COVID-led consumption displacement: A longitudinal analysis of hotel booking patterns[☆]

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ABSTRACT

This research contributes to the literature on *consumption displacement* by exploring the pandemic-led shifts in hotel booking patterns. We perform a longitudinal analysis and a critical comparison of bookings before and after COVID-19 outbreak, focusing on the *booking window, length of stay,* and *booking channel*. Data include weekly bookings of a representative sample of Balearic Islands' hotels between 2018 and 2021. Results indicate that the pandemic has led to a drop in the volume of bookings and a remarkable change in booking patterns. Specifically, we find a temporal shift in booking behavior, characterized by a lower anticipation and a change in the tourism supply chain, namely a decrease in the share of intermediated bookings. The expected increase in the frequency of exogenous shocks, such as weather-related and sanitary crises, could affect purchasing behaviors, thus enhancing the relevance of this study, with managerial implications for industry and destination managers.

1. Introduction

The COVID-19 pandemic has precipitated the largest drop in international tourism in recent history. The number of international tourists in 2020 fell to 402 million, a 72.6 % reduction compared to the previous year, leading to a significant decrease in the tourism industry's contribution to the world economy (the weight of the industry in the balance of payments on a global scale decreased from 6.8 % in 2019 to 2.8 % in 2020; UNWTO, 2020, 2021). The pandemic has radically disrupted the trend of growth observed in international tourism during the last decade, and estimations indicate that it will not be until 2025 when figures like those observed in 2019 will be reached again.

Given the pandemic's unprecedented impact on tourism, studies on changes in travel intentions and travel habits have received considerable momentum, especially in terms of destination, accommodation, and mode of transport (Boto-García and Baños-Pino, 2021; Boto-García and Leoni, 2021; Osti and Nava, 2020; Romagosa, 2020; Wen et al., 2020; Yu et al., 2021). Evidence points to a shift in preferences towards closer destinations (i.e., proximity tourism), avoiding overcrowded destinations, travelling by private transport, and engaging in open-air activities (Mackenzie and Goodnow, 2020; Park et al., 2021). By contrast, scarce

attention has been devoted to analyzing changes in booking patterns across the different phases of the pandemic. Understanding the structural changes in booking behavior might assist both the industry's recovery process and government policy design. Additionally, existing literature highlights how COVID-19 has challenged standard tourism forecasting. Many previous exercises and methodologies have become obsolete as they are unable to capture the impact of sudden unpredictable events (Zhang et al., 2021). On these premises, gaining knowledge of new tourism booking behaviors might help forecast the number of future tourist arrivals.

Booking management is a key factor in hotel operations, given the perishability and non-storability of hotel services. Therefore, analyzing booking patterns constitutes a crucial aspect in modern hotel management, not only with regard to revenue generation, but also to hotel operations. This aspect is even more important in highly seasonal destinations, where the number of tourism stays is not homogeneously spread across the year, hence increasing the relevance of having accurate bookings forecasts.

In this context, our objective is to analyze the effects of COVID-19 on hotel booking patterns from a longitudinal perspective. For this purpose, we focus on the case of the Balearic Islands, one of the main tourism

destinations in Europe. Considering the predominance of the island's hotel sector and its strong seasonality, the significant reduction of tourist overnight stays caused by COVID-19 had dramatic effects on the tourism industry. The islands' dependency on this industry contribute to making of the Balearic Islands the Spanish region mostly affected by COVID-19 (INE, 2021).

Existing literature has shown that crises can cause temporary or persistent changes in tourists' consumption patterns (Nigg, 2011). We study such changes in the Balearic Islands through the lens of consumption displacement (Crang, 1996), which is particularly important for tourism products such as airplane travel and hotel overnight stays. Based on a representative sample of hotels located in the Balearic Islands (28.28 % of the total number of hotels), this paper analyzes the evolution of weekly bookings from 2018 to 2021. Our objective is to characterize and compare booking patterns before and after the irruption of the COVID-19 crisis. Moreover, we develop a time-series benchmark model and provide an out-of-sample forecast of a non-COVID-19 scenario for this destination. The comparison of these estimates versus the real data clearly establishes that the temporal pattern of bookings has been severely affected by the pandemic. Therefore, we provide a detailed temporal analysis of the effects of the pandemic on hotel bookings. The analysis includes five aspects with relevant implications for hotel and destination management: the shape of bookings accumulation throughout the year, the weekly evolution of overall bookings, and its detailed disaggregation according to the booking window (BW), i.e., the span of time between booking the reservation and the date of arrival; the length of stay (LoS), i.e., the number of nights included in each booking; and the booking channel, focusing specifically on traditional tour operators versus online travel services.

The paper is structured as follows. First, a literature review with the theoretical contextualization of our research is conducted, followed by a description of our hypotheses. Section three describes the dataset and the Balearic Islands' tourism model. Section four is devoted to data analysis, including the benchmark forecasting model and detailed analyses of booking patterns. Finally, the last two sections summarize the study findings, discuss potential managerial implications and suggest further avenues of research.

2. Literature review and research hypotheses

2.1. Crises and tourists' preferences

Tourism depends heavily on mobility and social interactions. Therefore, this industry is especially vulnerable to international crises of various kinds such as economic downturns, natural disasters, health crises, and terrorist attacks (Ritchie and Jiang, 2019). The uncertainty generated by crises might increase protective behavior among tourists, leading to a decrease in travel and tourism expenditure (Alegre et al., 2013; Boto-García, 2020; McKercher and Hui, 2004).

The COVID-19 pandemic impacted the tourism sector on an unprecedented scale (UNWTO, 2020, 2021), causing significant, and perhaps long-term, changes in tourism preferences. In this regard, a flourishing body of literature focuses on the behavioral adaptations of tourists post-COVID-19, especially on the factors influencing the selection of destination, mode of transportation, and tourist activities. According to such studies, tourists are exhibiting a tendency towards so-called *locavism*, i.e., traveling to areas in close proximity (Arbulú et al., 2021; Mackenzie and Goodnow, 2020; Romagosa, 2020; Boto-García and Leoni, 2021), and a preference for less crowded destinations (Park et al., 2021), slow tourism (Wen et al., 2020), and outdoor activities (Osti and Nava, 2020).

The way in which people react to fear and uncertainty, which includes their attitude towards traveling, depends to some extent on their psychographic background. In this regard, Hajibaba et al. (2015) define *crisis-resistant tourists* as those who are more resistant, and resilient, to external events such as natural disasters and pandemics. Crisis-resistant

tourists are of special importance to tourism providers, since they are less prone to cancel bookings and are less willing to change their travel habits, despite knowledge of adverse factors. An application of such theoretical understanding to the current pandemic is provided by Boto-García and Baños-Pino (2021). They study the determinants of *deep travel habits,* and the perception of tourism as a *priority good* which might be postponed, but is hardly replaceable by other leisure activities.

Despite the abundant literature on the effects of the COVID-19 pandemic, scant attention has been paid to the evolution of temporal booking patterns in the hospitality industry. As discussed in Toubes et al. (2021), businesses need to reinvent themselves to reach customers whose outlook and consumption habits have changed as a consequence of this exogenous shock. In this regard, it is important to understand how people have responded to the uncertainty created by the pandemic, not only by examining their actions while traveling but also by investigating their new booking patterns. Analogously, in the field of airline studies, Gallego and Font (2021) attempt to describe and forecast the evolution of booking patterns, analyzing the *search* (proxy for *desire to travel*) and *picks* (proxy for *travel intention*) of people on the Skyscanner website.

2.2. COVID-19-led consumption displacement

During the last two years, social and academic debates point to a potential change in the consumption patterns of tourists. Previous analyses of the behavioral effects of structural shocks aptly describe the nature of these potential changes. In 1996, Crang proposed the term *consumption displacement* to refer to temporal or geographical consumption changes which arise from major unexpected events. This theoretical framework has already been applied in subsequent tourism analyses. With regard to the related concept of *temporal displacement*, Nigg (2011) studied the effects of the 2008 financial crisis on consumers and reports a change in advance booking behavior for tourism products, namely that the booking lead time is shorter than before the crisis. Such temporal shifts in consumption are also discussed in Hall et al. (2020) analysis of consumer behaviors in response to COVID-19. According to the authors, such displacement is the result of two types of uncertainties: one related to the fears and perceived health risks of the disease, affecting consumer demand; and the other to the lower availability of supply. While for commodities the limitation of the supply of certain goods might prompt people to buy in advance (i.e., panic-buying behavior), fears and uncertainty might lead to a postponement of engaging other services, such as those related to tourism. Evidence suggests there have been both spatial and temporal changes in consumption patterns during the COVID-19 pandemic, with spending patterns being more resilient for retail than for the accommodation sector (Hall et al., 2020). This is also confirmed by Toubes et al. (2021), who claim that, due to the pandemic, advanced travel contracts decreased because of the high risk of cancellation. A study made by the Destinia[1] for the Spanish market in August 2020 highlighted how most tourists were opting for domestic travel and booked with a very little advance.

2.3. Booking patterns and hotel management

2.3.1. Booking window (BW)

The role of time is of paramount importance for the hospitality industry considering that it offers a perishable and non-storable service. The performance and survival of hotels are heavily dependent on their ability to forecast future bookings based on historical patterns (Cetin et al., 2016; Gemar et al., 2019). Demand-driven pricing policies are mostly determined by the segmentation of customers based on their BW. Revenue management studies point towards a lower number of

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advanced bookings since the pandemic, as well as a new convergence of leisure and business tourists' booking habits, which have been disparate previously. Chen and Schwartz (2013) indicate that this convergence was driven by the emergence of what they call tourist "deal-seeking" behavior.

Tourism revenue management is vulnerable to changing scenarios and to nonlinear market dynamics, which require the adoption of sophisticated forecasting models. Exogenous shocks, such as COVID-19, might produce significant BW shifts. These structural breaks affect the models' forecasting reliability, producing inaccurate recommendations and suboptimal results in terms of revenue maximization (Webb et al., 2020). The fluctuation of demand in times of crises is especially detrimental to dynamic pricing and inventory management tactics. Thus, in periods of high demand volatility, it is important to adopt advanced methods able to reduce uncertainty and foster resilience through accurate demand projections (Qiu et al., 2021). Empirical evidence highlights the importance of using alternative sources of information, such as data from social media, to evaluate the fluctuations of tourism demand, especially in time of crises (Gallego and Font, 2021; Qiu et al., 2021). The segmentation of tourists according to their times of purchase is also discussed in Masiero et al. (2020). This paper proposes that earlier bookings are susceptible to a higher degree of uncertainty. On the premise that tourists tend to avoid risk, we therefore expect that the higher degree of uncertainty in times of crises might affect the timing of bookings and hence affect consumer strategic behavior. More formally, we propose our first hypothesis:

H1:. COVID-19 has led to a temporal displacement in booking behavior with a tendency towards shorter booking window (BW).

2.3.2. Length of stay (LoS)

Vacation duration is indeed another key non- price factor in hospitality services management. LoS has received considerable attention in tourism studies as an important metric to optimize hotel revenues (Riasi et al., 2017; Santos et al., 2015; Wilson et al., 2015). In fact, despite ethical concerns about its legitimacy (Wilson, 2001), minimum (and maximum) stay requirements is a common tool used by hotel managers to handle capacities. As stated in Quain et al. (1999), managing LoS "help[s] to shift demand from sold-out periods to slack periods." Additionally, this variable may also have consequences for hotel operating costs (higher tourist turnover translates into higher costs) and marketing expenditures (an overall reduction in LoS pushes hotels to increase marketing campaigns to attract a greater number of tourists to maintain total overnight stays). Furthermore, significant changes in LoS might also have important repercussions in terms of destination management. For example, an increase in the number of tourists with fewer overnight stays could translate into greater environmental pollution (mostly in island destinations, where airplanes are the primary means of transportation).

Crises and unexpected events might also modify the time that people devote to tourism activities. Several studies discuss the effect of economic crises on people's travel habits (Campos-Soria et al., 2015; Eugenio-Martin and Campos-Soria, 2014). A decrease in available income could lead to a decrease in LoS. This tendency is also exhibited in other circumstances, such as health crises (Baños-Pino et al., 2021; Wen et al., 2005). Changes in the duration of vacations can be seen as another type of consumption displacement, in which the emphasis is placed on "how much" tourism product is consumed. Consideration of this leads to our second hypothesis:

H2:. The COVID-19 pandemic has resulted in a shorter length of stay (LoS).

2.3.3. Booking channel

Finally, the booking channel, i.e., the channel used by tourists when reserving tourism services, has important implications on the management and profitability of the tourism industry. The effect of the Internet

Table 1
Research hypotheses.

#.	Displacement	Metric	Hypothesis	Literature
H1	When?	Booking Window	COVID-19 has led to a temporal displacement in booking behavior with a tendency towards shorter BW.	Nigg (2011);Hall et al. (2020); Tobues et al., 2021
H2	How long?	Length of Stay	The COVID-19 pandemic has led to a decrease in LoS.	Baños-Pino et al. (2021);Wen et al. (2005)
H3	How?	Booking Channel	COVID-19 is associated with a reduction in the share of bookings made through tourism intermediaries.	Tse (2003); González-Torres et al. (2021); Aigbedo (2021)

revolution on hotel distribution is a well-discussed topic. The increased role of e-distribution presents both opportunities and challenges to hospitality firms (Law et al., 2014; Myung et al., 2009). The option to perform low-cost searches through meta-searchers (like Trivago) and online travel agencies (OTA; like Booking.com and Expedia.com) has empowered customers and increased available information, and hence competition, in the hospitality market. Selling via third-party companies through agency models increases hotels' exposure and enlarges their catchment area but has clear repercussions in terms of profitability (i.e., commissions paid to intermediaries), control over booking behavior, and erosion of brand image (Calveras and Orfila-Sintes, 2019). Apart from selling through OTA, many hotels sign allotment contracts with other intermediaries, such as tour operators, allocating them a fixed daily capacity (Hadjinicola and Panayi, 1997). These contracts allow the hotel to deal with the uncertainty of tourism demand and guarantee *ex ante* a certain amount of bookings.

The relationship between hotels and their distribution system is a complex topic, especially with regard to the dependency of hospitality providers on their intermediaries. As discussed in González-Torres et al. (2021) and Aigbedo (2021), exogenous shocks could disrupt the supply chain of tourism services. In light of the COVID-19 pandemic, there is a need to theorize on the relationship between hotels and their supply chain in times of crises. According to the existing literature, hotels should aim at *disintermediation* in such times (González-Torres et al., 2021; Tse, 2003). In accordance with the previously analyzed topics, a change in the booking channel would correspond to another type of displacement, in which the emphasis is now placed on "how" the tourism product is booked. Pertaining to this topic, our third hypothesis is the following:

H3:. The COVID-19 pandemic is associated with a reduction in the share of bookings made through tourism intermediaries.

Considering the above, Table 1 summarizes the research hypotheses of the current work, the expected results, and the supporting literature.

2.3.4. Hotel management

To cope with the pandemic, the tourism industry had to adapt quickly to new circumstances and constraints, exhibiting different levels of resilience (Marco-Lajara et al., 2022; Jain et al., 2021). A flourishing body of literature analyzed the strategies adopted to cope with COVID-19 (among the many, see Marco-Lajara et al., 2021; Rodríguez-Antón and Alonso-Almeida, 2020; Smart et al., 2021) and their effects on companies' survival and performance (Hidalgo et al., 2022). An important tool to face sudden drops in demand is revenue management. In this regard, Piga et al. (2021) investigate the role of revenue management in facilitating business recovery. According to their findings, hotels responded to the uncertainty of the pandemic by using both managerial (dynamic pricing) and tactical booking strategies.

Table 2
Sample database structure.

Booking window (BW)	2018	2019	2020	2021
Less than 8 days	10.8 %	11.4 %	9.4 %	20.0 %
Between 8 and 30 days	19.1 %	19.5 %	11.6 %	33.0 %
Between 31 and 90 days	27.0 %	27.5 %	19.6 %	23.9 %
Between 91 and 180 days	22.7 %	22.1 %	27.3 %	9.7 %
Above 180 days	20.4 %	19.6 %	32.1 %	13.4 %
Length of stay (LoS)	**2018**	**2019**	**2020**	**2021**
Weekend (1–4 days)	34.0 %	34.8 %	32.7 %	33.1 %
Week (5–7 days)	45.5 %	45.2 %	43.4 %	45.0 %
Holidays (8–17 days)	20.1 %	19.6 %	23.4 %	21.4 %
Long holidays (18–30 days)	0.4 %	0.3 %	0.4 %	0.4 %
Very long holidays (>30 days)	0.0 %	0.0 %	0.0 %	0.0 %
Channel	**2018**	**2019**	**2020**	**2021**
Tour Operated	46.5 %	45.4 %	43.9 %	38.7 %
Online Travel Services	37.8 %	40.1 %	45.0 %	54.0 %
Bed Banks	8.6 %	10.0 %	9.4 %	7.3 %
N/A	7.1 %	4.4 %	1.7 %	0.0 %

LoS, and the booking channel are included in the data. Such variables have a discrete nature, and the categorization presented in the tables and figures is identical to that used by the data provider and is representative of the industry standards. Moreover, a similar categorization is found in existing literature on these topics (Martinez-Garcia and Raya, 2008; Ferrer-Rosell et al., 2014; Masiero et al., 2020). Table 2 shows the percentage patterns of bookings in each of the categories.[2]

Analyzing BW evolution, the data show certain stability during the pre-pandemic period, with most bookings made between 1 and 3 months prior to arrival, followed by bookings made between 3 and 6 months (category *Between 91 and 180 days*).

Interestingly, only about 30 % were made less than 1-month in advance. As expected, the irruption of COVID-19 in 2020 caused major changes in the temporal patterns of tourist reservations. In 2021, we can identify a certain tendency towards a shorter BW, with 53 % of bookings made less than 30 days in advance.

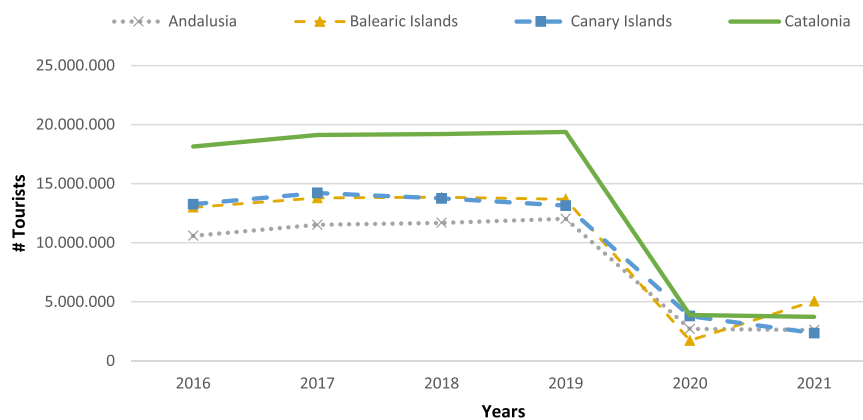Concerning LoS, the data display a relatively stable situation across

Fig. 1. International Tourist Arrivals (
Source: INE (2021).

The responses of hotels proved to be quite heterogeneous, depending on their structure (chain vs. independent hotels) and their dependence on OTA. Similarly, Arabadzhyan et al. (2021) examine both pricing and other booking policies adopted throughout the different phases of the pandemic. Their results suggest an initial drop in prices was followed by a relative stabilization and a wide adoption of free cancellation policies. Concerning the link between strategies and recovery, Hidalgo et al. (2022) find that differentiation strategies and market reorientation might foster a more rapid recovery of accommodation firms. The importance of revenue management during COVID-19 is also discussed in Zaki's (2022) study, in which a positive association between managerial choice and long-term efficiency is discovered.

With all these considerations in mind, an appropriate understanding of the changes in booking patterns appears to be a relevant research topic to inform the above studies.

3. Data and study area

3.1. Data description

Our dataset contains all bookings received during the period from January 2018 through October 2021 for a sample of hotels located in the Balearic Islands. Data have been provided by Dingus and HittGroup, two Spanish hotel channel and distribution companies. The sample is representative of both the tourism industry and the economy of the island as a whole and includes the complete booking information for more than 300 hotels, which account for an average of 29.6 % of the total number of hotels. The date of the booking, the consumption date, the

the 4 years. The most frequent LoS is between 5 and 7 days (*week*), followed by short-length bookings between 1 and 4 days (*weekends*). By contrast, the booking *channel* changed during the analyzed period. As displayed in Table 2, there is a decrease in the percentage of *tour-operated bookings* (made via tour operators and destination management companies) which lost about 8 % points between 2018 and 2021, in favor of *online travel services* (that is, those made via hotel-owned websites and OTA), which account for almost 54 % in 2021.

3.2. Tourism in the Balearic Islands

Our study focuses on the Balearic Islands, one of the leading tourism destinations in Europe, and one of the most affected by the pandemic outbreak. As Fig. 1 displays, within Spain, this region recorded the most dramatic percentage decrease in tourist arrivals in 2020 (–87.4 %), followed by Catalonia (–79.9 %), Andalusia (–77.5 %), and the Canary Islands (–71.2 %).

Such a reduction in tourist arrivals led to an even greater reduction in tourist overnight stays (from 58.1 million in 2019–5.8 million in 2020), causing a sudden drop of the annual average hotel occupation level, from 76 % in 2019 to 36 % in 2020 (IBESTAT, 2021). The negative effects have been exacerbated by the destination's tourism model, which is characterized by strong seasonality, with 62 % of tourists arriving in the summer season in 2019. The hotel sector suffered significantly due to COVID-19. As a quick indicator, 97 % of hotels were opened in August

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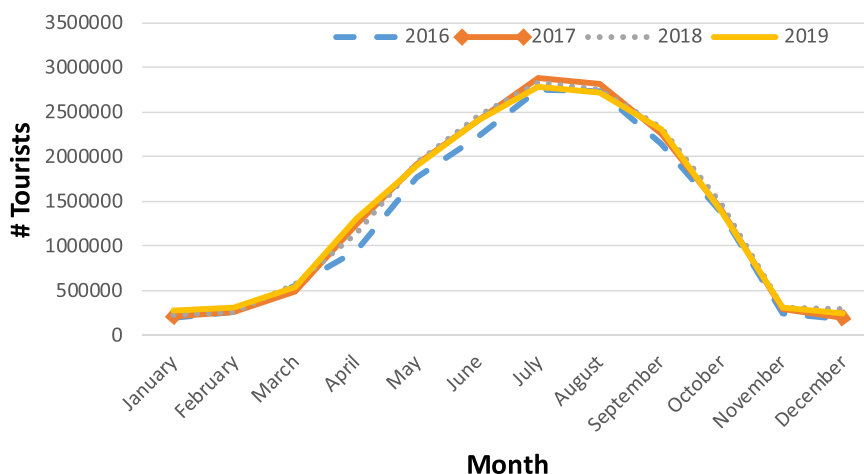[2] Data for 2021 are limited to the end of November.

Fig. 2. Monthly tourist arrivals to the Balearic Islands (
Source: IBESTAT (2021).

Table 3
Monthly hotels opened and average occupation level 2016–2019 (in percentage terms).

	2016		2017		2018		2019	
	Open	Occup.	Open	Occup.	Open	Occup.	Open	Occup.
January	5.3	38.6	5.4	37.2	5.5	35.9	5.1	31.2
February	10.5	50.0	11.2	46.1	11.8	48.4	11.0	45.1
March	22.5	58.2	19.5	55.6	20.3	55.5	20.6	48.6
April	38.0	65.5	37.7	70.8	39.9	63.1	39.7	68.0
May	90.1	69.9	92.9	69.6	93.7	67.9	92.9	65.6
June	96.8	84.6	96.9	84.8	97.8	83.0	97.2	82.3
July	96.8	91.5	97.2	90.0	97.9	89.3	96.9	88.6
August	97.4	92.9	97.3	90.5	97.7	90.0	96.8	90.7
September	97.2	86.6	97.2	84.6	97.6	83.0	97.0	81.6
October	79.3	67.1	80.5	66.5	80.8	64.7	78.1	63.5
November	7.9	50.4	8.2	50.3	7.8	44.5	8.1	43.6
December	5.4	39.5	5.4	39.2	6.0	41.9	6.1	40.6

2019 with an average occupation of approximately 91 %, whereas in August 2020 this percentage dropped to 46 % with an occupation level of 40 %. Compared to 2019, the revenue in 2020 per available room decreased 51.2 %, from 84.6 euros to 41.3 euros (AETIB, 2021; IBE-STAT, 2021).Fig. 2.

As previously mentioned, one of the main reasons for the strong negative impact of COVID-19 on tourism flows is the structural characteristics of the Balearic hotel sector. Its hotel sector is mostly composed of high-capacity hotels with an average of 148 rooms and 296 beds (AETIB, 2021). This structure benefits from economies of scale during the 4-month summer season, but it also implies significant high fixed costs. Thus, in order to achieve the break-even point, hotels need to operate with high occupancy levels. Consequently, when there is a decrease in demand typically starting in September, most hotels cannot

remain open, usually opting for off-season closures for 4–5 months.

To the best of the authors' knowledge, the minimum occupancy that covers fixed costs has not been determined. However, we can obtain an approximation of this average minimum occupancy rate based on their market behavior. Table 3 displays the monthly percentage of opened hotels and their average occupancy rate, which is calculated according to occupied and opened rooms. We can observe that during summer months (from May to September), most hotels are opened with high occupancy rates. However, during the low season (from November to February), only 5–10 % of hotels remain open, with occupation levels around 30–51 %. Obviously, if more hotels were open, the individual market share of each would be lower, and the average occupancy would fall below 30–40 %. As many hotels decide to close, this table suggests that the break-even point in terms of occupancy is around 30–40 %.

4. Data analysis

This section details the evolution of temporal booking patterns. First, in subsection 4.1, we provide a comparison between the real evolution of booking patterns and a benchmark forecast assuming the absence of COVID-19. Then, subsection 4.2 provides a detailed analysis of the temporal evolution of bookings considering (i) the accumulated pattern over the year, (ii) the weekly booking pattern, and (iii) the disaggregation by BW, LoS, and channel.

4.1. Benchmark forecast

We start the empirical analyses by providing visual insights into the

Table 4
Time-series benchmark model to estimate the non-COVID-19 scenario.

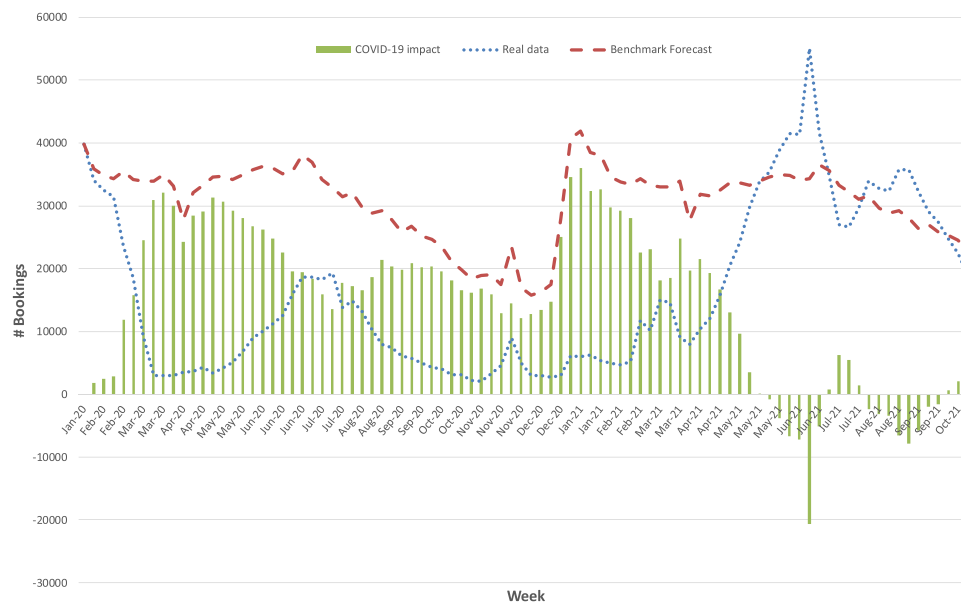| Variable	Coefficient	Std. Error	t-Statistic	Prob.
CONSTANT	28853.74	4541.43	6.35	0.00
TC	9922.46	2383.36	4.16	0.00
EASTER	-4693.61	927.07	-5.06	0.00
BF	4385.08	871.60	5.03	0.00
AR(1)	0.85	0.05	16.97	0.00
AR(52)	0.83	0.04	21.61	0.00
MA(1)	0.40	0.09	4.36	0.00
SIGMASQ	2294010	357403.9	6.42	0.00
Adjusted R-squared	0.96			
F-statistic	384.72			
Prob(F-statistic)	0.00			

Fig. 3. A comparison of real bookings vs. benchmark booking forecast (COVID-19 impact).

impact of COVID-19 on booking patterns and volumes. To do so, we use the weekly booking data for 2018 and 2019 to estimate a standard ARIMA model. Thereafter, we use the coefficients to compute an out-of-sample forecast for 2020 and 2021 bookings. To check the presence of unit roots and evaluate the appropriateness of integrating the series, we performed KPSS test. The test does not reject the hypothesis of stationary date. Therefore, we maintain the data in levels. The results of the model estimates are displayed in Table 4. The number of lags for the autoregressive and moving average components were based on the Akaike information criteria, which indicated that the optimal structure was an ARMA (1,52;0;1). Beyond the univariate components, the behavior of the data, which can be seen in Fig. 6, led us to include time-varying special events in the model, such as Easter, Black Friday, and a one-time dummy to capture the shock observed in September of 2019. This latter one-time event is probably related to the collapse of the British tour operator Thomas Cook on the 23rd of September of 2019.[3] This bankruptcy affected more than 300,000 tourists who had made bookings to Balearic Islands from October 2019 to March 2020.[4] The above-mentioned three dummy variables are labelled as *EASTER*, *BF*, and *TC*.

As reported in Table 4, all estimated coefficients are significant at 1 % and present the expected sign. Specifically, the collapse of Thomas Cook (*TC*) and Black Friday (*BF*) significantly increased the number of bookings for the corresponding period, while during the Easter holidays, travel planning decreased, which is reflected in a reduction of bookings.

Overall, the statistics displayed in the last two rows of Table 4 suggest a high goodness of fit of the model. Therefore, in the absence of a structural break, this model can be used to forecast the evolution of bookings. In this vein, we use the previous table's coefficients to compute an out-of-sample benchmark forecast assuming a non-COVID-19 scenario. Fig. 3 displays the benchmark estimation (orange dashed line), the real evolution of bookings (blue dotted line), and the difference between them (green columns) since February of 2020. The figure clearly illustrates the collapse of bookings caused by the COVID-19 crisis. Throughout the period from March 2020 to October 2021, the

difference between the estimated and real data indicates that there was a reduction of more than 1.3 million bookings in our dataset. This figure approximates the observed reduction of tourists in the Balearic Islands, taking into account that: our sample includes 30 % of the hotel population, there is usually more than one guest per booking, and the existence of other accommodation alternatives.

Following the analysis of Fig. 3, the green bars represent the estimated weekly effects of COVID-19 on bookings. These columns illustrate the remarkable change of booking patterns, which is this paper's main objective. Particularly, we can observe two facts: there is a low level of bookings at the end of 2020 and the beginning of 2021; and there is an extreme concentration of bookings during the summer peak season of 2021, when real bookings were far above the estimations.

In order to test the existence of a statistically significant change in both the volume and composition of bookings before and after the pandemic outbreak, we have performed a set of t-test analyses. Tables 5 to 7 include the comparison of BW, channel and LoS, respectively, pre- and post-COVID-19.(Table 8).

Data confirm a statistically significant decrease in bookings across the two periods, as well as a significant change in the monthly flow of bookings. Tables are meant to be read horizontally and display the amount of bookings pre-COVID-19, the amount of bookings after COVID-19, and test the statistical significance of the overall variation. T-tests of the monthly differences pre- and post- COVID-19 are available in Tables A1 to A3 of the Appendix.

4.2. Evolution of accumulated bookings

Fig. 4 presents the evolution of the accumulated bookings for the 4 years under analysis. The difference between the pre- and post-COVID-19 patterns is conspicuous. Pre-pandemic years display a quite homogeneous accumulation pattern with a constant shape until the beginning of September. The eruption of COVID-19 in March of 2020 brought bookings to a standstill, with only slight activity between June and August of that year. Interestingly, 2021 presents a remarkable contrast to pre-pandemic behavior. The accumulated bookings were very low for at least the first quarter. Afterwards, they increase sharply between May and June, with a higher slope than before the crisis, to reach a similar growth pattern as the pre-COVID-19 stage in July and August. Nevertheless, in terms of volume, the accumulated bookings of 2021 remained far below previous records.

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[3] "Thomas Cook collapses as last-ditch rescue talks fail", BBC News, 23rd of September 2019. https://www.bbc.com/news/business-49791249

[4] "Background to the Thomas Cook Crisis," Spanish Ministry of Industry, Commerce, and Tourism, https://www.mincotur.gob.es/en-us/crisis-thomas-cook/paginas/index.aspx

Table 5
Analysis of the overall average bookings, by booking window (*t statistics* in Brackets, * p < 0.10, ** p < 0.05, *** p < 0.01).

	Less than 8 days			Between 8 and 30 days			Between 31 and 90 days			Between 91 and 180 days			Above 180 days		
	Pre-Covid	Post-Covid	Δ sign (t-test)	Pre-Covid	Post-Covid	Δ sign (t-test)	Pre-Covid	Post-Covid	Δ sign (t-test)	Pre-Covid	Post-Covid	Δ sign (t-test)	Pre-Covid	Post-Covid	Δ sign (t-test)
	3015.1	2814.8	-200.3*** (-0.55)	5209	4389.6	-819.4*** (-1.28)	7696	3457.1	-4238.9*** (-6.17)	7064	1561.3	-5502.7*** (-8.41)	5992.5	2923	-3069.1*** (-7.45)

4.3. Temporal pattern of total bookings

In this subsection we discuss the evolution of weekly bookings displayed in Fig. 5. During the pre-pandemic period, the evolution of bookings showed a clear pattern. Each year started with a high number of bookings, reaching values above 40,000 bookings per week (BpW), which corresponded to the yearly maximum. This initial peak is probably due to early bookings through traditional channels for the following summer season. Then, the bookings remained relatively stable until they reached a new peak at the beginning of July, after which they started decreasing until reaching the yearly minimum below 14,000 BpW in the middle of December. The last couple weeks of the year showed a new increase with the early-booking rebound for the following season. It is worth mentioning that during 2018 and 2019, this standard booking temporal pattern was altered by some shocks related basically to four events: a) Easter holidays, b) a peak in the first week of July, c) a peak in the third week of September 2019 (probably related to the Thomas Cook collapse), and d) Black Friday. We will explain the impact of those events in the following subsections.

The year 2020 started with optimistic expectations and more bookings than previous years. However, the emergence of COVID-19 froze bookings, particularly in March, to values below 3000 BpW. This was a 92 % decline as compared with the corresponding week of the previous year. There was a modest acceleration of bookings in mid-June, coinciding with the start-up of the Balearic Islands tourism opening pilot project,[5] and the cautious announcement by most European countries that borders would start re-opening. The bookings reached a peak (below 20,000 BpW) during the third week of June. Then, the new travel restrictions imposed by the main European outbound markets (the United Kingdom on the 26th of July[6]; Germany on the 14th of August[7]) caused another drop in bookings.

The well-known collapse that the hospitality industry suffered during 2020 also characterized the beginning of 2021. However, a less expected finding was the remarkable change in the temporal pattern of bookings. In both 2018 and 2019, the years finished with a rebound of bookings for the next season close to 15,000 BpW. Conversely, in 2020, this rebound reached below 3000 BpW. Similarly, the enormous flow of bookings that remained above 35,000 BpW during the first 6 weeks in previous years presents a striking contrast with the flat behavior of around 6000 BpW during the first 10 weeks of 2021. It was only after April that bookings began an astonishing climb towards the maximum of the entire year, a peak reached at the end of June with more than 55,000 BpW, 23 % above the previous year's maximum (January 2020). Therefore, the booking pattern in 2021 shows an extreme temporal concentration of non-anticipated bookings just before the summer season. Thus, in contrast to pre-pandemic periods, hotels were forced to plan the year without early bookings.

This general analysis can be disaggregated to achieve further insights into the changes in hotel booking patterns. The following subsections discuss the specific changes in three relevant hotel managerial aspects: BW, LoS, and booking channel. We present the detailed graphical analysis for BW, while we leave graphs of LoS, and booking channel for the Appendix (Figure A1 and Figure A2).

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[5] "Balearic Islands to launch airlift for German tourists on June 15″. Reuters, June 9th, 2020. https://www.reuters.com/article/us-health-coronavirus-spain-islands-idUSKBN23G18O

[6] "Spain removed from travel corridors exemption list", United Kingdom Department for Transport and Foreign & Commonwealth Office, July 25th, 2020. https://www.gov.uk/government/news/spain-removed-from-travel-corridors-exemption-list

[7] "Germany declares most of Spain a virus risk region". Reuters, August 14th, 2020. https://www.reuters.com/article/us-health-coronavirus-germany-spain-idUSKCN25A1Y7

Table 6

Analysis of the overall average variation of bookings, by channel (*t statistics* in Brackets, * p < 0.10, ** p < 0.05, *** p < 0.01).

Bedbank			Intermediated			Direct		
Pre-Covid	Post-Covid	Δ sign (t-test)	Pre-Covid	Post-Covid	Δ sign (t-test)	Pre-Covid	Post-Covid	Δ sign (t-test)
2726.4	1162.7	-1563.7*** (−11.38)	13455.9	5827.4	-7628.5*** (−12.06)	11232.4	8133.1	-3099.3*** (−4.15)

4.4. Temporal pattern by booking window (BW)

The BW is defined as the span of days between the booking and the use or consumption of the corresponding good or service. Relevant for most economic activities, this variable is crucial for hotel management given the perishability of its services and the hotel industry's cost structure, particularly in destinations with high-capacity hotels and strong seasonality, like the Balearic Islands.

Fig. 6 presents the disaggregation of the BW. At first glance, we can see that the emergence of COVID-19 has led to a structural change in the BW temporal pattern.

The temporal BW patterns during the pre-COVID-19 years present relatively similar trends. The disaggregated analysis allows us to confirm our former hypothesis, namely that the high volume of bookings at the beginning and end of 2018 and 2019, and at the beginning of 2020, were mostly *long-advance bookings*, with a BW above 91 days (purple solid line and circle-mark light-blue line). In fact, some relevant features of the booking patterns that characterize this tourism destination become apparent. The very early booking phase for the following season, with a BW above 6 months (circle-dot light-blue line), already began at around May of the previous year, and accelerated in September. This very advanced BW was also relevant at the beginning of the year but soon became negligible. The BW of 91–180 days (purple solid line) remains at very low rates (below 500 BpW) from the end of July until the end of October. It is only then that bookings at this BW start to increase until they become dominant in the first half of January. At this point, this BW shows decline. The figure presents the *medium-advance bookings* disaggregate in two series: between 31 and 90 days (square-mark solid green line), and between 1 week and 1 month (star-mark discontinuous red line). As expected, the *medium-advance* BW follows the Balearic Islands' seasonal pattern of tourist arrivals. Finally, it is worth mentioning that the *last-minute bookings*, with a BW of less than one week (dotted blue line), was nearly irrelevant in 2018 and 2019, representing, on average, approximately 11 % of total bookings.

The two special events that we included in the forecasting model can be observed in Fig. 6. First, bookings reach a clear peak in the third week of September 2019. Our interpretation is that this event is related to the Thomas Cook bankruptcy on the 23rd of September because all bookings managed by that tour operator needed to be rebooked through other channels. Second, we can observe an increasing positive shock in the second half of November. Interestingly, this period corresponds to the Black Friday (*BF*) week.

We can also use Fig. 6 to monitor the effects of COVID-19 in 2020. The emergence of the pandemic paralyzed bookings, with only a short period of booking activity during the summer, with a BW below 3 months.

It was very reasonable to expect that COVID-19 would cause a unique booking pattern in 2020. However, it is informative to visualize the major changes that occurred during 2021. Particularly, BWs above 91 days became nearly irrelevant. An enormous number of bookings were made in a very short time period. The bookings between the first week of June and the first week of July accounted for nearly 20 % of all bookings until October, while in 2019 it accounted for only 10 %. BWs below one month accounted for 53 % of all bookings until October in 2021, compared to the 33 % recorded in 2019. Overall, we can conclude that the booking pattern after COVID-19 is characterized by a much shorter BW.

4.5. Temporal pattern of bookings by length of stay (LoS)

The dataset includes the number of days of each booking. To simplify the reading and editing of the manuscript the graph is presented as Figure A1 in the Appendix, but we discuss here the main findings.

Before the emergence of COVID-19, the 1-week bookings were dominant throughout the year, except for a few weeks from the end of September through November, when weekend fall breaks became relevant. The significant peak of bookings that characterized the end and beginning of these years corresponded to this 1-week LoS.

With the spread of COVID-19 after March 2020, all LoS measures collapsed. When bookings restarted in May, they follow the 1-week pattern. However, the uncertainty surrounding the disease manifests at the end of July and beginning of August 2020 in bookings that were basically for very short lengths.

All lengths remained minimal at the beginning of 2021. The pattern of exponential growth in May and June is mainly due to bookings of 1-week-length at explosive rates. Specifically, the bookings of 1 week or above for the third week of June were 40 % higher than the previous or subsequent weeks. In summary, we can conclude that even if COVID-19 caused major changes in booking patterns regarding the number of bookings and other variables, it did not have a substantial impact on the LoS. The 1-week bookings that characterize tourism stays in the Balearic Islands remain in the vicinity of 45 % of total bookings throughout the four years.

4.6. Temporal pattern of bookings by channel

To conclude our analysis, we discuss the weekly bookings disaggregated by booking channel. The detailed graphical analysis is presented as Figure A2 in the Appendix. Before COVID-19, tour-operated bookings were dominant throughout the year, except for some weeks between April and June, in which online travel services (OTS) were briefly dominant. The peaks of advanced booking at the beginning and end of each year (with 1-week duration and bookings made long in advance) corresponds to tour-operated bookings. However, COVID-19 changed this booking structure. Since June of 2020, OTS became systematically dominant for all the weeks ahead. It is also remarkable that bed-banks bookings remain relatively stable for all years. Overall, this subsection suggests that another major change in booking patterns due to COVID-19 is the reduced usage of traditional tour operators.

5. Findings and implications

In the first part of the empirical analysis, we used data from 2018 and 2019 to perform an out-of-sample forecast for 2020 and 2021. The objective was to portray a non-COVID-19 scenario for those years to provide further insights into the magnitude of booking losses. Data confirm that the outbreak of the pandemic resulted in a significant decrease in the volume of bookings with an estimated loss of about 1.3 million bookings in our sample.

The second part of the analysis focused on the main objective of the study, namely to characterize the changes in the temporal pattern of bookings due to COVID-19. To do so, we investigated three aspects of booking patterns (BW, LoS, and booking channel), which might have important implications for destination and hotel management.

In terms of the BW, we found that the pandemic led to a decrease in

Table 7
Analysis of the overall average variation of bookings, by length of stay (*t statistics* in Brackets, * p < 0.10, ** p < 0.05, *** p < 0.01).

	Week-end			Week			Holiday			Long Holiday			Very Long Holiday		
	Pre-Covid	Post-Covid	Δ sign (t-test)	Pre-Covid	Post-Covid	Δ sign (t-test)	Pre-Covid	Post-Covid	Δ sign (t-test)	Pre-Covid	Post-Covid	Δ sign (t-test)	Pre-Covid	Post-Covid	Δ sign (t-test)
	9880.4	5071.6	-4808.8*** (-9.97)	13127.6	6717.3	-6410.3*** (-8.92)	5863.8	3322.1	-2541.7*** (-7.77)	97.33	66.28	-31.05*** (-6.75)	7.496	4.108	-3.388*** (-5.01)

Table 8
Hypotheses summary.

	Hypothesis	Empirical evidence
H1	COVID-19 has led to a temporal displacement in booking behavior with a tendency towards shorter BW.	Accepted
H2	The COVID-19 pandemic has led to a decrease in LoS.	Partially accepted
H3	COVID-19 is associated with a reduction in the share of bookings made through tourism intermediaries.	Accepted

the booking anticipation, which supports Hypothesis 1. Specifically, the results reveal a partial substitution of early bookings, which normally tend to concentrate in the beginning and end of each year, with more "last-minute" bookings. While in 2020, the BW distribution showed a very peculiar pattern, in 2021 results confirm the overall tendency towards booking a shorter time in advance. In normal years, the peak of bookings generally occurred in the first months of the year and mostly comprised long-advance bookings. This totally disappears in 2021. In fact, in 2021, the peak of bookings coincides with the tourism summer season and is characterized by low-advance bookings. In other words, the advance bookings that were systematically concentrated in the end and the beginning of the year practically disappear after the COVID-19 crisis. Simultaneously, "last-minute" bookings increase exponentially. Such findings are in line with the temporal consumption displacement theory discussed in Hall et al. (2020) and Toubes et al. (2021), confirming that the uncertainty of the pandemic translated into travel plans with shorter anticipation.

This reduction in booking anticipation generates important consequences, not only for hotel pricing strategies, but also for hotel operating management. In the case of highly seasonal destinations, such as the Balearic Islands, and especially for high-capacity hotels, operational planning is fundamental to guarantee profitability. In this sense, long-advance bookings are essential not only to determine opening and closing operations, but also to plan other departments, such as Human Resources (e.g., employee hiring) or Food and Beverage (e.g., inventory management). Likewise, the reduction in booking anticipation has major impacts on the destination in terms of employment and overall income generation.

The substitution of early for last-minute bookings could lead to less effective operational hotel management that, in turn, could erode profit margins. In fact, many hotels decided to remain closed due to the great uncertainty generated by COVID-19. Those hotels that decided to open often opted to apply conservative cost-oriented strategies (i.e., limiting hiring, as employee-related expenses are usually the most important variable cost of hotels). As expected, such changes had important consequences on GDP (−23.7 % of GDP, Spain's highest drop) and unemployment rates in Spain (16.6 %, the highest in the last 30 years).

The consequences of the above described changes should be a wake-up call for destination organizations and academia. As more data become available, monitoring booking patterns should gain importance in tourism and destination management. This aligns with novel research that incorporates Internet search data (Gallego and Font, 2021) and content analysis (Chen et al., 2020) to detect behavioral trends that might shape the evolution of hotels and destinations.

The LoS results support Hypothesis 2 only partially. In response to the pandemic, data suggest a very short-term change, namely the reduction in the number of days per booking during the months of August to October 2020. This partial reduction in LoS during the early phase of the pandemic is in line with the existing literature (Baños-Pino et al., 2021; Li et al., 2020) which points to a decrease in tourist LoS as a result of pandemic shocks. However, our findings indicate that COVID-19 does not have a long-term effect on booking length, since in 2021, LoS trends show very similar patterns to those found in pre-pandemic times. Specifically, LoS is characterized by a strict dominance of week-long bookings, followed by weekend bookings and, only
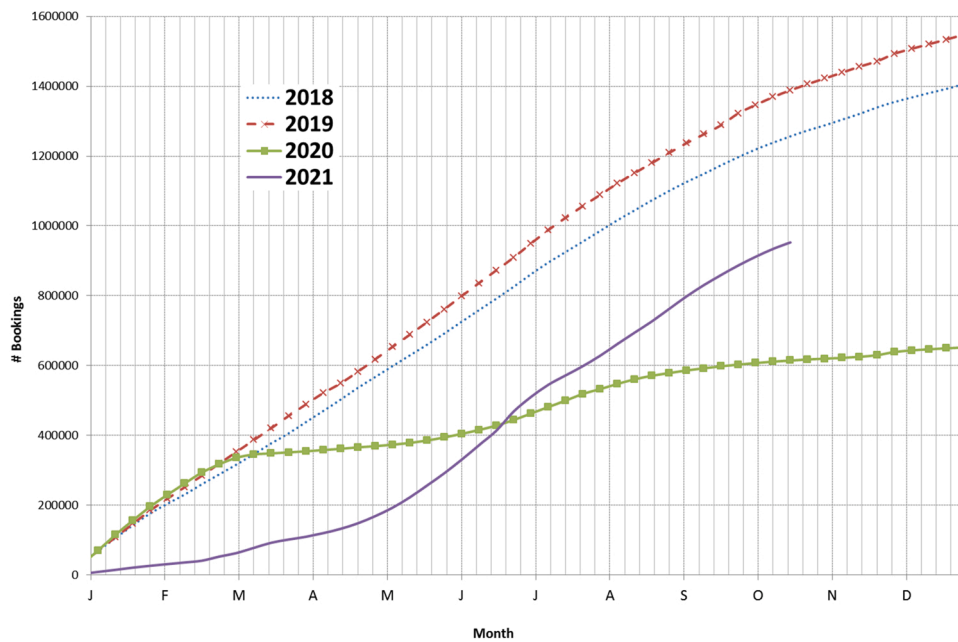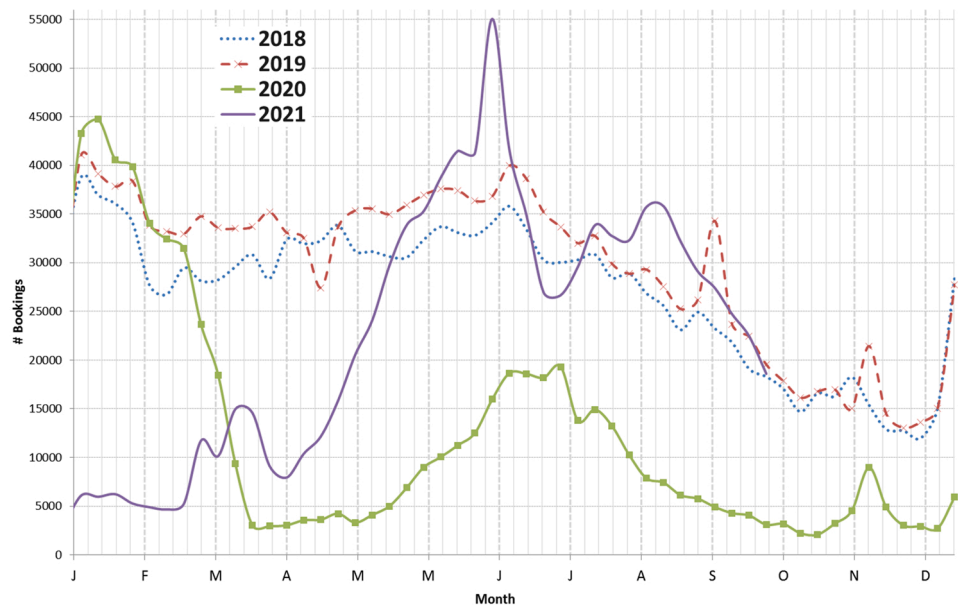
Fig. 4. Accumulated bookings.

Fig. 5. Temporal pattern of total bookings.

residually, longer (long and very long) bookings. It might seem reasonable that once the level of uncertainty decreases, individuals who decide to travel maintain similar behavior as before the pandemic in terms of LoS.

Finally, we also analyzed the booking channels used by tourists when reserving their vacations. Results show that COVID-19 has accelerated the changes observed in tourist consumer behaviors in the last couple years, in line with the arguments supporting Hypothesis 3. Before the pandemic, several studies already indicated that digitalization and other social changes caused significant changes in the tourism intermediation structure (Law et al., 2014). In this sense, results show that tour-operated channels, which traditionally constituted the main booking channel and are usually characterized by long-advance bookings, were losing prevalence in favor of online travel services like those

offered by OTA, which are usually characterized by bookings made a shorter time in advance. In fact, COVID-19 has exacerbated a previous tendency towards online bookings. The proliferation of new technologies and the digitalization of hotel booking management, together with changes in tourist consumer behaviors, has already generated significant changes in tourist consumption patterns (Pencarelli, 2020), with important consequences for hotel and destination management. Thus, our findings suggest that COVID-19 might have accelerated this process. This result is consistent with González-Torres et al. (2021) who argue that pandemic shocks might provoke significant disruption in the tourism supply chain, with a tendency towards hotel disintermediation.

Online channels tend to entail, apparently, lower intermediation costs compared with traditional offline channels. However, they also require higher investments in online positioning and reputation
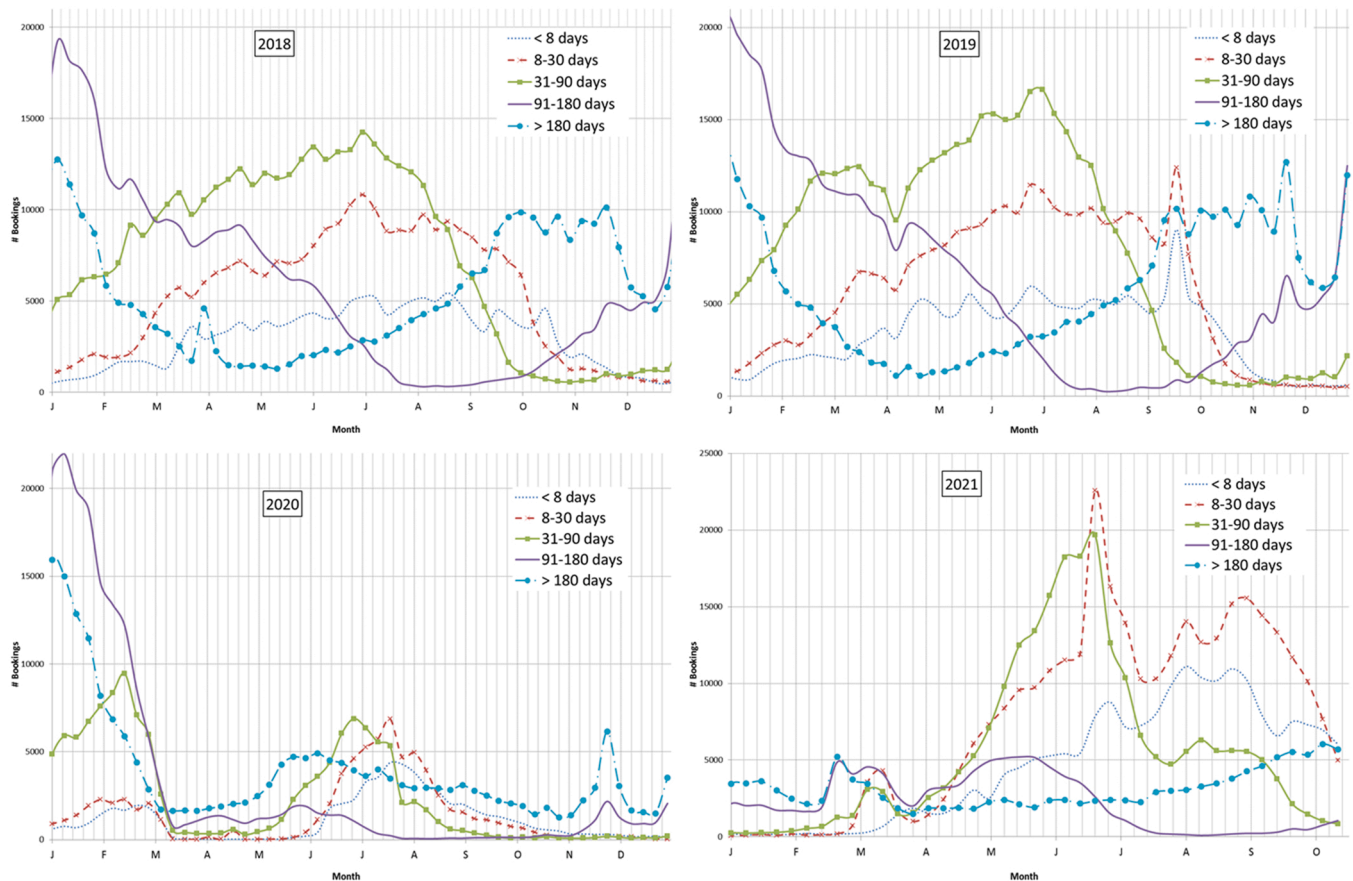
Fig. 6. Temporal pattern by booking window.

management, mostly in the case of business-to-consumer channels (e.g., directly-owned booking websites). A partial disintermediation is indeed unwelcome news for tour-operators and other intermediaries, which could lose market share. Moreover, from a hotel management perspective, stipulating contracts with tour-operators (e.g., allotment contracts) helps operational planning, ensuring a certain occupancy rate in advance.

6. Conclusion

This study develops a longitudinal analysis of hotel booking patterns using weekly data. Data were provided by Dingus and HittGroup, two Spanish companies offering hotel channel management services. Our empirical analysis focuses on a representative sample of hotels in the Balearic Islands from 2018 to 2021. Our main goal was to examine the changes in booking patterns after the COVID-19 outbreak and thereby offer a critical comparison with pre-pandemic trends.

The contribution of this paper to the existing literature is twofold. From an empirical point of view, we provide a detailed temporal analysis of bookings, which is an under-explored topic. We present the effect of COVID-19 on these patterns and elaborate on the linkage between revenue and capacity management. The methodological approach used in this study can be replicated for other destinations, and the results are of interest for hotel managers and destination management organizations. From a theoretical point of view, this paper further explored the concept of consumption displacement, which has been rarely applied to tourism studies. Therefore, the study also expands the literature on disaster-related consumption, with an interesting focus on non-commodity goods.

The initial forecasting analysis confirms a sharp decrease in the volume of bookings during the pandemic. This corresponds to a major

structural break in data behavior and suggests that pre-pandemic forecasting models must be reformulated, since the trend and cyclical components of the series have changed substantially.

From a theoretical standpoint, we analyze the change in booking behavior through the lens of consumption displacement (Crang, 1996), which might arise as a result of major structural changes. According to this theory, crises (of different kinds) could sensibly affect purchasing behaviors. Concretely, we investigated the existence of temporal displacement (*when*), in terms of bookings anticipation (when people book their vacations with respect to their travel dates). The displacement could also be related to the quantity of services consumed (*how much*) and hence correspond to the LoS. Finally, shocks might also affect the supply chain (*how*), which in this context corresponds to a change in the booking channel. The study confirms the existence of two COVID-19-led consumption displacements, related to *when* (Hypothesis 1) and *how* (Hypothesis 3). First, we observed a change in the temporal distribution of bookings, with a tendency for lower anticipation. Second, in terms of channel, results suggested a change in the tourism supply chain, particularly a reduction of tour-operated bookings. Concretely, we can point out that the traditional tour-operated bookings, characterized by high anticipation, have been substantially substituted by online last-minute bookings. By contrast, the LoS was affected only during the first phase of the pandemic, which was characterized by relatively shorter stays. In 2021, the LoS of bookings showed pre-pandemic patterns. These disruptions in booking patterns have important managerial consequences for hotels and destinations, especially for revenue management and commercialization departments, but also for other departments like Human Resources and Food and Beverage.

The paper is not without limitations. Despite the relevance of the destination analyzed and the good representability of the data, the study

was applied to a specific area, characterized by a dominance of international tourism, insularity, and a pattern of strong seasonality. Therefore, results could differ for other destination types, such as urban or cultural locations. This opens an avenue for future research in other contexts, hence allowing for a critical comparison among different types of tourism. Moreover, while the current study was devoted to the analysis of booking patterns, it would also be interesting to extend the discussion to the effect of COVID-19 on booking cancellations. As the pandemic caused a significant volume of cancellations, this undoubtedly led to significant management problems, both for destinations and hotel managers. In addition, frequent cancellations have also accelerated the proliferation of reservations without cancellation fees, which make hotel reservation management considerably more difficult. In this vein, future studies should investigate the effect of the pandemic on the real number of overnight stays (tourists who actually retain their bookings), which might be substantially different from the number of initial bookings. Finally, the analysis of additional booking segmentations could provide complementary insights that could enrich the conclusions obtained in this study. For example, considering the tourists' country of origin may lead to interesting results related to the COVID-19 policies adopted by different governments.

Acknowledgements

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.ijhm.2022.103343.

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