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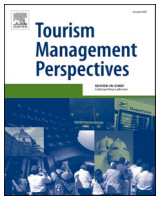

Advance booking pricing strategies: A comparison of the pre- and post-Covid-19 situation in the cruise industry

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ABSTRACT

This article analyses advance booking pricing strategies in the cruise industry before and after Covid-19 was declared a pandemic. To provide a complete picture of the booking process, booking information for departures from the date of data collection up to two years in advance has been analysed. This resulted in an extensive database of more than 1.6 million cruise prices from February 2019 to March 2021. The hedonic approach was used to estimate 121 regression models. Other price determinants considered in the study include the number of nights on the itinerary, cabin type, cruise company, place of departure, ship capacity, ship rating and month of departure. The results show that, in general, the earlier the booking, the more expensive the itinerary. This was accentuated by the uncertainty following the declaration of the Covid-19 pandemic. However, heterogeneous and selective pricing strategies for advance bookings were found, depending mainly on the cruise line and the place of departure. It is therefore possible to find cases where booking in advance is cheaper.

1. Introduction

Advance booking has been studied in the literature from several perspectives. In the field of tourism, it is considered a controversial issue (Bigné, Nicolau, & William, 2021), as it plays a key role in the revenue management of tourism activities (Chen & Schwartz, 2013). It can be analysed from a consumer utility and behaviour viewpoint or from a more economic, financial and managerial perspective.

Customers may want to book in advance to save money and/or reduce uncertainty, they may be concerned about the final price they will have to pay (hoping to get a guaranteed fare or discount), or they may be concerned about the availability of a particular seat, room or cabin (Schwartz, 2008). The decision to book in advance is far from optimal in situations where the customer may not be able to travel, making cancellation policies essential (Bigné et al., 2021). In a study using risky choice framing, Rahman, Crouch, and Laing (2018) found that loss-framed offers tend to encourage decision makers to focus more on losses than gains, prompting them to choose riskless options, which can hamper a company's long-term profitability (Ovchinnikov & Milner, 2012). From an economic and managerial perspective, companies try to adopt advance and last-minute strategies to optimise occupancy or revenue (Yang & Leung, 2018). Indeed, the number of available rooms plays a key role in dynamic pricing (Bigné et al., 2021).

Events such as the Covid-19 pandemic can influence advance booking behaviour and trends. Since the pandemic was declared by the World Health Organization, advance booking decisions have changed from the perspective of both customers and providers (Bulchand-Gidumal & Melián-González, 2021).

Given the major shift in the market and the resulting changes in consumer behaviour, research on advance booking since Covid-19 is important. Previous studies on the impact of Covid-19 on the cruise industry have mainly focused on describing the challenges faced by this market, as it is constrained by irreversible global mobility (Renaud, 2020). Future strategies to recover from this pandemic are also provided in previous literature on the topic (Da Silva, 2021; Gössling, Scott, & Hall, 2020; Pan, Shu, Kitterlin-Lynch, & Beckman, 2021; Zhou, Chen, Shi, Kanrak, & Ge, 2023) and are often based on image and reputation recovery (Ryschka, Domke-Damonte, Keels, & Nagel, 2016; Whyte, 2018), taking a crisis management perspective. However, these proposed strategies do not generally refer to pricing and advance booking strategies.

The effects of Covid-19 on booking patterns and prices have been

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analysed in the hotel industry (Deyá-Tortella, Leoni, & Ramos, 2022; Guizzardi, Ballestra, & D'Innocenzo, 2022). However, it is important that research also explores these effects in the cruise industry, given its unique products and services. First, the pandemic was expected to have a significant impact on sectors such as transport (Li, Nguyen, & Coca-Stefaniak, 2020). Cruise packages combine accommodation and transport attributes, but also on-site and on-board services (Niavis & Tsiotas, 2018), so they are very different from the hotel industry (Toh, Rivers, & Ling, 2005) and should be analysed differently. Second, the cruise industry was hit extremely hard by the pandemic due to its enclosed environment and the damage to its reputation caused by the media coverage of outbreaks in 2020. Therefore, the cruise industry's path to recovery is different and is not expected to be complete until 2024 (Cruise Lines International Association, 2022). Third, different market dynamics (e.g. cruise ship allocation, oligopoly, etc.) lead to different pricing strategies in the cruise market.

The aim of this article is to investigate the advance booking pricing strategies in the cruise industry before and after 11 March 2020, the date on which Covid-19 was declared a pandemic by the World Health Organization. To provide a complete picture of the booking process, booking information for departures from the date of data collection up to two years in advance was analysed. Prices were obtained from a leading online travel agency (OTA), as this channel plays a crucial role in the cruise booking process (CLIA, 2022). In terms of methodology, the hedonic approach was implemented as suggested in the academic literature in order to understand key price determinants. This study represents an important advance in understanding the changes in cruisers' booking patterns since Covid-19 emerged. The main contribution of this article is its in-depth analysis of advance pricing strategies in the cruise industry and its comparison of the pre- and post-Covid-19 situation for cruises.

The remainder of the article is structured as follows: first, a review of the most relevant literature on advance booking is given. Second, data collection and analysis process are described. Finally, results, conclusions, and some theoretical and practical implications are presented.

2. Literature review

2.1. Advance booking

There is extensive literature on advance booking in business and tourism journals, but the topic has received little attention in the cruise industry (Ayvaz-Cavdaroglu, Gauri, & Webster, 2017). The concept of advance booking falls within temporal construal theory (Liberman & Trope, 1998), which suggests that changes in customer behaviour depend on the temporal distance from future events. Several time periods are used in booking. For example, in the hotel industry, Jang, Chen, and Miao (2019) distinguish between the terms 'advance booking' and 'last-minute booking', where the former refers to bookings in the distant future and is built on abstract situations using a wide range of features focusing on elements of desirability such as quality, and the latter refers to situations in the near future and is built on detailed situations using more specific and casual features such as discounts and availability. In fact, the literature on advance booking often includes the term 'last minute', as many studies fail to differentiate or define this period as a specific number of days.

Most studies analysing advance booking refer to the 90-day period between the date of booking and the date of stay or departure (Beria, Redondi, & Malighetti, 2016; Kim, McGinley, Choi, Luberto, & Li, 2020; Malighetti, Paleari, & Redondi, 2010; Salanti, Maliguetti, & Redondi, 2012; Tse & Poon, 2015). Some studies consider advance booking as the period of time from the moment the booking decision is made up to 30 days before the stay (e.g. Liu, Guillet, Xiao, & Law, 2014), while others (e.g. Chen & Schwartz, 2013) analyse the 21-day period before the departure date. Jang et al. (2019) identified seven time brackets: the same day of arrival, 1–2 days before, 3–7 days before, 8–14 days before, 15–21 days before, 22–30 days before, and more than 30 days before the start of the stay. Very few studies cover periods of up to a year or more in advance (Chen & Schwartz, 2008).

To collect data on advance booking, most studies use surveys (Bulchand-Gidumal & Melián-González, 2021; Chen & Schwartz, 2008; Jang et al., 2019), while others rely on databases to gather information from multiple sources (Ayvaz-Cavdaroglu et al., 2017; Bigné et al., 2021; Malighetti et al., 2010), such as their own providers (e.g. Beria et al., 2016) or OTAs (Guizzardi, Pons, Angelini, & Ranieri, 2021). The most commonly used methods are descriptive analysis and estimated regression models. Recently, Guizzardi, Angelini, and Pons (2019) considered the hedonic approach as a good method for analysing advance booking pricing strategies.

In the tourism industry, advance booking has been widely studied from both the demand side (i.e. tourists) and the supply side (i.e. private and public stakeholders). From the demand perspective, customer behaviour plays a key role, as the 'simple' purchase decision is really not so simple (Chen & Schwartz, 2008) and customers may spend a lot of time searching for a better deal (Schwartz, 2006). Customers book in advance for two main reasons: price uncertainty and product availability.

For cruises, this applies to the fact that people may want to lock in a particular price or book a particular itinerary or cabin, despite the risk that any number of external or internal events may occur between these dates, such as pandemics or the overbooking strategies used by companies. Ayvaz-Cavdaroglu et al. (2017) found that 84% of bookings in the cruise industry take place within 20 weeks of the departure date, and the majority within three to 10 weeks of departure. However, total bookings can vary depending on several factors, such as the season. In addition, customers are more likely to book if they are told that many of the rooms are already booked (Chen & Schwartz, 2006). In recent years, several factors have contributed to a decrease in uncertainty. One of the most important is the internet, which has become the main source of information for travellers. The internet makes it easier to book in advance and reduces this feeling of uncertainty, partly because reviews and recommendations are more readily available online (Webb, Schwartz, Xiang, & Singal, 2020) and because it is easy to find last-minute deals (Schwartz, 2006). Companies can also reduce uncertainty by implementing cancellation policies, which affect customers both emotionally and financially (Benítez-Aurioles, 2018). These policies have evolved over time in line with customer behaviour and preferences and have been adapted to new determinants, such as the rise of the internet. Finally, health-related issues, which are fundamental non-negotiables, can also create uncertainty. Covid-19 has influenced customer behaviour since it was first identified (Bulchand-Gidumal & Melián-González, 2021) and may be a determinant of greater uncertainty when booking in advance.

On the supply side, advance booking is appealing as a way to secure revenue and reach break-even as quickly as possible (Salanti et al., 2012), which also reduces uncertainty (Bulchand-Gidumal & Melián-González, 2021). This explains the particular interest in demand forecasting (Guizzardi et al., 2021; Tse & Poon, 2015) and pricing strategies, which will be analysed in more detail below. Bigné et al. (2021) suggest that OTAs typically reach their booking targets for the 60 and 90 days in advance of booking. Therefore, several cancellation policies (Benítez-Aurioles, 2018; Chen, Schwartz, & Vargas, 2011; Schwartz, 2006) and refund policies (Bigné et al., 2021) are applied, although the cancellation fee charged does not have a statistically significant impact on tourist behaviour (Benítez-Aurioles, 2018; Chen et al., 2011). According to previous tourism literature, several determinants may affect advance booking strategies in the tourism industry (Table 1).

2.2. Advance booking pricing strategies

As mentioned above, advance booking pricing strategies are used to secure revenue and break even as quickly as possible. Suppliers set

Table 1
Main determinants of advance booking strategies in tourism.

Determinants	References	Definition
Booking channel	Bigné et al. (2021)	Distribution channel through which the booking is made, e.g. hotel, call centre or online travel agency.
Frequency of departure	Malighetti et al. (2010)	The cited work refers to the frequency of flight departures (e.g. a flight that departs once a day or twice a week).
Rating	Abrate, Fraquelli, and Viglia (2012); Oses, Gerrikagoitia, and Alzua (2016)	Quality of service, usually measured by official rating systems.
Competition level	Malighetti et al. (2010)	The number of competitors offering the same route, or the number of alternative routes within 100 km.
Number of days between booking date and stay date	Chen and Schwartz (2008); Jang et al. (2019)	The number of days between the date of booking and the date of stay, measured in number of days or in specific time periods.
Online reviews and guest rating	Jang et al. (2019); Zhang, Liang, Li, and Zhang (2019)	Customer value and satisfaction, usually determined by online reviews from surveys or worldwide websites.
Route length and place of departure	Malighetti et al. (2010)	In the case of air travel, this refers to the length of the flight and the airport of departure.
Season	Dacko (2004); Malighetti et al. (2010); Scaglione, Johnson, and Favre (2019)	This can refer to the month of the stay or other time classifications such as high, mid and low season.
Accommodation size	Yang and Leung (2018); Mohammed, Guillet, and Law (2019)	Accommodation size, based on the number of rooms, capacity, etc.
Day of the week	Malighetti et al. (2010); Abrate et al. (2012); Schamel (2012); Oses et al. (2016)	The day of the week on which the tourist books the room (from Monday to Sunday). It can also be classified as midweek, weekend or bank holiday.

prices according to the demand function, which is complex to interpret as it consists of both observable factors (e.g. historical occupancy rates and prices) and unobservable factors (e.g. expectations about demand) (Guizzardi et al., 2021). Pricing is more complex for cruise companies because they offer a wide variety of products and set their prices according to their costs. Pricing decisions are based on advertising, ship capacity and prices in the previous period. Cruise companies also try to forecast demand so that they can factor in customer choices (Ayvaz-Cavdaroglu et al., 2017). The role of time in pricing strategies has been widely justified (Chen & Schwartz, 2008; Phillips, 2005). Yang and Leung (2018) define dynamic pricing as 'the tactical practice of determining optimal room rates contingent upon the day and time when a reservation is received' (p. 199). For airlines, in particular Ryanair, Malighetti et al. (2010) found that although flights tended to sell out earlier when higher discounts were offered, the break-even point was reached more quickly when lower discounts were offered on advance bookings.

On the demand side, price is the most relevant factor in determining when a product is booked (Jang et al., 2019), and consumers' willingness to pay changes as the date of stay approaches (Schwartz, 2006). This is because consumers have different degrees of price elasticity (Alderighi, Nicolini, & Piga, 2016; Bulchand-Gidumal & Melián-González, 2021; Langelfeld & Li, 2008). Moreover, consumers' price perception, internal price reference (Chen & Schwartz, 2008) and price tolerance (Jang et al., 2019) need to be addressed to understand their booking behaviour. Chen and Schwartz (2013) suggest that the nearer the time of stay, the more willing travellers are to pay for an equal service, which could be due to expected higher utility and the risk of scarcity. This may be the case for business travellers, who tend to book closer to departure due to specific circumstances and their specific profile (Capiez & Kaya, 2004).

Customers have learned to anticipate price changes due to changes in information sources (Chen & Schwartz, 2013), which may make it more difficult for suppliers to formulate and implement pricing strategies. For example, Malighetti et al. (2010) found that Ryanair identified changes in consumer behaviour and therefore decided to reduce discounts in the advance booking period in order to reach break-even earlier, but at the cost of lower profits from last-minute bookings. However, companies should not feel pressured to reduce last-minute prices, as loyal customers may be disappointed by last-minute discounts and this priority for short-term profits may affect long-term results (Dacko, 2004). In the case of services with a strong reputation or high marginal variable costs, there is less pressure to reduce prices (Yang & Leung, 2018).

Technological advances have enabled suppliers to adapt their pricing strategies as needed to achieve their expected revenues, partly as a result of the proliferation of distribution channels. According to Ropero (2011), 20.4% of the hotels analysed changed their rates in the 12 weeks prior to the stay. Abrate et al. (2012) found that between 46% and 71% of the hotels analysed changed their prices in the last week, depending on the day of the week of the stay. Mohammed et al. (2019) concluded that the main price changes take place within seven days before the stay and are related to seller density, hotel size and star rating. However, constant price changes can have a negative impact on reputation (Ropero, 2011) and can be considered unfair (Choi & Mattila, 2005), especially in the cruise industry where companies have to keep prices within certain limits if they want to maintain customer satisfaction and high occupancy rates (Ayvaz-Cavdaroglu et al., 2017). The degree of unfairness is higher when customers feel that price increases are not linked to cost increases or changes in the market situation (Kimes & Wirtz, 2003).

Advance booking pricing strategies show mixed results. Many studies in the accommodation (Nicolau & Masiero, 2017; Schamel, 2012) and transport (Beria et al., 2016) sectors conclude that the earlier the booking, the lower the price, which motivates customers to book early. However, results from other studies suggest that advance booking is relatively more expensive (Malighetti et al., 2010) and last-minute booking is cheaper (Bigné et al., 2021). This illustrates the difficulty of defining pricing strategies that depend on the number of days between the date of booking and the date of stay or departure, especially when they involve several factors (see Table 1). Abrate et al. (2012) point out that pricing strategies for advance bookings vary according to customer profile: for business travellers (weekdays), the period immediately before the hotel stay is cheaper, but for leisure travellers (weekend), the closer the date is to the stay, the more expensive it is. Nicolau and Masiero (2017) add that this decrease is not proportional, reaching a point where an additional price increase does not have a significant impact on the days of advance booking. In order to discourage customers from looking for a better deal, the use of a low-price-guarantee strategy could be useful (Carvell & Quan, 2005). In the cruise industry, Ayvaz-Cavdaroglu et al. (2017) conclude that the cheapest price is often, but not always, the one found at the last minute. For the same itinerary and departure date, cruise companies keep prices within certain limits to avoid losing bookings or discouraging customers from booking. Yang and Leung (2018) argue that smaller hotels are associated with better discounts, especially for last-minute bookings. The same authors also conclude that homogeneous services with little differentiation tend to offer higher discounts.

2.3. Advance booking since Covid-19

The impact of Covid-19 on the tourism industry has been widely analysed (Huang & Wang, 2022). This impact has been greater for tourism activities involving transport services and enclosed environments, such as cruises (Li et al., 2020). In fact, the cruise industry is not expected to recover until 2024 (CLIA, 2022), mainly due to the image created during the beginning of the pandemic and the following months, which led to a lack of confidence among cruise passengers (Muritala, Hernández-Lara, Sánchez-Rebull, & Perera-Lluna, 2022; Pan et al., 2021). Cruise lines have attempted to address this situation, but it is a complex issue as most people would only be willing to take a cruise if they received a large discount on the price (Pan et al., 2021). Rate discounts are one of the common pricing strategies in times of crisis, but they are controversial as they often delay the recovery of both RevPAR and occupancy losses (Kim et al., 2020).

This recovery path is particularly challenging due to differences in health decisions and strategies and how they are communicated across countries, which can lead to behavioural disparities. For example, in mid-2020, Australian citizens trusted their government more than cruise companies (Quintal, Sung, & Lee, 2022). However, by early 2021, more than a year after the pandemic was declared and amid signs of recovery, these travellers were willing to cruise regardless of the health situation (Walters, Magor, Kelly, & Wallin, 2022). In this sense, although culture influences tourists' perceptions, especially about constraints, the sense of security around cruise tourism is a priority for everyone (Hung, Lee, Wang, & Petrick, 2020).

Despite all the research into Covid-19's impact on tourism, empirical research on its effects on early booking patterns is scarce. In fact, the most relevant studies are Deyá-Tortella et al. (2022) and Guizzardi et al. (2022), both of which focus on the hotel sector. The main Covid-19-driven changes that they identified were a significant decrease in advance bookings and an exponential increase in last-minute bookings (Deyá-Tortella et al., 2022) and, in response to these changes in demand, higher discounts, last-minute price adjustments and changes in last-minute shocks due to the disappearance of the MICE segment (Guizzardi et al., 2022). Moreover, these strategies were not the same in different phases of the pandemic. For example, in the early phase, when it was believed that the situation would be resolved quickly, marketing practices were still a priority, while in later phases these strategies were downgraded in order to save this budget for further recovery phases (Lai & Wong, 2020).

To the best of our knowledge, no specific studies on early booking in the cruise industry since Covid-19 have been published. Espinet and Gassiot-Melian (2022) consider the impact of Covid-19 on cruise package prices and conclude that these prices have decreased on average by 4.3%, although there are relevant differences depending on the classification, e.g. the type of cruise line, the place of departure, the size and rating of the ship, and the number of days between the date of booking and the date of departure. These attributes, which are relevant for pricing in the cruise industry (Espinet-Rius, Fluvià-Font, Rigall-Torrent, & Oliveras-Corominas, 2018), are taken into account in this study to explain early booking behaviour and the choices made when taking a cruise.

Thus, this research provides insights into advance booking pricing strategies in the cruise industry, including last-minute policies in an oligopolistic market. Furthermore, our study compares pre- and post-Covid-19 strategies, taking into account that the current situation is characterised by high uncertainty, especially due to the negative impact of Covid-19 on the cruise industry.

2.4. Theoretical analysis and research hypotheses

There are various price determinants in the cruise industry, and these have been identified in the literature (Espinet-Rius, Gassiot-Melian, & Rigall-I-Torrent, 2021; Niavis & Tsiotas, 2018). In order to explore advance cruise pricing strategies, both before and after Covid-19, this article analyses the impact of key price determinants on these strategies.

First, cabin type can be considered as a price determinant in the cruise industry. From the cheapest to the most expensive, cabins are classified as inside, oceanview, balcony and suite, with the literature showing clear price differences between them (Espinet, Gassiot-Melian, & Rigall-I-Torrent, 2020). This leads to the following hypothesis:

H1. : Cabin type affects advance pricing strategies differently before and after Covid-19.

Second, the specific pricing strategy of each cruise company should be considered. It has been shown that cruise companies follow different pricing strategies depending on their segmentation strategy (Espinet-Rius et al., 2021). This leads to the following hypothesis:

H2. : Cruise company affects advance pricing strategies differently before and after Covid-19.

Third, the place of departure is also an important factor in determining prices. In the cruise industry, CLIA (2022) has identified 13 areas with clear price differences – Alaska tends to be the cheapest and South America the most expensive (Espinet-Rius, Gassiot-Melian, & Rigall-i-Torrent, 2022). This leads to the following hypothesis:

H3. : Area of departure affects advance pricing strategies differently before and after Covid-19.

Fourth, ship capacity is also a characteristic that needs to be taken into account. Ships with a higher passenger capacity tend to offer better prices, while smaller ships are more expensive (Espinet-Rius et al., 2022). This leads to the following hypothesis:

H4. : Ship capacity affects advance pricing strategies differently before and after Covid-19.

Fifth, a ship's rating may also affect pricing strategies. Ships are usually classified by stars, from 1 star (the cheapest) to 6 stars (the most expensive) (Espinet & Gassiot-Melian, 2022). This leads to the following hypothesis:

H5. : Ship rating affects advance pricing strategies differently before and after Covid-19.

Sixth, the length of the itinerary may also be a price determinant. The longer the trip, the more expensive it will be (Niavis & Tsiotas, 2018). This leads to the following hypothesis:

H6. : Itinerary length (in nights) affects advance pricing strategies differently before and after Covid-19.

Finally, the date of departure is also an influencing factor. The cheapest quarters are the first and the fourth, while the third quarter is the most expensive (Espinet-Rius et al., 2018). This leads to the following hypothesis:

H7. : Quarter of departure affects advance pricing strategies differently before and after Covid-19.

3. Methodology

3.1. Data collection

For this study, we collected data once a month between February 2019 and March 2021 using web scraping techniques. Specifically, we gathered all available final prices (including port taxes) paid online by customers from the website of a leading Spanish OTA. OTAs are intermediaries and subject to intense competition (Talwar, Dhir, Kaur, & Mantymaki, 2020), which has led to higher price parity across direct and indirect channels (Kim et al., 2020), making this an important research topic. Furthermore, the use of information provided by an OTA on the internet facilitates transparency and replicability (Guizzardi et al.,

2021). After data collection, the quality of the collected data was thoroughly analysed, and inconsistent and incomplete observations were eliminated. The final database contains 1,644,098 prices. These prices correspond to worldwide cruise itineraries departing between one day and 730 days (two years) after the date of booking. The itinerary length ranges from 2 to 14 nights, which is the most common cruise itinerary length. Cruise lines plan their itineraries three to five years before departure, which eases the booking process for customers who prioritise itinerary and cabin choice. This information could be useful in estimating booking patterns and facilitating yield and revenue management strategies. In addition, as prices are collected worldwide, this two-year period ensures that the data cover all seasons and fluctuations throughout the year, both before and after Covid-19. The aim of this study is therefore to compare advance booking pricing behaviour before and after the declaration of Covid-19 as a pandemic on 11 March 2020. The database covers the 13 months before this date (863,919 observations) and the 13 months after (780,179 observations). Prices for the period up to 90 days before departure represent only 9.6% of the total database; prices from 91 to 181 days, 15.1%; prices from 182 to 365 days, 31.9%; and prices from more than one year to up to two years, 43.4%.

As pointed out in previous studies, the database includes a wide range of price determinants apart from price itself (see Appendix B for further details). These determinants were selected in line with previous studies (e.g. Espinet et al., 2020; Espinet, Saez, Coenders, & Fluvià, 2003; Espinet-Rius et al., 2018). First, cabin type classifies prices into four categories (inside, oceanview, balcony and suite). Second, the cruise company covers a total of 24 categories. Third, area of departure is grouped into 13 zones according to the CLIA classification. Fourth, ship capacity is divided into four categories based on the number of passengers: up to 2000, from 2001 to 3000, from 3001 to 4000, and more than 4000. Fifth, ship rating is grouped according to the number of stars: 3-star, 4-star, 5-star or 6-star. Sixth, the length of the itinerary is divided into three categories: 2 to 5 nights, 6 to 9 nights, and 10 to 14 nights. Finally, the quarter of departure can be first, second, third or fourth.

3.2. Descriptive statistics

For our analysis of advance booking, we divided the two-year period into eight intervals. The first three months of the first year were considered individually and the remaining months of that year were grouped into quarters (second, third and fourth). The second year was divided into two six-month intervals. We had originally defined 24 intervals of 30 days each. However, we found that these intervals were very stable and grew steadily. These reduced week-to-week differences were also observed by Schamel (2012) and Ayvaz-Cavdaroglu et al. (2017). Accordingly, the final classification of eight intervals maintained the conclusions previously drawn using 24 intervals, with the use of this final classification allowing for a simpler and more robust interpretation.

Data analysis began with descriptive statistics. First, the average price per night in each interval was given. An analysis of tendency and dispersion was then carried out using the coefficient of variation (standard deviation / average) and an index was calculated to capture the differences in average prices between 0 and 30 days (index 100) and the remaining intervals. Finally, the average prices before and after Covid-19 were compared using *t*-tests to assess the intervals and determine whether or not the differences were statistically significant.

3.3. Hedonic analysis

Following the descriptive statistics, hedonic regression techniques were implemented. This method is well known in the tourism literature (Arora & Mathur, 2020), including the cruise industry (Niavis & Tsiotas, 2018). It addresses the disaggregated impact of each price determinant on the overall price of the tourism package and is commonly suggested and used for advance booking analysis (Beria et al., 2016; Bigné et al., 2021; Guizzardi et al., 2019; Guizzardi, Pons, & Ranieri, 2017; Schamel, 2012; Yang & Leung, 2018). A semi-logarithmic model was defined to determine prices. The dependent variable of the defined models (i.e. ln price) is determined by several independent variables, which in this case refer to the attributes of the cruise package (i.e. number of nights, cabin type, cruise company, area of departure, ship capacity, number of days before departure, month of departure). As shown in the equations below, the cruise product can be defined as a vector of characteristics or attributes (Ci), where $i = 1\ldots$, n represents the ship and *cim* the value of each of its *m* characteristics. All these attributes have an impact on price, so they are represented in the hedonic price function for each cruise (P_i). This functional form of *P* is assumed to be constant over time and across ships, although the weight or contribution of each attribute may change ($\ln P_i$), where *P* is the price, c_m are each of the *m* attributes of the cruise, β_n are the parameters to be estimated and εi is the error term of the regression:

$$Ci = (ci1, \ldots, cim) \tag{1}$$

$$Pi = f(ci1, \ldots, cim) \tag{2}$$

$$lnPi = f(ci1, \ldots, cim, \beta n, \varepsilon i) \tag{3}$$

Although this approach is useful for assessing price changes according to cruise package characteristics, other regression models were also tested (e.g. linear and logarithmic specifications). However, due to lower fit-indices and previously existing methodological choices (e.g. Espinet-Rius et al., 2018; Halvorsen & Pollakowski, 1981; Rigall-I-Torrent & Fluvià, 2011), the semi-logarithmic model was chosen.

The aim of this article is to compare pre- and post-Covid-19 advance pricing strategies, so we estimated the following models: first, a global model for the pre- and post-Covid-19 periods was provided; second, 119 models were run according to different categories. These models are as follows: eight models for cabin type (four pre-Covid-19 and four post-Covid-19); 55 models for cruise line (of the 60 models to be estimated, two post-Covid-19 and three pre-Covid-19 models were removed due to lack of data); 26 models by place of departure (13 in each period); eight models for ship rating (four in each period); eight models for ship capacity (four each); six models for itinerary length in nights (three each); and finally, eight models per quarter (four each). Appendix A lists the variables included in the models, the variable type, the specific values for each dummy variable, and the t-values and *p*-values for the global model. The models show acceptable goodness of fit indices (adjusted R^2) and the regressions do not present multicollinearity problems between any of the variables included (VIF). The adjusted R^2 ranges from 0.560 to 0.967 (92% of the models have values above 0.700) and the VIF values are less than 10.

Finally, because the time intervals include a different number of days, a weighted index was calculated in order to improve the precision of these variations. This was calculated for both average and hedonic prices. For an example, see Appendix B, where an average of 8.2% is calculated in the pre-Covid-19 model using these weights according to the different number of days in the intervals.

4. Results

In this section the main results of the study are described. First, those of the descriptive statistics, t-tests and global hedonic models performed for each interval to compare the pre- and post-Covid-19 periods. Then, there is the presentation of the results of the analysis carried out according to different classifications of the above-mentioned price determinants: cabin type (H1), cruise company (H2), place of departure (H3), ship capacity (H4), ship rating (H5), itinerary length in nights (H6) and quarter of departure (H7). Finally, we show the results of a specific analysis of advance booking strategies, interval by interval. See

Appendix B for the full table of results.

4.1. Global results

When considering the average price per night, a price index was calculated for each time interval (see Table 2) by dividing the average price per night of each interval by the average price of the '0–30 days' interval. In order to determine how these average prices fluctuate, the weighted difference of these indexes was calculated, taking into account the difference in days of the time intervals. For the situation before Covid-19, considering the average price per night and without adjusting for characteristics or attributes (Table 2), on average, the earlier the booking, the higher the price (the weighted difference is +4.9%, taking into account the different number of days in each interval), and booking 31–60 days before departure is slightly cheaper (−0.9%) than booking in the last 30 days before departure. The index of comparison with 0–30 days (index 100) ranges from 99.1 to 107.7. The analysis of the post-Covid-19 strategy shows that, on average, it is also cheaper to book in advance (the weighted difference is −8.3%, taking into account the different number of days in each interval). There is little difference between the intervals, which range from an index of 90.9 to 94.3.

The adjusted price obtained from the hedonic analysis (Fig. 1) shows that both before and after Covid-19 was declared, the cheapest prices are found in the last interval, when the itinerary departs between 0 and 30 days after the date of booking, and prices tend to be higher the earlier the customer books. Prices for itineraries departing between 31 days and 2 years after the date of booking were, on average, +8.2% before and + 10.2% after Covid-19, compared to those departing between 0 and 30 days after the date of booking. A possible explanation for these results could be differences in passengers' priorities and willingness to pay. On the one hand, people who book in advance may have different reasons for doing so: firstly, they may prioritise the choice of a particular itinerary or cabin, (i.e. those who do not want to risk not finding certain cabins available); secondly, they may want to secure the price in advance; thirdly, they may have more free time (e.g. retired people) and may not be overly concerned about prices and want a guaranteed itinerary in advance. On the other hand, last-minute bookers may be those who are unable to decide in advance because they do not have the time to go on a cruise or simply prefer to wait until the last minute; or those who expect lower prices and do not care about the itinerary or cabin type.

Whatever the reasons for differences in booking behaviour, the results show that the later a customer books a cruise package, the lower the price. However, there are other choices that may be more limited, such as the itinerary, the particular ship or the type of cabin. These results appear to contradict the existing literature on advance booking in the accommodation and transport sectors (Beria et al., 2016; Nicolau & Masiero, 2017; Schamel, 2012), as previous studies have concluded that last-minute prices are higher. However, the results of this study are in line with more recent research. For example, studies by Ayvaz-Cavdaroglu et al. (2017) and Bigné et al. (2021) show that in many cases it is cheaper to book at the last minute.

Covid-19 has affected booking patterns, with customers deciding to book later. This in turn has affected cruise lines' pricing decisions, with prices being lowered as the cruise departure date approaches in order to achieve maximum occupancy (Bulchand-Gidumal & Melián-González, 2021). Before Covid-19, the global coefficient of variation is 50.3% and after Covid-19 it is 41.1%. This indicates a more homogeneous post-Covid-19 strategy (Table 2). The results show that prices are further lowered as departure approaches in order to achieve maximum occupancy. In this context, cruise lines should consider developing strategies to encourage customers to book earlier. Due to the composition of the available prices before and after Covid-19, these results differ significantly from the descriptive analyses and average prices (+4.9% before Covid-19 and -8.3% after Covid-19). Hedonic analyses are useful for observing these changes under equal conditions and with the specific characteristics of a cruise package.

4.2. Results by classification

Analyses by classification reveal several advance booking pricing strategies. Due to the large amount of data obtained from the regressions, only the main results are summarised in this section (Table 3). As mentioned above, the full table of results can be found in Appendix B, which may be useful for readers wishing to analyse the results in more detail. In summary, the most homogeneous strategies are applied by cabin type (H1) and the most heterogeneous strategies are applied by cruise line (H2) and place of departure (H3). For example, when analysing differences in ship capacity (H4), it appears that this strategy has changed since Covid-19, as larger ships have more difficulty in achieving

Table 2
Descriptive analysis divided into eight advance-booking intervals.

	Pre-Covid-19				Post-Covid-19				% dif.	p-
Days in advance	Average price per night	Standard deviation	Coefficient of variation	Price index 0–30:100	Average price per night	Standard deviation	Coefficient of variation	Price index 0–30:100	Average post-pre	value
0–30 (1st month)	194.5	163.3	84.0%	100.0	222.6	197.6	88.7%	100.0	14.5%	0.000
31–60 (2nd month)	192.7	152.6	79.2%	99.1	203.3	163.6	80.5%	91.3	5.5%	0.000
61–90 (3rd month)	196.7	150.0	76.3%	101.1	205.9	170.3	82.7%	92.5	4.7%	0.000
91–181 (2nd quarter)	201.9	147.4	73.0%	103.8	210.0	449.9	214.2%	94.3	4.0%	0.000
182–273 (3rd quarter)	201.4	149.0	74.0%	103.6	202.4	170.9	84.4%	90.9	0.5%	0.111
274–365 (4th quarter)	200.5	151.8	75.7%	103.1	202.4	209.3	103.4%	90.9	1.0%	0.008
366–546 (1st half of 2nd year)	205.7	152.4	74.1%	105.8	205.7	168.6	82.0%	92.4	0.0%	0.989
547–720 (2nd half of 2nd year)	209.4	168.9	80.6%	107.7	201.5	160.6	79.7%	90.5	−3.8%	0.000

Source: Authors' own work.

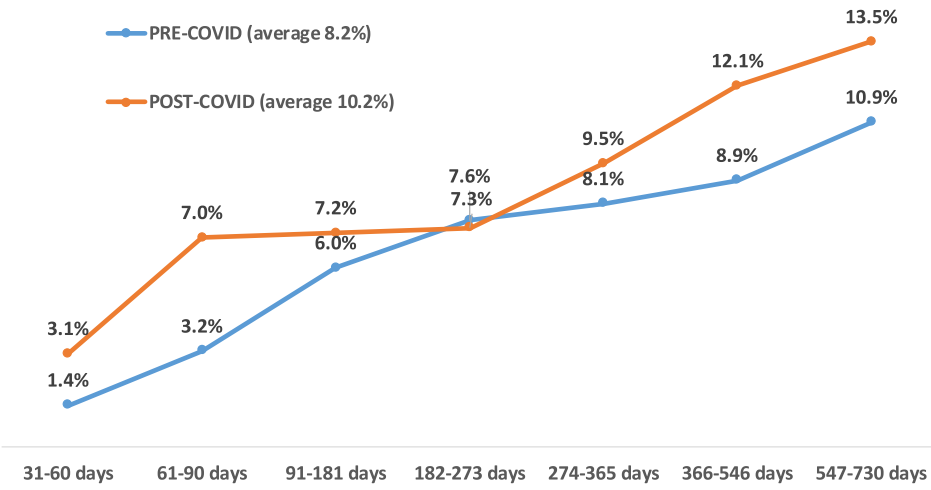

Fig. 1. Price difference compared to 0–30 days by advance booking intervals based on hedonic analysis.
Source: Authors' own work.

high occupancy rates and cruise companies have therefore lowered their prices to stimulate demand. In addition, the differences between the lowest and highest rated ships are smaller both before and after Covid-19 for different reasons (H5). Regarding itinerary length (H6), the longer the itinerary, the greater the differences found before Covid-19, but not after Covid-19, when differences are higher for the most common itineraries of six to nine nights. Finally, when considering the quarter of departure (H7), although homogeneity could be expected due to the fact that seasonality can be countered by ship allocation strategies in the cruise industry, some differences are found. These analyses therefore support all the hypotheses formulated.

4.3. Advance booking strategies interval by interval

This section analyses the main differential strategies in the eight advance booking intervals (see Appendix B). Fig. 2 shows the proportion of cases out of the total number of cases analysed in each interval where it is cheaper to book in advance. On average, it is cheaper to book in advance in 18.4% of the pre-Covid-19 and 28.1% of the post-Covid-19 estimates.

4.4. From 31 to 60 days (second month of the first year)

The price differences in relation to 0 to 30 days are +1.4% before Covid-19 and + 3.1% after Covid-19. In the pre-Covid-19 period, in 16 out of 56 model estimates (28.6%), it is cheaper to book between 31 and 60 days before departure than between 0 and 30 days. Ten of these 16 models are from cruise line strategies, four from place of departure, one from ship rating and one from quarter of departure. In 13 models (23.2%), the price is more than twice the average, corresponding to six cruise lines and six places of departure.

In the post-Covid-19 period, in 22 out of 56 cases (39.3%), it is cheaper to book between 31 and 60 days before departure than between 0 and 30 days. Thirteen of these 22 cases are from cruise line strategies, six from the place of departure, one from ship capacity, one from itinerary length and one from quarter of departure. In 14 cases (25.0%), the value is more than twice the average, corresponding to eight cruise lines, three places of departure, one ship capacity range and two quarters of departure.

4.5. From 61 to 90 days (third month of the first year)

The price differences in relation to 0 to 30 days are +3.2% before Covid-19 and + 7.0% after Covid-19. In the pre-Covid-19 period, in 9 out of 56 models (16.1%), it is cheaper to book between 61 and 90 days before departure than between 0 and 30 days. Seven of these nine models are from cruise line strategies, one from place of departure and one from ship rating. In 14 models (25.0%), the value is more than twice the average, corresponding to eight cruise lines and six places of departure.

In the post-Covid-19 period, in 21 out of 56 models (37.5%), it is cheaper to book between 61 and 90 days before departure than between 0 and 30 days. Sixteen of these 21 models are from cruise line strategies, three from place of departure, one from ship capacity and one from quarter of departure. In eight cases (14.3%), the value is more than twice the average, corresponding to five cruise lines and three places of departure.

4.6. From 91 to 181 days (second quarter of the first year)

The price differences in relation to 0 to 30 days are +6.0% before Covid-19 and + 7.2% after Covid-19. In the pre-Covid-19 period, in 10 out of 56 models (17.9%), it is cheaper to book between 91 and 181 days before departure than between 0 and 30 days. Nine of these 10 models are from cruise line strategies and one from ship rating. In 11 models (19.6%), the value is more than twice the average, corresponding to six cruise lines and five places of departure.

In the post-Covid-19 period, in 19 out of 56 models (33.9%), it is cheaper to book between 91 and 181 days before departure than between 0 and 30 days. Fourteen of these 19 models are from cruise line strategies, three from place of departure, one from ship capacity and one from quarter of departure. In eight models (14.3%), the value is more than twice the average, corresponding to eight cruise lines and two places of departure.

4.7. From 182 to 273 days (third quarter of the first year)

The price differences in relation to 0 to 30 days are +7.6% before Covid-19 and + 7.3% after Covid-19. In the pre-Covid-19 period, in nine out of 56 models (16.1%), it is cheaper to book between 182 and 273 days before departure than between 0 and 30 days. All of these models correspond to cruise companies strategies. In 10 models (17.9%), the value is more than twice the average, corresponding to six cruise companies and four places of departure.

In the post-Covid-19 period, in 16 out of 56 models (28.6%), it is cheaper to book between 182 and 273 days before departure than

between 0 and 30 days. Twelve of these 16 models are from cruise line strategies, three from place of departure and one from ship capacity. In eight models (14.3%), the value is more than twice the average, corresponding to five cruise companies and three places of departure.

4.8. From 274 to 365 days (fourth trimester of the first year)

The price differences in relation to 0 to 30 days are +8.1% before Covid-19 and + 9.5% after Covid-19. In the pre-Covid-19 period, in eight out of 56 models (14.3%), it is cheaper to book between 274 and 365 days before departure than between 0 and 30 days. Seven of these eight models are from cruise line strategies and one from place of departure. In 13 models (23.2%), the value is more than twice the average, corresponding to nine cruise companies and four places of departure.

In the post-Covid-19 period, in 11 out of 56 models (19.6%), it is cheaper to book between 274 and 365 days before departure than between 0 and 30 days. Eight of these 11 models are from cruise line strategies and three from place of departure. In six cases (10.7%), the value is more than twice the average, corresponding to three cruise companies and three places of departure.

4.9. From 366 to 546 days (first half of the second year)

The price differences in relation to 0 to 30 days are +8.9% before Covid-19 and + 12.1% after Covid-19. In the pre-Covid-19 period, in 10 out of 56 models (17.9%), it is cheaper to book between 366 and 546 days than between 0 and 30 days. Seven of these 10 models are from cruise line strategies, two from place of departure and one from ship rating. In 13 models (23.2%), the value is more than twice the average, corresponding to nine cruise companies and four places of departure.

In the post-Covid-19 period, in 10 out of 56 models (17.9%), it is cheaper to book between 366 and 546 days before departure than between 0 and 30 days. Seven of these 10 models are from cruise line strategies and three are from place of departure. In three models (5.4%), the value is more than twice the average, corresponding to two cruise companies and one place of departure.

4.10. From 547 to 730 days (second half of the second year)

The price differences in relation to 0 to 30 days are +10.9% before Covid-19 and + 13.5% after Covid-19. In the pre-Covid-19 period, in 10 out of 56 models (17.9%), it was cheaper to book between 547 and 730 days before departure than between 0 and 30 days. Eight of these 10 models are from cruise line strategies and two are from place of departure. In 12 models (21.4%), the value is more than twice the average, corresponding to eight cruise lines and four places of departure.

In the post-Covid-19 period, in 11 out of 56 models (19.6%), it is cheaper to book between 547 and 730 days before departure than between 0 and 30 days. Eight of these 11 models are from cruise line strategies and three are from place of departure. In three models (5.4%), the value is more than twice the average, corresponding to two cruise companies and one place of departure.

5. Conclusions

The aim of this article was to analyse advance booking pricing strategies in the cruise industry before and after the declaration of Covid-19 by the World Health Organization. Advance booking has been widely analysed in the tourism sector; however, literature on this topic is lacking in the cruise market, and the only relevant research to date is by Ayvaz-Cavdaroglu et al. (2017). The present study examined advance booking from zero days to two years before departure, using an extensive database of more than 1.6 million prices obtained from a leading Spanish OTA between February 2019 and March 2021. These data were used to explore the determinants of advance booking patterns before and after Covid-19 (13 months before and 13 months after). In terms of methodology, we used the hedonic approach, as suggested by the academic literature. The study variables include, in the same order as the

Table 3
Main results of the hedonic analysis comparing booking 0–30 days in advance to the remaining intervals.

Category	Main results
Cabin type (H1)	• The most homogeneous strategy is found by cabin type. • Oceanview cabins have higher price differences, as this is the most common type of cabin. • Suites have lower price differences, which may be due to the fact that people booking this type of cabin are willing to pay more and are less sensitive to price changes.
Cruise company (H2)	• This classification had the largest dispersion, showing different advance pricing strategies among cruise companies before and after Covid-19. • In terms of available cabins, Royal Caribbean, Carnival, MSC, Norwegian and Princess were the main cruise lines with strategies in place. According to Cruise Market Watch (2021), these companies cover 54.4% of the market.
Place of departure (H3)	• Differences were found between the pre- and post-Covid-19 periods, indicating heterogeneous strategies. • In the pre-Covid-19 period, the two main CLIA zones (the Caribbean and the Mediterranean) show less price variation. • In the post-Covid-19 period, the Caribbean has higher-than-average prices and the Mediterranean slightly lower-than-average prices.
Ship capacity (H4)	• Differences were found between the pre- and post-Covid-19 periods, indicating heterogeneous strategies. • In the pre-Covid-19 period, the larger the ship capacity, the smaller the difference between time intervals. • In the post-Covid-19 period, the larger the ship capacity, the greater the difference between time intervals.
Ship rating (H5)	• The smallest differences are observed at the two ends of the ship rating system, both before and after Covid-19. • For the ships with the highest rating, these differences can be explained by lower price sensitivity. • For the ships with the lowest rating, these differences may be due to the fact that this category corresponds to only nine out of the 255 ships analysed and that more than 65% of the prices with the lowest rating correspond to only two cruise companies.
Itinerary length (H6)	• Before Covid-19, price differences increased in relation to the number of nights in the itinerary. This could be explained by the fact that the longer the itinerary, the more opportunities there are to adjust prices. • After Coved-19, the main differences are in the range of 6–9 nights, which could be because this is the most common itinerary length.
Quarter (H7)	• Cruise ships are not seasonal and departures are demand driven, so one would expect homogeneous strategies across seasons. However, the results do not support this homogeneity. Differences between quarters can be explained by cruise companies' decisions on how to allocate ships over the year. • There was a steady upward trend in the period before Covid-19, with price differences increasing from quarter to quarter. These differences may be due to the fact that in most places the third quarter coincides with family and work holidays and the fourth quarter with the Christmas holidays. During these periods, demand and prices increase, so consumers need to book in advance if they want a specific itinerary or cabin. In fact, July is the most expensive month of the year, August the third most expensive and December the sixth most expensive (Espinet-Rius et al., 2022). • In the post-Covid-19 period, the smallest difference is found in the third quarter, followed by the second quarter. The first and fourth quarters show much larger differences. As work and school patterns have not changed, these differences may be only temporary as each country's recovery from the pandemic is different.

Source: Authors' own work.

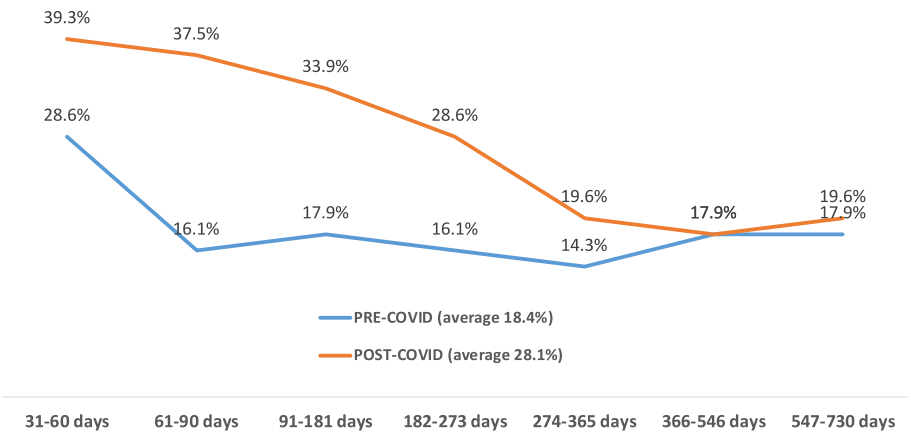

Fig. 2. Percentage of model estimates that are cheaper than booking 0–30 days before departure.

hypotheses formulated: cabin type, cruise company, place of departure, ship capacity, ship rating, number of nights on the itinerary and month of departure.

The hedonic analysis shows that for both periods (pre- and post-Covid-19), the earlier the booking, the more expensive the itinerary, and that the monthly changes are very stable and tend to grow steadily. These findings are significant because they mean that cruise passengers can get a better price by booking at the last minute. This is in line with another study by Ayvaz-Cavdaroglu et al. (2017), who found that the cost of getting a better price is not having access to some itineraries or cabin types. However, considering only the average price, the characteristics and attributes of the available itineraries and cabins show that early booking was the cheapest after Covid-19. In fact, the number of available prices in the 0–30 days before departure period is on average half that of the other months, so this could also be an indicator of pre-departure demand.

Price differences for bookings made between 0 and 30 days before departure and up to two years in advance are higher in most cases since Covid-19 was declared a pandemic. This may be due to uncertainty among cruise lines and cruise passengers. A wide range of strategies were also identified, making the future behaviour of cruise lines an interesting topic for future research. In this context, cruise lines should consider developing strategies to encourage customers to book earlier. Covid-19 has already influenced supplier strategies in a number of industries, such as the hotel and airline industries, and the intention of some passengers to buy tickets closer to the departure date (Bulchand-Gidumal & Melián-González, 2021).

The analysis by different types of classification shows heterogeneous strategies, both before and after Covid-19. The most diversified are the cruise lines, many of which have both pre- and post-Covid-19 strategies. The post-Covid-19 situation may again be due to uncertainty. Indeed, in support of H2, seven out of 24 cruise lines raised their last-minute prices before Covid-19 and eight after Covid-19. Only two (Celestyal and Silversea) did so both before and after Covid-19. Furthermore, the major cruise companies used different strategies, which is consistent with the findings of Yang and Leung (2018), who concluded that hotel market power does not explain price discounts, contradicting previous market research findings (Wolk & Ebling, 2010). Other strategies with respect to place of departure are as follows, supporting H3: before Covid-19, two out of 14 places were more expensive when the cruise was booked last minute. After Covid-19, three out of 14 were more expensive when the cruise was booked last minute, and only Africa was more expensive in both periods.

Compared to 0–30 days, there are relatively few differences between cabin type (H1), ship rating (H5), ship capacity (H4), itinerary length in nights (H6) and quarter of departure (H7). After Covid-19, prices recorded in the 0–30 days before departure are lower than those for larger ships on the most popular itineraries (6–9 days), supporting H4 and H6, which can be explained by the fact that larger ships have more difficulty in achieving higher occupancy rates and therefore cruise lines lower prices to stimulate demand. These results confirm that the main heterogeneity depends on the cruise lines' strategies (H2), as indicated above.

An analysis of the difference between intervals of days between the date of booking and the date of departure, together with the classifications, shows that although it is generally cheaper to book last minute (up to 30 days in advance), according to 18.4% of the pre-Covid-19 estimates and 28.1% of the post-Covid-19 estimates, it is cheaper to book earlier. In general, the earlier the booking, the lower the percentage of estimates stating that it is cheaper to book earlier (between 39.3% and 17.9% pre-Covid-19 and between 28.6% and 14.3% post-Covid-19). Advance booking is therefore used selectively and can be an advantage for customers, but only in some cases.

In short, two cruise customer profiles can be identified: (1) those who prefer to book in advance so that they can choose the date, itinerary and cabin; and (2) those who wait until the last minute to get a better price or because of uncertainty. These findings contradict most of the previous literature on advance booking. This may be because the cruise industry is distinct from other tourism industries, such as the hotel industry (Toh et al., 2005).

5.1. *Theoretical implications*

This study provides some theoretical implications in the context of advance booking pricing strategies. Moreover, it does so in the cruise industry, which has received very little attention in the academic literature (Ayvaz-Cavdaroglu et al., 2017). Some of these theoretical implications can be useful not only for cruise researchers, but also for tourism academia in general.

Firstly, the study provides a long-term analysis, covering bookings

made up to two years in advance. It is the first study to analyse this market taking into account both last-minute booking strategies (which focus mainly on discounts and availability) and advance booking strategies (for cruises in the distant future, considering a wide range of features such as availability and quality). In the tourism industry, very few studies cover periods up to a year or more in advance (Chen & Schwartz, 2008). Unlike other tourism industries, in the cruise industry it is possible to book most itineraries two years or more in advance, so there is a greater temporal distance from the day of departure. This may lead to differences in booking patterns compared to more widely studied industries such as hotels (Toh et al., 2005).

Secondly, it provides a better understanding of how cruise booking patterns have changed since Covid-19. In fact, studies of last-minute booking since Covid-19 are scarce and none are specific to the cruise industry. The results of this study show that although average last-minute prices were lower both before and after Covid-19, the differences are greater since Covid-19. In fact, the results indicate that cruise lines have adopted heterogeneous and selective advance pricing strategies since Covid-19, which may be due to cruise lines' segmentation strategies, i.e. market structure is not directly related to pricing strategies. This heterogeneity in cruise lines' strategies is also highlighted by Ayvaz-Cavdaroglu et al. (2017). Our analysis is particularly relevant in uncertain situations, such as Covid-19, because buying behaviour changes and cruise lines can adjust their pricing strategies according to customer distrust by considering the possibility of offering higher discounts when demand is more uncertain (Pan et al., 2021).

Third, in the tourism industry, and more specifically in the cruise industry, it is not possible to establish specific rules or patterns as to when it is cheaper to book, because there are different influencing factors (e.g. booking channel, departure frequency, guest ratings, etc.) and because these decisions are linked to the break-even point and long-term profits (Dacko, 2004; Malighetti et al., 2010). Indeed, some studies show that the earlier the booking, the lower the price (Beria et al., 2016; Nicolau & Masiero, 2017; Schamel, 2012), while other empirical studies find that booking in advance is relatively more expensive (Bigné et al., 2021; Malighetti et al., 2010). In order to better explore these different results, we take a more precise look at the specific pricing strategies used by cruise lines. In general, cruise lines define their services to a high degree in order to better adapt to their customers, for example by offering an average of 24.78 cabin types (Espinet, 2018), which fully influences their pricing strategies. Therefore, acknowledging the high specification of the cruise product, both tactical and strategic decisions linked to the offer must be particularly addressed in the literature, as this offer is different from other industries, such as hotels.

5.2. Practical and managerial implications

The implications of this study are of interest to all stakeholders involved in cruise activities (i.e. cruise lines, ports, destination management organisations, cruise passengers, etc.). Firstly, this study can help cruise lines to increase booking rates and strategically set prices. In addition, the results allow a comparison of the strategies used by different cruise lines and highlight the relevance of price segmentation strategies in situations considered normal and in exceptional and uncertain situations. In this sense, flexible cancellation policies are very relevant to facilitate the anticipation of bookings (Walters et al., 2022). Overall, these results have important implications for marketing decisions, as they suggest that many cruise customers delay their purchase decision in anticipation of better future prices. However, marketing actions must be in line with the financial plan if they are to be profitable. Secondly, the results of this study can be used by ports and destinations as an indicator of the purchasing power of cruise passengers and therefore an indicator of the purchasing power of destinations. Thirdly, the results of this study can provide passengers with a better understanding of when is the best time to book a cruise, bearing in mind that the later the booking, the less opportunity there is to choose a particular itinerary or cabin.

5.3. Limitations and future research

The main limitation of this research is that it only refers to one leading Spanish OTA, although bookings can be made through its website worldwide. Another limitation is that it focuses only on the supply side and lacks information on the demand side. However, we can reasonably assume that the OTA only publishes available cabins, so this can be taken as a measure of demand when the price disappears from the database. This may explain why the number of available prices decreases as the departure date approaches. Further research should look at other OTAs and booking channels. The inclusion of itineraries could be another focus of future studies, although the number of ports with berthing capacity for high tonnage ships limits the possible itineraries. A further study could assess the situation over a longer period of time to determine the long-term impact of Covid-19 on advance booking patterns.

CRediT authorship contribution statement

Josep Maria Espinet-Rius: Conceptualization, Data curation, Investigation, Writing – original draft, Writing – review & editing, Resources. **Ariadna Gassiot-Melian:** Formal analysis, Methodology, Validation, Writing – review & editing. **Lluís Coromina:** Formal analysis, Methodology, Supervision, Validation, Writing – original draft, Writing – review & editing.

Declaration of competing interest

None.

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Appendix A

A.1. Results of the hedonic model

		Pre-Covid-19			Post-Covid-19		
Variable	Categories	Coefficient	t	p-value	Coefficient	t	p-value
Constant		5.963	2329.682	0.000	5.958	1349.055	0.000
Nights		0.120	1010.606	0.000	0.123	932.922	0.000
Cabin type	Inside	Reference					
	Oceanview	0.169	209.519	0.000	0.175	202.975	0.000
	Balcony	0.371	445.579	0.000	0.355	403.433	0.000

(continued on next page)

(*continued*)

		Pre-Covid-19			Post-Covid-19		
Variable	Categories	Coefficient	t	p-value	Coefficient	t	p-value
Cruise company	Suite	0.755	937.744	0.000	0.733	852.589	0.000
	AIDA	−0.020	−12.013	0.000	0.008	4.856	0.000
	Azamara	0.656	177.488	0.000	0.602	147.753	0.000
	Carnival	−0.172	−148.717	0.000	−0.254	−210.720	0.000
	Celebrity	0.380	227.431	0.000	0.484	278.771	0.000
	Celestyal Cruises	−0.024	−8.852	0.000	−0.160	−55.818	0.000
	Costa Cruises	−0.152	−104.714	0.000	0.038	24.147	0.000
	Cruise & Maritime Voyages	−0.175	−50.544	0.000	−0.279	−54.915	0.000
	Crystal	1.171	281.374	0.000	0.967	226.420	0.000
	Cunard	0.381	154.474	0.000	0.384	140.507	0.000
	Desire Cruise	1.005	14.181	0.000	1.134	10.416	0.000
	Disney	0.838	374.681	0.000	0.866	335.424	0.000
	Fred Olsen	0.256	4.311	0.000	–	–	–
	Hapag Lloyd	0.867	65.079	0.000	0.661	49.391	0.000
	Holland America	0.128	69.175	0.000	0.168	77.525	0.000
	MSC Cruises	−0.216	−171.547	0.000	−0.271	−208.355	0.000
	Norwegian	0.199	144.100	0.000	0.155	109.769	0.000
	Oceania Cruises	0.586	199.960	0.000	0.460	146.278	0.000
	Paul Gauguin Cruises	1.364	217.725	0.000	1.280	203.371	0.000
	Princess	0.100	65.448	0.000	0.023	13.275	0.000
	Pullmantur	−0.157	−60.883	0.000	−0.147	−37.684	0.000
	Regent	0.757	134.950	0.000	0.740	126.486	0.000
	Royal Caribbean	Reference					
	SeaDream Yacht Club	1.281	285.525	0.000	1.265	247.179	0.000
	Seabourn	0.589	111.279	0.000	0.729	145.986	0.000
	Silversea	0.842	182.891	0.000	0.892	199.861	0.000
	Windstar	0.754	206.545	0.000	0.712	213.883	0.000
Place of departure	Africa	0.012	3.531	0.000	0.126	−13.283	0.000
	Alaska	0.115	78.611	0.000	−0.049	85.094	0.000
	Asia, excluding China	0.023	12.507	0.000	0.132	9.159	0.000
	Australia / New Zealand / Pacific	0.053	27.810	0.000	0.021	47.738	0.000
	Canada / New England	0.110	36.797	0.000	0.087	42.359	0.000
	Caribbean	Reference					
	China	0.115	33.112	0.000	0.096	26.903	0.000
	Hawaii / West USA	0.669	184.064	0.000	0.759	193.592	0.000
	Mediterranean	0.132	123.193	0.000	0.124	112.316	0.000
	Mexico / Central America	−0.072	−43.591	0.000	−0.062	−33.630	0.000
	Northern Europe	0.122	88.899	0.000	0.126	86.220	0.000
	South America	0.401	182.499	0.000	0.454	208.197	0.000
	United Arab Emirates	−0.038	−16.520	0.000	0.046	18.160	0.000
Ship capacity	Up to 2000	Reference					
	From 2001 to 3000	−0.110	−83.026	0.000	−0.166	−105.482	0.000
	From 3001 to 4000	−0.067	−47.526	0.000	−0.160	−95.972	0.000
	More than 4000	0.001	0.347	0.729	−0.075	−44.437	0.000
Number of days before departure	Up to 30	Reference					
	From 31 to 60	0.014	6.701	0.000	0.031	7.097	0.000
	From 61 to 90	0.031	15.489	0.000	0.068	16.546	0.000
	From 91 to 181	0.058	33.915	0.000	0.069	17.915	0.000
	From 182 to 273	0.073	42.679	0.000	0.071	18.365	0.000
	From 274 to 365	0.078	45.698	0.000	0.090	23.514	0.000
	From 366 to 546	0.085	52.052	0.000	0.114	29.826	0.000
	From 547 to 730	0.103	60.096	0.000	0.127	32.781	0.000
Month of departure	January	−0.358	−242.128	0.000	−0.346	−226.008	0.000
	February	−0.325	−214.593	0.000	−0.315	−197.599	0.000
	March	−0.281	−191.200	0.000	−0.259	−167.525	0.000
	April	−0.264	−181.590	0.000	−0.245	−161.886	0.000
	May	−0.192	−141.417	0.000	−0.179	−127.491	0.000
	June	−0.057	−41.995	0.000	−0.057	−40.834	0.000
	July	Reference					
	August	−0.056	−42.656	0.000	−0.055	−40.521	0.000
	September	−0.212	−157.965	0.000	−0.204	−148.042	0.000
	October	−0.295	−214.963	0.000	−0.292	−208.599	0.000
	November	−0.381	−263.840	0.000	−0.366	−240.818	0.000
	December	−0.217	−149.638	0.000	−0.204	−133.754	0.000

Source: Authors' own work.

Appendix B

B.1. Hedonic analysis: percentage price difference compared to 0–30 days by advance booking intervals and classifications

		% variation r/. 0–30 days																		
		Pre-Covid-19								Post-Covid-19								Adjusted R square		Coef. of variation	
		31–60	61–90	91–181	182–273	274–365	366–546	547–730	Average	31–60	61–90	91–181	182–273	274–365	366–546	547–730	Average	Pre	Post	Pre	Post
GLOBAL		1.4%	3.2%	6.0%	7.6%	8.1%	8.9%	10.9%	8.2%	3.1%	7.0%	7.2%	7.3%	9.5%	12.1%	13.5%	10.2%	0.849	0.862	50.3%	41.1%
Cabin type	**Inside**	1.9%	3.6%	6.7%	8.2%	8.4%	9.2%	11.2%	**8.6%**	3.5%	8.0%	8.5%	9.3%	12.0%	14.7%	16.2%	**12.5%**	0.813	0.829	46.1%	42.0%
	Oceanview	2.4%	5.0%	8.4%	10.6%	11.2%	12.1%	14.8%	**11.3%**	4.0%	8.7%	9.4%	10.2%	13.1%	16.1%	18.4%	**13.8%**	0.834	0.852	46.5%	42.5%
	Balcony	1.1%	3.1%	6.2%	8.2%	8.9%	10.2%	12.1%	**9.1%**	4.7%	9.0%	9.1%	9.3%	12.3%	15.7%	16.2%	**12.9%**	0.832	0.861	55.0%	37.6%
	Suite	0.0%	1.1%	2.5%	2.9%	3.5%	3.6%	4.1%	**3.2%**	1.2%	3.3%	2.7%	2.0%	2.5%	3.7%	4.1%	**3.2%**	0.830	0.841	58.2%	36.1%
Cruise company	**AIDA**	4.5%	6.7%	16.0%	29.6%	33.8%	32.6%	34.4%	**28.3%**	4.6%	8.5%	11.9%	14.3%	15.6%	16.3%	16.9%	**14.7%**	0.890	0.911	58.4%	36.5%
	Azamara	−1.8%	−2.4%	−2.5%	4.5%	4.5%	9.7%	17.6%	**7.8%**	2.0%	−0.8%	−6.4%	−6.1%	−0.5%	5.9%	16.0%	**4.1%**	0.751	0.789	178.0%	530.9%
	Carnival	−0.3%	−1.1%	−0.7%	−1.0%	−1.4%	−1.1%	−2.0%	**−1.3%**	−3.6%	−3.5%	−2.1%	1.1%	4.6%	6.1%	6.7%	**3.5%**	0.879	0.844	−49.3%	338.4%
	Celebrity	0.4%	6.9%	20.4%	23.5%	24.0%	22.8%	16.7%	**19.5%**	26.1%	41.0%	40.9%	36.9%	43.3%	45.5%	38.0%	**40.5%**	0.831	0.860	56.4%	16.3%
	Celestyal Cruises	1.7%	1.1%	0.8%	−1.4%	−4.0%	−5.6%	−5.4%	**−3.4%**	2.0%	−3.0%	−4.2%	−4.4%	−6.0%	−7.0%	−8.7%	**−6.0%**	0.895	0.888	−169.6%	−77.1%
	Costa Cruises	2.4%	4.3%	4.8%	4.0%	4.7%	3.6%	7.0%	**4.8%**	−4.6%	−5.2%	−5.8%	−1.1%	3.5%	3.9%	4.4%	**1.3%**	0.793	0.770	32.2%	−653.0%
	Cruise & Maritime Voyages	0.3%	9.7%	17.1%	18.7%	16.6%	6.2%	−1.1%	**8.6%**	4.7%	14.0%	17.7%	18.8%	15.4%	10.6%	9.1%	**12.7%**	0.891	0.919	84.9%	39.2%
	Crystal	−1.0%	−2.5%	−0.9%	5.5%	18.2%	43.1%	29.1%	**21.7%**	−4.8%	−5.0%	−9.7%	−10.7%	−11.0%	−11.4%	−18.1%	**−12.2%**	0.754	0.853	135.1%	−44.6%
	Cunard	−0.1%	0.5%	5.6%	8.7%	5.6%	2.3%	5.3%	**4.6%**	−2.8%	−0.9%	5.1%	4.2%	5.1%	1.6%	−1.1%	**1.8%**	0.861	0.839	79.6%	204.1%
	Disney	0.3%	0.6%	2.6%	1.9%	1.2%	2.0%	0.0%	**1.3%**	−4.9%	−2.6%	−2.9%	0.3%	3.4%	3.3%	−6.3%	**−1.0%**	0.872	0.890	79.2%	−275.5%
	Hapag Lloyd	3.3%	12.6%	−2.0%	−1.5%	−16.0%	−19.8%	−22.8%	**−13.0%**	7.2%	−1.8%	4.8%	5.9%	8.5%	−0.3%	−4.1%	**1.6%**	0.690	0.737	−199.3%	170.9%
	Holland America	1.8%	4.8%	10.0%	12.8%	16.8%	19.3%	22.8%	**16.4%**	2.8%	17.2%	25.1%	38.9%	43.4%	48.9%	54.2%	**41.8%**	0.826	0.840	60.5%	56.4%
	MSC Cruises	0.5%	0.5%	0.3%	−0.8%	−2.6%	−4.9%	−2.5%	**−2.3%**	12.4%	18.8%	20.1%	20.1%	21.3%	22.1%	22.7%	**21.1%**	0.820	0.810	−150.9%	17.6%
	Norwegian	3.3%	9.4%	21.4%	31.8%	35.2%	39.3%	44.7%	**34.0%**	−2.1%	−2.8%	−3.9%	−2.9%	1.5%	6.3%	8.5%	**2.9%**	0.774	0.800	58.9%	767.2%
	Oceania Cruises	0.4%	1.2%	−0.4%	−0.2%	4.4%	5.6%	8.1%	**4.1%**	−6.9%	−13.9%	−10.3%	−8.1%	−5.5%	−0.1%	1.4%	**−3.7%**	0.851	0.855	120.7%	−87.7%
	Paul Gauguin Cruises	−1.7%	−4.6%	−0.8%	−0.6%	1.5%	2.9%	7.1%	**2.3%**	−3.5%	−0.3%	2.8%	3.9%	0.3%	2.0%	−10.9%	**−1.6%**	0.920	0.866	709.7%	−615.9%
	Princess	1.8%	5.5%	8.3%	10.0%	14.0%	23.2%	25.9%	**17.4%**	0.2%	0.9%	−3.1%	−5.9%	−0.6%	4.4%	7.4%	**1.9%**	0.826	0.805	70.7%	907.3%
	Pullmantur	5.1%	9.1%	11.8%	9.8%	8.0%	7.7%	10.7%	**9.3%**	1.2%	1.5%	−3.0%	−0.9%	−3.3%	−4.0%	−1.4%	**−2.2%**	0.617	0.759	24.8%	−154.9%
	Regent	−10.1%	−15.8%	−17.8%	−18.8%	−16.8%	−16.3%	−15.2%	**−16.3%**	−4.0%	−1.5%	6.2%	6.0%	6.3%	7.2%	6.4%	**5.7%**	0.588	0.631	−17.6%	119.4%
	Royal Caribbean	−2.2%	−1.0%	−0.7%	−1.1%	−1.3%	−1.3%	−1.4%	**−1.2%**	19.4%	27.1%	25.5%	17.4%	15.4%	19.3%	21.5%	**20.3%**	0.770	0.770	−35.7%	20.3%
	Seabourn	−0.4%	3.0%	8.2%	12.1%	17.8%	28.0%	46.2%	**24.4%**	−16.3%	−9.9%	−6.2%	−1.3%	1.8%	6.9%	17.2%	**4.4%**	0.781	0.847	98.8%	−992.4%
	SeaDream Yacht Club	−1.7%	0.5%	0.4%	1.4%	2.4%	0.7%	2.7%	**1.4%**	−2.0%	−1.8%	−1.7%	−0.6%	1.9%	1.4%	0.7%	**0.3%**	0.781	0.873	158.5%	−563.0%
	Silversea	−4.7%	−4.3%	−6.6%	−7.5%	−5.8%	−8.1%	−7.1%	**−7.0%**	−12.1%	−11.3%	−10.6%	−10.0%	−11.0%	−10.6%	−11.6%	**−10.9%**	0.632	0.797	−22.6%	−6.4%
	Windstar	4.2%	15.0%	29.6%	38.4%	39.1%	48.9%	47.4%	**39.9%**	−12.3%	−12.4%	−16.1%	−13.4%	−4.2%	−3.5%	0.0%	**−6.4%**	0.560	0.562	52.7%	−69.6%
Place of departure	**Africa**	3.6%	6.7%	5.5%	6.7%	−1.1%	−9.1%	−1.0%	**−0.7%**	−0.4%	0.1%	−4.5%	−9.0%	−11.3%	−10.1%	−4.1%	**−7.0%**	0.965	0.967	356.0%	−82.3%
	Alaska	4.3%	6.5%	12.8%	14.1%	14.2%	19.8%	22.8%	**16.9%**	−6.7%	−9.5%	−6.7%	−5.2%	−6.2%	−2.3%	−0.6%	**−3.8%**	0.838	0.832	49.0%	−56.0%
	Asia (excluding China)	−0.9%	0.0%	4.6%	10.7%	14.3%	15.0%	13.1%	**11.2%**	5.7%	9.5%	8.2%	8.1%	14.0%	18.0%	18.2%	**14.1%**	0.856	0.907	83.7%	43.1%
	Australia/NZ/ Pacific	2.9%	2.3%	5.2%	7.8%	10.7%	12.9%	14.1%	**10.4%**	−0.7%	6.5%	8.3%	6.6%	6.1%	6.2%	9.4%	**7.1%**	0.900	0.875	59.4%	53.0%

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		% variation r/. 0–30 days																			
		Pre-Covid-19								Post-Covid-19								Adjusted R square		Coef. of variation	
		31–60	61–90	91–181	182–273	274–365	366–546	547–730	Average	31–60	61–90	91–181	182–273	274–365	366–546	547–730	Average	Pre	Post	Pre	Post
GLOBAL		1.4%	3.2%	6.0%	7.6%	8.1%	8.9%	10.9%	8.2%	3.1%	7.0%	7.2%	7.3%	9.5%	12.1%	13.5%	10.2%	0.849	0.862	50.3%	41.1%
	Canada / New England	4.5%	8.1%	13.6%	20.6%	18.4%	20.0%	28.1%	**19.9%**	−5.7%	−4.5%	1.0%	8.5%	11.8%	12.2%	10.3%	**8.2%**	0.882	0.890	49.7%	161.2%
	Caribbean	0.2%	1.6%	3.7%	4.9%	5.7%	5.0%	4.8%	**4.5%**	4.8%	10.2%	9.4%	8.7%	11.4%	12.9%	14.6%	**11.7%**	0.843	0.866	55.5%	30.8%
	China	−0.3%	7.6%	13.5%	9.3%	7.2%	15.5%	26.9%	**15.3%**	−3.1%	−7.1%	−14.7%	−19.0%	−16.3%	−8.1%	−18.3%	**−13.8%**	0.632	0.659	74.8%	−50.2%
	Hawaii / West USA	7.1%	11.3%	27.7%	39.1%	39.8%	39.3%	42.3%	**36.0%**	6.9%	24.2%	24.2%	21.4%	19.5%	22.8%	26.5%	**22.7%**	0.826	0.846	49.8%	31.4%
	Mediterranean	2.6%	4.1%	5.5%	5.5%	4.7%	5.9%	8.7%	**6.2%**	4.5%	7.3%	7.3%	7.9%	9.9%	11.8%	10.8%	**9.7%**	0.856	0.862	35.2%	29.3%
	Mexico / Central America	−0.3%	0.6%	1.8%	2.6%	2.6%	3.4%	2.9%	**2.5%**	−2.3%	2.2%	1.5%	5.2%	10.4%	13.6%	15.8%	**9.9%**	0.915	0.912	69.6%	102.0%
	Northern Europe	1.0%	6.1%	12.1%	15.5%	17.0%	18.2%	21.5%	**16.5%**	3.8%	7.8%	9.8%	12.5%	15.6%	17.7%	17.0%	**14.5%**	0.839	0.847	55.3%	43.0%
	South America	−0.3%	1.0%	0.6%	1.1%	2.8%	−3.3%	−0.2%	**−0.3%**	13.4%	14.4%	13.9%	13.9%	20.1%	23.4%	25.1%	**20.1%**	0.942	0.948	727.0%	28.4%
	United Arab Emirates	2.7%	3.4%	9.2%	16.2%	17.5%	10.3%	17.3%	**13.1%**	4.3%	7.6%	11.4%	18.8%	30.2%	36.9%	41.5%	**28.8%**	0.785	0.859	57.6%	68.5%
Ship capacity	**Up to 2000**	1.9%	4.6%	7.6%	10.4%	11.4%	12.6%	14.8%	**11.3%**	−2.8%	−2.4%	−1.3%	−0.1%	1.4%	3.5%	4.8%	**1.9%**	0.894	0.903	50.5%	660.3%
	From 2001 to 3000	1.1%	3.0%	6.8%	8.6%	9.8%	9.8%	10.2%	**8.7%**	3.3%	7.7%	7.2%	8.2%	10.9%	13.5%	13.6%	**11.0%**	0.864	0.877	51.7%	40.4%
	From 3001 to 4000	1.1%	2.9%	4.9%	6.3%	6.7%	7.7%	9.0%	**6.9%**	2.1%	7.3%	7.6%	8.1%	11.9%	12.9%	13.4%	**10.9%**	0.837	0.831	50.4%	44.4%
	More than 4000	0.8%	1.6%	2.2%	1.9%	1.2%	1.4%	3.4%	**2.0%**	8.4%	10.9%	10.6%	9.7%	11.0%	13.7%	14.6%	**12.3%**	0.762	0.765	47.4%	19.0%
Ship rating	**3 stars**	1.9%	3.8%	4.6%	3.5%	1.2%	−0.5%	0.8%	**1.5%**	5.7%	2.9%	2.6%	3.8%	2.4%	1.4%	1.5%	**2.3%**	0.731	0.802	84.4%	51.0%
	4 stars	1.4%	2.7%	4.9%	6.1%	6.1%	5.7%	6.8%	**5.7%**	4.9%	9.2%	9.3%	10.1%	12.2%	14.1%	15.4%	**12.4%**	0.849	0.853	41.5%	32.7%
	5 stars	1.4%	4.1%	7.7%	9.7%	10.9%	13.3%	16.0%	**11.6%**	1.4%	5.1%	5.7%	5.5%	7.9%	10.9%	13.8%	**9.2%**	0.826	0.849	56.5%	57.2%
	6 stars	−2.6%	−3.5%	−1.1%	2.4%	4.3%	5.9%	7.2%	**3.9%**	1.1%	5.5%	6.7%	5.1%	6.1%	5.2%	0.6%	**4.1%**	0.876	0.871	235.9%	56.6%
Nights	**From 2 to 5**	0.4%	1.8%	3.3%	4.3%	3.3%	2.5%	1.4%	**2.5%**	1.2%	4.7%	4.5%	4.9%	6.8%	8.8%	10.6%	**7.4%**	0.778	0.783	56.0%	52.2%
	From 6 to 9	1.9%	3.2%	5.6%	6.8%	7.4%	8.5%	11.0%	**7.9%**	4.7%	9.2%	8.8%	8.6%	10.6%	13.3%	14.3%	**11.5%**	0.793	0.814	48.8%	32.2%
	From 10 to 14	0.7%	4.7%	9.8%	13.3%	15.3%	16.4%	19.1%	**14.5%**	−0.3%	3.5%	4.0%	4.2%	7.1%	9.1%	8.8%	**6.8%**	0.797	0.804	58.4%	64.6%
Quarter of departure	**First**	−0.5%	0.1%	0.8%	2.5%	3.8%	3.3%	2.9%	**2.5%**	6.3%	9.5%	5.8%	4.5%	8.2%	8.6%	13.8%	**8.9%**	0.860	0.876	91.0%	37.7%
	Second	2.4%	3.3%	7.0%	5.5%	5.3%	8.8%	8.3%	**7.0%**	−0.6%	4.1%	7.5%	4.5%	8.2%	9.0%	13.4%	**8.6%**	0.862	0.880	41.5%	67.2%
	Third	0.4%	2.9%	6.6%	7.9%	7.8%	9.9%	12.4%	**8.9%**	1.9%	−1.6%	−0.1%	2.1%	2.3%	6.6%	4.3%	**3.4%**	0.877	0.884	59.1%	121.8%
	Fourth	3.7%	7.5%	9.9%	14.7%	16.0%	13.0%	18.0%	**13.9%**	7.2%	15.1%	11.4%	14.0%	16.7%	19.9%	19.0%	**16.6%**	0.825	0.847	42.9%	29.8%

Source: Authors' own work.

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