shipping approaches are among the different alternatives that businesses have been developing as a means to boost customer satisfaction.

With that in mind, a variety of distribution services is more suitable for businesses with a diversified portfolio of products/services. In fact, consumers feel appreciated when they have several alternatives to pick from because, not only are they not forced to select the single available option, but they may also choose the most convenient method for them. In other words, clients believe they have some control over their purchases, which is half the way to enjoying a pleasant shopping experience overall. Nevertheless, with the implementation of new services, buyers may remain faint-hearted and set higher expectations (Vakulenko et al., 2019).

Another variable which impacts the delivery experience and prospects is the carriers. In this line of thought, the customer's possibility of selecting the carrier has a positive influence on both satisfaction and repurchase intentions. Yet, clients tend to opt for the most well-known one (Esper et al., 2003). Notwithstanding, and according to Hummels et al. (2009), in the presence of expensive products, greater taxes, lower import demand elasticities, and limited competition, ocean cargo couriers tend to charge higher delivery fees. Moreover, this study has demonstrated that such traits are the main causes of shipping price variations insofar as removing market power would enhance trade volumes by 5.9% in the USA, for example.

There are significant differences when comparing a free transportation policy, where the delivery cost is included in the main price, and a price-partitioned strategy, where shipping and handling charges are separated from the product/service prices. First, not charging delivery expenses attracts more consumers, but it reduces revenues. In contrast, having prices split into two decreases the demand. On the one hand, popular retailers, with many sceptic clients regarding shipping charges and/or with a high-risk atmosphere, should implement the free delivery approach (Gümüſ et al., 2013). On the other hand, the price-partitioned policy should be used when shoppers are not concerned about assessing prices (Frischmann et al., 2012).

According to Shao (2017), a free shipping strategy is best suited to smaller retailers. Furthermore, this strategy is most likely associated with higher base prices (Yao and Zhang, 2012), and e-tailers can opt for a threshold free delivery approach (Huang et al., 2019). From the consumers'

perspective, this method seems, most of the time, the best choice because it is risk-free. As a matter of fact, “humans are intrinsically afraid of losses” in such a way that the gap between 1 and 2 dollars is recognised as almost nil, while paying 1 dollar instead of having free charges is viewed as a considerable difference (Frischmann et al., 2012; Shampanier et al., 2007).

In short, the key may be to offer a combination of delivery alternatives, including free shipping, so that distinct groups of buyers are reached (Nguyen et al., 2019). Besides, operational expenses, demand, and customer base growth should be the main determinants of an appropriate distribution fee structure (Lewis, 2006).

2.7 Online Basket Abandonment

It is relevant to underline that it is not enough to attract people to the websites or even attract them to the shopping cart or checkout. Online cart abandonment is a common phenomenon. E-sellers may attempt to implement strategies insofar as website visitors are effectively converted to shoppers, while bearing in mind the major causes that contribute to the aforementioned phenomenon. As stated by Kukar-Kinney and Close (2010), organisational tool, source of amusement and prices are the main reasons that lead customers to abandon virtual baskets. First, shopping carts can be used as a wishlist to store favourite goods or to save items to purchase later. Second, from an entertainment perspective, the purchase rate tends to decrease due to an increase in the abandoned-basket effect, nonetheless, a positive word-of-mouth may be fostered. Third, the cost of an order as well as the expectation of a decline in prices could hinder actual purchases. In such context, a fixed delivery price has better outcomes than a variable shipping price because shoppers are continuously aware of the fees. Finally, the financial factor is the main culprit of cart abandonment (Egeln and Joseph, 2012; Song, 2019; Yao and Zhang, 2012).

The conversion rate corresponds to the percentage of visitors who actually shop on the platform. To enhance this rate, e-retailers should focus on either promotions or service quality. Within the luxury industry, a free shipping approach positively impacts the conversion ratio (Fatta et al., 2018), in other words, it contributes to a reduction in virtual cart abandonment (Frischmann et al., 2012).

Virtual suppliers can benefit from abandoned baskets so that, with a list of customer preferences, retailers can develop strategies to deliver recommendations for alternative or complementary items (Kukar-Kinney and Close, 2010).

From another perspective, Gudigantala et al. (2016) stated that both purchase intention and satisfaction are powerful variables to predict customer actions, more precisely whether or not a visitor will leave the platform without shopping. Besides, high levels of satisfaction are associated with better buying intent scores.

In such context, and considering customer acquisition and retention, the most effective shipping strategy to avoid online basket abandonment is to provide free delivery. Still, order volume incentives primarily affects client acquisition, whilst buyer retention is more responsive to the

shipping charges (Lewis, 2006). Moreover, the transportation prices have a greater negative influence on customers' intentions to shop via the internet for inexpensive products or services (Bansal and Muzatko, 2021).

2.8 Decoy Effect

The decoy effect, also known as the attraction effect or asymmetric dominance effect (Huber and Puto, 1983), is an effective psychological practice which impacts on customers' choice. When clients have at their disposal three purchase options – target, competitor, and decoy – their preferences shift in such a way that it becomes acceptable to buy an overpriced product or service. Thus, attraction effect is entirely irrational once human decisions are biased whenever a third option appears. In fact, with only two alternatives (e.g., items A and B) it is clear for the customer its preference (item A). Still, the introduction of item C suddenly makes item B a better choice. In theory, this phenomenon does not make sense because A should always be superior to B. In reality, it follows that customers' desires are relative and always depend on the quantity and type of options available (Sherlin et al., 2020).

The cinema was one of the businesses that employed the asymmetric dominance effect with respect to popcorn sales. Before, customers had to opt between a small popcorn box (e.g., of 3 dollars) and a large popcorn box (e.g., of 7 dollars). Naturally, the small alternative was the most chosen, since the big one seemed too expensive. Nevertheless, the appearance of a medium popcorn box (e.g., of 6.5 dollars) changed sales distribution considering the existence of three possibilities, as the large option became the client's preference. Since the price difference between the large and the medium boxes is only 0.5 dollars, consumers believe they are making an amazing deal (Roks, 2015). From the buyer's perspective, they can purchase a larger amount of popcorn for almost the same price. But at the same time, sellers are able to optimise their revenue with the majority of purchases being placed on the most expensive product.

Research and experiments were conducted over the years to validate the fact that the decoy effect is real, and it has a substantial impact on demand (Ariely and Wallsten, 1995; Kaptein et al., 2016; Bateman et al., 2005). However, slight shifts in decoy position have a huge influence on the intensity of the effect (Kaptein et al., 2016). To be more precise, and regarding options distinction, not only graphic and perceptual representations but also the use of valued qualitative-verbal descriptions can diminish attraction effect or even cancel it (Yang and Lynn, 2014; Frederick et al., 2014). In short, boundary conditions exist (Frederick et al., 2014).

Last but not least, it is possible to infer a relationship between the asymmetric dominance effect and the adoption of new delivery options along with a price increase, which corroborates the expectation of witnessing positive changes.

Chapter 3

Current Situation

This chapter aims to expose the key processes and strategies of the organisation to better understand the current status and the challenges in place. Therefore, it starts by revealing the several steps towards order fulfilment in order to comprehend how the delivery service fits into the picture. Afterwards, a detailed description and analysis of the current shipping options and related prices is given. To be more precise, it is highlighted how those fees are determined at Farfetch insofar as different factors that have to be considered to achieve the final values are discriminated against. Additionally, for the further impact analysis, the company's key performance indicators, Farfetch customers, and the peak sales seasons are addressed. In conclusion, the challenge at stake is fully described.

3.1 Order Processing at Farfetch

Farfetch is constantly concerned with the displayed products on its platform, both in terms of source and price. As a result, order allocation criteria have been defined in such a way that there is a continuous analysis of partners' performance and also an attempt to minimise the distance between a boutique and a customer, thereby reducing the overall price.

This company comprises a well-structured and automated order processing system to address the business model's inherent complexity. Before any processing can occur, a customer must place an order through the website by specifying the items to purchase, the desired shipping option, and the payment method. Following a successful checkout, a portal order (PO) is created, frequently known as a customer order. Since a PO includes all the items presented in the shopping bag at the time of checkout, it can incorporate products from different merchants. Therefore, another type of order emerges – boutique orders (BO) – which only encompasses products shipped from the same stock point (boutique) within a particular client's basket (Figure 3.1). As a result, a portal order is composed of one or more boutique orders due to Farfetch's multi-partner trait. In addition, each BO is divided into several product orders, each representing a single item. In a shipping price-focused context, PO represents the most appropriate level for investigation.

The six steps of order processing are illustrated in Figure 3.2.

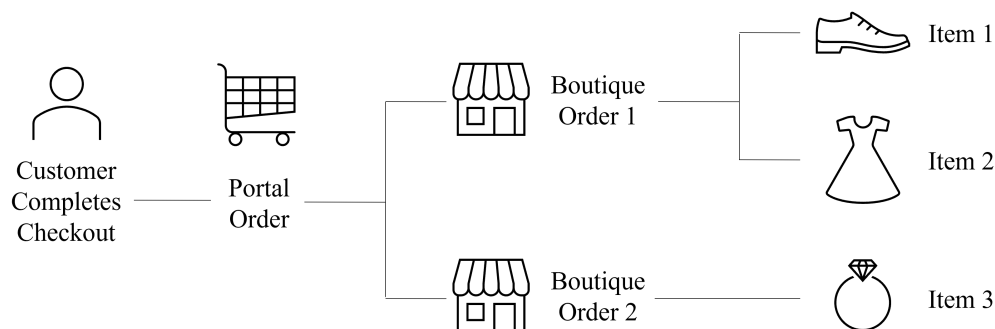


Figure 3.1: Order granularity levels

The first stage relies on stock validation made by the boutique. Essentially, the partner is responsible for confirming whether the products requested online by the customer are physically available to sell. Such verification is imperative because brick-and-mortar store sales and online sales can occur at the same time and there is no real-time synchronisation in what concerns fulfilment capability. Plus, it can be due to registration failures in the physical stores. In case of product unavailability, it is necessary to check for equivalent items and/or alternative boutiques. Thereafter, supposing there is no stock anyhow or the shopper rejected the exchange, the order must be cancelled, and the customer refunded. On the other hand, if the partner confirms availability or if the item swap procedure is successful, the order moves on to the next stage.

In the second step, Farfetch's fraud team, along with a third-party service provider, examine the payment's credibility to prevent fraudulent purchases. In light of these facts, an order can be automatically accepted or cancelled if the legitimacy or high suspiciousness of the client is known in advance, respectively, thanks to historical transactions (black and white lists of customers). However, in case of uncertainty, a manual revision is made in pursuit of inconsistencies, and only then is the purchase approved or refused. It is worth noting that the fraud check occurs simultaneously with step 1.

Afterwards, boutiques steer the product packaging procedure – the third stage –, using boxes provided by Farfetch. Even though this company has recommendations regarding the most appropriate package for distinct groups of items, partners retain total control over the box selection process in terms of size and shape. Also, merchants have the freedom to personalise the order, enhancing the customer experience.

The fourth step is entirely managed by Farfetch and covers the creation of Air-Way Bills (AWB), which are documents (with details of the carrier and the buyer) attached to the packages for tracking purposes. Normally, the shipping label is generated automatically. Nevertheless, some events can cause manual intervention, such as non-integration of data from certain carriers into Farfetch's systems or even mistakes made when filling in delivery-related information. Meanwhile, consumer requests or legal limitations might pause an order at this point.

Following the successful conclusion of the two preceding phases, the parcel is ready for delivery by a carrier, which represents the fifth stage. There are two sorts of handing packages to

the courier: daily pick-ups, which are usually associated with high order volumes, and requested pick-ups, which the partners must schedule with the carrier. At this step, the shipping agent scans the AWB, and the buyer receives an e-mail to track his/her purchase.

Finally, when an order reaches the sixth step, it is said to be in transit towards the final destination – the customer. Farfetch has worldwide partnerships with an assortment of carriers, and clients are expected to receive their parcels in good condition. Yet, packages sometimes disappear or get stuck at customs, making it necessary to proceed with a Return to Origin (RTO) process. Therefore, the delivery team monitors orders to ensure that everything goes as planned. The Section 3.2 goes into more detail on the company shipping process.

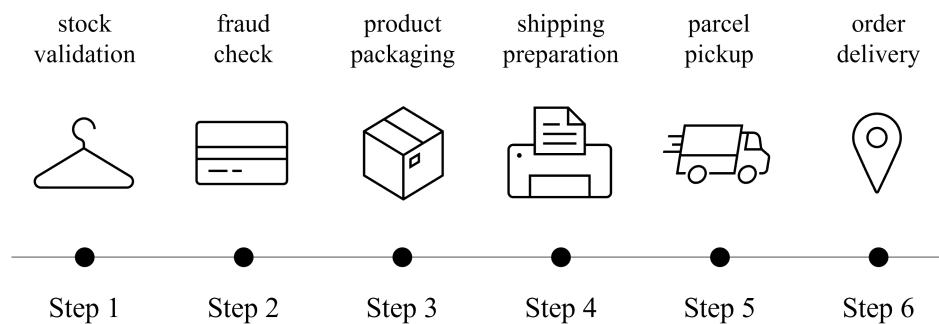


Figure 3.2: Order processing stages

3.2 Delivery Service at Farfetch

In an ever-growing environment, Farfetch communicates with several carriers to fulfil a variety of needs all over the world and to guarantee a streamlined parcel delivery. Currently, orders can be delivered by DHL, UPS, FedEx, TNT, or DPD. The courier for each purchase, as well as the transportation route, will be determined by the destination country, the origin country, and the shipping method chosen by the client.

According to what was delineated above, it became important to classify thousands of different routes into three major order categories. Firstly, when both the boutique and the customer belong to the same country, the parcel does not cross any borders, and the routes are classified as domestic. Whereas intra-EU orders occur whenever the nations involved are European Union (EU) members. The remaining type relates to international routes and encompasses purchases that do not belong to the previous categories. In other words, it concerns packages that cross countries' borders to arrive at the customer's address, except if both countries are within the EU. Concerning the order granularity levels, a PO can be mixed (for example, it can be domestic and international at the same time), while a BO has only one type.

In the same way as there are different order categories, multiple delivery methods exist as well, and the extent of available options will always be determined by the route (origin and target countries). In a broader sense, customers receive their purchases through Click & Collect or

Direct Delivery. The first one allows the consumer to collect his parcel at a physical store chosen by himself/herself. Such an approach is suitable when clients are unable to wait for the courier at home, and boutiques have the chance to communicate and nurture relationships with their Farfetch clientele. Yet it is unappropriated for isolated areas. On the other hand, Direct Delivery is the most common alternative, and the package is sent to the buyer's address instead of going to a public pick-point. Depending on the origin and destination, customers may have different home shipping services at their disposal, namely: Standard, Express, Same-day, and 90-Minutes Deliveries. The methods' diversity and the delivery cost and time always depend on the available carriers.

Regarding the conventional shipping services, Express is the default method insofar as it is accessible for all routes, and the delivery time is within 3 to 4 days, on average. In contrast, Standard service is slower and only a few countries are eligible for it. Plus, the transportation time is around 5 to 6 days. These estimates may vary, but Express will always be the fastest.

On top of that, to boost the assortment of delivery options and to augment customer experience and satisfaction, premium shipping services were implemented, which are exclusive in terms of time. More precisely, the 90-Minutes method offers the fastest delivery time, and as the name suggests, the parcel is delivered to the customer within 90 minutes after the order is placed. The Same-day service carries purchases on the same day, and the order must be placed by 11 am, otherwise the shopper will only receive it the following day.

In addition, both Standard and Express services embrace the majority of the volume, and the current project will focus on these two types of deliveries.

3.3 Shipping Income Structure

In any e-commerce business, virtual shopping of tangible goods implies store-to-door transportation, which, in most circumstances, entails additional charges for the business. Those fees are then partially passed on to the buyer. With that in mind, to establish an accurate delivery system, it is crucial not only to provide multiple options but also to make a thoughtful and well-reasoned judgement on the pricing to charge customers in terms of shipping (Shipping Income).

As a result of the multi-country environment, transactions comprise a variety of currencies, and the Shipping Income appears to the customer in the local one. However, the present dissertation will report values in the United States dollar currency not only for ease of understanding but also because Farfetch always analyses its profitability in dollars. Thus, setting delivery prices in that currency enables the revenue's immediate impact to be recognised. As a consequence, the fees that appear on the platform are constantly computed considering the defined values and the conversion rate to a specific currency at the moment.

In the company under scrutiny, it is relevant to underline that Shipping Income and Shipping Cost may diverge. Naturally, Shipping Cost reports the actual expenses of the parcel shipment process. Overall, Shipping Income tends to be lower than Shipping Cost and Farfetch does not envision exchanging this relation because the precedence relies on the optimisation of the customer experience.

The client is aware of delivery prices both in the Shopping Basket and the Checkout pages, where the latter presents three phases: Delivery, Payment, and Review. At an early stage, the Shipping Income presented is an estimation, in particular, it corresponds to the fee of the cheapest service available. The final value is only displayed on the Review page (Figure 3.3) where the selection of the desired shipping alternative occurs.

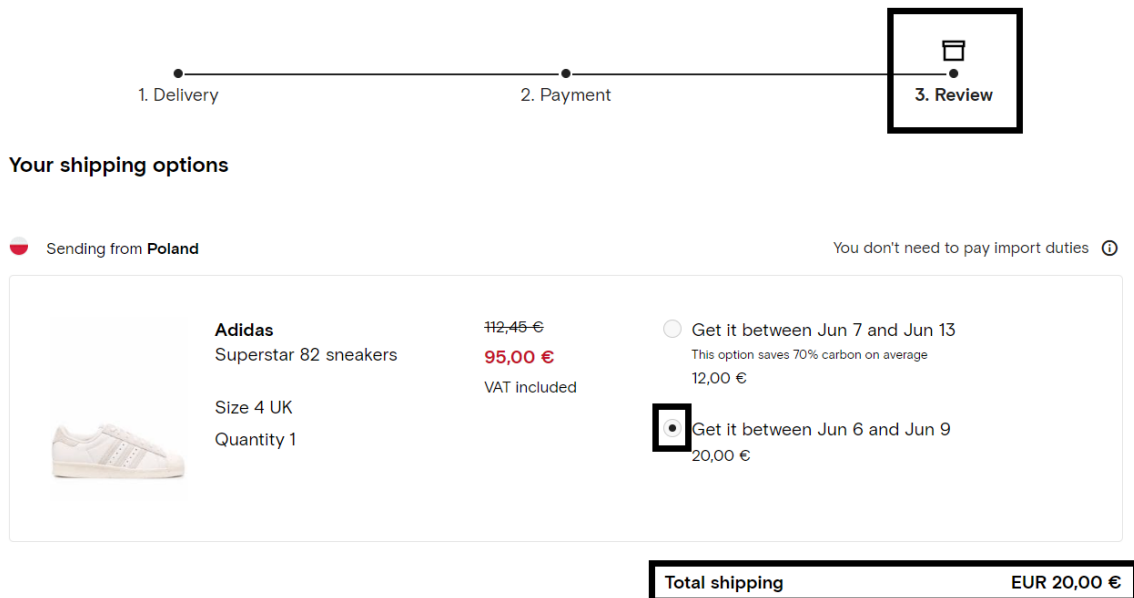


Figure 3.3: Layout of the Review page within Checkout

Bearing in mind the multi-partner attribute of portal orders, the quantity of boutique orders within a PO represents the number of deliveries needed to completely satisfy the buyer's request. Nevertheless, the company charges a fixed shipping fee per PO regardless of the multiple related routes. In other words, the transportation costs are not accrued and instead the consumer merely pays the most expensive delivery path.

Naturally, the Shipping Income will be contingent on the chosen method, along with the boutiques' location and customers' address. Aside from that, Farfetch has structured a set of rules involving the definition of thresholds that are country-specific and constant, so that delivery prices are one of two possible values, for a given shipping service and route. When the entire basket value surpasses the defined threshold (for the client region), the company offers a lower rate, and vice versa. Yet, sometimes the values may be the same, whether the order value is above or below the threshold. Summing up, each combination of the variables: shipping service, order value type, and route has a defined fee. For instance, on a domestic route to Portugal for the Express service, if the total order value is greater than 140€ (Portugal's threshold), the shopper must pay 15€ for transport, otherwise 23€ is the price.

E-shoppers can also access a free shipping (FS) policy in three cases. First, when the order value is above a given threshold (only available for some countries, such as Hong Kong and China). Second, the occurrence of free transport promotional campaigns for a limited period of time on a global scale, or on a country, client, or platform level, among others. These initiatives are

excellent at increasing revenue during off-peak periods and enhancing customer engagement. Last but not least, the perk of not paying for delivery differs depending on the privilege access a buyer has at a certain moment. Within the customer tier, a consumer can be classified as Bronze, Silver, Gold, Platinum, or Private Client (PC) (in Section 3.6, each of these groups is fully profiled). The latter mentioned tier has unlimited free global shipping for all orders and for all shipping services. Platinum clients have the same benefit, but is only valid on the lowest price delivery option available and when the basket value is above the country's threshold. Silver and Gold members are entitled to unpaid shipping in the same condition as the preceding tier, however they only have it on two or four orders per year, respectively. In addition, this number of orders does not accumulate for future years. Supposing Standard and Express services are the only accessible options, free shipping is usually offered on the first one, and the second is showcased as an upgrade. As a result, the parcel transport will be paid for. Still, it is interesting to note that, in Hong Kong and USA, purchases must not be subject to price discounts for customers to have FS.

Figure 3.4 summarises the structure under the definition of the price charged to customers around order transportation.

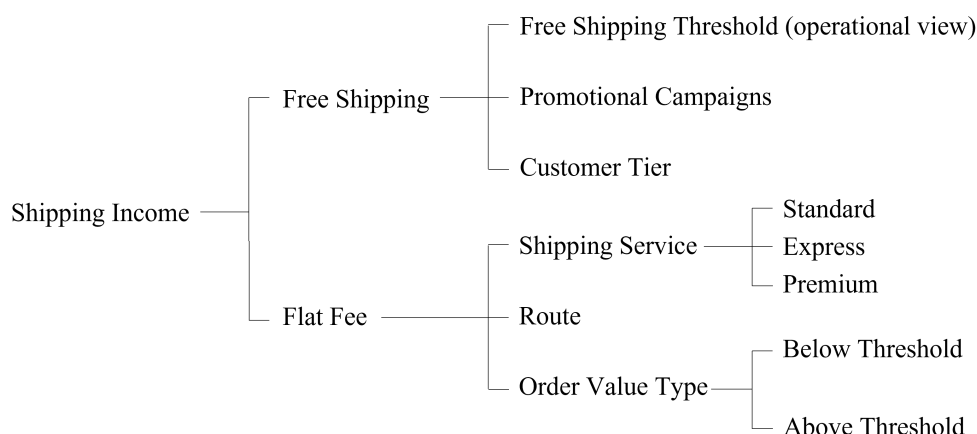


Figure 3.4: Shipping Income structure

3.4 Statistical Analysis of the Current Delivery Prices

The statistical analysis presented in Figure 3.5 gives a better understanding of the current relationship between delivery prices, shipping services, and order categories. Regarding international routes, of the 202 destination countries, 38% offer both Express and Standard services, and the remaining territories have just one shipping service, the fastest one. The premium alternatives (Same-day and 90-Minutes) are available for domestic orders only, and their charges are order value type-independent. Naturally, Shipping Income is lower, on average, in the domestic category when compared with international routes, whereas intra-EU orders resemble domestic ones in terms of delivery fees. Overall, shipping prices range from 5 to 40 dollars. Both premium options report similar behaviour, so that the Shipping Income varies between 10 and 20 dollars.

Considering the conventional services, minimum values are 5 dollars when it comes to the domestic category. However, these prices will depend on the shipping service as well as on the order value type for international routes.

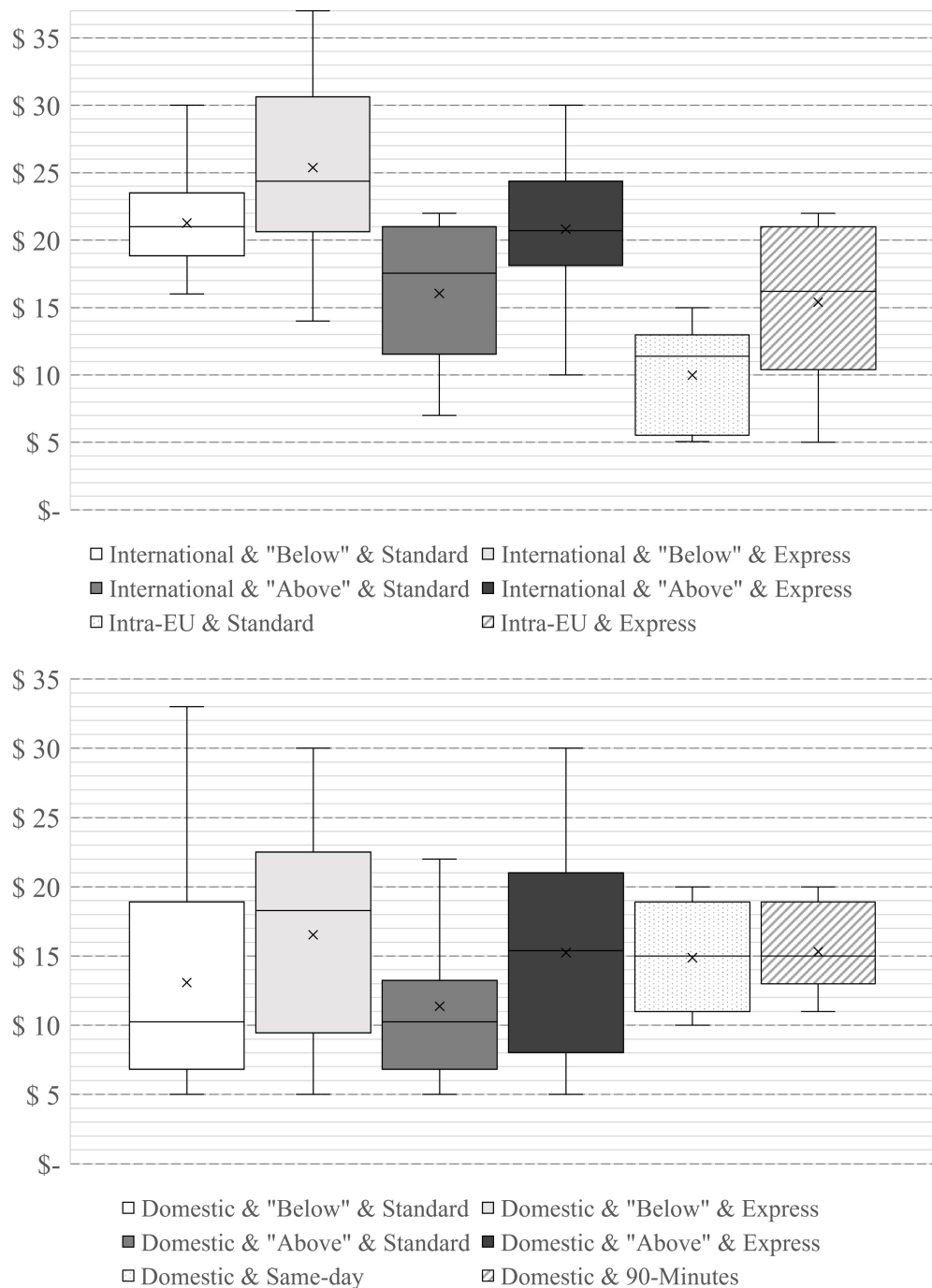


Figure 3.5: Current Shipping Income for international, intra-EU, and domestic routes

Moreover, there is more delivery price heterogeneity within the same option when orders are domestic rather than international (considering just the conventional services). On that account,

the domestic category has the highest variety, while the international category has the lowest, with respect to Standard and below-threshold purchases. Finally, the Express service reports essentially the same behaviour on domestic routes regardless of the order value type, in contrast to international ones. Nevertheless, the Standard service has distinct behaviour for each order value type in both domestic and international orders.

3.5 Key Performance Indicators

Although Farfetch is the leader of the online luxury fashion industry, it is vital to keep in mind a continuous pursuit for improvement points, which is only achievable through performance indicators (KPIs) of various natures. For instance, the Net Promoter Score (NPS) is a customer-oriented metric that evaluates client satisfaction and brand loyalty by asking shoppers the likelihood of recommending Farfetch to their friends and family after order placement.

This company also looks upon a range of profitability measures. The Gross Transaction Value, also known as GTV, is the first and crudest indicator which reflects the value of all orders placed on the website, including the retail price and the Shipping Income. Alongside this metric arises the Average Order Value (AOV), presented in Equation 3.1, which is the average amount a customer spends on a portal order over a specific period. Essentially, by increasing AOV, the firm is receiving higher level POs. Notwithstanding, purchase cancellation is a common event due to the lack of stock in the boutiques, payment refused, or other reasons (e.g., order cancelled by the client). Following the stock-out, Farfetch searches for the same item in other merchants, and if successful, boutiques are exchanged in order to fulfil a purchase. In such context, the value of GTV, once subtracted by the total amount of rescinded orders and added by the value of items swapped, gives the Actual Transaction Value (ATV), also referred to as the GTV Delivered, since it embodies the amount of all orders that were sent to the shopper. Another factor at stake is the sales returns. By eliminating them from the ATV, the Net Transaction Value (NTV) is achieved. This measure analyses the total price of orders sent and never returned or cancelled. On the other hand, the Gross Merchandise Value (GMV) is similar to NTV but excludes the sales taxes charged to the consumers. Finally, the Net Sales statistic is computed by deducting the duties and shipping prices from the purchases that were not cancelled or returned, as well as any tax paid and any promo codes employed by the client. Figure 3.6 shows the relationship between the various metrics that have been described.

From another perspective, the Return Rate states the proportion of returned products when compared to the total quantity of transacted goods. This indicator is useful for the assessment of discrepancies in customer groups and countries, and for understanding the effect of brand-new initiatives. When it comes to old customers, the company appeals to the Retention Rate in order to acknowledge the client's willingness to re-purchase in the marketplace, and it can also be a way to evaluate contentment. The Conversion Rate (CR), or the percentage of visitors who have successfully placed an order, is calculated as the ratio between the number of POs and the number of visits. Undeniably, this is a powerful metric because, even though it is influenced by

both external and internal factors, its analysis reveals the impact on a visitor's final decision of validating an order. The Review Conversion Rate (RCR) corresponds to the percentage of people who visited the Review page within the Checkout area and actually purchased something. Given the scope of the present project, this KPI appears to be the most suitable indicator for analysing the influence of delivery price changes on customer satisfaction and experience, since the client visualises the final shipping fee on this page, that means, just before confirming an order.

$$AOV = \frac{GTV}{\text{number of POs}} \quad (3.1)$$

GTV
- Cancellations (No Stock, Payment Refused, Other Cancellations)
+ Item Swap
ATV or GTV Delivered
- Returns
NTV
- Sales Tax (VAT, USA Interstate Taxes)
GMV
- Brazillian Commission, Duties Income, Shipping Income with VAT, Extra Margin
Net Sales

Figure 3.6: Profitability measurement

3.6 Farfetch Customers

Without customers, Farfetch or any other e-retail company would not be able to achieve success and growth throughout the years. Thereupon, clients' prioritisation and the ongoing goal of exceeding expectations grant exceptional online experiences. Before delving into further detail about the various benefits that the platform provides to its users, it is worth noting distinct and valuable statistics that typify the shoppers of this marketplace, namely:

- There are more than 3 million active customers;
- The average age of a client is 35 years old;
- 72% of consumers are Millennial or Generation Z;
- The female gender represents 60% of the buyers;
- 24% of customers possess several residences, and 10% own a house in a foreign country;
- 64% of clients often compare luxury fashion prices via the internet.

(April 2022 data)

At Farfetch, a person can make purchases as a guest without the obligation to register, but, on the other hand, this hinders the entrance to the Loyalty programme - Access -, which guarantees many advantages. Once a visitor creates an account and places an order for the first time, he/she automatically joins the programme. The starting tier of a new client is determined by the amount paid, and every year the Access renews insofar as the rewards will be extended for another year if the spend criterion for a group is fulfilled during that period; the consumer will be promoted to the next tier if the expenditure threshold is reached; yet, if the spend criterion is not met, the customer will be demoted a tier. As a matter of fact, the Access will always enhance the virtual shopping experience, and every time shoppers make a purchase, they are one step closer to upgrading their privileges (Farfetch, 2022c).

Figure 3.7 depicts the distribution of consumers into the customer tiers, as well as the proportion of GTV and the average annual expenditure. First, Bronze members represent the majority of customers, even though they are the least frequent shoppers, with less than 1 order per year, on average, and they have the lowest AOV. This is because they are the youngest buyers. In this line of thought, the Silver tier is the second youngest group, and they place more than double the orders of Bronze clients. Moreover, Gold consumers buy more often than the previous ones, and, at this level, shoppers have higher engagement with Access benefits. The next group is composed of highly demanding customers who love their rewards but expect more premium treatment. Referred to as the Platinum members, they place slightly more than 12 orders per year, on average, and they are a balanced age group. Finally, a Private Client is the most valuable and loyal customer since they are the biggest shoppers of the most premium brands. Indeed, this is the ultimate group that presents the highest spending and engagement. A little older than Platinum, PCs represent less than 1% of Farfetch's clients, but they are the second tier that contributes most to the company's revenue. These members also have access to personal stylists and the Fashion Concierge programme (Farfetch, 2022c).

12 Month Net Spend USD		% Customers	% GTV
+\$12,000	PC	0.8%	19.9%
\$6,000 - \$11,999	Platinum	1.4%	10.4%
\$2,400 - \$5,999	Gold	5.6%	18.5%
\$1,200 - \$2,399	Silver	10.5%	16.6%
\$1 - \$1,200	Bronze	81.7%	34.6%

Figure 3.7: Access tiers

3.7 Sales and Promotions

Promotional events' occurrence or non-occurrence is one of the primary conditions that influence demand and other business-related KPIs because, in the presence of lower prices, customers alter their behaviour. In this company, there are two-peak sales seasons throughout the year - in the months of May and November - where Farfetch offers discounts on the product prices. Also, the firm can apply occasional and specific promotions to stimulate purchases in off-peak periods. Sales discounts and promo codes are the two options shoppers have so that their orders suffer a markdown. Lastly, the combination of promotions and selling season contributes to the retention of old customers and the attraction of new ones.

3.8 The Challenge

As already expressed in Section 1.2, in the midst of the proliferation of the luxury internet-based industry emerges the necessity to expand delivery flexibility, to propose value-added services, and to diminish Shipping Costs' effects. At Farfetch, single-service routes are not optimised from both the buyer and seller perspectives. As a result, the company's priority is to standardise its delivery service by introducing a new method (Standard) in paths that only present a single option (Express) to distribute orders.

Concerning the unpaid delivery programme, the firm has created a promotion tool to automatically provide free options within specific conditions, so that with only one method available (Standard or Express), the client is entitled to free shipping with that option, but when both Standard and Express services are available, the shopper is entitled to unpaid delivery only with the Standard alternative. Hence, Farfetch's aim also includes providing customers with the possibility of upgrading their purchases in the event of free shipping offers, so that this policy can be made as profitable as possible. As a consequence, in the event of two services, only Private Clients are eligible for free shipping in the Express option.

The ensuing dilemma concerns the redefinition of delivery prices once the shipping services presented to consumers have doubled. There are two alternative strategies the company could opt for. On the one hand, Express charges should remain the same and the fee for Standard should be lowered because increasing prices could reduce the Review Conversion Rate. On the other hand, the company should take the opportunity to raise prices on average considering a set of constraints.

In fact, the first alternative is not feasible since it always involves a reduction in the shipping revenue per PO. Considering the following data as an example, the company obtains 10 dollars per purchase from transporting orders on a route that only has Express service. If it implements Standard delivery at 5 dollars per portal order, customers will always be distributed between the two options, which implies less revenue per order taken from this route. Thus, in the case of 50% of clients choosing the Express method, Farfetch only receives 7.5 dollars per PO. As a consequence, there is less income to cover delivery expenses.

Therefore, the second alternative is preferable. The firm must at least maintain the weighted average of the per-order delivery revenue, taking into account the expected distribution of orders among the existing shipping options. In addition, the decoy effect, described in Section 2.8, underpins this strategy. Finally, with this approach, there is a valorisation of the FS policy by the customer. To be more precise, in the presence of greater price differences, clients give more importance to the unpaid delivery once they perceive it as a great deal and, consequently, the FS programme becomes a more powerful tool which can help augment the Review Conversion Rate (Ma, 2017).

As a matter of fact, both international trajectories, with the USA and UK as the destination countries, have already broadened their delivery services and there were positive impacts. Tables 3.1 and 3.2 illustrate the Shipping Income structure before and after the implementation of the overall strategy in a broad sense.

In a nutshell, the optimisation of the weighted average of the Shipping Income per portal order is the goal, bearing in mind the Standard service addition. Therefore, the present dissertation focuses on the deployment of this approach in the most critical markets considered by the company, which encompasses international orders made on the Farfetch platform and whose destinations are Hong Kong, Australia, and Japan. These countries were selected not only due to the absence of Standard service but also because an opportunity has arisen to implement this method with the carriers of those nations.

Table 3.1: AS-IS structure of the Shipping Income

Order Value Type	Shipping Service	Shipping Income / PO (e.g.)
Below Threshold	Express	\$ 30
Above Threshold	Express	\$ 20
Below Threshold	FS offer (Express)	\$ 0
Above Threshold	FS offer (Express)	\$ 0

Table 3.2: TO-BE structure of the Shipping Income

Order Value Type	Shipping Service	Shipping Income / PO (e.g.)
Below Threshold	Standard	\$ 30
Below Threshold	Express	\$ 37
Above Threshold	Standard	\$ 20
Above Threshold	Express	\$ 27
Below Threshold	FS offer (Standard + Express)	\$ 0
Below Threshold	Upgrade from FS (Express)	\$ 37
Above Threshold	FS offer (Standard + Express)	\$ 0
Above Threshold	Upgrade from FS (Express)	\$ 27

Chapter 4

Delivery-Pricing Model

The purpose of the present chapter is to describe the method behind the new delivery-pricing strategy for Hong Kong, Australia, and Japan in order to implement a second shipping service while optimising the related prices. First and foremost, it details the methodology of the whole process, which consists of three steps: decision on the existence of a threshold, optimal prices' discovery, and subsequent validation. However, the focus of this chapter will be only on the first two stages. In such context, the Integer Programming Model developed to reach the optimal solution is meticulously described, including the approach used to handle the Shipping Income elasticity of demand, the parameters, the decision variables, the objective function, and the outlined constraints.

4.1 Methodology

Poorly made price changes have adverse effects on the company since those fees directly influence the decision-making of a client. With that in mind, it is mandatory to shape a well-structured methodology to guarantee the best outcomes in terms of price and performance. The first step relies on the decision about the existence of a threshold for each country, in other words, if the delivery cost for the customer will fluctuate depending on the order's value. The rationale applied is simple. In the case of a threshold already established for a certain territory, there are no changes. In contrast, a threshold may or may not be defined for a country that lacks one, depending on the existing scenario and on the distribution of orders in each AOV interval. To be more precise, it is unnecessary to implement two alternative prices when most of the sales are concentrated on lower AOV intervals. Since Hong Kong, Japan, and Australia already had thresholds in place, nothing changed. The second stage addresses the discovery of the best-case scenario for each combination of order value type and shipping service, regarding delivery fees. To do so, an Integer Programming Model was built. Finally, the third step covers a three-factor approval of the new Shipping Income. In particular, competition, the gain or loss of per-order delivery revenue, and the Review Conversion Rate variation validate or disprove the new strategy.

4.2 Integer Programming Model

An Integer Programming Model was built to discover the most suitable pricing values for each country, order value type, and shipping service that comply with a set of restrictions while maximising the order transportation revenue. When it comes to the development of such a model to solve the optimisation problem under scrutiny, the *OpenSolver* tool of Microsoft Excel was employed, which is an open-source linear, integer, and non-linear optimiser. In fact, this engine has no artificial limits on the number of variables and constraints, and it provides a variety of solvers, with the *COIN Branch and Cut Solver* being particularly useful for big mixed-integer problems and, in turn, for the present project. The developed model is country-specific insofar as parameters must be replaced each time the strategy is to be deployed for a new geography.

4.2.1 Handling Shipping-Income Elasticity of Demand

With the implementation of a new transport service, the distribution of orders among the eight options from Table 3.2 is subject to adjustments, and it is shipping fee-dependent. Thus, the Shipping Income elasticity of demand was considered as follows:

First, it is assumed that the overall percentage of POs for each order value type (above or below threshold) is constant. There is no reason to believe that item-level demand will significantly fluctuate with delivery price variations (within the limits defined in the constraints pointed out later). In other words, customers will not remarkably modify their preferences in terms of what products to purchase to have a better shipping price option, mainly because visitors only observe on the Review page the Standard and Express prices associated with the basket's value at stake. So, to compare fees between different order value types, consumers must change the selected goods.

With respect to the FS policy, as denoted in Section 3.3, the client has access to this perk by means of customer tiers, campaigns, or in the presence of free shipping thresholds, which are Shipping Income-independent. As a consequence, consumers with unpaid delivery offers will continue to have them, and the proportion of POs in free delivery and upgrading will remain the same.

In short, shipping fee changes do not lead to significant modifications in the distribution of buyers among the three main categories stated: above-threshold orders, below-threshold orders, and purchases with the option of free shipping. The questionable divisions are at the shipping service level, so that demand is primarily shaped by Standard and Express prices. In addition, within the latter category declared, it is inferred that clients' behaviour between unpaid delivery and upgraded orders is similar to the division between Standard and Express methods since upgrading purchases always concern the Express service, and free shipping is mostly on the Standard option. In this line of thought, it is important to understand how customers will be distributed within each of the aforementioned groups.

Rather than obtaining a price elasticity model, it was assumed that, on average, 80% of consumers choose the Standard service, while 20% opt for the Express one. These estimates were

determined from historical-data analysis, since Farfetch has already implemented this price typology in different regions. The main assumption relies on considering the predicted behaviour in the countries at stake as the previous behaviour, in other countries, independent of the price in place. With the aim of making this hypothesis suitable and reasonable, some constraints will restrict price variations, which are fundamental to minimise possible discrepancies in the 80/20 percentages.

The pricing strategy determined by this model is simply the first step towards the ultimate structuring of the Shipping Income in Hong Kong, Australia, and Japan. After implementation, and in the event of a considerable change in customer behaviour compared to the expected historical behaviour, the next step of the project concerns delivery price readjustments, taking into account the observed order distribution.

4.2.2 Parameters and Decision Variables

The starting point encompasses, for a given country, entry data related to the current Shipping Income charged to buyers on each alternative and the respective percentage of portal orders. These statistics comprise purchases from June 2021 to April 2022 in order to secure a representative and up-to-date sample. Table 4.1 illustrates the AS-IS situation, as well as the parameters' categorisation.

Table 4.1: Parameters for the AS-IS scenario

Order Value Type	Shipping Service	Parameter SI / PO	Parameter %POs
Below	Express	a_1	b_1
Above	Express	a_2	b_2
Below	FS	a_3	b_3
Above	FS	a_4	b_4

With respect to the TO-BE framework, the distribution of orders is also an input insomuch as it is computed by both AS-IS percentages and the division of customers among the Standard and Express services, as explained in Section 4.2.1. Besides, the model requires records concerning minimums and maximums, which are pointed out later in Section 4.2.4.3. The decision variables of the model are the new unitary delivery charges X_i of each possibility i . In such context, Table 4.2 shows the labelling of the TO-BE elements used.

The complexity of some constraints demands the creation of auxiliary decision variables (Y_i and $Z_{c,k}$) in an effort to preserve the model's linearity. To be more specific, whenever a condition includes the logical operator OR, these variables appear as binary and have one restriction coupled with each one that adjusts depending on the nature of the condition. Table 4.3 summarises the types of constraint to use for each case. It is important to appreciate that, as long as those restrictions are valid, the auxiliary variables can be either 0 or 1. However, they are forced to be 0 when a breach of the constraints happens. For instance, to ensure that expression 1 is equal to or higher than zero or expression 2 is less than zero, two auxiliary variables along with two conditions are required:

one to validate the first expression (line 3 of Table 4.3) and another to verify the second one (line 2 of Table 4.3). Plus, a third restriction is mandatory to guarantee at least one of the expressions is true, insofar as the sum of the two auxiliaries must be equal to or greater than 1.

Notation is synthesised in Appendix A.

Table 4.2: Parameters and decision variables for the TO-BE scenario

Order Value Type	Shipping Service	Decision Variable SI / PO	Parameter %POs	Parameter Minimum	Parameter Maximum
Below	Standard	X_1	$p_1 = 0.8 \cdot b_1$	min_1	max_1
Below	Express	X_2	$p_2 = 0.2 \cdot b_1$	min_2	max_2
Above	Standard	X_3	$p_3 = 0.8 \cdot b_2$	min_3	max_3
Above	Express	X_4	$p_4 = 0.2 \cdot b_2$	min_4	max_4
Below	FS	X_5	$p_5 = 0.8 \cdot b_3$	-	-
Below	Upgrade	X_6	$p_6 = 0.2 \cdot b_3$	-	-
Above	FS	X_7	$p_7 = 0.8 \cdot b_4$	-	-
Above	Upgrade	X_8	$p_8 = 0.2 \cdot b_4$	-	-

Table 4.3: Types of constraint with auxiliary decision variables

Line	Primary Condition	Final Condition
1	$\Delta \leq 0$	$\Delta - (1 - Y) \cdot M \leq 0$
2	$\Delta < 0$	$\Delta - (1 - Y) \cdot M + 1 \leq 0$
3	$\Delta \geq 0$	$\Delta + (1 - Y) \cdot M \geq 0$
4	$\Delta > 0$	$\Delta + (1 - Y) \cdot M - 1 \geq 0$
5	$\Delta = 0$	$\Delta - (1 - Y) \cdot M \leq 0 \wedge \Delta + (1 - Y) \cdot M \geq 0$
6	$ \Delta = D$	$+\Delta - D - (1 - Y) \cdot M \leq 0 \wedge -\Delta - D - (1 - Y) \cdot M \leq 0$

In this model, one can consider that < 0 is equivalent to ≤ -1 because all values are integers, and vice versa.

Y depicts an auxiliary variable.

Δ represents a linear expression.

D constitutes a positive value.

M corresponds to a very high positive value.

4.2.3 Objective Function

Concerning the scheme described in Section 3.8, both the future shipping prices and the foreseen distribution of purchases generate the objective function of the model (overall delivery revenue), which is intended to be maximised by redefining those fees (Equation 4.1). Essentially, for each available option i , this function multiplies the unitary Shipping Income X_i by the percentage of orders established p_i , and then it is all summed up to attain the weighted average of the delivery price per portal order.

$$\text{Maximise } \sum_{i=1}^8 X_i \cdot p_i \quad (4.1)$$

4.2.4 Constraints

4.2.4.1 Fundamental Rule

First and foremost, price variation must entail an increase in the per-order Shipping Income, on average, regardless of any other specification or, at a bare minimum, maintain it. The fundamental rule is to not achieve a case scenario worse than the current situation in the matter of order transportation revenue. Equation 4.2 reports this constraint as far as the new weighted average of the unitary delivery price must be equal to or greater than the current one.

$$\sum_{i=1}^8 X_i \cdot p_i \geq \sum_{j=1}^4 a_j \cdot b_j \quad (4.2)$$

Furthermore, no direct account was taken of Shipping Costs throughout the model's construction, and various reasons are behind this decision. First, the present project focuses on Shipping Income maximisation rather than Shipping Cost minimisation. Also, the company does not aim to cover all of those expenses since it prioritises online customer experience (as previously noted in Section 3.3). On the other hand, Standard expenditure is lower and, consequently, it will imply an overall cost reduction, assuming that customers will always divide themselves between the two services. As such, along with the aforementioned constraint, the offset expenses will remain covered and, indeed, more costs will be neutralised. Therefore, while optimising revenue, more expenses are implicitly reimbursed, which is always value-added to Farfetch.

4.2.4.2 Business Viewpoint Restrictions

Bearing in mind the business features of the electronic retailer, within the same order value type, Standard service must always be cheaper than Express (Equation System 4.3) and, for every shipping service, the delivery price for orders beneath the threshold must be greater than for those beyond it. On top of that, the gap between these last two prices should be considerable to support the existence of a defined threshold, even though a flexible model is desired. Thereby, with twice as many options, the difference can decrease by up to half the AS-IS difference, which is the gap observed between fees of portal orders below and above the threshold in the AS-IS situation (Equation System 4.4).

$$X_1 - X_2 < 0 \quad \wedge \quad X_3 - X_4 < 0 \quad (4.3)$$

$$X_1 - X_3 \geq \frac{a_1 - a_2}{2} \quad \wedge \quad X_2 - X_4 \geq \frac{a_1 - a_2}{2} \quad (4.4)$$

Every time customers choose to enjoy the benefits of the free shipping policy, they are logically exempted from paying for order transportation. Yet, selecting the Express service is perceived as an upgrade when the Standard option is associated with unpaid delivery, so the client pays the same price set for the expedited service, in each order value type (Equation System 4.5).

$$X_5 = X_7 = 0 \quad \wedge \quad X_6 - X_2 = 0 \quad \wedge \quad X_8 - X_4 = 0 \quad (4.5)$$

Another key limitation states that e-customers must have access to at least one price equivalent to or better than the current status, either within the prices of above-threshold orders or within the prices of below-threshold purchases (Equation System 4.6). This approach safeguards client satisfaction because, in the event of displeasure with the new pricing structure, buyers still have one alternative identical to the old configuration.

$$(X_1 - a_1) - (1 - Y_1) \cdot M \leq 0 \quad \wedge \quad (X_3 - a_2) - (1 - Y_2) \cdot M \leq 0 \quad \wedge \quad Y_1 + Y_2 \geq 1 \quad (4.6)$$

4.2.4.3 Minimum and Maximum Values

Before the eyes of a maximisation dilemma, it is essential to establish the highest values that decision variables can assume, as well as the minimum prices (Equation System 4.7). When it comes to the maximum value for each option, it is the same as Farfetch's most expensive international shipping service for that alternative. Consequently, the solution will be within business limits. In the meanwhile, the domestic service is naturally cheaper than the international one. For that reason, the domestic delivery fee represents the lowest value that Shipping Income can assume for a specific country and for each option. Supposing there are no domestic routes in a given geography, the minimum prices are the average of domestic rates.

$$X_i \leq \max_i \quad \wedge \quad X_i \geq \min_i \quad i = 1, \dots, 4 \quad (4.7)$$

4.2.4.4 Constraints Limiting Price Variation

The idea behind the constraints that minimise order distribution disparities was to first recognise the variations that Standard pricing might have insofar as the model must respect at least one of the following conditions: (1) Inside the TO-BE picture and for each shipping service, the delivery price of purchases below the threshold minus the price of orders that surpass it, is at most the difference perceived in the current scenario; (2) When comparing TO-BE Standard fees with AS-IS Express fees, the difference between those charges when the order value type is equal to "below" and the subtraction between those charges when the order value type is equal to "above", must be symmetric (same amount and opposite directions), and the absolute value must be lower than or equal to the AS-IS difference. This is because, from a business perspective, a decline in one component must be balanced out by an increment in another, and vice versa. All the rules just described are condensed in the Equation Systems listed below. If condition (1), expressed in restriction 4.8, is not observed for both Standard and Express services, then constraint 4.9 sets Y_5 to 0, and restriction 4.13 ensures that condition (2) is satisfied by setting Y_{12} to 1. In such context, constraint 4.10 guarantees that the subtractions between TO-BE Standard fees and AS-IS Express fees for both order value types are symmetric, and restrictions 4.11 and 4.12 warrant that those differences are lower than or equal to the AS-IS scenario, in absolute terms.

$$(X_1 - X_3) - (a_1 - a_2) - (1 - Y_3) \cdot M \leq 0 \quad \wedge \quad (X_2 - X_4) - (a_1 - a_2) - (1 - Y_4) \cdot M \leq 0 \quad (4.8)$$

$$(Y_3 + Y_4) - 2 + (1 - Y_5) \cdot M \geq 0 \quad (4.9)$$

$$(X_1 - a_1) - (a_2 - X_3) - (1 - Y_6) \cdot M \leq 0 \quad \wedge \quad (X_1 - a_1) - (a_2 - X_3) + (1 - Y_7) \cdot M \geq 0 \quad (4.10)$$

$$(X_1 - a_1) - (a_1 - a_2) - (1 - Y_8) \cdot M \leq 0 \quad \wedge \quad (a_1 - X_1) - (a_1 - a_2) - (1 - Y_9) \cdot M \leq 0 \quad (4.11)$$

$$(X_3 - a_2) - (a_1 - a_2) - (1 - Y_{10}) \cdot M \leq 0 \quad \wedge \quad (a_2 - X_3) - (a_1 - a_2) - (1 - Y_{11}) \cdot M \leq 0 \quad (4.12)$$

$$\sum_{t=6}^{11} Y_t - 6 + (1 - Y_{12}) \cdot M \geq 0 \quad \wedge \quad Y_5 + Y_{12} \geq 1 \quad (4.13)$$

Afterwards, constraints to state Express pricing in accordance with the Standard charges are required. First, the difference between Express and Standard upcoming fees must be the exact same amount within each order value type, and Equation 4.14 reports this restriction.

$$(X_2 - X_1) - (X_4 - X_3) = 0 \quad (4.14)$$

Second, the model should also respect at least one of the following conditions: (1) The subtraction between Standard and Express prices must be equal to or less than the AS-IS difference, for each order value type and inside the TO-BE scenario; (2) For the same order value type, the difference between the TO-BE Standard price and the AS-IS Express price and the subtraction between the TO-BE Express charge and the AS-IS Express charge, must be symmetric. Plus, the absolute value of these variations cannot be greater than the AS-IS difference. This information is summarised in the Equation Systems mentioned below. If condition (1), expressed in restriction 4.15, is not observed, then constraint 4.16 sets Y_{15} to 0, and restriction 4.23 sets Y_{28} to 1, which ensures that condition (2) is satisfied by setting $Y_{16}, \dots, Y_{27}$ to 1. In such context, constraints 4.17 and 4.20 guarantee that the difference between the TO-BE Standard price and the AS-IS Express price and the subtraction between the TO-BE Express charge and the AS-IS Express charge are symmetric for each order value type, and restrictions 4.18, 4.19, 4.21, and 4.22 warrant that those differences are lower than or equal to the AS-IS scenario, in absolute terms.

$$(X_2 - X_1) - (a_1 - a_2) - (1 - Y_{13}) \cdot M \leq 0 \quad \wedge \quad (X_4 - X_3) - (a_1 - a_2) - (1 - Y_{14}) \cdot M \leq 0 \quad (4.15)$$

$$(Y_{13} + Y_{14}) - 2 + (1 - Y_{15}) \cdot M \geq 0 \quad (4.16)$$

$$(X_1 - a_1) - (a_1 - X_2) - (1 - Y_{16}) \cdot M \leq 0 \quad \wedge \quad (X_1 - a_1) - (a_1 - X_2) + (1 - Y_{17}) \cdot M \geq 0 \quad (4.17)$$

$$(X_1 - a_1) - (a_1 - a_2) - (1 - Y_{18}) \cdot M \leq 0 \quad \wedge \quad (a_1 - X_1) - (a_1 - a_2) - (1 - Y_{19}) \cdot M \leq 0 \quad (4.18)$$

$$(X_2 - a_1) - (a_1 - a_2) - (1 - Y_{20}) \cdot M \leq 0 \quad \wedge \quad (a_1 - X_2) - (a_1 - a_2) - (1 - Y_{21}) \cdot M \leq 0 \quad (4.19)$$

$$(X_3 - a_2) - (a_2 - X_4) - (1 - Y_{22}) \cdot M \leq 0 \quad \wedge \quad (X_3 - a_2) - (a_2 - X_4) + (1 - Y_{23}) \cdot M \geq 0 \quad (4.20)$$

$$(X_3 - a_2) - (a_1 - a_2) - (1 - Y_{24}) \cdot M \leq 0 \quad \wedge \quad (a_2 - X_3) - (a_1 - a_2) - (1 - Y_{25}) \cdot M \leq 0 \quad (4.21)$$

$$(X_4 - a_2) - (a_1 - a_2) - (1 - Y_{26}) \cdot M \leq 0 \quad \wedge \quad (a_2 - X_4) - (a_1 - a_2) - (1 - Y_{27}) \cdot M \leq 0 \quad (4.22)$$

$$\sum_{t=16}^{27} Y_t - 12 + (1 - Y_{28}) \cdot M \geq 0 \quad \wedge \quad Y_{15} + Y_{28} \geq 1 \quad (4.23)$$

4.2.4.5 Scenarios

On a second iteration to the model, possible price outcomes were even more controlled by defining a set of 19 scenarios for the Shipping Income based on the first four options of the TO-BE situation. More specifically, there is only one price (Express) for a specific order value type in the current status, which will be the basis to establish the two upcoming prices (Standard and Express). Three groups were drawn concerning delivery price variations within each order value type. The first group states that there is a favourable Shipping Income change, regardless of the purchase value. In turn, the second group considers that a negative price variation for above-threshold orders is balanced by a positive price variation for below-threshold purchases. Finally, the third set is the opposite of the previous one.

Regarding group 1, depicted in Table 4.4, there is only one scenario in which new Standard fees are equal to the AS-IS and new Express fees are higher. It is neither intended that all prices rise, nor that all prices increase except for one of the possibilities. Otherwise, there would be a considerable impact on customer experience.

Table 4.4: Scenario group 1

Order Value Type	Shipping Service	SI / PO Variation	1
Below	Standard	$X_1 - a_1$	=
Below	Express	$X_2 - a_1$	+
Above	Standard	$X_3 - a_2$	=
Above	Express	$X_4 - a_2$	+

"=" means that $X_i - a_j = 0$

"-" or "--" means that $X_i - a_j < 0$

"+" or "++" means that $X_i - a_j > 0$

"++(--)" means that the absolute variation of the Shipping Income in that service must be greater (lower) than that of the other service, within a particular order value type.

On the other hand, the scenarios attached to groups 2 and 3 are exhibited in Tables 4.5 and 4.6. In some cases, it was necessary to define the relationship between the increments and declines to ensure the desired variations. For example, in scenario 4, the positive variation (e.g., 2 dollars) for below-threshold orders is due to a decrease in the Standard charge (e.g., -3 dollars) and an increase in the Express charge higher than the reduction (e.g., 5 dollars), in absolute terms, while the negative variation for above-threshold purchases is achieved by maintaining the Express price and reducing the Standard one. That being said, the model must certify that the final solution lies in one of the scenarios.

It is also important to shed light on some unfeasible scenarios in this environment that have not been contemplated. First, increasing Standard charges while maintaining or decreasing Express charges or preserving Standard prices while reducing Express prices are impractical solutions as

Standard service becomes more expensive than Express. Moreover, in the light of scenario 4, if only a symmetric variation was considered between the two shipping services in under-threshold orders, then it is given the possibility of an overall negative variation. As a consequence, the negative variation in over-threshold purchases may not be compensated.

Table 4.5: Scenario group 2

Order Value Type	Shipping Service	SI / PO Variation	2	3	4	5	6	7	8	9	10
Below	Standard	$X_1 - a_1$	=	+	-	=	+	-	=	+	-
Below	Express	$X_2 - a_1$	+	++	++	+	++	++	+	++	++
Above	Standard	$X_3 - a_2$	-	-	-	--	--	--	--	--	--
Above	Express	$X_4 - a_2$	=	=	=	-	-	-	+	+	+

Table 4.6: Scenario group 3

Order Value Type	Shipping Service	SI / PO Variation	11	12	13	14	15	16	17	18	19
Below	Standard	$X_1 - a_1$	-	--	--	-	--	--	-	--	--
Below	Express	$X_2 - a_1$	=	-	+	=	-	+	=	-	+
Above	Standard	$X_3 - a_2$	=	=	=	+	+	+	-	-	-
Above	Express	$X_4 - a_2$	+	+	+	++	++	++	++	++	++

In short, instead of allowing the model to freely perceive the best relationship between AS-IS and TO-BE fees, the definition of those scenarios was important to discard the ones that were not realistic. Finally, the following-listed Equations encompass all the expressions necessary to mathematically represent the scenarios. The set of Equations from 4.24 to 4.39 comprises restrictions to verify the relationships stated in the aforementioned tables. Additionally, Equations from 4.40 to 4.43 guarantee the variations stated in the three groups, and only some constraints are necessary since the restriction in Equation 4.3 secures that Standard service is always cheaper than Express. Then, the set of Equations from 4.44 to 4.47 warrants the coverage of just one scenario by the optimal Shipping Income insofar as only one of the auxiliary variables $Z_{c,k}$ is set to 1.

$$(X_1 - a_1) - (1 - Z_{c,1}) \cdot M \leq 0 \quad c = 1, 2, 5, 8 \quad (4.24)$$

$$(X_1 - a_1) + (1 - Z_{c,2}) \cdot M \geq 0 \quad c = 1, 2, 5, 8 \quad (4.25)$$

$$(X_1 - a_1) - (1 - Z_{c,3}) \cdot M + 1 \leq 0 \quad c = 4, 7, 10, 11, \dots, 19 \quad (4.26)$$

$$(X_1 - a_1) + (1 - Z_{c,4}) \cdot M - 1 \geq 0 \quad c = 3, 6, 9 \quad (4.27)$$

$$(X_2 - a_1) - (1 - Z_{c,5}) \cdot M \leq 0 \quad c = 11, 14, 17 \quad (4.28)$$

$$(X_2 - a_1) + (1 - Z_{c,6}) \cdot M \geq 0 \quad c = 11, 14, 17 \quad (4.29)$$

$$(X_2 - a_1) - (1 - Z_{c,7}) \cdot M + 1 \leq 0 \quad c = 12, 15, 18 \quad (4.30)$$

$$(X_2 - a_1) + (1 - Z_{c,8}) \cdot M - 1 \geq 0 \quad c = 1, 2, \dots, 10, 13, 16, 19 \quad (4.31)$$

$$(X_3 - a_2) - (1 - Z_{c,9}) \cdot M \leq 0 \quad c = 1, 11, 12, 13 \quad (4.32)$$

$$(X_3 - a_2) + (1 - Z_{c,10}) \cdot M \geq 0 \quad c = 1, 11, 12, 13 \quad (4.33)$$

$$(X_3 - a_2) - (1 - Z_{c,11}) \cdot M + 1 \leq 0 \quad c = 2, \dots, 10, 17, 18, 19 \quad (4.34)$$

$$(X_3 - a_2) + (1 - Z_{c,12}) \cdot M - 1 \geq 0 \quad c = 14, 15, 16 \quad (4.35)$$

$$(X_4 - a_2) - (1 - Z_{c,13}) \cdot M \leq 0 \quad c = 2, 3, 4 \quad (4.36)$$

$$(X_4 - a_2) + (1 - Z_{c,14}) \cdot M \geq 0 \quad c = 2, 3, 4 \quad (4.37)$$

$$(X_4 - a_2) - (1 - Z_{c,15}) \cdot M + 1 \leq 0 \quad c = 5, 6, 7 \quad (4.38)$$

$$(X_4 - a_2) + (1 - Z_{c,16}) \cdot M - 1 \geq 0 \quad c = 1, 8, 9, 10, 11, \dots, 19 \quad (4.39)$$

$$(X_1 - a_1) + (X_2 - a_1) - 1 + (1 - Z_{c,17}) \cdot M \geq 0 \quad c = 4, 7, 10 \quad (4.40)$$

$$(X_3 - a_2) + (X_4 - a_2) + 1 - (1 - Z_{c,18}) \cdot M \leq 0 \quad c = 8, 9, 10 \quad (4.41)$$

$$(X_1 - a_1) + (X_2 - a_1) + 1 - (1 - Z_{c,19}) \cdot M \leq 0 \quad c = 13, 16, 19 \quad (4.42)$$

$$(X_3 - a_2) + (X_4 - a_2) - 1 + (1 - Z_{c,20}) \cdot M \geq 0 \quad c = 17, 18, 19 \quad (4.43)$$

$$\sum_{k=1}^{20} Z_{c,k} - 6 + (1 - Z_{c,21}) \cdot M \geq 0 \quad c = 1, 2, 4, 8, 10, 11, 13, 17, 19 \quad (4.44)$$

$$\sum_{k=1}^{20} Z_{c,k} - 5 + (1 - Z_{c,22}) \cdot M \geq 0 \quad c = 3, 5, 7, 9, 12, 14, 16, 18 \quad (4.45)$$

$$\sum_{k=1}^{20} Z_{c,k} - 4 + (1 - Z_{c,23}) \cdot M \geq 0 \quad c = 6, 15 \quad (4.46)$$

$$\sum_{k=21}^{23} Z_{c,k} = 1 \quad c = 1, \dots, 19 \quad (4.47)$$

Finally, the model must ensure that delivery prices X_i are natural numbers (company's condition), while auxiliary variables Y_t and $Z_{c,k}$ are binary numbers (Equations 4.48, 4.49, and 4.50).

$$X_i \in \mathbb{N} \quad i = 1, \dots, 8 \quad (4.48)$$

$$Y_t \in \{0, 1\} \quad t = 1, \dots, 28 \quad (4.49)$$

$$Z_{c,k} \in \{0, 1\} \quad c = 1, \dots, 19 ; k = 1, \dots, 23 \quad (4.50)$$

Chapter 5

Results

This chapter encompasses both the model's outcomes and the analysis of the results obtained from the strategy's implementation. Therefore, the last step of the methodology for this project - the validation of the new Shipping Income - is fully addressed in this chapter. First, the positioning of the company in relation to its competitors is presented and discussed. Second, the real customer redistribution among the eight shipping options is explored and, at the same time, compared with the predictions. Moreover, the real gains obtained through order shipment are evaluated considering three factors (price, distribution of POs, and Platinum upgrade), and are also compared with the forecasts. The third and last step relies on analysing the impact on the RCR, taking into account four relevant variables to build different cluster groups and assess the RCR variation.

5.1 Model's Outcomes

The Integer Programming Model's construction has furnished a new set of delivery prices for the three destination countries under study. Each of these sets has fallen into a single scenario, as described in Section 4.2.4.5, and a rise in the weighted average of the unitary Shipping Income is foreseen. Both Hong Kong and Australia dovetail into scenario 1, where Express prices have increased, and Standard prices have taken the value of the old Express service. Plus, Japan fits into scenario 14, where the Standard charge has declined and the Express charge remained the same within the order value type equal to "below", while prices of both shipping services have climbed for above-threshold purchases. Table 5.1 exhibits the estimated gains from the optimisation insofar as per-order average earnings are projected to be between 3 and 4 dollars.

Table 5.1: Expected per-order Shipping Income gains for Hong Kong, Australia, and Japan

Destination	AS-IS	TO-BE	Expected
Country	Real SI / PO	Expected SI / PO	SI / PO Gains
Hong Kong	\$ 8.37	\$ 12.12	\$ 3.75
Australia	\$ 9.08	\$ 12.44	\$ 3.36
Japan	\$ 13.19	\$ 16.87	\$ 3.68

For additional detail, in Appendix B, Table B.1 presents the old prices charged to customers for shipment, alongside with the essential parameters for each country, whereas Table B.2 encompasses the optimal fees for each combination of order value type and shipping service, together with more input data.

From another perspective, to assess the model's limitation with respect to the consumers' division between Standard and Express services, and between FS and upgraded orders, the model was tested with 60%, 65%, 70%, 75%, 80%, 85%, and 90% of orders being in the Standard option and the remaining in the expedited alternative, for each geography. The optimal prices have kept constant regardless of the distribution, and even though there is a change in the expected gain, this estimate remains positive. As such, the constraints' intended goal of minimising the impact on the percentage of orders by restricting price variation was accomplished.

In view of such findings, on May 24th, 2022, this Shipping Income strategy was implemented on the Farfetch platform for the three countries.

5.2 Farfetch versus Competition

Although the optimisation did not incorporate the competition's policy, it is an asset to acknowledge Farfetch's standing in the luxury fashion e-commerce with regard to shipping prices. To do so, six market-players were contemplated, namely: Net-a-Porter, Mytheresa, Luisa via Roma, MatchesFashion, Moda Operandi, and Mr Porter, with the intent of comparing delivery fees among these competitor companies and Farfetch. The placement of the firm in each of the three countries is graphically shown in Appendix C. In short, the new pricing approach, irrespective of the territory, has not damaged the company as an industry element since the highest prices are charged by Moda Operandi, which provides a competitive advantage for Farfetch. Yet, the cheapest charges are not secured by this firm, except in Hong Kong, where both Farfetch and MatchesFashion hold the lowest position. Overall, the brand-new policy has not mispositioned the company under study, and Figure 5.1 demonstrates it.



Figure 5.1: Average per-order delivery prices charged by Farfetch and its competitors for the three countries at stake

5.3 Impact Analysis

Following the deployment of the optimal prices, data was collected to understand how the changes in the Shipping Income have affected both Farfetch's performance and consumer behaviour. On the one hand, the data after implementation comprises purchases from May 25th to June 25th, 2022, to cover the longest possible period of time, which is one month. On the other hand, data prior to the new course of action encompasses orders from June 2021 to April 2022. Besides that, data standardisation and automatisisation were imperative (by creating datasets based on others in Google *BigQuery*) as a means to directly acquire each portal order's related Shipping Income, as well as other relevant factors. Not to mention, the number of clients that were successfully converted to purchase on the Review page compared to the overall number of people who visited that page.

The evaluation of the model's delivery-pricing strategy is twofold. First, the redistribution of the customers among the new eight options and the divergence between forecasts and outcomes gauges the degree of the model's truthfulness in the matter of unitary gains or losses, on average. Second, the Review Conversion Rate assessment before and after the new approach implementation directly reveals how e-shoppers perceive the new charges as far as their willingness to shop is concerned.

5.3.1 Customer Redistribution Assessment and Real Gains

As a result of delivery options' duplication and subsequent price changes, customers' redistribution is inevitable. Understanding whether there is a significant incongruity between the projected and the real orders' percentage becomes important to validate anticipated gains. Overall, and according to Figure 5.2, the percentage of portal orders in the three main categories (orders above the threshold, below the threshold, and with the option of free shipping) has not endured considerable fluctuations as expected, judging from data prior to and after deployment. Nevertheless, there is a slight increase in the quantity of orders under the threshold in Japan (6 pp) and a slight decrease in the number of purchases above the threshold in Australia (4 pp).

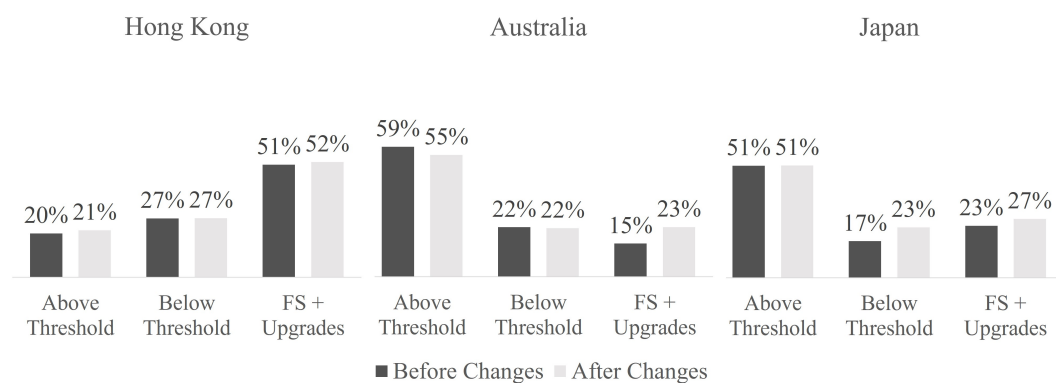


Figure 5.2: Comparison of the distribution of portal orders among the three main categories before and after strategy implementation

Prior to taking a closer look at these percentages, it is relevant to underline that Private Clients always have access to free delivery on any option, so their purchases never correspond to paid upgrades. Furthermore, Silver and Gold shoppers have a limited number of free shipping offers on the cheapest delivery service. As a consequence, in the company's database, it is impossible to distinguish normal Express orders from upgraded Express orders since the fee is the same in both situations, and datasets do not register when clients have had the possibility of FS. Plus, they only register if a customer has enjoyed unpaid transport. In such context, only Platinum consumers are highlighted in the upgrade situation since it is the tier with free delivery offers, always on the least expensive alternative, so Express purchases are, without exception, an upgrade. Therefore, when comparing the real distribution with the forecast in the upgrading choices, a much lower value is verified because it was not possible to detach this type of order made by tiers other than Platinum.

Before analysing the notable differences, outlined in Table 5.2, it is interesting to note that Hong Kong presents a high percentage of above-threshold orders with free shipping due to the existence of operational FS (no shipping is charged over a given order value). In addition, unpaid transport occurs with much more frequency in above- than in below-threshold purchases because, through the Access programme, this perk is only available when the order value type is equal to "above" (except for Private Clients). Notwithstanding, dissimilarities are found in over-threshold purchases with unpaid delivery since they are more in quantity than expected. This is probably because the period after deployment comprises the month of May, which is when sales discounts and campaigns are most prevalent.

Table 5.2: Order percentages predicted versus actual

Order Value Type	Shipping Service	Hong Kong		Australia		Japan	
		Predicted % POs	Real % POs	Predicted % POs	Real % POs	Predicted % POs	Real % POs
Below	Standard	21 %	23 %	18 %	19 %	13 %	21 %
Below	Express	5 %	3 %	4 %	3%	3 %	2 %
Above	Standard	16 %	13 %	47 %	48 %	40 %	43 %
Above	Express	4 %	8 %	12 %	7 %	10 %	8 %
Below	FS	2 %	3 %	3 %	3 %	8 %	6 %
Below	Upgrade	1 %	0.1 %	1 %	0.02 %	2 %	0.04%
Above	FS	41 %	49 %	12 %	19 %	19 %	21 %
Above	Upgrade	10%	0.5 %	3 %	0.2 %	5 %	0.3 %

Moreover, in Japan, Standard purchases below the threshold have a greater rate than predicted, which may be a result of the Standard alternative being 7 dollars cheaper than the AS-IS, so a more appealing price can attract more customers. However, in the case of Express, the proportions are similar. On the other hand, Express orders above the threshold to Australia are less in quantity than expected, and this may be due to the higher prices charged. But, in the case of Standard, the percentages are nearly the same. In Hong Kong, the opposite is valid. Above-threshold purchases with Express service present a greater percentage than expected, which is curious since the fee

has increased. Two reasons may be behind this value: either because upgraded and non-itemised orders fall into this option, or because clients effectively prefer this alternative once the percentage of Standard has slightly decreased. Besides that, most of the options fail to present a critical divergence, which is a good sign. Table 5.3 depicts the differences between Shipping Income before and after the new strategy.

Table 5.3: Shipping Income before and after the new strategy for Hong Kong, Australia, and Japan

Order Value Type	Shipping Service	Hong Kong		Australia		Japan	
		AS-IS	TO-BE	AS-IS	TO-BE	AS-IS	TO-BE
		SI / PO	SI / PO	SI / PO	SI / PO	SI / PO	SI / PO
Below	Standard	-	\$ 24	-	\$ 22	-	\$ 30
Below	Express	\$ 24	\$ 37	\$ 22	\$ 37	\$ 37	\$ 37
Above	Standard	-	\$ 10	-	\$ 7	-	\$ 18
Above	Express	\$ 10	\$ 23	\$ 7	\$ 22	\$ 14	\$ 25
Below	FS	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0
Below	Upgrade	-	\$ 37	-	\$ 37	-	\$ 37
Above	FS	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0
Above	Upgrade	-	\$ 23	-	\$ 22	-	\$ 25

Concerning repartition between the two shipping services, it was assumed that 20% of customers would choose Express and, indeed, such an assumption was not far from the truth. Nonetheless, disparate cases concern order value types equal to “above” in Hong Kong, where 39% of buyers opt for the expedited alternative, which represents a great outcome since Express rates in this situation have risen. Conversely, only 8% of consumers in Japan place Express orders under the threshold, and it is in line with what has already been described (Figure 5.3). Additionally, the split between free delivery and upgrades is not analysed on account of the stated limitation.

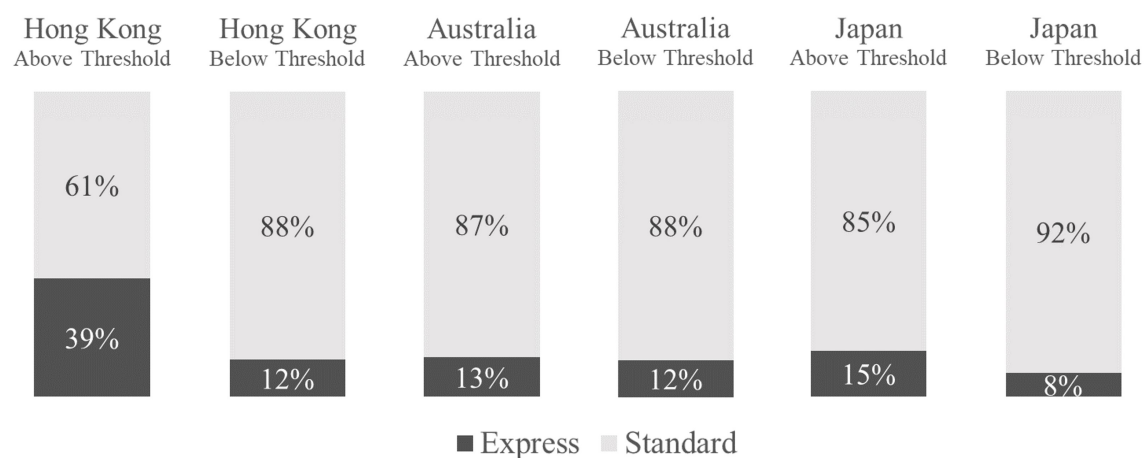


Figure 5.3: Customers' real division between Standard and Express services after strategy deployment

Due to the small changes in the distribution just reported, the earnings of the Shipping Income weighted average are below expectations for each country, but still positive (Table 5.4). It is important to note that the upgrade limitation does not affect these outcomes because upgraded orders have the same delivery price as the normal ones. The observed gain in Japan is very close to what was anticipated. Thus, it may indicate that the increase in the number of Standard purchases under the threshold has helped to offset the price reduction. In Hong Kong, the decline is mainly due to a higher percentage of free shipping (more 8 pp than expected), although there are more Express purchases above the threshold than predicted. The highest discrepancy between anticipated and real gains occurs in Australia because not only FS orders are more in quantity than anticipated, but also there are fewer Express purchases (when order value type is equal to "above"), leading to a difference of 2.45 dollars.

Table 5.4: Expected versus real earnings of the weighted average delivery price

Destination Country	Expected SI / PO Gains	Real SI / PO Gains	Difference
Hong Kong	\$ 3.75	\$ 2.92	\$ 0.83
Australia	\$ 3.36	\$ 0.91	\$ 2.45
Japan	\$ 3.68	\$ 3.42	\$ 0.26

Thereafter, appraisal of data before and after strategy implementation enables the discovery of the reasons behind per-order Shipping Income deviation, on average. In light of these facts, four scenarios were engineered, each having a weighted average of the per-order delivery price, in order to analyse three factors. The first scenario (before changes) covers the situation prior to modifications, considering the old prices and the old percentage of POs, and the second (price changes) comprises the new prices along with the old distribution of clients. The Shipping Income difference between these two scenarios sheds light on the power of the price factor in the gains or losses. On the other hand, the new fees and the new and real percentage of purchases shape the third scenario (distribution changes), without considering the potential for upgrading. The gap between the two latest scenarios encompasses the behaviour of the distribution factor. At last, the fourth (after changes) holds the possibility of order upgrades only for Platinum customers, and the effect of the Platinum upgrade factor is given by the difference between the average Shipping Income of the fourth and third scenarios. Concluding, the sum of these three factors discloses whether the overall and unitary shipping price rose or fell.

Bearing in mind such components, Hong Kong, Australia, and Japan reveal the same behaviour, and Figure 5.4 illustrates it. First, price variation has a positive effect insofar as it contributes to an increase in the mean of the Shipping Income, which is normal since the strategy's aim is to maximise this value. Yet, the distribution factor has a negative impact, and it is also expected given that most customers will naturally prefer the inexpensive option. Even so, the price factor offsets the distribution one. Finally, although the Platinum upgrade factor is not critical to ensure a gain, it boosts the unitary price, and in the end, there are shipping fee-related average earnings.

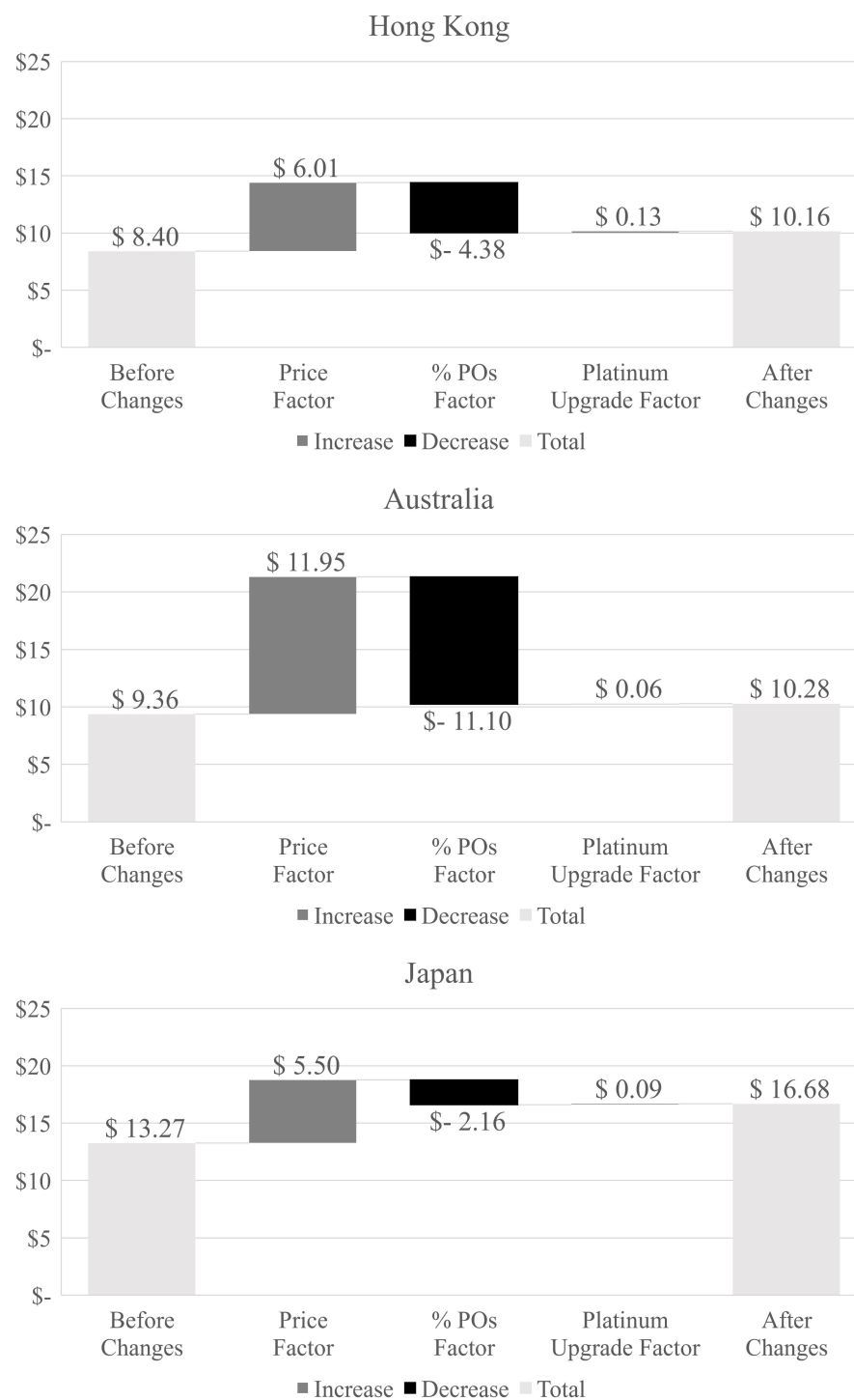


Figure 5.4: Real variation of the weighted average Shipping Income per portal order considering three factors

5.3.2 Review Conversion Rate Assessment

Typically, A/B tests are the procedure Farfetch deploys as a means to test novel tactics prior to application. In this case, it may be applied to understand how a change in the Shipping Income affects the Review Conversion Rate. This technique consists of assessing two versions of the same variable and concluding which one works best to accomplish a given objective. However, due to the random nature of the population division, several factors that may have an impact on the RCR, in addition to the delivery price, are not taken into consideration. On top of that, this method can operate for between one month and one year. Hence, in the first instance, optimal shipping prices were deployed without conducting A/B tests, also because, in the past, fee increases did not harm the Review Conversion Rate, so there was some confidence in that matter. Afterwards, a meticulous and much more accurate analysis is mandatory to fully grasp any potential effects that the new delivery-pricing strategy may have had. To do so, four relevant variables that could influence this rate were evaluated, specifically: order value type, customer tier, markdown existence (full price versus markdown orders), and clients' retention and attraction (new versus old consumers). Each combination of these variables gives rise to a cluster.

Bearing in mind these notions, Appendix D reports the Review Conversion Rate variation in different cluster groups for each geography, along with portal orders' percentage before and after changes in each set that are also essential to look at. The investigation was performed separately for the three countries, and the rationale behind it was to compute RCR before and after deployment and, subsequently, its variation in percentage points (pp), for a given set of clusters. First and foremost, with all clusters considered, the overall variation of the Review Conversion Rate is calculated, as well as the variation for each cluster. Thereafter, clusters will gradually be divided into more specific groups. When analysing only clusters with a negative variation, the next chosen variable used to segment into smaller groups is the factor (order value type, clients' retention and attraction, or markdown existence) that has the biggest discrepancy allied with symmetric variations. Considering the markdown existence as the critical variable, for example, the majority of the clusters under scrutiny must rely on one of the versions (full price or markdown). Plus, if there is a positive variation in clusters with full price, then the variation in clusters with markdown must be negative, or vice versa. Nevertheless, in the case of no symmetry, only the discrepancy is contemplated. Furthermore, with just one binary variable, the customer tier is also examined for the decision-making. Finally, client groups with the same type of variation (positive or negative) can be aggregated, as long as the grouped variation presents the same nature.

At times, there was no need to further subdivide since doing so would not add value to the analysis. Apart from that, orders' distribution diverges (from before to after deployment) when groups include the markdown existence insofar as a higher discount sales volume is verified in the new scenario because it encompasses a peak-sales season (May) where many campaigns and promotions exist (Figure 5.5). Moreover, a greater quantity of purchases above than below the threshold, in general, may influence conclusions since a higher volume is naturally related to a lower conversion (Perdikaki et al., 2011). Finally, old buyers will likewise make more purchases

than new ones.

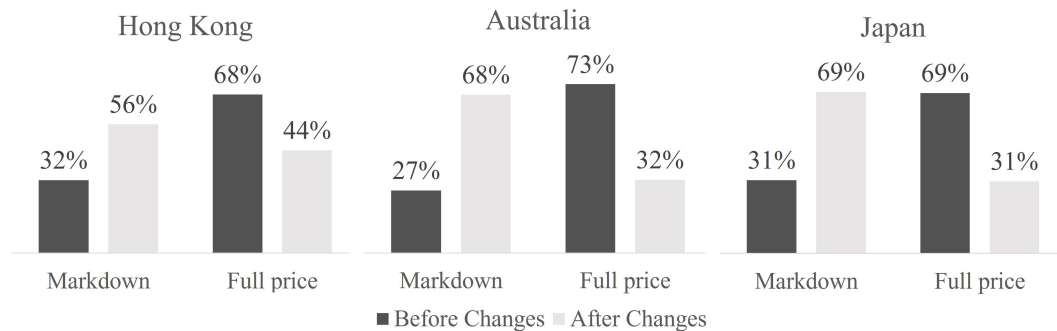


Figure 5.5: Comparison of the distribution of customers between markdown and full price orders before and after strategy deployment

5.3.2.1 Hong Kong

Overall, there is an increment in the ratio under scrutiny of 4.1 pp in Hong Kong, and aggregating clusters by the markdown existence, full price orders exhibit an adverse effect on the RCR (- 1.3 pp), while markdown orders deliver a favourable effect (+ 8 pp).

When it comes to clusters with promotions, the perceived negative variation in new Silver clients is not meaningful owing to the 1% or less of POs coupled to them, despite the reduction in the rate of 11.4 pp. Thus, Shipping Income modifications did not have any negative influence on the conversion of visitors in the presence of campaigns and discounts in such a way that they are less sensitive to the stated fees. This is consistent with the research described in Section 2.7.

In regard to clusters with just full price orders, there is a reduction in the Review Conversion Rate in above-threshold purchases made mainly by Bronze customers that had already shopped at Farfetch. The reason behind it could be that former shoppers are aware of the previous pricing and end up having a greater perception of the alterations introduced (as stated in Section 2.7). In addition, this group holds the lowest AOV, which can justify the greater price sensitivity, and given that the order has already exceeded a certain price level, shoppers are not so willing to spend more money when Express service is more costly than the AS-IS. The Silver tier reports a decline in the ratio as well, but it is not at least 1 pp, hence this type of consumer is not regarded as relevant. Yet, clusters with an order value type equal to “below” do not present the same behaviour, inasmuch as the variation is positive. Figure 5.6 summarises the conclusions just described.

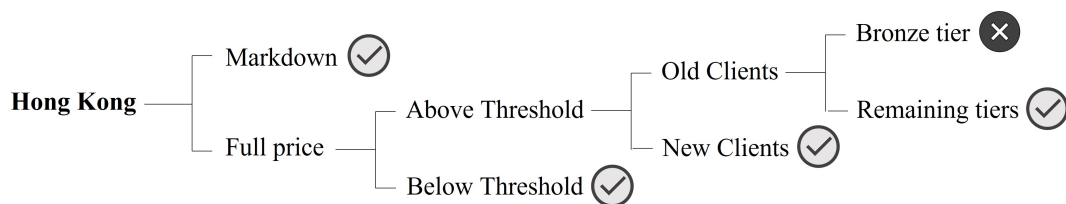


Figure 5.6: RCR behaviour (positive or negative) in Hong Kong

5.3.2.2 Australia

In Australia, there is an increase in the Review Conversion Rate of 2.9 pp. Adopting the order value type as the first variable to scrutinise clusters, the ratios for “above” and “below” has increased (+ 3.8 pp) and decreased (- 1.5 pp), respectively.

With respect to above-threshold purchases, the negative variation of full price clusters is not meaningful because, with further division, the percentage of POs is equal to or less than 1% or the RCR variation is less than 1 pp. On the other hand, in the presence of markdowns, merely the conversion of existing Gold members has decreased by 1.4 pp.

Concerning the below-threshold orders, although new clients (Bronze and Silver) have an adverse effect on the ratio, it is not significant. Therefore, the overall decline in the Review Conversion Rate is primarily due to clusters with markdowns and former customers in the three lowest tiers (Bronze, Silver, and Gold), with a reduction of 5.5 pp. The reason behind it could be that these types of buyers have a better understanding of the previous fees charged, adding up to the fact that the order’s value corresponds to the cheapest values (lowest AOV + “below” + markdown) compared to the company’s level, which increases the sensitivity to the extra charges, such as the delivery price. For instance, a rise in Shipping Income is more notable in a PO of 100 dollars than in a purchase of 5 000 dollars. This is in accordance with the literature delineated in Section 2.7. Figure 5.7 summarises the conclusions just described.

Besides, it is possible to infer that in the presence of promotions, old customers tend to shop more since there is a symmetric variation when the order value type is concerned (positive variation for “above”).

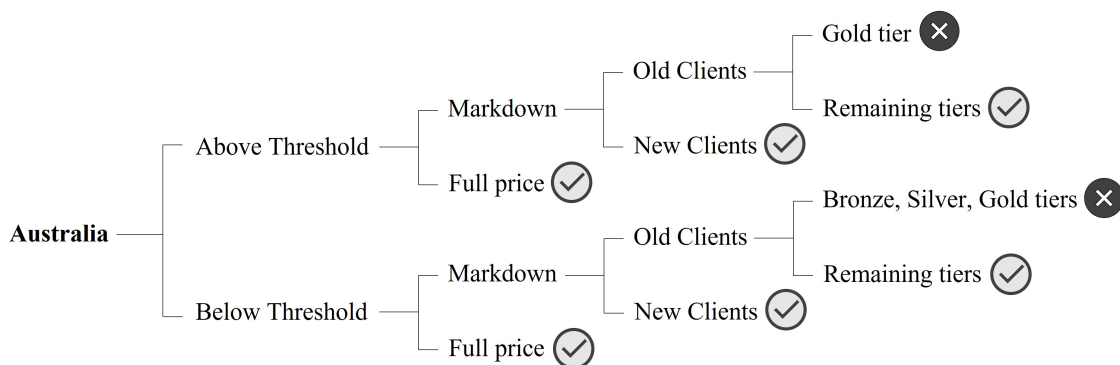


Figure 5.7: RCR behaviour (positive or negative) in Australia

5.3.2.3 Japan

In Japan, the Review Conversion Rate presents a positive variation of 7.2 pp, which is the highest value among the three countries. The two major groups of clusters were generated by the mark-down existence variable, and the subset of full price orders has a decline in the rate (- 0.4 pp), while the other has a rise (+ 10.4 pp).

For clusters with markdowns, despite the favourable impact, the conversion of existing customers within Bronze and Silver groups has diminished, and in the matter of over-threshold orders, the same happens with the old Platinum clients. The first case has already been justified, and the second one may be because Platinum consumers must pay for the Express service, and that price has increased (from 14 to 25 dollars).

In clusters with full price and above-threshold purchases, there is a general decrease in RCR of 3.3 pp. On the other hand, the most critical area of clusters with full price and under-threshold orders is when the consumers belong to the Bronze tier and have already shopped at Farfetch, where the negative variation of the ratio is 6 pp. However, it is not very relevant.

In short, clusters with an order value type equal to “below” present a very high increment in the rate compared to “above”, and the latter even has an adverse effect, in the case of full price. This phenomenon can be explained by the implemented approach. In below-threshold orders, the Standard fee has diminished (regarding to the AS-IS) and the Express fee remained the same, so the clients’ likelihood of shopping substantially increased within this order value type. While in above-threshold orders, the Shipping Income has increased in both shipping services. Figure 5.8 summarises the conclusions just described.

Besides, it is plausible to infer that a higher percentage of under-threshold POs (Section 5.3.1) is linked to a large conversion of the customers.

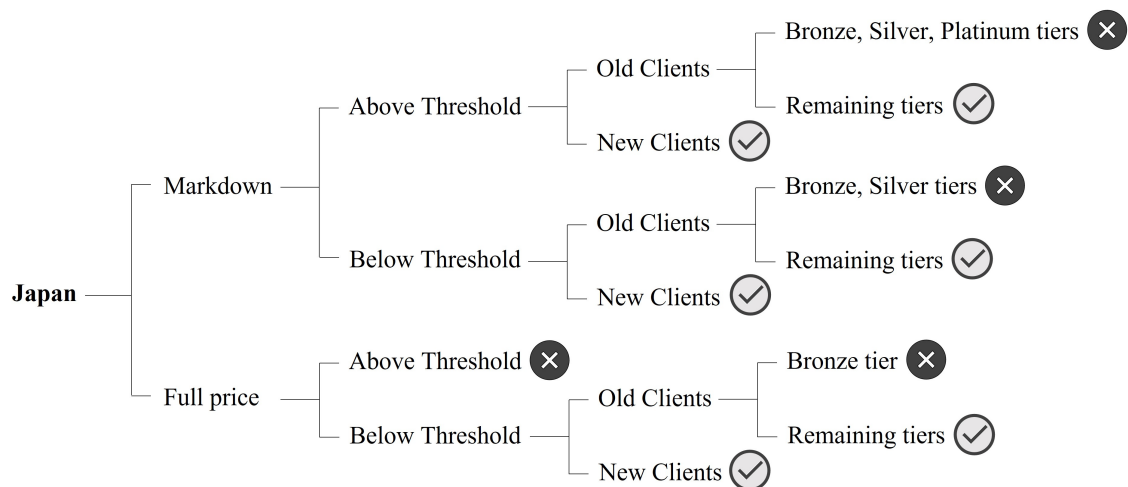


Figure 5.8: RCR behaviour (positive or negative) in Japan

5.3.2.4 Summary

Briefly, the Review Conversion Rate has increased regardless of the territory (Table 5.5). Furthermore, once the period of time following implementation overlaps with one of the selling peaks, it is impossible to infer that this rise is due to the new delivery-pricing strategy, but it is feasible to deduce that this approach has not damaged the rate, in other words, the visitors’ willingness to confirm an order on the Review page. Even though it only covers one month, the after-changes sample is sizeable enough to make conclusions due to the peak.

Table 5.5: Overall variation of the Review Conversion Rate

Destination Country	Hong Kong	Australia	Japan
RCR Variation	+ 4.1 pp	+ 2.9 pp	+ 7.2 pp

Chapter 6

Conclusions and Future Work

The present dissertation concerns the enhancement of Farfetch's shipping service on international routes (with Hong Kong, Australia, and Japan as the destination countries) by optimising the related prices charged to the customers while adding a second delivery option: the Standard service. The main approach followed in this project was based on an Integer Programming Model as the means to discover the best Shipping Income for each option. Being a data-driven company, it is possible to acknowledge the shopper's actions in response to historical implementations of the Standard alternative in other countries. Therefore, this information was used as an assumption to build the model by outlining the future demand (considering 80% of orders with Standard service). Following the adoption of the optimal fees, the delivery-pricing strategy was validated against three criteria: competition, impact on the Review Conversion Rate, and average variation in the unitary Shipping Income, with the first component bearing the least weight and the last bearing the most.

In terms of results, first Farfetch continues to have a good position among competitors when it comes to the fee imposed on clients for order shipment.

Second, even though there were some modifications in the distribution of customers among the eight options when assessed with the predictions, average unitary gains in the Shipping Income were obtained, so that price and Platinum upgrade factors (positives) have always neutralised the distribution one (negative). Japan presented the highest earnings (3.42 dollars), while Australia had the lowest (0.91 dollars). Moreover, in Hong Kong, an unexpected and positive outcome was noted insofar as more clients than predicted opted for the Express service (for above-threshold orders). Still, the opposite has happened in Australia, maybe because of the rise in that charge. In Japan, a higher percentage of purchases observed in the Standard option (for below-threshold orders) is not so much a great result, but the Review Conversion Rate has considerably increased when the order value type is equal to "below" rather than "above". This can be explained by the significant decline in Shipping Income. In light of these facts, the new approach concerning delivery fees has presented good outcomes so far.

Third, regardless of the geography, the RCR did not decrease despite price changes, which entails that particular unfavourable effects were always outweighed by favourable ones. In fact,

the most adverse clusters concern old shoppers and the three lowest customer tiers (Bronze, Silver, and Gold). The reasons behind it are the higher awareness of current delivery fees, which implies higher price sensitivity, and the lower purchasing power. On top of that, in Hong Kong and Japan, the conversion of visitors into consumers is greater when orders are subjected to discounts. Yet, in Australia, individuals are much more sensitive to the shipping charges when their basket's values are amongst the lowest prices, that means, below the threshold and with promotions.

As a consequence, this project legitimates the relationship between the decoy effect, explicitly addressed in Section 2.8, with the introduction of new shipping methods along with a price average increase. Indeed, customers' preferences are contextual and rely on the spectrum of possibilities provided. As such, the transition from one to two services is well-perceived by consumers because individuals believe they have decision power over the additional and mandatory fees, and they are no longer forced to choose the single available alternative. Although the model has increased delivery prices in general, the client's behaviour was not adversely affected. The defined constraints in Section 4.2.4 also account for these achievements, since rises were always compensated in some way. In short, the proposed model can tackle Shipping Income dilemmas and, at the same time, help Farfetch augment its profitability without negatively influencing the Review Conversion Rate.

One of the project's limitations concerns the impact analysis. On the one hand, it was not conceivable to study the behaviour of shoppers between choosing the free delivery option or upgrading the order in that matter. On the other hand, the period of time that comprises orders resulting from the new strategy is one month long, and it encompasses a peak-sales season where many promotions happen, which logically impacts the demand. In turn, a longer analysis should be conducted to appraise the trends in off-peak periods of the Review Conversion Rate and the redistribution of customers among alternatives and, consequently, to perceive if conclusions diverge.

The designed model depicts a few limitations as well. Due to the urgency of implementing the new approach, the delivery-price elasticity of demand was not deemed dynamic. Thus, future work could rely on, for example, running A/B tests to evaluate this elasticity. With this project, a good data sample is secured both in terms of market diversity and price variation. Consequently, another solution could be to conceptually define this elasticity based on Farfetch's historical records insofar as the percentage of orders would depend on the decision variables instead of remaining constant. The result would be the acquisition of a strong and knowledgeable baseline for Shipping Income judgements. The introduction of non-pricing parameters, variables, and/or restrictions to the Integer Programming Model would also add value to the model by involving intrinsic business characteristics.

Bearing in mind the company's operating environment, primary research in the future must comprise the assessment of growth opportunities for Farfetch to stay competitive among luxury fashion players. In a business area dedicated to order shipment, expansion should be both geographical and internal by creating more routes, acquiring more countries, and developing innovative parcel delivery methods.

Bibliography

- Agatz, N. A., Fleischmann, M., and van Nunen, J. A. (2008). E-fulfillment and multi-channel distribution - a review. *European Journal of Operational Research*, 187:339–356.
- Alabi, K. (2017). *Decentralization as a Tool for Securing Ecommerce and Business Processes*. Available online at: <https://www.ssrn.com/index.cfm/en/>.
- Alonso, T. (2019). *Farfetch acquire New Guards Group, proprietário da Off-White*. (accessed in 5th April 2022). Available online at: <https://pt.fashionnetwork.com/news/Farfetch-acquire-new-guards-group-proprietario-da-off-white,1127865.html>.
- Altıntaş, M. H., Kılıç, S., and Akhan, C. E. (2020). The transformation of the e-tailing field: a bibliometric analysis. *International Journal of Retail and Distribution Management*, 48:152–168.
- Ariely, D. and Wallsten, T. S. (1995). Seeking subjective dominance in multidimensional space: An explanation of the asymmetric dominance effect. *Organizational Behavior and Human Decision Processes*, 63:223–232.
- Ba, S., Stallaert, J., and Zhang, Z. (2007). Price competition in e-tailing under service and recognition differentiation. *Electronic Commerce Research and Applications*, 6:322–331.
- Bajaj, K. K. and Nag, D. (2005). *E-Commerce: The Cutting Edge of Business*. Tata McGraw-Hill Publishing Company Limited, second edition.
- Bansal, G. and Muzatko, S. (2021). Shipping and return shipping prices and online purchase intentions: The role of gender and product price category. *International Journal Of Business*, 26.
- Bateman, I. J., Munro, A., and Poe, G. L. (2005). Asymmetric dominance effects in choice experiments and contingent valuation. Technical Report 05-06, University of East Anglia, The Centre for Social and Economic Research on the Global Environment (CSERGE), Norwich. Available online at: <https://www.econstor.eu/>.
- Bhatti, A., Akram, H., Basit, H. M., Khan, A. U., Naqvi, S. M. R., and Bila, M. (2020). E-commerce trends during covid-19 pandemic. *International Journal of Future Generation Communication and Networking*, 13:1449–1452.
- Bjørn-Andersen, N. and Hansen, R. (2011). The adoption of web 2.0 by luxury fashion brands. In Janzcewski, L., editor, *CONF-IRM 2011 Proceedings*. University of Auckland. Available online at: https://research-api.cbs.dk/ws/files/58899124/Rina_Hansen_2011_5.pdf.

- Burnasheva, R., GuSuh, Y., and Villalobos-Moron, K. (2019). Factors affecting millennials' attitudes toward luxury fashion brands: A cross-cultural study. *International Business Research*, 12:69.
- Burt, S. and Sparks, L. (2003). E-commerce and the retail process: a review. *Journal of Retailing and Consumer Services*, 10:275–286.
- Chaudhary, H. (2020). Analyzing the paradigm shift of consumer behavior towards e-commerce during pandemic lockdown. Technical report, Amity University, Marketing and Sales Department. Available online at: <https://ssrn.com/abstract=3664668>.
- Chen, J. S., Le, T. T. Y., and Florence, D. (2021). Usability and responsiveness of artificial intelligence chatbot on online customer experience in e-retailing. *International Journal of Retail and Distribution Management*, 49:1512–1531.
- Chen, P., Zhao, R., and Lan, Y. (2022). E-commerce platform canvassing and service upgrade in an ocean shipping supply chain. *Transportation Research Part E: Logistics and Transportation Review*, 158.
- Chou, Y. C., Chuang, H. H. C., and Shao, B. B. (2016). The impact of e-retail characteristics on initiating mobile retail services: A modular innovation perspective. *Information and Management*, 53:481–492.
- Chou, Y. C. and Shao, B. B. (2021). Adoption and performance of mobile sales channel for e-retailers: Fit with m-retail characteristics and dependency on e-retailing. *Information Systems Frontiers*, 23:681–694.
- Costa, S. I. S. (2019). Understanding demand and pricing behavior in the car rental business. Master's thesis, Faculdade de Engenharia da Universidade do Porto.
- Daripa, A. and Kapur, S. (2001). Pricing on the internet. *Oxford Review of Economic Policy*, 17:202–216.
- Delfmann, W., Albers, S., and Gehring, M. (2002). The impact of electronic commerce on logistics service providers. *International Journal of Physical Distribution and Logistics Management*, 32:203–222.
- Docters, R., Tilstone, L., Bednarczyk, S., and Gieskes, M. (2011). Pricing in the digital world. *Journal of Business Strategy*, 32:4–11.
- Eastman, J. K., Fredenberger, B., Campbell, D., and Calvert, S. (1997). The relationship between status consumption and materialism: A cross-cultural comparison of chinese, mexican, and american student. *Journal of Marketing Theory and Practice*, 5:52–66.
- Egeln, L. S. and Joseph, J. A. (2012). Shopping cart abandonment in online shopping. *Atlantic Marketing Journal*, 1. Available online at: <https://digitalcommons.kennesaw.edu/>.
- Esper, T. L., Jensen, T. D., Turnipseed, F. L., and Burton, S. (2003). The last mile: An examination of effects of online retail delivery strategies on consumers. *Journal of Business Logistics*, 24:177–203.
- Farfetch (2018a). *About Farfetch*. (accessed in 5th April 2022). Available online at: <https://aboutfarfetch.com/>.

- Farfetch (2018b). *Farfetch Limited Launches Initial Public Offering*. (accessed in 5th April 2022). Available online at: <https://www.farfetchinvestors.com/financial-news/news-details/2018/Farfetch-Limited-Launches-Initial-Public-Offering/default.aspx>.
- Farfetch (2022a). *Farfetch Group*. (accessed in 5th April 2022). Available online at: <https://farfetchgroupcareers.com/our-group>.
- Farfetch (2022b). *Farfetch Share Price*. (accessed in 5th April 2022). Available online at: [Availableonlineat:https://www.farfetchinvestors.com/investor-resources/share-price/default.aspx](https://www.farfetchinvestors.com/investor-resources/share-price/default.aspx).
- Farfetch (2022c). *Loyalty Programme*. (accessed in 13th May 2022). Available online at: <https://www.farfetch.com/pt/farfetch-access-programme>.
- Fatta, D. D., Patton, D., and Viglia, G. (2018). The determinants of conversion rates in sme e-commerce websites. *Journal of Retailing and Consumer Services*, 41:161–168.
- Forbes (2021). *Growth Of Online Luxury Marketplaces Continues In 2021*. (accessed in 12th June 2022). Available online at: www.forbes.com/sites/kaleighmoore/2021/08/30/growth-of-online-luxury-marketplaces-continues-in-2021/.
- Frederick, S., Lee, L., and Baskin, E. (2014). The limits of attraction. *Journal of Marketing Research*, LI:487–507.
- Frischmann, T., Hinz, O., and Skiera, B. (2012). Retailers' use of shipping cost strategies: Free shipping or partitioned prices? *International Journal of Electronic Commerce*, 16:65–88.
- Gale, D. (1955). The law of supply and demand. *Mathematica Scandinavica*, 3:155–169.
- Gokal, K. (2019). *Store of the Future: Revolutionising Luxury Retail One Store at a Time*. (accessed in 5th April 2022). Available online at: <https://www.farfetchtechblog.com/en/>.
- Goldmanis, M., Hortaçsu, A., Syverson, C., and Önsel Emre (2010). E-commerce and the market structure of retail industries. *Economic Journal*, 120:651–682.
- Gudigantala, N., Bicen, P., and in) Eom, M. T. (2016). An examination of antecedents of conversion rates of e-commerce retailers. *Management Research Review*, 39:82–114.
- Guillet, B. D. (2020). Online upselling: Moving beyond offline upselling in the hotel industry. *International Journal of Hospitality Management*, 84.
- Gümüş, M., Li, S., Oh, W., and Ray, S. (2013). Shipping fees or shipping free? a tale of two price partitioning strategies in online retailing. *Production and Operations Management*, 22:758–776.
- Hall, R. W. (1996). Pickup and delivery systems for overnight carriers. *Transportation Research Part A: Policy and Practice*, 30:173–187.
- Hannak, A., Soeller, G., Lazer, D., Mislove, A., and Wilson, C. (2014). Measuring price discrimination and steering on e-commerce web sites. *Proceedings of the ACM SIGCOMM Internet Measurement Conference, IMC*, pages 305–318.
- Har, L. L., Rashid, U. K., Chuan, L. T., Sen, S. C., and Xia, L. Y. (2022). Revolution of retail industry: From perspective of retail 1.0 to 4.0. *Procedia Computer Science*, 200:1615–1625.

- Huang, W. H., Shen, G. C., and Liang, C. L. (2019). The effect of threshold free shipping policies on online shoppers' willingness to pay for shipping. *Journal of Retailing and Consumer Services*, 48:105–112.
- Huang, Y. S., Chen, S. H., and Ho, J. W. (2013). A study on pricing and delivery strategy for e-retailing systems. *Transportation Research Part E: Logistics and Transportation Review*, 59:71–84.
- Huber, J. and Puto, C. (1983). Market boundaries and product choice: Illustrating attraction and substitution effects. *Journal of Consumer Research*, 10:31–44.
- Hummels, D., Lugovskyy, V., and Skiba, A. (2009). The trade reducing effects of market power in international shipping. *Journal of Development Economics*, 89:84–97.
- Izogo, E. E. and Jayawardhena, C. (2018). Online shopping experience in an emerging e-retailing market. *Journal of Research in Interactive Marketing*, 12:193–214.
- Jaiswal, S. and Singh, A. (2020). Influence of the determinants of online customer experience on online customer satisfaction. *Paradigm*, 24:41–55.
- Jiang, Y., Shang, J., and Liu, Y. (2013). Optimizing shipping-fee schedules to maximize e-tailer profits. *International Journal of Production Economics*, 146:634–645.
- Jiang, Y., Shang, J., Liu, Y., and May, J. (2015). Redesigning promotion strategy for e-commerce competitiveness through pricing and recommendation. *International Journal of Production Economics*, 167:257–270.
- Kalla, R., Murikinjeri, S., Abbaiah, R., and Samanthapudi, V. R. (2017). Price elasticity model for fashion products. *Global Journal of Pure and Applied Mathematics*, 13:3727–3737.
- Kaptein, M. C., Emden, R. V., and Iannuzzi, D. (2016). Tracking the decoy: Maximizing the decoy effect through sequential experimentation. *Palgrave Communications*, 2. Available online at: <https://www.nature.com/>.
- Kim, T. Y., Dekker, R., and Heij, C. (2017). Cross-border electronic commerce: Distance effects and express delivery in european union markets. *International Journal of Electronic Commerce*, 21:184–218.
- Klaus, P. P. (2020). The end of the world as we know it? the influence of online channels on the luxury customer experience. *Journal of Retailing and Consumer Services*, 57.
- Kukar-Kinney, M. and Close, A. G. (2010). The determinants of consumers' online shopping cart abandonment. *Journal of the Academy of Marketing Science*, 38:240–250.
- Laatikainen, G. and Ojala, A. (2019). Pricing of digital goods and services. *Selected Papers of the IRI*, 9:1–16.
- Lee, K. S. and Tan, S. J. (2003). E-retailing versus physical retailing. a theoretical model and empirical test of consumer choice. *Journal of Business Research*, 56:877–885.
- Lewis, M. (2006). The effect of shipping fees on customer acquisition, customer retention, and purchase quantities. *Journal of Retailing*, 82:13–23.

- Loureiro, S. M. C. and de Araújo, C. M. B. (2014). Luxury values and experience as drivers for consumers to recommend and pay more. *Journal of Retailing and Consumer Services*, 21:394–400.
- LuisaViaRoma (2022). *Shipment and Fees*. (accessed in 10th June 2022). Available online at: <https://www.luisaviaroma.com/en-us/contactus/shipment-fees>.
- Ma, S. (2017). Fast or free shipping options in online and omni-channel retail? the mediating role of uncertainty on satisfaction and purchase intentions. *The International Journal of Logistics Management*, 28:1099–1122.
- Marquez, J. (1990). Bilateral trade elasticities. *The Review of Economics and Statistics*, 72:70–77.
- MatchesFashion (2022). *Delivery*. (accessed in 10th June 2022). Available online at: <https://www.matchesfashion.com/us/delivery>.
- ModaOperandi (2022). *Shipping Times and Costs*. (accessed in 10th June 2022). Available online at: <https://help.modaoperandi.com/>.
- Morcillo, F. M. (2006). *Principios de economia*. McGRAW-HILL, 3 edition.
- MrPorter (2022). *Delivery*. (accessed in 10th June 2022). Available online at: <https://www.mrporter.com/en-us/content/help/delivery/>.
- Mytheresa (2022). *Shipping Information*. (accessed in 10th June 2022). Available online at: https://www.mytheresa.com/euro_en/customer-care/shipping/.
- NetaPorter (2022). *Delivery*. (accessed in 10th June 2022). Available online at: <https://www.net-a-porter.com/en-us/content/help/delivery/>.
- Nguyen, D. H., de Leeuw, S., Dullaert, W., and Foubert, B. P. (2019). What is the right delivery option for you? consumer preferences for delivery attributes in online retailing. *Journal of Business Logistics*, 40:299–321.
- Perdikaki, O., Kesavan, S., and Swaminathan, J. M. (2011). Effect of traffic on sales and conversion rates of retail stores. *Manufacturing & Service Operations Management*, 14:145–162.
- Roks, T. (2015). The decoy effect versus ewom. Master's thesis, University Rotterdam. Available online at: <http://hdl.handle.net/2105/18725>.
- Rose, S., Hair, N., and Clark, M. (2011). Online customer experience: A review of the business-to-consumer online purchase context. *International Journal of Management Reviews*, 13:24–39.
- Shampanier, K., Mazar, N., and Ariely, D. (2007). Zero as a special price: The true value of free products. *Marketing Science*, 26:742–757.
- Shao, X. F. (2017). Free or calculated shipping: Impact of delivery cost on supply chains moving to online retailing. *International Journal of Production Economics*, 191:267–277.
- Sherlin, I., Ferry, S., and Sarmigi, E. (2020). *Analysing the Decoy Effect on Online Product Purchasing Preference: An Experimental Study*. Available online at: <https://www.atlantis-press.com/>.

- Soh, C. Q. Y., Rezaei, S., and Gu, M. L. (2017). A structural model of the antecedents and consequences of generation y luxury fashion goods purchase decisions. *Young Consumers*, 18:180–204.
- Song, J. D. (2019). A study on online shopping cart abandonment: A product category perspective. *Journal of Internet Commerce*, 18:337–368.
- Statista (2022). *Retail e-commerce sales worldwide from 2014 to 2025*. (accessed in 20th April 2022). Available online at: <https://www.statista.com/statistics/379046/worldwide-retail-e-commerce-sales/#:~:text=In%202021%2C%20retail%20e-commerce,7.4%20trillion%20dollars%20by%202025>.
- Ulmer, M. W. and Thomas, B. W. (2018). Same-day delivery with heterogeneous fleets of drones and vehicles. *Networks An International Journal*, 72:475–505.
- Vakulenko, Y., Shams, P., Hellström, D., and Hjort, K. (2019). Service innovation in e-commerce last mile delivery: Mapping the e-customer journey. *Journal of Business Research*, 101:461–468.
- Walczuch, R. and Lundgren, H. (2004). Psychological antecedents of institution-based consumer trust in e-retailing. *Information and Management*, 42:159–177.
- Yaman, H., Karasan, O. E., and Kara, B. Y. (2012). Release time scheduling and hub location for next-day delivery. *Operations Research*, 60. Available online at: <https://pubsonline.informs.org/>.
- Yang, S. and Lynn, M. (2014). More evidence challenging the robustness and usefulness of the attraction effect. *Journal of Marketing Research*, 51:508–513.
- Yao, Y. and Zhang, J. (2012). Pricing for shipping services of online retailers: Analytical and empirical approaches. *Decision Support Systems*, 53:368–380.
- Zhao, Y. B., Wu, G. Z., Gong, Y. X., Yang, M. Z., and Ni, H. G. (2019). Environmental benefits of electronic commerce over the conventional retail trade? a case study in shenzhen, china. *Science of the Total Environment*, 679:378–386.

Appendix A

Model Notation

A.1 Indices

- i Options in the TO-BE situation
- j Options in the AS-IS situation
- t Id of an auxiliary variable
- c Scenarios
- k Id of an auxiliary variable

A.2 Parameters

- a_j Shipping Income in the AS-IS situation for option j (\$)
- b_j Percentage of portal orders in the AS-IS situation for option j
- p_i Percentage of portal orders in the TO-BE situation for option i
- min_i Minimum Shipping Income in the TO-BE situation for option i (\$)
- max_i Maximum Shipping Income in the TO-BE situation for option i (\$)

A.3 Decision and Auxiliary Variables

- X_i Shipping Income in the TO-BE situation for option i (\$)
- Y_t Auxiliary binary variable t
- $Z_{c,k}$ Auxiliary binary variable k for a given scenario c

Appendix B

Input and Output Data of the Integer Programming Model

Table B.1: Parameters' values for the AS-IS scenario for Hong Kong, Australia, and Japan

Destination Country	Order Value Type	Shipping Service	Parameter SI / PO	Parameter %POs
Hong Kong	Below	Express	\$ 24	27%
	Above	Express	\$ 10	20%
	Below	FS	\$ 0	3%
	Above	FS	\$ 0	51%
Australia	Below	Express	\$ 22	22%
	Above	Express	\$ 7	59%
	Below	FS	\$ 0	3%
	Above	FS	\$ 0	15%
Japan	Below	Express	\$ 37	17%
	Above	Express	\$ 14	51%
	Below	FS	\$ 0	9%
	Above	FS	\$ 0	23%

Table B.2: Values of the parameters and decision variables for the TO-BE scenario for Hong Kong, Australia, and Japan

Destination Country	Order Value Type	Shipping Service	Decision Variable	Parameter %POs	Parameter Minimum	Parameter Maximum
Hong Kong	Below	Standard	\$ 24	21%	\$ 10	\$ 30
	Below	Express	\$ 37	5%	\$ 20	\$ 37
	Above	Standard	\$ 10	16%	\$ 5	\$ 22
	Above	Express	\$ 23	4%	\$ 15	\$ 30
	Below	FS	\$ 0	2%	-	-
	Below	Upgrade	\$ 37	1%	-	-
	Above	FS	\$ 0	41%	-	-
	Above	Upgrade	\$ 23	10%	-	-
Australia	Below	Standard	\$ 22	18%	\$ 22	\$ 30
	Below	Express	\$ 37	4%	\$ 22	\$ 37
	Above	Standard	\$ 7	47%	\$ 7	\$ 22
	Above	Express	\$ 22	12%	\$ 7	\$ 30
	Below	FS	\$ 0	3%	-	-
	Below	Upgrade	\$ 37	1%	-	-
	Above	FS	\$ 0	12%	-	-
	Above	Upgrade	\$ 22	3%	-	-
Japan	Below	Standard	\$ 30	13%	\$ 5	\$ 30
	Below	Express	\$ 37	3%	\$ 5	\$ 37
	Above	Standard	\$ 18	40%	\$ 5	\$ 22
	Above	Express	\$ 25	10%	\$ 5	\$ 30
	Below	FS	\$ 0	8%	-	-
	Below	Upgrade	\$ 37	2%	-	-
	Above	FS	\$ 0	19%	-	-
	Above	Upgrade	\$ 25	5%	-	-

Appendix C

Delivery Prices in Luxury Industry

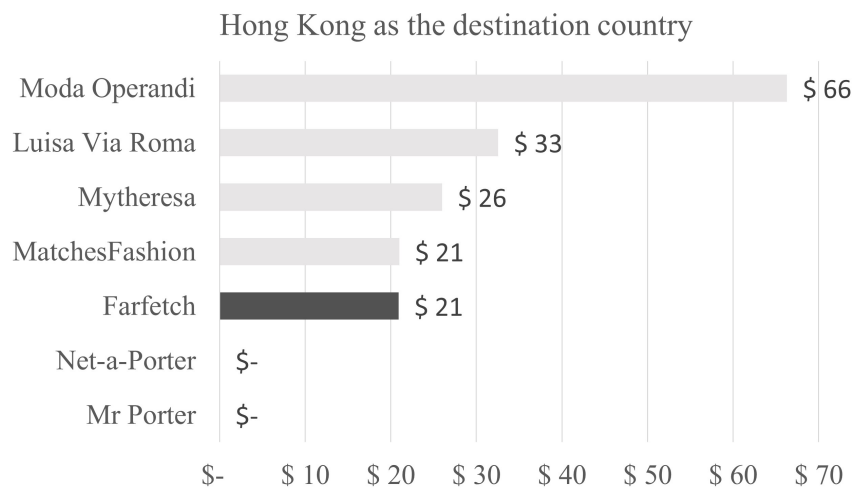


Figure C.1: Average per-order delivery prices charged by Farfetch and its competitors for Hong Kong



Figure C.2: Average per-order delivery prices charged by Farfetch and its competitors for Australia

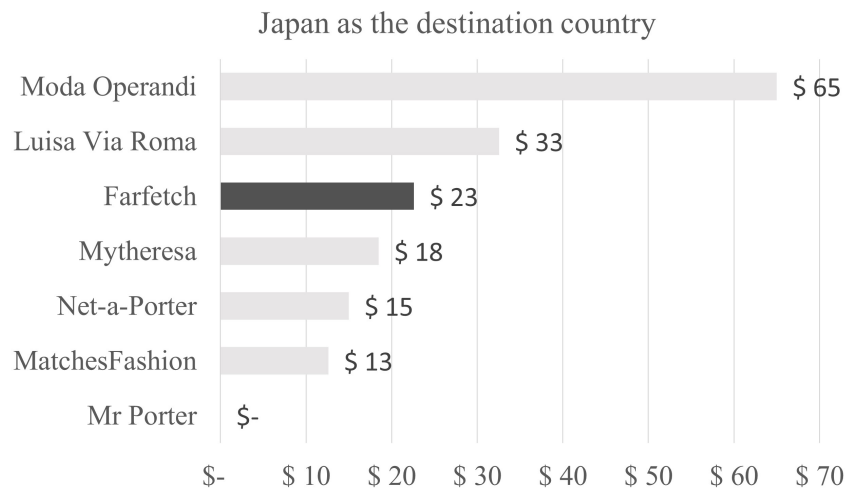


Figure C.3: Average per-order delivery prices charged by Farfetch and its competitors for Japan

It is worth noting that the data was retrieved online from each business's website (NetaPorter, 2022; Mytheresa, 2022; LuisaViaRoma, 2022; MatchesFashion, 2022; ModaOperandi, 2022; Mr-Porter, 2022), and the fees correspond to an overall average given the demand. On the one hand, with the exception of Moda Operandi, who only offers Standard service, the rivals simply have Express delivery, so the price was directly obtained without having to evaluate each one's demand. On the other hand, the average price of Farfetch was computed bearing in mind the distribution of POs observed between May 25th and June 25th, 2022, in other words, after the implementation of the new strategy.

Appendix D

Review Conversion Rate Variation

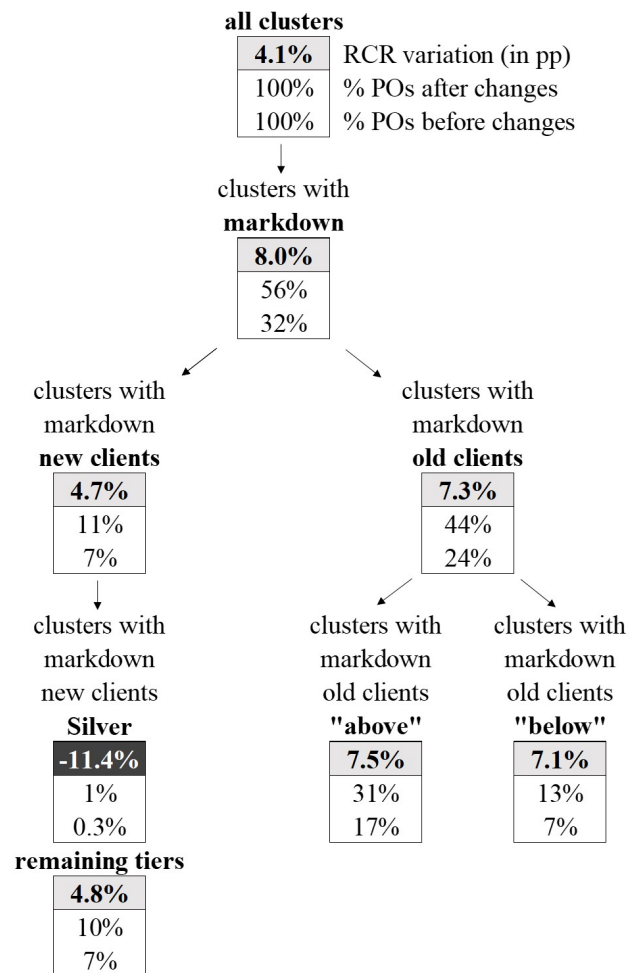


Figure D.1: Review Conversion Rate variation in cluster groups with markdown orders for Hong Kong, along with portal orders' percentage before and after changes

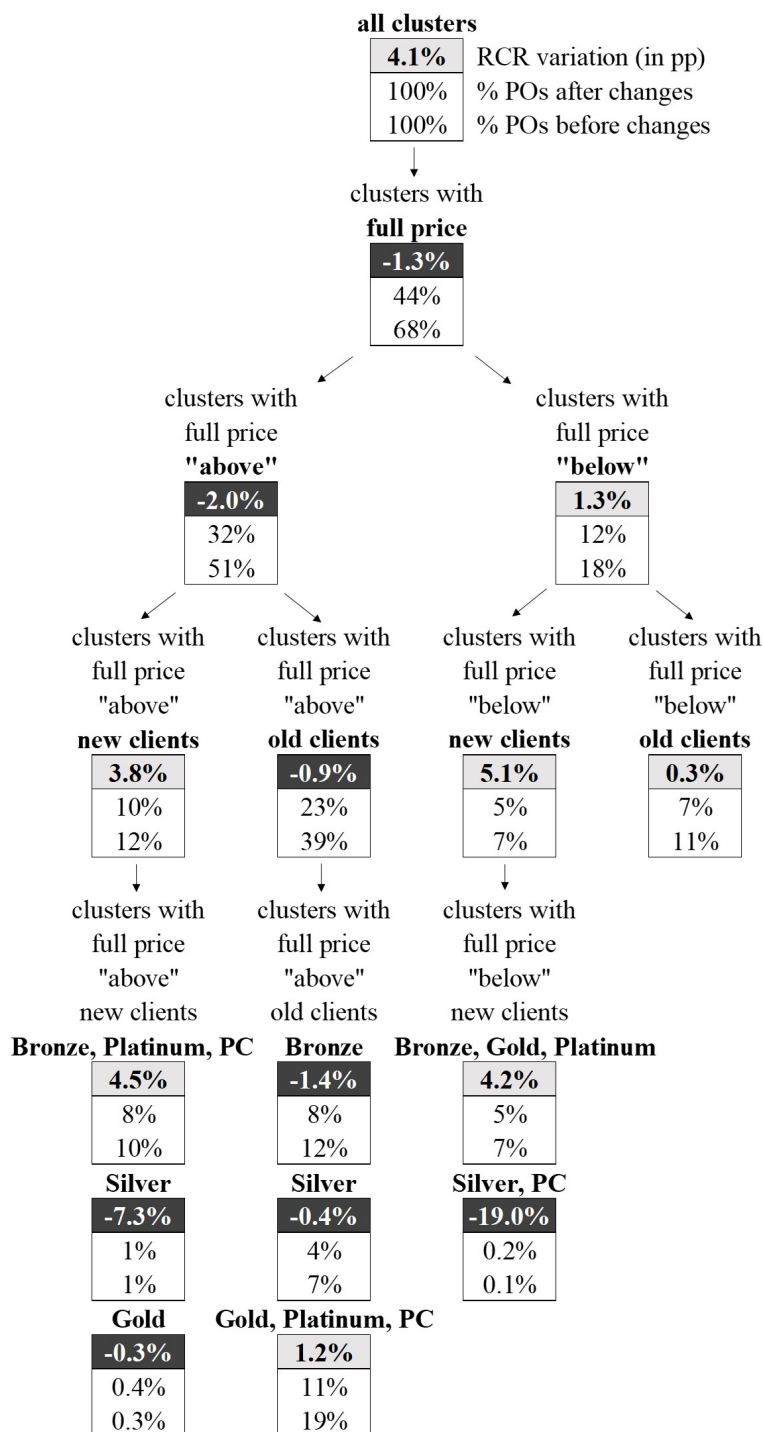


Figure D.2: Review Conversion Rate variation in cluster groups with full price orders for Hong Kong, along with portal orders' percentage before and after changes

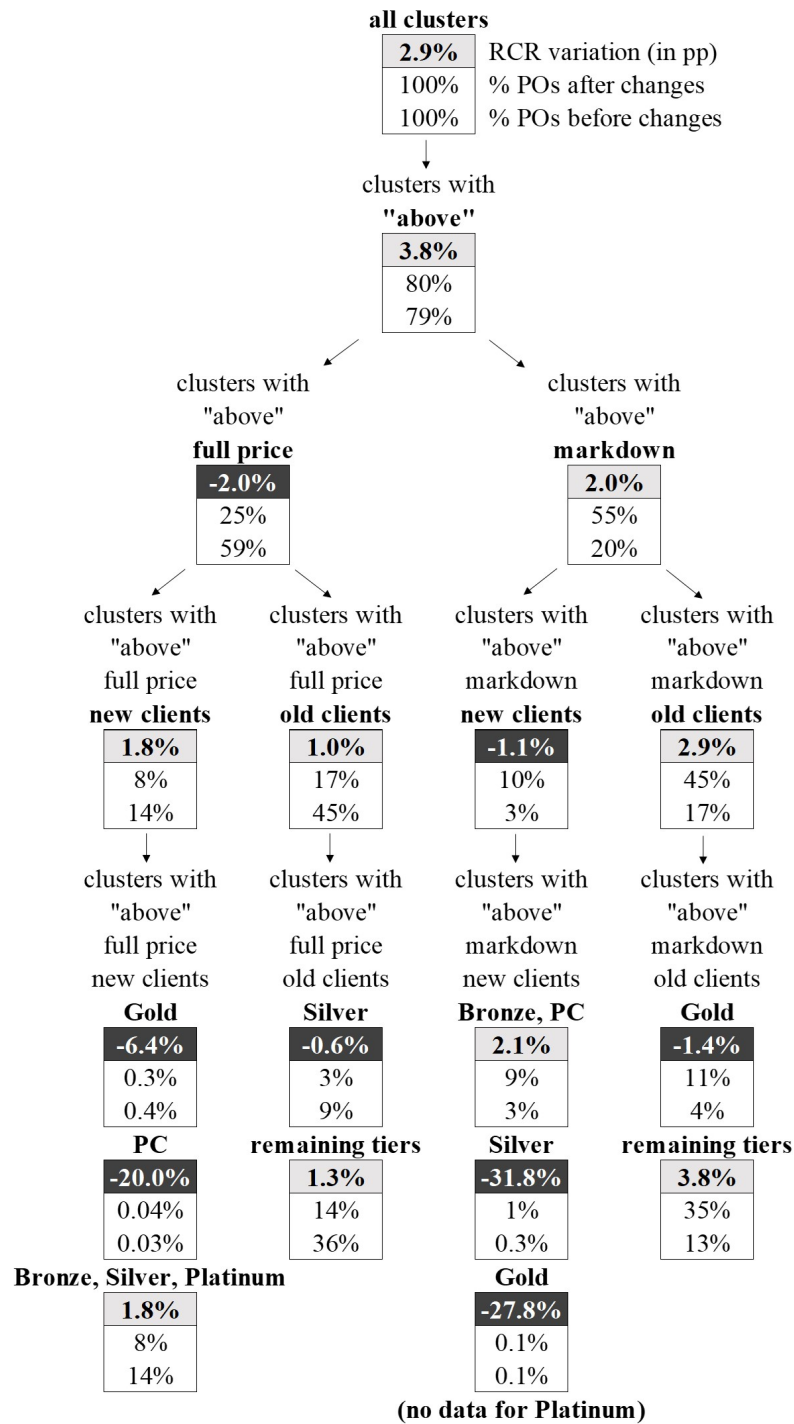


Figure D.3: Review Conversion Rate variation in cluster groups with above-threshold orders for Australia, along with portal orders' percentage before and after changes

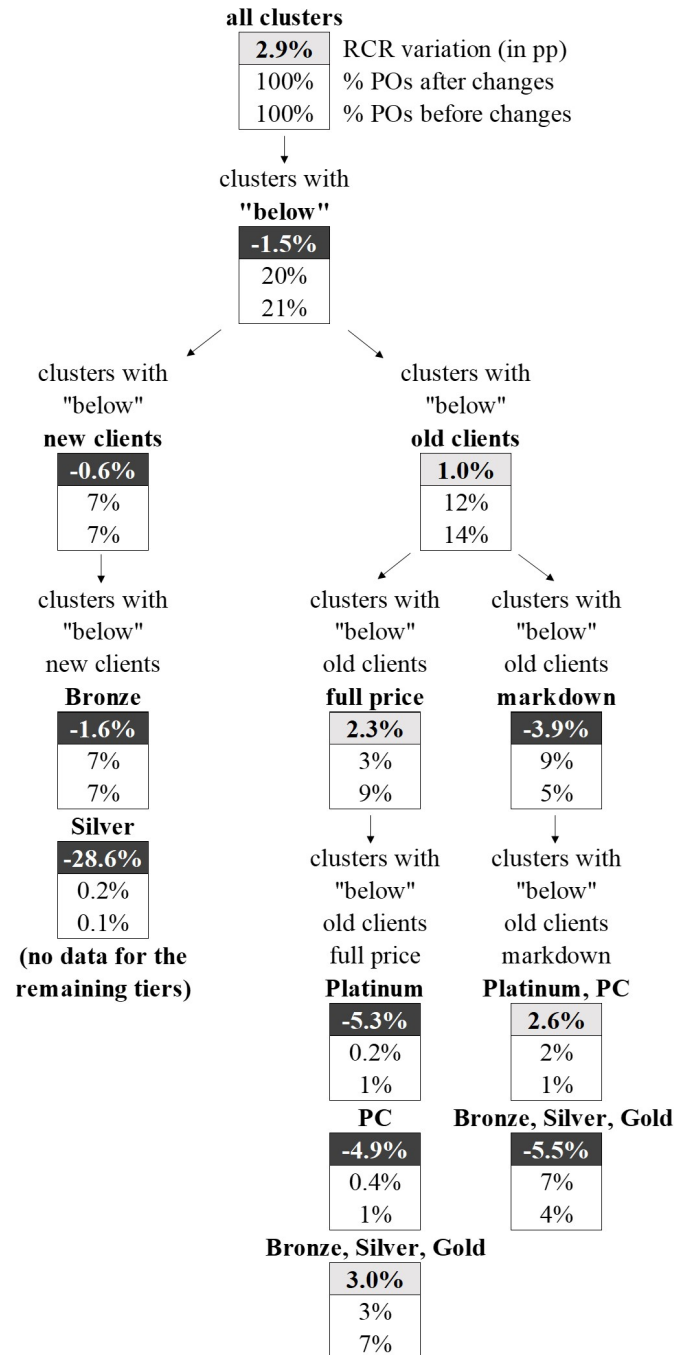


Figure D.4: Review Conversion Rate variation in cluster groups with below-threshold orders for Australia, along with portal orders' percentage before and after changes

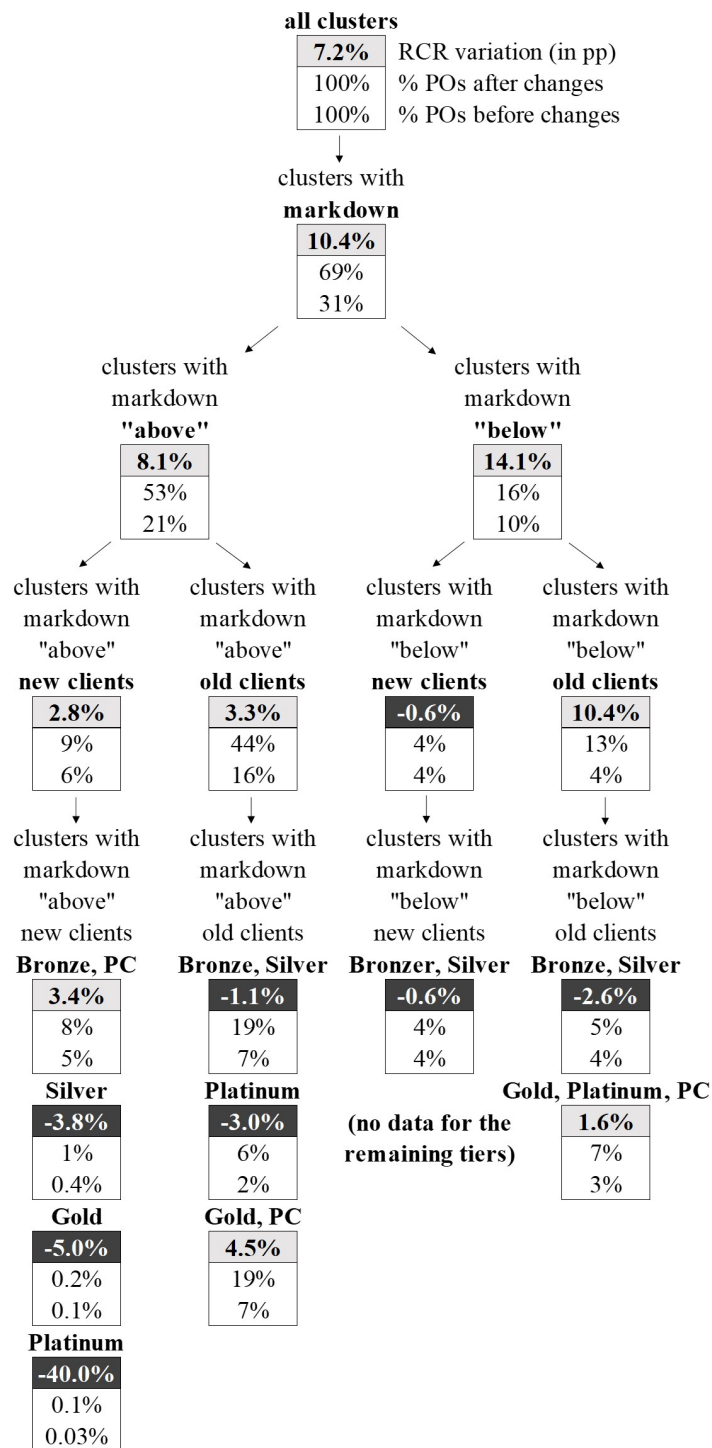


Figure D.5: Review Conversion Rate variation in cluster groups with markdown orders for Japan, along with portal orders' percentage before and after changes

