LUISS

Degree Program in Economics and Business

Course of IO & Competition Theory

The Price is Right, but Is it Fair? Price Discrimination in the Digital Economy: an Empirical Analysis of Booking.com

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"Il mio maestro mi insegnò com'è difficile trovare l'alba dentro l'imbrunire"

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Abstract

This paper explores the investigation of price discrimination on Booking.com in the context of the digital economy, emphasizing the potential consequences for both consumers and travel service providers (TSPs). The study examines the distribution and the effect of different discount strategies used by Booking.com by applying web-scraping techniques. Smaller hotels are more likely to offer multiple discounts, according to the findings, which show a strong correlation between hotel size and discount offerings. The number of reviews, hotel ranking, and distance from city centers are among the factors that impact discount likelihood that can be determined through logistic regression analysis. The study follows the theoretical foundation of price discrimination by demonstrating how Booking.com applies price discrimination through the use of different pricing strategies.

Introduction

Many industries have been transformed by the emergence of the digital economy, and the travel and tourism industry is one of the primary recipients of this change. Online Travel Agencies (OTAs) such as Booking.com have revolutionized how people plan and book their vacations, providing convenience, extensive options, and competitive pricing. These advantages do, however, come with the increasingly complex practice of price discrimination, in which prices are determined not only by supply and demand but also by the individual characteristics and behaviors of consumers. This study revolves around Booking.com, a leading player in the OTA market. Examining price discrimination's implementation and effects on travel service providers (TSPs) and consumers has been rendered more accessible by the platform's extensive use of discounts and dynamic pricing algorithms. First-degree, second-degree, and third-degree discrimination are all included in the theoretical framework of price discrimination; each has unique traits and ramifications.

This study examines pricing trends and discount distributions on Booking.com using empirical data gathered via web-scraping techniques. The thesis aims to investigate the different pricing strategies and scrutinize the underlying mechanisms of price discrimination, as well as their influence on market dynamics. Among the issues this thesis attempts to answer are:

- How does Booking.com carry out price discrimination?
- What are the main determinants of hotels' propensity to provide discounts on the platform?

The study's conclusions add to the existing knowledge of price discrimination in digital marketplaces by bringing to light the possible advantages of this practice as well as the ethical implications thereof. This research offers a thorough understanding of the state of price discrimination in the digital travel industry today by combining theoretical perspectives with empirical observations. Its implications have significance for consumers, industry stakeholders, and policy makers alike.

Price is what you pay, value is what you get.

Warren Buffett

1 - Overview of the OTA Market

The internet revolutionized travel-related services. Traditionally reliant on brochures and physical agents, travelers can now research, compare, and book flights, hotels, and activities directly online. Today, online platforms allow consumers to book entire trips with a few clicks.
An online travel agency (OTA) is a web-based platform that allows consumers to research and book travel products and services directly with travel suppliers[1].
Online intermediation and booking services offered through OTAs allow two interdependent groups of users, *i.e.,* consumers and travel service providers (TSP), to be connected through a platform.
A general definition of *online platform* is provided by Bahadır Balkı:

> "An online platform is a digital service connecting two or more interrelated sets of customers on different sides of the market; these sets of customers may be businesses and/or individuals and the platform may create commercial and/or social networking opportunities."[2]

In this regard, OTA platforms are a typical example of a two-sided market, which connects two different groups of users in such a way that the demand of one group influences the demand of the other[3].
OTAs play the role of the *middleman*, mediating and setting the transactions' standards between the two parties (providers and final consumers).
Like other digital platforms, OTAs exhibit direct and indirect network effects. On this basis, the greater the number of consumers using a certain OTA platform, the more attractive it will be for TSPs to list their inventory on the OTA. Similarly, the greater the number of TSPs present on an OTA platform, the more attractive it will be for consumers to use the OTA[4].
From the consumer's point of view, the most important feature of OTAs is the ability to compare different offerings of multiple providers, in terms of characteristics, prices, number of reviews and the ratings given by users who have already purchased a product or a service of the TSPs.
This point is of particular importance; indeed, the question of whether to distinguish the online direct channels of TSPs from OTA platforms could arise.
In the TSPs' perspective, an OTA platform allows, especially to the smaller facilities, to reach an infinitely greater number of potential customers than could be achieved through their own online direct channels and to serve groups of consumers or geographic markets that would otherwise be unreachable. At the same time, the platforms provide complementary services (such as targeted advertising, secure payment systems, bookings functionalities), which allow companies to significantly reduce transaction costs so as to be able to grow with more limited investments.

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[1] *What's an online travel agency (OTA) & Why Do You Need One?. Expedia Group*. Welcome to Expedia Group. (n.d.-b). https://welcome.expediagroup.com/en/resources/hotel-distribution-strategy-resources-tips/otas-work-use one#:~:text=What%20is%20an%20OTA%3F,more%2C%20directly%20with%20travel%20suppliers
[2] *Bahadır Balkı. Global Dictionary of Competition Law, Concurrences. Art. N° 112963.*
[3] Anticipated acquisition by Booking Holdings Inc. of certain activities of eTraveli Group AB (CMA September 29, 2022).
[4] *Id.* at 22

The characteristics of OTAs just mentioned seem to suggest that the online direct channels of TSPs cannot fall within the same definition and relevant product market as the OTAs: only OTAs offer consumers the possibility of searching for and comparing the offers of multiple facilities, as TSPs don't usually promote or link their offerings to the ones provided by the rivals[5].
Indeed, there is a limited demand-side substitution between OTA services and the online direct channels of TSPs, which has led antitrust authorities to conclude that OTAs constitute a distinct relevant product market[6].
Today, the distribution of sales between online- and offline-conducted business in the tourism industry is tending towards the online activities, which now account for ca. 70% of the revenues[7].

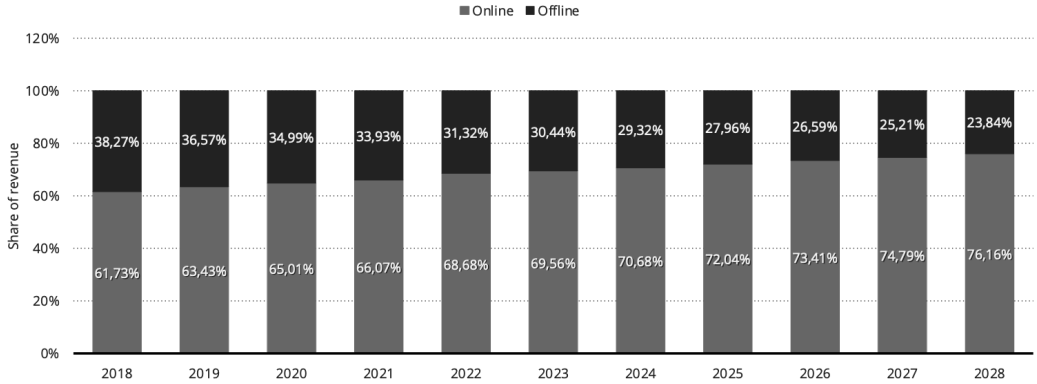

Figure 1 - Revenue share of sales channels of the travel and tourism market worldwide from 2018 to 2028

Since the foundation of what is recognized to be the first-ever OTA, Hotels.com[8], the online travel industry has grown steadily[9] (apart from the pandemic), with a combined revenue of more than 500 billion U.S. dollars.

[5] Provvedimento n. 31126 (AGCM March 15, 2024).
[6] *Supra* note 3.
[7] Statista. (February 16, 2024). Revenue share of sales channels of the travel and tourism market worldwide from 2018 to 2028 [Graph]. In *Statista*. Retrieved April 15, 2024, from https://www.statista.com/forecasts/1239068/sales-channels-travel-tourism-worldwide
[8] Hotels.com, originally Hotel Reservation Network (HRN), began in 1991 as the first ever toll-free hotel booking service. By 2002, it became Hotels.com and rapidly expanded online, launching 29 travel booking websites in just two years.
[9] Statista. (December 1, 2023). Online travel market size worldwide from 2017 to 2023, with a forecast until 2028 (in billion U.S. dollars) [Graph]. In *Statista*. Retrieved April 14, 2024, from https://www.statista.com/statistics/1179020/online-travel-agent-market-size-worldwide/

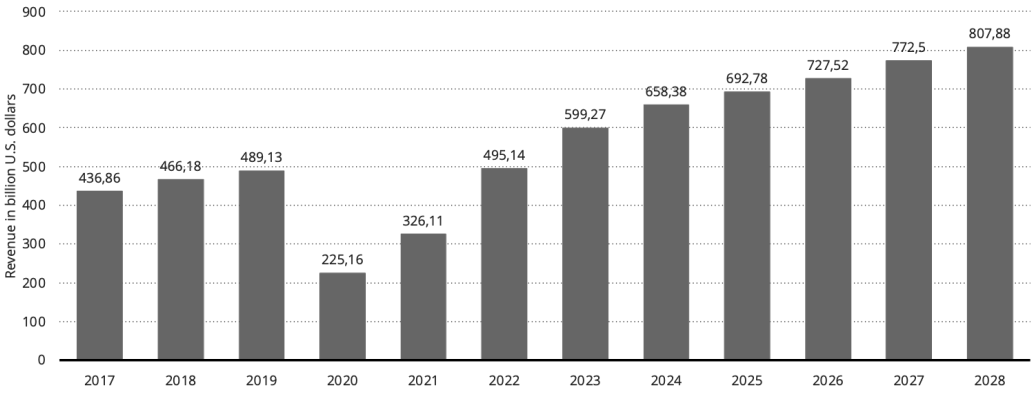

Figure 2 - Online Travel market size from 2017 to 2023 with a forecast to 2028 (in billion USD)

In the hotel OTA market, two firms (Booking.com and Expedia) have acquired a position of absolute importance.
The two companies also manage a vast network of related services, from car-rental activities to meta-search engines. Namely, Booking also controls Priceline, Agoda, Kayak, Rentalcars.com among others. Expedia, instead, controls the homonymous service and Hotels.com, VRBO, Travelocity, Hotwire, Orbitz, eBookers, Trivago among others. It is important to mention that, as stated by the CMA:

> "The range of travel products (including accommodations and flights) available for comparison and booking is one of the main factors that consumers consider when comparing suppliers of OTA services"[10].

Thus, the network effects that the two platforms are endowed with added to the array of complementary services offered by them explains the solid significance of the two companies.

1.1 - The Consumers' Side

On the consumers' side, Booking.com and Expedia mediate a significant portion of hotel reservations both in Europe and in the USA[11].
Although similar, the market structure in these two regions differs: the Expedia Group is focused on the American market[12] (where it enjoys a greater market share), while Booking concentrates in Europe[13].
The two companies are the preferred medium of reservations for hotels in Europe, Booking being first and Expedia second[14].

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[10] These affirmations are the result of several interviews conducted by the CMA to several travel service providers. *Supra* note 3.
[11] *Siteminder's Hotel Booking Trends*. SiteMinder. (2024, March 12). https://www.siteminder.com/hotel-booking-trends/
[12] The source of this claim is a report produced by the brokerage firm BTIG. According to the report, 55-60% of Booking.com business is concentrated in Europe, while 60% of Expedia activities are centered in the USA. In *Skift*. Retrieved April 25, 2024, from https://skift.com/2023/08/07/has-expedia-blunted-bookings-u-s-market-share-gains/
[13] HOTREC. (June 14, 2022). Relative market share of major online travel agencies (OTAs) in Europe in 2021 [Graph]. In *Statista*. Retrieved March 04, 2024, from https://www.statista.com/statistics/870046/online-travel-agency-ota-market-share-in-europe/
[14] *Supra* note 11.

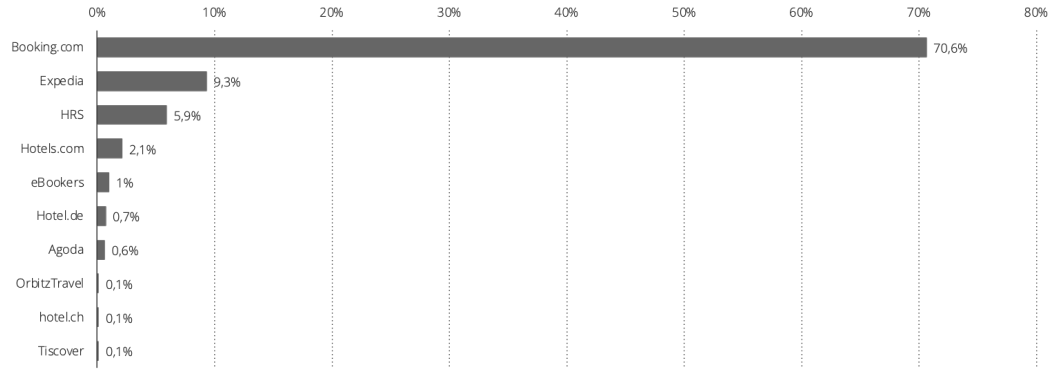

Figure 3 - Relative market share of major online travel agencies (OTAs) in Europe in 2021

Both companies have a large number of monthly-active users. In the EU, where this metric is particularly relevant[15], Booking exceeds 45 million active users per month[16], while Expedia acknowledges to have ca. 17 million active users.
The European Commission describes users as "recipients of the service", which are defined, under the DSA[17], as:

> "Any natural or legal person who uses an intermediary service, in particular for the purposes of seeking information and making it accessible".

This definition requires to count as "recipients" the number of people who see information on a platform, regardless of whether they make a transaction or not.
The platforms are accessible either from a website or from an app. As expected from the data on their market shares, Booking and Expedia obtain large shares of the total visits and downloads.
As of April 2024, the time in which we are writing, Booking.com is the most visited OTA website in the world[18], with more than 500 million visits per month; Expedia follows with about 90 million visits.
In 2023, Booking was also the most downloaded OTA app worldwide, with 76.45 million downloads, while the Expedia app was downloaded 21.95 million times[19].
Conceivably, OTAs matter especially to the younger, tech-savvy portions of the population. As it appears from Figure 4, Millennials and Gen Z think it is important to be able to book trips entirely online more than Gen X and Baby Boomers.

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[15] The number of monthly-active users is one of the metrics used to assess which platform qualifies as a *VLOP* (Very Large Online Platform) under the DSA (Digital Services Act), which is a regulation aimed at the protection of EU users in digital markets. *Regulation (EU) 2022/2065 of the European Parliament and of the Council of 19 October 2022 on a Single Market For Digital Services and amending Directive 2000/31/EC (Digital Services Act).*
[16] *Digital Services Act*. Booking.com. (n.d.). https://www.booking.com/about
[17] *Supra* note 15 at 3.
[18] SimilarWeb. (April 1, 2024). Most visited travel and tourism websites worldwide as of April 2024 (in million visits) [Graph]. In *Statista*. Retrieved April 17, 2024, from https://www.statista.com/statistics/1215457/most-visited-travel-and-tourism-websites-worldwide/
[19] AppMagic. (April 2, 2024). Number of aggregated downloads of selected leading online travel agency apps worldwide in 2023 (in millions) [Graph]. In *Statista*. Retrieved April 17, 2024, from https://www.statista.com/statistics/1229193/most-downloaded-online-travel-agency-apps-globally/

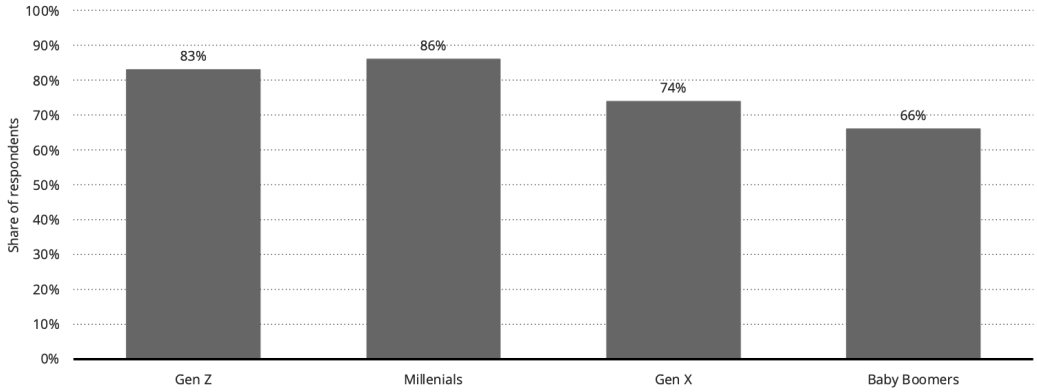

Figure 4 - Share of travelers who think it is important to be able to book their trip entirely online worldwide as of July 2023, by generation.

This characteristic also reflects on the market's revenues. Millennials account for 33% of the total revenues[20], and 52% of them prefer to book their trips entirely through an OTA service[21].
The *comparability* feature, combined with the large bundle of connected services (car-rentals, flights, experiences), and the general ease of use of OTA platforms improve the consumer's experience in their bookings.

1.2 - The Travel Service Providers' Side

The relevance of OTAs also extends to the supply side of the platform.
According to a survey report produced by the European Commission[22], all the interviewed[23] hotel chains, along with individual hotels within those chains, confirmed using multiple platforms.
This is not limited to hotel chains; most independent hotels (72%) use more than one platform, with Booking.com being the most adopted OTA (used by 88% of respondents). Expedia follows at 61%[24].
The majority of hotels decided to add OTAs to their distribution channels, as it appears from Table 1[25].

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[20] Feinstein, E. (2018, February 23). *Ota's VS. direct hotel bookings: Which is the leading trend for 2018?* TravelDailyNews International. https://www.traveldailynews.com/column/articles/otas-vs-direct-hotel-bookings-which-is-the-leading-trend-for-2018/
[21] *Id.*
[22] Final Report of the European Commission (2022) on *Market study on the distribution of hotel accommodation in the EU COMP/2020/OP/002*.
[23] The individual interviews have been conducted based on the computer-assisted telephone interviewing (CATI) method. It is a telephone surveying technique in which the interviewer follows a script provided by a software application.
[24] *Supra* note 22 at 65.
[25] *Id.* at 32.

	Hotels that belong to a hotel chain (N=15)	%	Independent hotels not using OTAs (N=77)	%	Total individual hotels (N=377)	%
Direct offline sales channels	12	**80%**	60	**78%**	300	**80%**
Online Travel Agencies	15	**100%**	0	**0%**	322	**85%**
Direct online sales channels (hotel website, chain website)	14	**93%**	41	**53%**	293	**78%**
Offline travel agencies and tour operators	6	**40%**	13	**17%**	121	**32%**
Bed wholesalers/bed banks (for example, Hotelbeds)	2	**13%**	4	**5%**	45	**12%**

Table 1 - Sales channels used in 2021 by all hotels in the sample[26].

As indicated by the same report, smaller hotels depend more on OTAs for bookings. Micro and small hotels get nearly half (46.2% and 40.5% respectively) of their sales through these platforms. This is compared to medium-sized hotels, which rely on OTAs for a smaller portion of their business (27.1%).

The pattern is similar for hotel chains, though they tend to rely on OTAs even less than independent hotels[27]. This is due to the reservation patterns that chains exhibit[28]. Most of them, indeed, get a large share of their reservations from GDS mediation[29], group and corporate bookings[30].

As it was stated earlier in the chapter, this dependency may be explained by the growth opportunities that OTAs give.

Small, independent, and low-star hotels are hypothesized to have less capital to spend on promotions, to lack adequate reservation engines and to be employing untrained staff in sales and marketing[31].

Then, OTAs can be a valuable source of business intelligence for hotels.

By analyzing OTA data, hotels can gain insights into guest preferences, competitor pricing strategies, and broader industry trends. This intelligence can help hotels to

[26] *Id.*

[27] *Id.* at 65

[28] Regarding this data, some scholars have argued that some hotels may have underestimated their dependency on OTAs (particularly small, independent, and low-star ones).
Particularly, in a study conducted in 2018 (Martin-Fuentes, E., & Mellinas, J. P. (2018). "Hotels that most rely on Booking. com–online travel agencies (OTAs) and hotel distribution channels". *Tourism Review*.) the number of reviews on an OTA was used as a proxy for the number of reservations and overall hotel sales through the same OTA. Results have shown a discrepancy between the proxy data and the observed data. According to the authors of the study, the only plausible explanation for this phenomenon is that some hotels are under-reporting their dependency on OTAs in interviews.

[29] GDSs (Global Distribution Systems) are the mediation tools between the travel agents and the hotels' reservation engines. These are used by brick-and-mortar travel agencies.

[30] It must be noted that OTAs usually don't allow consumers to book more than 10 rooms in a single transaction.

[31] Mellinas, J. P. (2019). "Dependency of Spanish urban hotels on Booking. Com". *Tourism Analysis*, Vol. 24 No. 1, pp. 3-12. https://doi.org/10.3727/108354219X15458295631909

provide better services, more competitive prices, and more responsiveness to fluctuations in the demand[32].

1.3 - Conclusions and Key Figures

In the latest HOTREC[33] report[34] – which is focused on the distribution channels of hotels, bars, restaurants among others – it is observed that, in the last ten years, the market share growth in Europe is not alike for all the OTAs. Booking continues to grow, while Expedia is following a descending trend.

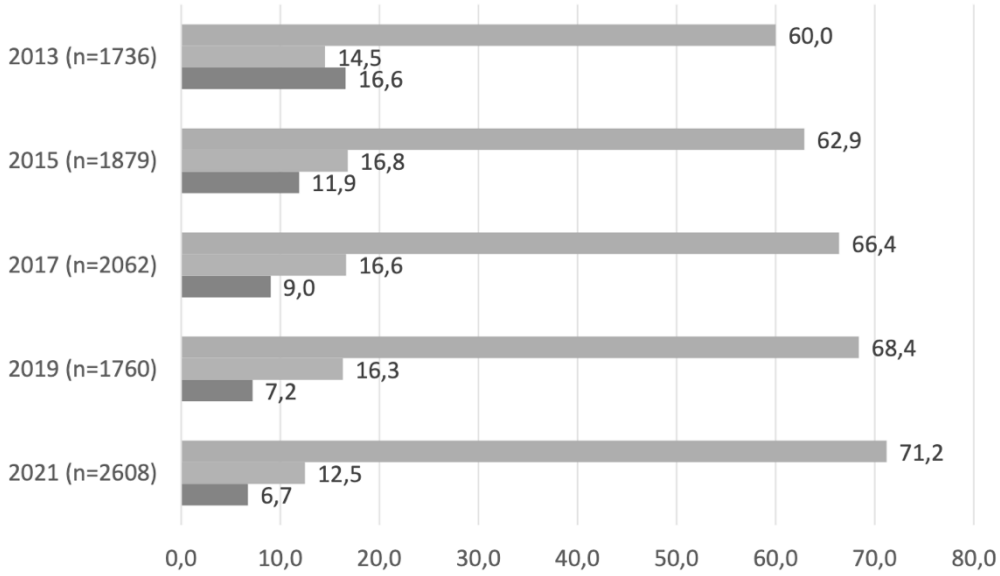

Table 2 - Unweighted relative market shares (in %) of major OTAs in Europe (2013-2021)

The situation that has been pictured (the market shares and their growth, the consumer's preferences, the hotels' preferences, alongside the importance that OTAs have for both the users and the TSPs) seems to suggest that Booking enjoys a position of dominance in the European market for OTAs, and that this position is consolidating. A summarized version of the key figures is provided in Table 3.

[32] EY Parthenon (2021). "Online travel agencies - Helping Europe's small and independent accommodations succeed in the global marketplace". https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/strategy/pdf/ey-online-travel-agents-helping-european-small-independent-accommodations.pdf

[33] "HOTREC is the umbrella association of national trade associations representing the hotels, restaurants, cafés, and similar establishments in Europe. HOTREC therefore acts as the representative of the hospitality businesses vis-à-vis the EU institutions." https://www.hotrec.eu

[34] Schegg, R. (n.d.). *European Hotel Distribution Study - 2022*. HOTREC. https://www.hotrec.eu/hotrec-hotel-distribution-study-2022-2/

	Booking	***Expedia***
Market Share	≅ 70%	≅ 15%
Monthly-active users	> 45 million	≅ 17 million
Number of global website visits	≅ 500 million	≅ 90 million
Number of global app downloads	≅ 80 million	≅ 22 million
Reservations preference ranking	1	2
Share of Hotels on the platform	≅ 88%	≅ 61%
Number of controlled brands	11	12

Table 3 - Key figures on OTAs[35]

2 - BOOKING.COM AND ITS ROLE IN THE MARKET

The Booking group is a major player in OTA services. Their website, Booking.com, is available in over 43 languages and 28 million accommodations worldwide are listed on the platform.
The group is a subsidiary of Booking Holdings Inc. (incorporated in Delaware, USA and publicly listed on NASDAQ), and encompasses several brands.
In 2023, their revenue surpassed 21 billion US dollars (nearly 20 billion euros).
Booking Group operates on a local level through dedicated companies that provide support and assistance to customers in each region.
In Europe, for instance, Booking operates as *Booking.com International B.V.* (incorporated in the Netherlands).

[35] The data on market shares, monthly-active users, consumers' preferences, and hotel presence on the platforms are relative to the European Union. The number of website visits are to be intended per month. Expedia has been included as the closest competitor.

2.1 - The Business Model

OTAs generally work on the basis of two different business models: the so-called *agency* model and the merchant *model*.
Under the *agency* model (which has been first implemented by Booking[36]), hotel rooms are distributed by the OTA, who charges the hotel a certain rate on the room price when the room is purchased through the OTA channel – a commission.
The OTA does not purchase the inventory of hotels, and both the OTA and the hotels are paid if and only if there is an effective reservation.
What this entails is that OTAs, together with the hotels, are more likely to invest in marketing expenses and promotion efforts both for the hotels listed on the platform and on the platform itself. In this model, the final consumer pays the price directly to the hotels, which then pay the agreed commission to the OTA. While this model is appealing to the consumer (with the chance to pay directly at the time of the check-in) and to the hotels (being able to manage their inventories and their prices while reducing the agency risk[37]), the OTA bears the operational risk of not securing the target reservations. Furthermore, since hotels manage the payments, they face the risk of frauds and chargebacks.[38]
Under the *merchant* model, instead, hotel rooms are purchased in bulk at a wholesale price by the OTA, which then sells the rooms to final consumers with at a mark-up. In this case, hotels get paid regardless of whether the OTA secures any reservation, thus bearing a lower operational risk. The final consumer pays directly to the OTA. Under this model, hotels may be disincentivized to invest in marketing efforts since the sales operations are outsourced to the OTA.
Contextually, the OTA gets its revenues from two streams: the first one is the commission that the OTA charges to the hotels for the services they receive (presence on the platform, marketing efforts, customer service, etc.); the second is *implicit*: indeed, the other stream of revenues is calculated as the difference between the displayed price of the room (what the final consumers sees on the platform and pays) and the wholesale price at which the room was purchased by the OTA.
In both models, estimating the effective commissions paid by the hotels is a complex operation; as for the agency model, the effective commission rates are usually not publicly available, while in the merchant one it is difficult to determine the wholesale prices of hotel rooms. Nevertheless, some reports estimate the commission rate under the agency model to be in the range of 10% - 30%[39], while for the merchant model this range is slightly higher, 15% - 35%[40].
As aforementioned, Booking started as a company focused on an *agency* model.
At the beginning of the OTA market, allowing final consumers to pay to hotels directly was an innovative solution – this increased their perceived value. The

[36] Duong, M. Q. (2023, March 2). Understanding Booking Holdings. https://onepercentamonth.com/2023/03/02/understanding-booking-holdings/
[37] If Booking had gone out of business, and the reservations were made already, the hotels would still have been paid.
[38] *Id.*
[39] *Supra* note 20. *Supra* note 32.
[40] *Id.*

company largely implemented this model, earning most of their revenues (85% in 2015[41]) from reservation secured through this model.
This situation has since changed.
In 2023 the *merchant*-generated revenues surpassed the agency revenues for the first time in Booking.com's existence.

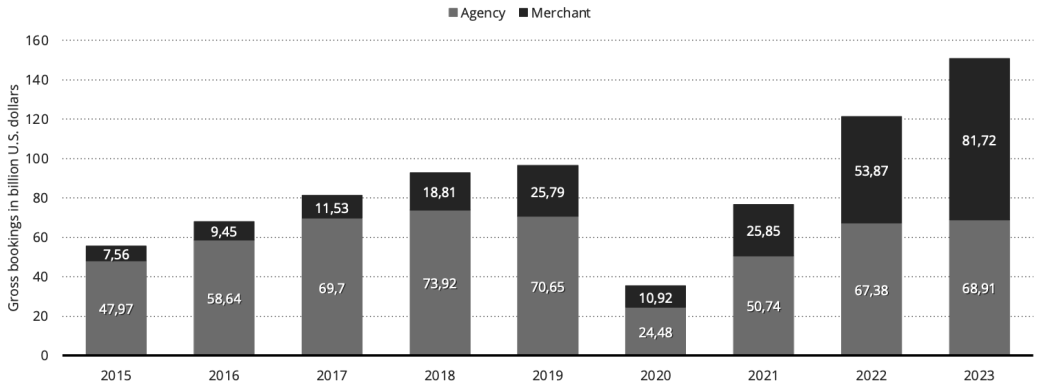

Figure 5 - Gross bookings of Booking Holdings worldwide from 2015 to 2023, by type (in billion U.S. dollars)[42]

Notably, the pandemic has only accelerated a model shift that had already started.
The uncertainty linked to the restrictions and the interruption of international tourism has pushed hoteliers to look for fast, secure, and guaranteed payments, which are entailed in the merchant model[43].
Furthermore, under this model, the OTA has the chance to *manage the prices*, which is the central tenet at the basis of Booking.com's strategies – the Genius program, the Preferred Partners Program, the bundling of different travel services (flights, car rentals, etc.), the foreign exchange opportunities.

2.2 - The Pricing Strategy

The pricing and the commission structures of Booking.com have witnessed many changes during the OTA's existence. They went from being simple structures based on fixed rates, to the complex nature they exhibit today.
As aforementioned, it is important for Booking.com to manage the prices. According to their own website:

> *Making sure each potential guest is shown the right price at the right time is key to securing more bookings.*[44]

Expectedly, Booking.com has little interest in delegating the decisions on which is the right price and when is the right time.

[41]Priceline.com, & Booking Holdings. (February 22, 2024). Gross bookings of Booking Holdings worldwide from 2015 to 2023, by type (in billion U.S. dollars) [Graph]. In *Statista*. Retrieved April 19, 2024, from https://www.statista.com/statistics/225466/booking-holdings-gross-bookings/
[42] *Id.*
[43] Hancock, J. (2022, March 29). *The merchant model is helping agencies to deliver better customer experiences*. Travolution. https://www.travolution.com/news/in-depth/guest-posts/guest-post-the-merchant-model-is-helping-agencies-deliver-better-customer-experiences/
[44] *Pricing foundations*. Booking.com for Partners. (2024, January 30).

Bearing this in mind, Booking.com features several solutions to set, enforce and improve the prices of hotel rooms.
Every pricing strategy conducted on (or by) the platform starts from the **Rate Plan**. It is defined as the combination of the fundamental elements of each reservation: the price the hotels intend to charge per room, the rooms included in a particular rate, the validity of the price (for example, for how long before the check-in date the price is valid for a room), the length of stay, the cancellation fees, and (if any) the meals that are included in a rate.
The two base Rate Plans that Booking features are:

- The *Fully Flexible* rate: the price that offers the most freedom to consumers, entailed with free cancellation up to seven days before check-in. It is the higher price[45].
- The *Non-Refundable* rate: there is no free cancellation, but the price offered is lower. This is the most common choice for bookings made less than seven days in advance[46].

Booking advises to set a mix of the two rates (so each room will show at least two prices), as the platform alleges that hoteliers who implement this mix observe an increase in reservations.
In addition to the two base Rate Plans, Booking features the opportunity to further customize the rates. Namely, the set of possible customizations is composed of:

- The *Long-staying guest* rate – a customer gets a favorable rate for its prolonged staying.
- The *Early Bookers* rate – it attracts customers who plan their trips ahead, by discounting the price if the reservation is made in advance.
- The *Families with children* rate – it works by setting a competitive rate for children.
- The *Groups/single traveler* rate – it tailors the rate to the number of guests for a reservation.

After the setting of the basic rates (and the pertinent customizations), hotels can then explore the Booking.com's *Pricing Toolkit*. In its more advanced version, the service takes the name of **Pricing Solutions Portfolio** (**PSP**). This is defined as a system of pricing strategies aimed at the improvement of both the profitability of the hotels and the competitiveness of the platform (by showing competitive prices compared to rival OTAs and channels).
The PSP divides itself into two different streams:

- The **Reactive** approach.
- The **Proactive** approach.

Reactive solutions are preferred if there is an anomaly in a hotel's normal reservation pattern (a pandemic, a storm, a concert, etc.). They are designed to tackle sudden changes in the demand, and the most implemented ones are:

- *Basic Deals* – they are also called "Last Minute deals". This solution improves the hotels' visibility by offering a lower price (which is shown in comparison to the original, higher price). It works on a per-room basis (the occupation that is offered at a discount) and for a short period.

[45] *Id.*
[46] *Id.*

- *Visibility Booster* – it improves the hotels' visibility for a short period of time, at the cost of a higher commission paid to the OTA.

Notably, these solutions are suitable for short-run needs. Proactive solutions, instead, are designed to *anticipate* and *influence* the fluctuations in the demand.
According to the platform's website[47], these solutions must serve as a tool to "*prepare the future"*. These are intended to meet long-term revenue and occupancy targets, and to reach valuable customers on a consistent basis.
The three Proactive Solutions are:

- The *Targeted rates* – these are rates intended to capture the demand of certain targets of customers. They divide into *Country rates* (offering a certain rate to consumers from certain countries), *Campaign rates* (offering a certain rate in particular periods, like holidays and particular celebrations), and *Mobile rates* (offering a certain rate to consumers booking from a mobile device). With respect to the reactive ones, these solutions can help hoteliers to structurally enjoy more visibility among the targeted consumers.
- The *Genius program* – it is a loyalty program aimed at the retention of customers. Participating properties offer discounts and exclusive deals to Genius members. These properties are marked with a Genius logo, indicating the availability of Genius program benefits. On average, "partners who join receive 70% more search result views from Genius travelers, 45% more booking and 40% more revenues". It is also stated that "30% of bookings at Genius properties are for non-Genius room types, meaning the visibility boost also benefits the hotels' undiscounted rooms". The Program "further boosts visibility through *ranking boosts*, *search filters* that allow travelers to see only Genius properties, and *marketing campaign investments from Booking.com* (including individual global campaigns, year-round targeted marketing initiatives and communications through email, social media, and PR)". For hotels to be able to participate in the program, the properties must have at least three guest reviews and a minimum review score of 7,5.
  Genius works on a three-levels basis (each with its own dedicated discounts), giving users the chance to climb from one level to the other by completing more reservations on the platform.
  1. Level 1. It is obtained by every Booking.com user that registers on the website. It is endowed with a minimum 10% discount (though this number may differ).
  2. Level 2. It is designed for users that have completed at least 5 bookings in a range of two years. It offers a base discount of 15%, with the addition of free breakfast and free room upgrades.
  3. Level 3. Dedicated to users which have booked more than 15 rooms in two years. It offers a base 20% discount, with the same additions of free room upgrades and breakfast, plus a priority customer support.

[47] Van Trommel, H., Donovan, N., (2021, January 19). *Pricing portfolio: When to use proactive and Reactive Solutions*. Booking.com for Partners. https://partner.booking.com/en-us/click-magazine/industry-perspectives/pricing-portfolio-when-use-proactive-and-reactive-solutions

As it is evident from Figure 6, the only common feature among the different levels is the *Dynamic Pricing* component. As reported by Booking.com itself, this model "optimizes the way discounts are offered, helping to further boost occupancy and increase revenue". It is "*machine learning based"*, meaning that the discounts and the prices adjust holding in consideration the business' needs. The platform then states that this model is *finely targeting* consumers, meaning that "higher discounts will only be shown to smaller and more exclusive audiences*"*.

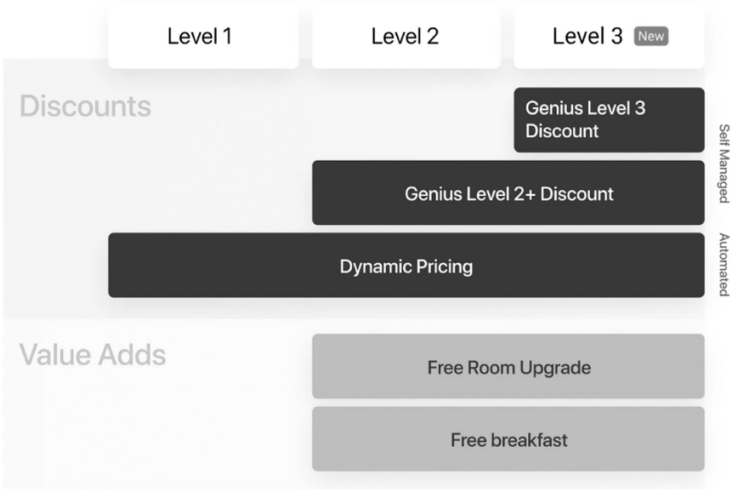

Figure 6 - Value-adds for Genius levels.

- The *Preferred Partners Program* (*PPP*) – it is an optional service that Booking offers to hotels to improve their visibility in Booking's search results and increase their earning potential through the platform "in exchange for a small increase in commission." The Program, presented to hotels as an exclusive tool reserved for "our best partners, representing 30% of the total," allows for greater visibility, quantified as "on average up to 65% more page views and 20% more bookings". Hotels that adhere to the PPP are marked with a distinctive "thumbs up" icon next to the hotel name. Hotels that adhere to the PPP pay Booking higher commissions, reaching a maximum of 18%[48]. This version of the Program clearly states that one of the requirements ("External Prices") to be met to access the Program is that the hotel is "competitive", namely, it applies a price on Booking equal to or lower than the price practiced on the website of other OTAs or on its own website. The top 10% of PPP partner structures can access an additional ranking improvement program, the so-called Preferred Partner Plus, in return for the payment of an even higher commission of 23% (compared to 18% for PPP).

[48] *Supra* note 5, at 11.

As it appears, one of the recurrent features that are underlined in each pricing solutions is the *visibility increase*. In practice, the concept of *visibility* takes the name of **ranking**, which is defined as the order in which search results appear. According to the platform, the positioning system depends on the fact that a hotel is well positioned in each of the following three areas: *Click-through rate* (the number of people who click on a certain hotel); *Gross number of bookings* (the number of bookings made at a certain hotel); *Net number of bookings* (the number of bookings made at a certain hotel, minus the number of cancellations). However, Booking also specifies that "The positioning of a hotel can also be influenced by other elements, such as the amount of commission paid to us on Bookings, the promptness of payment of such commission, whether or not it is part of our Genius Program or the Preferred Partner Program, and in some places if we manage the payments". It is important to mention that the search ranking in which the offerings are displayed positively impacts the consumers' behavior, driving potential customers to higher-ranked options[49].

In other instances, the platform states that the search ranking can also depend on the *Conversion* rates, i.e., the percentage of reservations in relation to the number of page views.

The concept of *Conversion* also appears in the *Pricing Solutions Portfolio* guide, as the platform also features pricing solutions aimed at the improvement of this metric. A notable **Conversion program** is:

- The *Booking Sponsored Benefit* (*BSB*) – it is a discount that Booking applies to the price of room reservations offered on its platform. The discount is fully funded by Booking, which waives a portion of the commission received from the partner property to reduce the room price visible to the consumer on the platform. In order for Booking to be able to intervene directly on the price through the discount, it is necessary that the property adheres to the "Pay with Booking" program, which allows the consumer to pay online directly on Booking (practically, the hotelier needs to partake in the *merchant* model). Booking constantly monitors the cases in which hotels apply prices on their platform that are higher than those practiced on other online channels (rival OTAs and online direct channels) and offers the discount accordingly. The discount is shown to the consumer on the at the time of reservations and is highlighted graphically: the consumer sees the original rate, or the one agreed between the property and Booking, which is crossed out with a horizontal line and flanked by the new discounted price with the wording "The price you see is discounted because Booking.com pays part of it" and the indication of the amount of the discount. Booking defines BSB as a price incentive that it "may offer" to customers to encourage them to book, "covering the difference so that the property always receives the full transaction value for each reservation." Booking adds that "The benefits of BSB apply only to certain bookings. When certain customers search for accommodation on Booking.com, we show a reduced rate to encourage them to book." In addition, Booking clarifies that "We decide whether or not to show the Booking Sponsored Benefit based on

[49] Ghose, A., Ipeirotis, P. G., & Li, B. (2014). Examining the Impact of Ranking on Consumer Behavior and Search Engine Revenue. *Management Science*, *60*(7), 1632–1654. http://www.jstor.org/stable/42919626

demand data on Booking.com" and specifies that the amount of the discount is determined by a "machine learning algorithm" shown only to consumers considered sensitive to price fluctuations.

The different pricing solutions can also combine, thus reaching a final price shown to the consumer sensibly lower than the starting *Rate Plan*. We will assess the impact of these combinations later on.

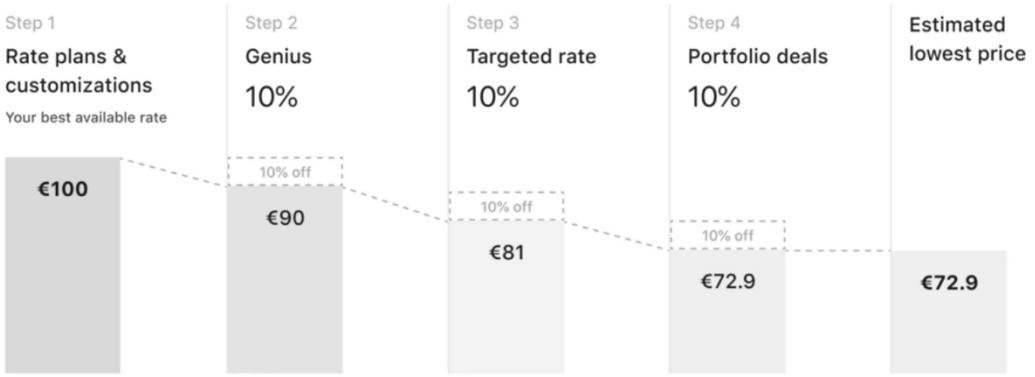

Figure 7 - Discount Combination Example

The pricing strategies that are offered to hoteliers and that are featured by the platform seem to suggest that one of the points on which they revolve is engaging in some sort of *price discrimination*, aimed at the assessment of the consumers' willingness to pay and the consonant adjustment of the prices that are displayed. Indeed, both in the *Genius* program and in the *BSB* one, the ability to "show the right prices to the right audiences" serves as an important contribution to the effective utility of the pricing strategies.

3 - Price Discrimination in the Digital Economy

3.1 - Defining Price Discrimination

In economics, price discrimination takes place when two similar products (where "similar" refers to having the same marginal cost) are sold at different prices and/or to different customers. It generally refers to the practice of applying "dissimilar conditions to equivalent transactions"[50].

The economic literature usually[51] divides price discrimination in three categories. The first category is known as *First-degree price discrimination* (or perfect price discrimination). It is a form of price discrimination where each consumer is charged its full willingness to pay. It is considered to be a theoretical concept as, in order for it to be implemented, the firms should be able to assess all relevant heterogeneity among its customers and discriminate them accordingly[52].

Second-degree price discrimination (or versioning) involves a firm setting different prices for different versions of the products, leaving the consumers with the choice of what is their preferred version. It is an indirect form of discrimination, as it does not rely on information about consumers.

[50] Treaty on the Functioning of the European Union Article 102.
[51] Pigou, A. (1920) The Economics of Welfare. MacMillan and Co., London.
[52] OFT. (May 17, 2013). The economics of online personalized pricing. OFT1488.

Finally, *Third-degree price discrimination* (or group pricing) refers to the practice of setting different prices to different groups of consumers, which are divided according to their observed characteristics (age, sex, gender, etc.). It relies on known information about group characteristics, as opposed to the first-degree (where the information is relative to individual features).
Though this definition of price discrimination is the most mentioned one, other alternative definitions have been provided. Among the alternative ways to classify price discrimination, a notable contribution comes from Armstrong[53], which divides this practice into three different, yet complementary categories, which are defined on the basis of the time frame in which the transactions happen. In the first place, *Static price discrimination* happens when all purchases occur within a single time frame. It entails non-anonymous discrimination between different consumer groups with different observable characteristics (the classic third-degree discrimination) and bundling (the traditional second-degree discrimination).
Dynamic price discrimination, instead, occurs when prices change over time. It includes the definition of intertemporal price discrimination[54] (a company might start charging a high price for a product to target buyers willing to pay more, then gradually lower the price to attract consumer with a lower willingness to pay)[55], together with the behavioral price discrimination, where the price differs according to the consumer's behavior over a time frame. This behavior might entail the purchasing history of the consumer, and other characteristics inferred by the company to assess the consumer's willingness to pay (the classic first-degree price discrimination).
Intermediate price discrimination, finally, occurs when pricing differences happens between suppliers and downstream firms rather than between the seller and the final consumer. In many intermediate markets, prices are reached not through a seller setting a price but through a process of bilateral negotiation. These may often result in different sellers facing different prices.
For any type of price discrimination to be implemented, there needs the be the realization of three conditions:

1. A **downward sloping demand curve and an element of market power**. If the firm operates in a perfectly competitive market, then it will charge the market price. Therefore, in order to discriminate the prices, the firm needs a form of market power. The practice of discriminating prices may be particularly feasible in markets that exhibit economies of scale, economies of scope, network effects and entry/switching costs. As it has been clarified in the previous chapter, Booking.com enjoys a position of dominance in its relevant product market, which is also endowed with network effects and high entry costs.
2. A **no-arbitrage condition**. The possibility of arbitrage, where consumers with a low willingness to pay would be able to sell the products at a higher price to consumers with a higher willingness to pay, removes the ability of firms to charge higher prices to any buyer.

[53] Armstrong, M. (2008). Price discrimination. MIT Press.
[54] Löfgren, K. G. (1971). The Theory of Intertemporal Price Discrimination. An Outline. *The Swedish Journal of Economics*, 73(3), 333–343. https://doi.org/10.2307/3439170
[55] *Id.*

The no-arbitrage condition might also be intrinsic to the nature of the product (a perishable good, a personal good like a flight ticket, etc.).

3. The possibility for a firm to **assess** the buyers' **willingness to pay**, either through observable and/or inferable characteristics or through the self-revelation of heterogeneous consumers (by choosing different quantities, or by purchasing in certain conditions at a certain time, etc.). If the firm does not have the chance to identify the heterogeneity and the different valuations of different consumers, it is not feasible to charge different prices.

3.2 - The Concept of "Fairness" and the Impact of Price Discrimination

It is important to mention that, regardless of the implicit negative connotation that the word "discrimination" has, there is no inherent unfairness linked to price discrimination. In this regard, the standard argument for *fairness* in transactions posits that the prices charged should not depend on the consumers' valuations at all, hence that every customer should pay the same price for equivalent transactions[56]. Under this doctrine, nonetheless, low-valuation consumers may be completely excluded from a market with uniform pricing. Thus, equal prices do not necessarily mean equal access to the market.

One example of the actual equitableness of the practice of discriminating prices might be that more consumers are served, and that those less willing to pay (assuming because of their budget constraints) could pay lower prices, while the firms could retain their profit margins by charging higher prices to "wealthier" consumers.

Price discrimination could then bring benefits to competition (thus increasing output and reducing prices)[57]. For instance, this type of situation is represented by the traditional model of two businesses offering differentiated products, each at one end of a straight line, and with the ability to see where their clients are. In this case, the customers are typically found on a beach, with an ice cream vendor at either end. Customers located closer to the first seller choose it, and those located closer to its rival choose it as their second option. Sellers have an incentive to lower the unilateral price they would otherwise charge to those who are located closer to their rival as a mean to attract them, in order to make up for having to travel further to purchase from them if they are able to see where the consumers are, and discrimination is possible. Assuming they can stop customers from reselling the product and know who sits farther away, they are able to discriminate profitably. But if a vendor anticipates that its competitor would charge its closest customers with lower prices in an attempt to attract them, it will no longer be able to charge the same price to them and still hope to retain them. Therefore, in order to keep these close customers, it must lower its price to a point where it dissuades them from travelling farther to purchase from the competing seller, leading the distant seller to further lower its prices, and so on. In this scenario, when price discrimination is possible, all consumers end up paying lower prices than they

[56] Gehrig, T. P., and R. Stenbacka (2005): "Price discrimination, competition, and antitrust," in *The Pros and Cons of Price Discrimination*, 131–160, Stockholm, Sweden. Konkurrensverket—Swedish Competition Authority.

[57] Helfrich and Herweg (2016), "Fighting Collusion by Permitting Price Discrimination", CESIFO Working Paper No. 5786, Category 11, Industrial Organisation.

would if discrimination was not possible, since in this case the firms would all set their uniform prices higher in order to maximize their profit from their local customers[58]. Price discrimination that raises earnings might also encourage businesses to take measures they believe will give them the best chance of securing these higher profits. Consequently, this could increase dynamic efficiency by promoting competition in the investment of money towards innovation and reducing expenses[59]. If other businesses follow accordingly, these innovations might have a positive external impact in addition to benefiting consumers.

3.3 - Exploitative, Distortionary, and Exclusionary Practices

Price discrimination, intuitively, is not always a positive practice. As an example, price discrimination might result in a shift in the distribution of welfare from consumers to producers. Generally, concerns related to price discrimination fall into four main categories: those that are exploitative, distortionary, or exclusionary.
The first category, **exploitative** price discrimination, deals with the concept and the effects of market power.
Since market power is defined as the capacity to raise prices above marginal costs and that it can be obtained, increased, safeguarded, and exploited, there needs to be a distinction between those practices that *exploit* the market power and those practices that are aimed at the *consolidation* of it.
According to one perspective, exploitative pricing discrimination is just the practice of a dominant company setting prices in order to maximize its profit[60]. This viewpoint, however, ignores the fact that non-exclusionary acts, often known as "partitioning strategies," might help a dominant firm in adjusting the prices that maximize profits rather than maximizing profits themselves[61]. These “partitioning strategies” can involve collecting and assessing information on each customer's willingness to pay for a product, as well as taking action to prevent arbitrage or to discern between “rational” and “naïve” consumers. The company may employ these moves to divide a market, raise average markups, and ultimately gain market power. Price discrimination—at least on the part of dominant firms—can cause consumer surplus to be transferred from consumers to producers, which, at least temporarily, hurts customers. Then, consumers won't always profit from the dynamic incentives of which price discriminating firms may be endowed with. For instance, some dynamic incentives may be detrimental, as they include stronger incentives to engage in partitioning activities that promote better discrimination and to engage in rent-seeking activities.
As was mentioned earlier, Booking.com has implemented a series of pricing mechanisms that could be addressed as exclusionary or partitioning strategies, such as the *Dynamic Pricing* algorithm featured in the Genius program or the adjustment

[58] Thisse and Vives (1988), "On the Strategic Choice of Spatial Price Policy", *The American Economic Review*, 78(1), 122-137.
[59] Verizon Communications, Inc. v. Law Offices of Curtis V. Trinko, LLP, 540 US 398 (2003)
[60] Pandropoulos, P. (2007). *How should price discrimination be dealt with by competition authorities?*. Concurrences. 2007(3), 34-38.
https://ec.europa.eu/dgs/competition/economist/concurrences_03_2007.pdf
[61] Nalebuff, B. (2009). Price discrimination and welfare. *CPI Journal*, *5*.

of the *Booking Sponsored Benefits* in accordance with the price sensitivity of consumers.

The second category of concerns relates with **distortionary** price discrimination. When price discrimination takes place upstream, there's also a chance that the variation in prices will distort the competition among downstream input buyers, harming the process of competition and driving up ultimate consumer prices.

When a dominant firm in upstream input markets practices price discrimination, it can cause concerns. This strategy might lead to lower prices for less efficient firms and higher prices for more efficient ones[62]. Because the demand for the input of efficient firms isn't as sensitive to price fluctuations as that of less efficient ones, the most efficient firms may not be significantly impacted by price changes. This lack of sensitivity can result from the large-scale operations that these productive companies depend on; decreasing their volume would entail compromising productivity. Since these businesses' demand isn't easily affected, the dominant firm may raise prices to these businesses in order to efficiently recover fixed costs.

Thirdly, price discrimination is also a common component of many **exclusionary** strategies used to increase or preserve market power. Price discrimination can be used, for instance, in predatory pricing, fidelity discounts, and margin squeezing situations to exclude competitors. As for the first instance, there are two phases to a predatory pricing approach[63]. A company sets prices below the level of competitive equilibrium in the first stage, referred to as the "sacrifice" phase, with the goal of driving a competitor or a new entrant out of the market. Following the competitor firm's exit from the market, the incumbent firm might take advantage of its enhanced market position and raise prices in a second stage known as the "recoupment" phase[64]. This enables it to recover the earnings it gave up in the initial stage. It must be noted that price discrimination is not usually a part of predatory pricing strategies, although it can be implemented to lessen the sacrifice necessary for the strategy to be successful. For instance, it can benefit the company to focus on the competitor's customers, possibly even only their most important clients. By doing so, the company avoids losing sales to its current customers.

Secondly, fidelity rebates, also known as loyalty discount programs (like Genius) or exclusivity rebate systems, provide sellers the ability to set a lower price for customers if they can prove their loyalty through their purchases. Therefore, they can represent the imposition of a price penalty for disloyal customers or constitute a discriminatory price decrease for loyal customers[65]. Lastly, the phenomenon known as "margin squeeze"[66] occurs when a vertically integrated firm establishes a narrow margin between its *retail* pricing, which represents its own downstream

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[62] Stole, L. A. (2007). Price discrimination and competition. *Handbook of industrial organization*, *3*, 2221-2299. https://www.sciencedirect.com/science/article/pii/S1573448X06030342?casa_token=6Iq446TS2B8AAAAA:vc4EVNnzVAfFX4E74C4yupICFMFFJsN9C2tYo7A-gKn1el0HrPBliz4WfIpwqqDNw9gqX5Wx

[63] *Predatory foreclosure*. OECD. (2004).

[64] Leslie, C. R. (2013). Predatory pricing and recoupment. *Colum. L. Rev.*, *113*, 1695.

[65] Waelbroeck, D. (2005). Michelin II: A Per Se Rule Against Rebates by Dominant Companies?. *Journal of Competition Law and Economics*, *1*(1), 149-171.

[66] Geradin, D., & O'Donoghue, R. (2005). The concurrent application of competition law and regulation: the case of margin squeeze abuses in the telecommunications sector. *Journal of Competition Law and Economics*, *1*(2), 355-425.

price, and its *wholesale* price, which represents its price for an essential input, so forcing out a rival. The company may decide to charge different prices to its competitors and its downstream subsidiary in an effort to drive up those competitors' costs. This could drive out competitors and lessen general competition in the downstream industry.
In conclusion, depending on the particular situations and behaviors involved, price discrimination can have both beneficial and harmful effects.

3.4 - From Price Discrimination to Price Personalization

The emergence of digital markets, in particular of platform services (OTAs are an example), frequently results in significant network effects, leading to barriers to entry and high concentration within the market.
Potentially the most significant influence that the digital economy can have on the scope for price discrimination is the opportunity it provides to accumulate and analyze massive volumes of big data, often from multiple sources. These might include, for instance, the location of a consumer, its past purchase history, its political preferences, the content it posts and interact with on social media.
This raises the possibility that businesses using ever-more-advanced analytical tools could be able to model and precisely predict an individual's willingness to pay[67].
What this entails is that firms, that were previously engaged in some practices of third-degree price discrimination[68], could improve their pricing models to resemble first-degree price discrimination. Alternatively, in the definition provided by Armstrong[69], these new possibilities can be seen as an increased potential for dynamic behavior-based discrimination. In general terms, what was previously seen as a theoretical concept, in this new landscape is now possible.
Fist-degree price discrimination is sometimes referred to as "personalized pricing", and the two terms are used interchangeably, though these two definitions feature different scopes and purposes. A definition of personalized pricing comes from Reisinger, Rey and Jullien, who define this practice as:

> "The practice of charging individual consumers (or small groups of consumers) prices that are based on their personal characteristics."[70]

Furthermore, the British Office for Fair Trade (while defining price personalization in a similar way), also includes a clarification on how the businesses can assess the consumers' willingness to pay, mentioning that "businesses may use information

[67] Brynjolfsson, Erik, Michael D. Smith, and Yu (Jeffrey) Hu. 2003. "Consumer Surplus in the Digital Economy: Estimating the Value of Increased Product Variety at Online Booksellers." *Management Science*. 49(11). 1580-1596.
[68] As it was underlined in the previous examples, third-degree price discrimination refers to the act of discriminating consumers in accordance with their observable characteristics. Namely, the traditional model of the sellers on a straight line entails the discrimination of consumers based on their *observable location*. Also, in the case of exploitative, distortionary, and exclusionary practices the discrimination perpetuated is more likely to be of the third-degree kind (observing if a firm is a competitor or not, if the consumers purchase from a competitor or not, etc.).
[69] *Supra* note 53.
[70] Reisinger, M., Rey, P., & Jullien, B. (2022, August 25). *Personalised pricing and distribution strategies*. CEPR. https://cepr.org/voxeu/columns/personalised-pricing-and-distribution-strategies

that is observed, volunteered, inferred, or collected about individuals' conduct or characteristics".
In this light, the difference that arises from the generally accepted definition of price discrimination (of any kind) is that the focus is on *consumers*, thus excluding the business-to-business relationships. Secondly, the personalization is carried out in accordance with the *personal* characteristics of consumers.

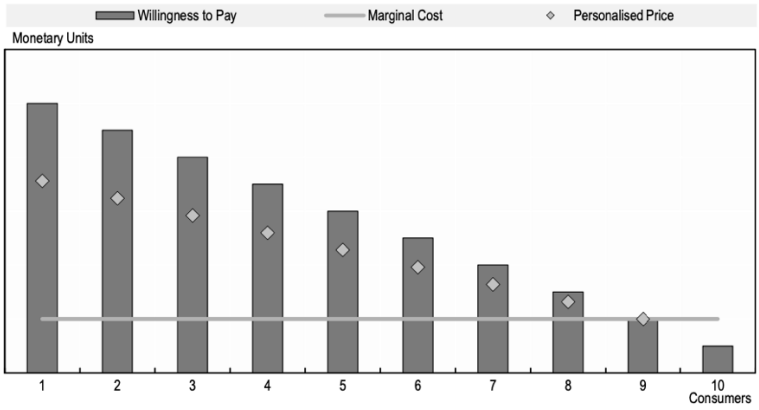

Figure 8 - Illustration of personalized pricing.

As it appears from Figure 7[71], the price charged is based on an estimate of the consumers' willingness to pay, which many times diverges form the actual one, thus characterizing price personalization as not necessarily equivalent to first-degree price discrimination.
In the context of the digital economy, the evaluation of consumers' willingness to pay is carried out using three distinct sets of data: information provided voluntarily by the customer, information the company has directly observed, and information deduced from the customer's behaviour.

Volunteered data	Observed data	Inferred data
Name	IP address	Income
Phone number	Operating system	Health status
Email address	Past purchases	Risk profile
Date of birth	Website visits	Responsiveness to ads
Address for delivery	Speed of click through	Consumer loyalty
Responses to surveys	User's location	Political ideology
Professional occupation	Search history	Behavioural bias
Level of education	"Likes" in social networks	Hobbies

Figure 9 - Categories of personal data collected online.

Unlike pre-digitalization eras, when most business models would essentially rely on data supplied by consumers, businesses may now rely more on both observed and inferred data thanks to the emergence of advanced data analytics. This change has significant ramifications since it allows businesses to customize prices more effectively without the knowledge of customers, who might not be aware that these businesses maintain extensive profiles of them. It must be noted that willingness to pay is not an observable variable that can be gathered and analyzed using

[71] *Personalised pricing in the digital era*. OECD. (2018).

conventional models. Rather, what businesses observe is if a customer who visits the website made the decision to buy a product at a particular price or not.
By applying more sophisticated algorithms, this data can be utilized to estimate consumers' willingness to pay as a function of personal characteristics.
As it has been mentioned earlier, the possibility for price personalization to be implemented lies on the same three conditions underlined for general price discrimination. Indeed, price personalization should be considered as a particular form of discrimination, and not a divergent practice. The same applies to the economic effects of personalization; likewise, it can bear both benefits and harms to the welfare.
On the consumers' side, the practice of personalizing prices is generally perceived as unfair[72], and this has also been assessed by several survey reports, both in the US[73] and in Europe[74]. What these reports also state is that the perception of the personalization's fairness (or of discrimination in general) is largely impacted by how the practice is implemented. In the US survey[75] the respondents have deemed as "acceptable" the practice of showing different discount coupons to different consumer over a same product and a same listed price. In this context, some scholars [76] have argued that coupons are the preferred means to implement personalization. This also holds true in our situation, as Booking.com customizes the discounts rather than the prices.
Though the underlying ideas of personalized pricing are by no means new, it is an intriguing aspect of digital markets that has generated significant debate.

4 - Empirical analysis of Booking.com discounts

This study examines pricing patterns and discount distributions on Booking.com. Furthermore, it aims to investigate the different pricing strategies and inspect the underlying mechanisms of price discrimination, as well as their influence on market dynamics. This thesis addresses the question of understanding what are the main factors influencing the likelihood that hotels may offer discounts on the platform, alongside the impact of the aforementioned discounts. We used web-scraping techniques to obtain the required data from the Italian website of Booking.com in order to perform our empirical investigation. The preferred language has been Python, along with specialised libraries like Pandas (to guarantee proper data extraction), Fake User-Agent (to simulate platform access from various devices), and Selenium (which offers strong automation capabilities and cross-browser compatibility).

[72] In this regard, it must be noted that the same considerations were made for price personalization in general.
[73] Turow, J., Feldman L., Meltzer K. (2005). Open to Exploitation: America's Shoppers Online and Offline, *Annenberg Public Policy Centre of the University of Pennsylvania*.
[74] Publications Office of the European Union. (2018, September 25). *Consumer market study on online market segmentation through personalised pricing/offers in the European Union - Final Report*. Publications Office of the EU. https://op.europa.eu/en/publication-detail/-/publication/ed9ce056-c2cf-11e8-9424-01aa75ed71a1/language-en
[75] *Supra* note 73.
[76] Narayanan, A. (2014, August 30). *Personalized coupons as a vehicle for perfect price discrimination*. 33 Bits of Entropy. https://33bits.wordpress.com/2013/06/25/personalized-coupons-price-discrimination/

Next, in order to perform our analysis, we have generated three distinct users, "sunnytraveler," "pantilaura56," and "marcofantile." The various users are simulated to conduct their research from desktop devices (Windows, Linux, and MacOS) and mobile ones (Android) in order to evaluate the potential impact that the device utilised for the search would have had. The research and the scraping have been conducted on March 7th, 2024, for a one-night stay for two people in the city of Milan on March 28th.
Subsequently, the data have been transferred to a CSV file to allow for further manipulation. The original extraction contains 23,948 observations each organized according to the following variables: the name of the hotel; the initial price of a hotel room (without discounts); the final price shown to the consumers; the date of the stay, the ranking score[77] of the hotels; the stars category of the hotel (for missing values, we have used the stars that booking assigns to a particular hotel); if the hotel partakes in the Preferred Partners Program[78] (and if it is a new partner); if the hotel is highlighted[79]; the number of reviews a hotel has; the distance from the hotel to the centre; if the hotel offers Genius discounts; if the observation contains a particular discount (in our case, we have observed five different kinds of it: Booking Paga[80], Offerta Solo Mobile[81], Offerta Tempo Limitato[82], Offerta Super Segreta[83], Offerta Inizio 2024[84]); if the price shown includes the breakfast; if there is the chance to cancel the reservation for free; if there is the possibility to not pay in advance; the operating system from which the search was made; the username and the time in which the search was conducted. Furthermore, we created a variable defined as the percentage change in prices (from the initial one to the price shown to the final consumer). In addition to the extracted data, we have partitioned the observations into 4 different quantiles of the logarithm of reviews. This is used as a proxy for the reservations that hotels receive[85], hence as a size of the hotels.

[77] *Supra* chapter "The Pricing Strategies".
[78] *Id*
[79] *Visibility Booster* program.
[80] *Booking Sponsored Benefits*.
[81] *Targeted Rates*.
[82] *Basic Deals*.
[83] *Id.*
[84] *Supra* note 81.
[85] *Supra* note 28.

4.1 - Summary Statistics

A summary of the statistics of the quantitative variables is presented in Table 4.

VARIABLE	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Initial Price	€ 204.41	€ 124.29	€ 50	€ 1459
Price	€ 182.71	€ 109.84	€ 46	€ 1459
Price Difference	-9.4%	9.3%	-62.9%	0
Reviews	999.28	1548.09	1	12623
Ranking	8.35	0.834	1	10
Distance	2.68 km	1.63 km	0.03 km	9.4 km

Table 4 - Summary statistics of quantitative variables (Sample Size N=23,948)

The distribution of hotel categories in our observations seem to suggest not being the same as the actual data from Region Lombardia[86], with large differences regarding the low-category hotels[87].

STARS	*Observed*	*Region Lombardia*
1* - 2**	5,88%	23,9%
3***	52,25%	38%
4**** - 5*****	41,87	38,1%
Total	**100%**	**100%**

Table 5 - Category distribution of hotels.

We then observed how many observations are related to hotels partaking in the *Preferred Partners Program* (and in its more advanced version, PPP plus). 16,082 (67.15%) observations feature an offering from a PPP hotel, while just 1,283 (5.4%) are related to PPP plus hotels.
Next, we have analyzed how the different pricing strategies that Booking.com features are distributed among our data. 21,436 hotels feature one or more discounts. 15,257 observations refer to the hotels offering Genius discounts. It is the most observed pricing strategy in our data, accounting for 63.7% of the total.
Furthermore, 5,774 (24.11%) observations feature one or more discount.
It is worth mentioning that, when analyzing the distribution of the discounts in our observations, the general trend is that hotels belonging to the lower quartiles of reviews present more discounts.

[86] Covedo, L. (2022). La capacità ricettiva in Lombardia anno 2021. *Polis Lombardia*, 2022(15*)*. https://www.polis.lombardia.it/wps/wcm/connect/3b74dda0-5a2c-49ff-a2cc-248e96eb6eea/WP+15-2022+-++La+capacità+ricetiva+in+Lombardia+dati+2021_cavedo_ed202206.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-3b74dda0-5a2c-49ff-a2cc-248e96eb6eea-o8C2cqp

[87] It must be noted that Region Lombardia accounts for non-hotel accommodations as aggregated to 3*** hotels, such as B&Bs, private rentals, etc.

QUARTILE	*Genius*	*Booking Paga*	*Offerta Tempo Limitato*	*Offerta Super Segreta*	*Offerta Solo Mobile*	*Offerta Inizio 2024*	*TOT*	*%*
I	4,838	398	22	28	671	968	6,925	**32%**
II	4,512	377	23	71	563	760	6,306	**29%**
III	3,153	253	62	0	607	479	4,554	**22%**
IV	2,754	177	14	47	417	269	3,678	**17%**
TOT	**15,257**	**1,205**	**121**	**146**	**2,231**	**2,476**	**21,436**	**100%**

Table 6 - Discounts Distribution

We have then analyzed how many hotels offer more than one discount, and the situation does not differ.

QUARTILE	*More than 1 Discount*	*%*
I	1,606	36%
II	1,417	32%
III	893	20%
IV	564	12%
TOT	**4,480**	**100%**

Table 7 - Distribution of Multiple Discounts

The same trend recurs for the observations featured as “New” or “Highlighted”.
Namely, observations deemed as “new” (related to hotels that recently adhered to the PPP) are present only in the first quartile of reviews, while the highlighted observations follow the same observed trend.
According to the retrieved data, discounts are more likely to be offered by smaller hotels. This supports the hypothesis that was highlighted in the first chapter, according to which smaller hotels rely more heavily on OTAs for bookings[88].

4.2 - Price Differences

As stated in the chapter dedicated to the pricing strategies featured on Booking.com, the different discounts can combine. The average price difference that we have observed among all the hotels in our sample is -9.4%, but this amount does not take into account the different combinations of discounts that might occur.
We first analyze the average price differences considering one discount at a time, thus excluding combinations[89].

[88] *Supra* note 22.
[89] As it appears, some data do not coincide with the previous analyses. This is because we have excluded from this calculation all those observations with more than one discount.

QUARTILE	*Genius*	*Booking Paga*	*Offerta Tempo Limitato*	*Offerta Super Segreta*	*Offerta Solo Mobile*	*Offerta Inizio 2024*
I	-9.13%	-8.03%	-20.96%	0	-9.06%	-16.14%
II	-9.87%	-7.82%	-53.73%	-10.93%	-9.27%	-15.89%
III	-10.12%	-8.18%	-42.28%	0	-10.59%	-18.74%
IV	-8.79%	-9.01%	0	-13.30%	-11.36%	-22.32%
TOT	**-9.48%**	**-8.30%**	**-40.38%**	**-12.19%**	**-10.45%**	**-18.41%**

Table 8 - Average Price Difference per Discount

Despite the general trend that has been observed of lower-quartile hotels (in terms of reviews) offering more discount, the situation differs when analyzing the impact of these discounts when they combine.
On the one hand, hotels in the upper quartile typically offer lower initial prices. Furthermore, the average price difference observed for these hotels (when there is the presence of two or more discounts) is generally higher.

QUARTILE	*Initial Price*	*Price Difference*
I	€ 233.73	-18.97%
II	€ 210.36	-21.82%
III	€ 202.27	-22.92%
IV	€ 171.85	-27.61%

Table 9 - Initial Prices and Price Differences (two or more discounts) per quartile

4.3 - Model and Estimation

We aim to evaluate the effects of the characteristics of hotels (the number of reviews o hotel has; the ranking score; the distance from the city center; the participation in any of the Preferred Partners Program) on whether the hotels offer a discount or not. Thus, we define the dependent variable "Discount" which equals 1 if the hotel offers a discount and 0 if the hotels does not offer any discount.
We use the following model to estimate "Discount":

$$Discount = \beta_0 + \beta_1 * Reviews + \beta_2 * Ranking + \beta_3 * Distance + \beta_4 * PPP + \beta_5 * PPP(Plus) + \varepsilon$$

Considering that "Discount" is a binary variable, we utilize a logistic regression[90] model to compute our estimation.

[90] Odds ratios in logistic regression provide a straightforward method to interpret how predictor factors affect the likelihood of the result. Because of their scale independence, predictors can be compared with each other on any measurement scale. Odds ratios are a favored option for evaluating binary outcomes in logistic regression models because they enable the direct evaluation of the degree and direction of the association between the variables and the outcome.

	Odds Ratio	***Std. Error.***	***z***	***P>|z|***	***95% conf. interval***	
Reviews	0.99976	0.00001	-16.83	0.000	0.99973	0.99979
Ranking	0.94597	0.01851	-2.84	0.005	0.91039	0.98295
Distance	1.02446	0.00999	2.48	0.013	1.00504	1.04425
PPP	1.30306	0.04915	7.02	0.000	1.21019	1.40305
PPP Plus	6.26441	0.41961	27.39	0.000	5.49369	7.14325

Observations	***23,802***
Log likelihood	**-12553.66**

Table 10 - Estimation Results.

4.4 - Findings

The data analysis shows a relationship between hotels' sizes and their propensity to provide discounts. Smaller hotels typically depend more on OTAs like Booking.com because they frequently lack sophisticated technological infrastructure and substantial marketing resources[91]. These hotels' need to draw reservations encourages them to offer more discounts. According to the analysis, 36% of hotels located in the lowest quartile of reviews feature multiple discounts. By contrast, the more reviews a hotel receives, the less likely it is to offer multiple discounts, which is likely related to the hotel's increased size and popularity. This pattern provides validity to the hypothesis that smaller hotels strategically employ discounts as a means of competing in the online hotel market.

Several hotel attributes are found to have a significant impact on the likelihood of offering discounts by the logistic regression analysis.

Firstly, the number of reviews a hotel has is inversely related to its likelihood of offering discounts. Hotels with fewer reviews are more likely to offer discounts to enhance their visibility and attract bookings. This finding suggests that newer or less popular hotels use discounts as a mechanism to increase their market presence.

Second, a hotel's ranking is also of significant. Discounts are less common at higher-ranked hotels because they typically enjoy better recognition and steady demand. In fact, the positioning and ranking opportunities these discounts have may be the driving force behind smaller hotels' strategic decision to offer more discounts overall. However, in order to compete with smaller, lower-ranked hotels, larger hotels might be encouraged to offer greater discounts.

Thirdly, the analysis demonstrates that a hotel's discounting behavior is also affected by its geographic location, specifically by how far the hotel lies from the city center. Hotels located farther from city centers tend to offer more discounts to offset their less convenient locations and attract more travelers. Moreover, a hotel's likelihood of providing discounts is increased by the participation in the Preferred Partners Program (PPP) or its upgraded version, PPP Plus. Because of the increased visibility and promotional support received from Booking.com, this finding suggests that hotels involved in these programs are likely motivated to offer more discounts. The study further evaluates how Booking.com's different discount strategies are employed, and it finds differences in how they affect prices.

[91] *Supra* note 22.

With an average price reduction of 9.48%, the Genius Program is the most common discount strategy, appearing in 63.7% of the data that was observed.
The average price reduction from Booking Sponsored Benefits (Booking Paga) is 8.30%. Basic Deals (Offerta Tempo Limitato and Offerta Super Segreta) exhibit the largest price reduction, demonstrating their efficiency in generating rapid sales, with an average price difference of 40.38% and 12.19% respectively. Significant price reductions are also a result of Targeted Rates (Offerta Solo Mobile and Offerta Inizio 2024) result in an average price reduction 10.45% for the first, and of 18.41% for the second. The empirical results, which show how Booking.com leverages its market position and data capabilities to implement complex pricing strategies, lend support to the theoretical framework of price discrimination. An example of Booking.com's first-degree price discrimination is the ability to charge customers close to their maximum willingness to pay thanks to personalized discounts and dynamic pricing algorithms. Group-specific discounts (like the Genius program or the Mobile Rates) that are contingent on the type of device or user status are an example of third-degree price discrimination.

CONCLUSIONS

In the context of the digital economy, this study looks at the effects of price discrimination on the Booking.com platform, with a particular emphasis on how different pricing strategies impact both consumers and travel service providers (TSPs). To arrive at thorough conclusions, the analysis combines theoretical concepts of price discrimination with empirical data collected using web-scraping techniques. The empirical findings confirm the presence of conditions necessary for price discrimination. Through its network effects, which elevate the platform's value with an increase in users and listings, and its market share, Booking.com demonstrates a strong level of market power. The no-arbitrage condition is intrinsic to the nature of the product sold, as hotel rooms are a personal good. Lastly, it has been assessed that Booking.com has the possibility to estimate the consumers' willingness to pay, as it has access to vast amount of data.
It has then been then observed how does Booking.com carry out different price discrimination strategies, particularly in the context of first-degree discrimination (dynamic pricing and personalized discounts) and third-degree discrimination (Genius program and Mobile Rates). The findings are also coherent with the alternative definition of price discrimination, as the study reveals the use of both static (e.g., fixed discounts like Genius) and dynamic (e.g., real-time adjustments based on demand) price discrimination practices by Booking.com. Moreover, the estimation results indicate a correlation between different hotel characteristics and the propensity of hotels to offer discounts. In particular, it has been assessed that the number of reviews and the ranking score of a hotel negatively impact the probability of hotels to offer discounts, as opposed to the distance from the center and the participation in one of the Preferred Partner Programs.
The use of different coupons (instead of price cuts) showed to different consumers is coherent with the available literature on price discrimination, which sustains that coupons are the preferred means to discriminate prices (as this positively impacts the consumers' perception of fairness). The intricate pricing structure and vast amount of data that Booking.com has access to may give rise to questions about the

fairness of the discounts, customer profiling and discrimination, and hotel competition. The three streams of concerns regarding price discrimination—exploitative, distortionary, and exclusionary—are reflected in these phenomena. It is a topic for further research to analyze and understand how policymakers and competition authorities can address these concerns.

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TABLES AND FIGURES