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Comparing the temporal changes of airfares on online travel agency websites and metasearch engines

Abstract

Recent trends in transport and communication infrastructures have had a profound impact on the tourism industry. Despite the growing number and importance of online travel agencies and travel metasearch sites tourism literature addressing this issue is very scarce. This paper aims to examine the temporal changes of return airfares on online travel agency (OTA) and travel metasearch websites from Budapest to three short-haul destinations for fixed departure dates in high and shoulder season. The study was based on quantitative research methods using automated internet data collection and statistical analysis (ANOVA tests). During the study, we created a database containing more than 31 thousand ticket prices over a 182-day period for the three selected destinations. Empirical findings showed that no single website offered lowest airfares consistently and metasearch sites outperformed OTAs in almost any cases by offering lower airfares. Results also indicated the best time to book flights on the selected sites, airfares for shoulder season were significantly cheaper than for high season and ticket prices tend to be more expensive on Mondays and Sundays.

Key words: online travel agency; travel metasearch site; low-cost airlines; ANOVA; airfares ; Hungary

Introduction

In the second half of the 20th century, the development of transportation and information technologies have had a profound impact on the tourism industry (Buhalis & Law, 2008; Cantalops, Cardona & Matarredone, 2013; Law, Leung & Buhalis, 2009). The establishment of the Computer Reservation Systems (CRSs) in the 1970s followed by Global Distribution Systems (GDSs) in the 1980s and the emergence of the Internet in the late 1990s, have transformed the distribution and travel search process of tourism globally (Buhalis & Law, 2008; Cantalops, Cardona & Matarredone, 2013; Kracht & Wang, 2010). Nowadays, the Internet is an ideal distribution channel for tourism as it enables, both, consumers and providers to communicate with each other directly and to take advantage of direct access to information at any time through various channels (Law, Denizci Guillet & Leung, 2010).

In air travel, until the late 1990s, brick-and-mortar travel agencies served as the primary ticket distribution channel for airlines (Koo, Mantin & O'Connor, 2011; Pötzl, 2000). The rise of the Internet and its applications to travel and tourism offered the opportunity to online information search and allowed airlines to sell tickets directly to the public disintermediating travel agents (Buhalis & O'Connor, 2005; Koo et al., 2011). In the beginning of the Internet era, there were the airline sites followed by the development of major online travel agencies (OTAs) such as Expedia, Travelocity, and Orbitz. These sites provided global platforms for consumers to gather information and the opportunity to manage all travel related bookings on a single site (Koo et al., 2011; McIvor, O'Reilly & Ponsonby, 2003). These portals

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quickly became popular: for example, in Europe, gross bookings for OTAs totalled 23,6 billion EUR in 2009, and by 2012 it was estimated that OTAs' share of the online leisure and unmanaged business travel market would reach 37% in Europe and 40% in the US in 2012 (PhoCusWright, 2011).

As airfares became increasingly available on the Internet via various channels, travellers could compare the lowest fares and make purchases any time during the year, and became more sophisticated and flexible in departure date/time (Law et al., 2010). However, as travellers like to compare travel options quickly (Olenski, 2015) and use numerous websites to compare prices before making their final bookings (Law & Huang, 2006), the large number of travel websites cause information overload to consumers (Law, Chan & Goh, 2007). So, the searching process became time-consuming and poses unexpected challenges to those who wish to travel cheaply. This gave rise to metasearch engines such as Kayak, Skyscanner or Momondo, as these sites display all the information needed for a booking decision by scraping information from various websites and presenting it in one place. Nevertheless, we must note that airfares in the airline industry change frequently due to the use of dynamic pricing strategies and different sales channels (Etzioni, Tuchida, Knoblock & Yates, 2003), thus, for the actors in the airline industry it is very important to make customers know when and where to buy air tickets. Tourism literature addressing this issue is very scarce, so the aim of the research is to compare the lowest airfares offered by different major OTAs and metasearch engine websites for selected destinations, and to understand how the airfares vary over a 182-day period. Based on the issues outlined in the previous paragraphs the research seeks to answer the following question: Which online travel search site offers the lowest fares for fixed departure dates? In connection with the above, the study is to answer "When is the best time to buy air tickets on OTA sites and metasearch sites for high and shoulder season?"

The remainder of this paper is organized as follows. The next chapter reviews published articles related to OTAs and metasearch engines. That follows the explanation of the methodology discussing the data collection process. After that, findings and analysis are presented and finally, the conclusions and directions for future studies are summarized.

Literature review

Historically, travel bookings were conducted via telephone or through a travel agent, but innovation in information technologies and the proliferation of the Internet in the last decade has increased the complexity and changed the structure of travel distribution (Christodoulidou, Conolly & Brewer, 2010a; Buhalis & Laws, 2001; Kracht & Wang, 2010) and created a new competitive environment (Kim, Kim & Han, 2007). This evolution and transformation of tourism distribution channels increased the competition by offering more options for consumers and enabling them to search, compare and book proper travel products on their own (Kim et al., 2007; Kracht & Wang, 2010). Due to the convenience and easiness of purchasing online, electronic bookings soon became the norm rather than the exception (Christodoulidou et al., 2010a). In the last decade, a number of contributions have been written in the area of effective online travel distribution (Christodoulidou, Brewer, Feinstein & Bai, 2007; Tse & Yim, 2001) and e-commerce (Buhalis & Law, 2008) dealing with themes such as travel intermediaries (Buhalis & Licata, 2002; Christodoulidou, Brewer & Countryman, 2007), OTAs (Granados, Gupta & Kauffman, 2003; Lee, Denizci Guillet & Law, 2013; PhoCusWright, 2011), travel meta sites (Christodoulidou et al., 2007; Christodoulidou et al., 2010a, b; Dorn, Hrastnik, Rainer & Starzacher, 2008), e-travel and tourism (Buhalis, 2003; Buhalis & Licata, 2002; Dorn, Hrastnik, Rainer & Starzacher, 2008) and the list is not exhaustive.

In this new competitive and ever-changing environment, OTAs rapidly acquired a large share of the market and nowadays play a fundamental role in travel distribution, representing 38% of the global

online market and 13% of the total market with gross bookings exceeding \$150 billion dollars (Carroll & Sileo, 2014). Their success and popularity could be attributed to different reasons. Law and Leung (2000) attributed it to their client-centric approach, Kim, Bojanic and Warnick (2009) related to consumers' growing confidence in online purchase, while Law, Leung, Lo, Leung and Fong (2015), Morosan and Jeong (2008) and Tse (2003) highlighted that the Internet eliminates the need for customers to be physically present at the travel agency during the purchasing process. In addition, O'Connor and Murphy (2008) and Mantin and Koo (2010) stressed that price is the primary force that fosters travellers to purchase online.

As consumers were able to search on different websites to find the best fares or travel products that fit their individual needs, comparing prices among various websites became crucial due to the abundant supply of online distribution channels. A number of studies have addressed this issue: Gazzoli, Kim and Palakurthi (2008) compared online room prices of global hotel chains across online distribution channels and own brand sites and their results showed that chain websites outperformed OTA sites by offering the lowest rates; in their study Clemons, Hahn and Hitt (2002) analysed price dispersion and product differentiation on different OTAs and found that ticket prices vary by as much as 18% across OTAs; Law and Chang (2007) investigated the online pricing practice on three OTAs, while Law et al. (2010) examined the practices of five OTA websites and their empirical findings showed that local or regional OTAs outperformed the global leaders in offering lower airfares.

Considering the fundamental role of OTAs in travel distribution researchers also highlight some problems regarding the use of OTAs (Buhalis & Law, 2008; Tso & Law, 2005) as they provide too many choices to possible customers. People like to check best prices before booking on multiple websites and as Higgins (2010) stated travellers made an average of 21 visits before booking a trip, while according to Breure (2013) consumers visit on average 5-6 sites looking for hotels, which can lead to an over-supply of information and complicates and slows down the decision-making and booking process. In addition, most of the major OTAs do not display ticket prices from low-cost airlines as these airlines pursue a different business and ticket distribution model and prefer to sell their tickets via their own websites. Travel meta sites, the new generation of online travel agencies can offer a solution to these problems (Christodoulidou et al., 2007). The main difference between OTAs and metasearch sites lies in their different operational and revenue generating mechanism. OTAs (such as Expedia, Orbitz, etc.) operate by collecting information from customers (e.g. departure and arrival destination, preferred flight times, the number of travellers). This information is submitted to a computerized reservation system (CRS) which searches for relevant flights matching the search criteria. The agency receives the requested information from the CRS and provides it to the customer in the form of a travel itinerary. If the customer purchases a ticket from this final output, the OTA processes the booking with the CRS and receives a commission from the airline in return (Clemons et al., 2002; Kim et al., 2007).

Unlike OTAs, travel meta sites operate by gathering data simultaneously from multiple online travel websites (including the OTAs) (Park & Gretzel, 2006) by using their inventory and present the search results on a single screen (Clemons et al., 2002; Kim et al., 2007). Nevertheless, we have to note that meta sites do not provide the full range of travel possibilities and content usually found on OTA sites as their search area do not cover all travel related OTAs and websites. Besides, they do not offer the possibility to complete the booking transaction (i.e. there is no actual money transfer). Instead, they only refer or link the potential buyers directly to the source website (OTA, airline or other third-party website), where the booking transaction can be completed. This may raise the question of how reliable are the listed prices on the metasearch sites. According to the metasearch companies' business policy, they enforce strict price accuracy policies with all their data providers and partners and endeavour to

ensure that data content listed on the site is accurate and up-to-date. Moreover, as Michael McCartan stated the "Battle Gets Bloodier" between OTAs and metasearch engines (McCartan, 2014), to maintain their steady growth path (Reals & Hadwick, 2015), metasearch engines cannot afford and tolerate to list prices from sources which are not reliable. Meta sites receive commissions or payment after they have linked the potential buyer to the website (pay per click model) regardless whether the consumers finish the booking or just visit the site (Christodoulidou et al., 2007; Christodoulidou et al., 2010a, b). In contrast, the OTAs have to pay the CRS a fee for each query regardless of whether the customer purchased the product or not, but OTAs get only revenue if the traveller purchases a product (Clemons et al., 2002).

As travel meta sites are increasing in number and gaining market share and popularity (Christodoulidou et al., 2007) it is important to analyse the variations of publicly available lowest fares offered by OTAs and meta sites, as the existing travel literature has a few if any published articles addressing this issue. Thus, this paper makes an attempt to bridge this gap by comparing lowest airfares available on major OTAs and metasearch sites for a fixed departure date and tries to define the best time to book air tickets for shoulder and high season on different travel sites.

Methodology

The purpose of this study is to identify the temporal changes of airfares on major OTAs and travel metasearch sites. Quantitative data collection was used and airfare data was directly collected from major travel websites including OTAs and travel metasearch engines. It is important to note, that there are several OTAs (e.g. CheapTickets, Expedia, Orbitz, Priceline, Travelocity, etc.) and travel metasearch (e.g. Kayak, Momondo, Skyscanner, etc.) websites, but due to our limited resources we had to maximize the number of websites included in the study. According to previous studies of Law et al. 2010 and Law, Leung, Denizci Guillet and Lee (2011), we decided to collect data from five major travel-related websites including three OTAs (Expedia, Orbitz, Cheaptickets) and two metasearch engines (Kayak, Skyscanner). During the selection, we wanted to include the largest online service providers, but we had to consider that the website should have been compatible with our data collection agent. Considering this, we selected Expedia, the world's leading online travel agency and Orbitz (ranked 4) (Euromonitor International, 2014) as these two represent 60% of all European OTA gross bookings (Sileo, 2015). The reason for including CheapTickets is twofold. On the one hand, according to Law et al. (2011) CheapTickets is a "specialized travel website that offers additional products like concerts and sports", so it enables consumers to search and book a range of travel products (e.g. air travel, hotels, cruises, car rentals, etc.) and offers additional destination services such as event tickets like sport, theatre, and concerts (MarketLine, 2014), which can be attractive to potential customers. On the other hand, as CheapTickets is an Orbitz affiliate it enables us to analyse the changes of lowest fares on affiliated websites. Kayak and Skyscanner were included as they are generally recognized as leaders among metasearch sites (Coletta, 2015) and both focus mainly on flight search.

After the selection of the data sources, Budapest was chosen as the departure city. The reason for choosing Budapest, on the one hand, is that the city has a well-developed airport and transport infrastructure while on the other hand, we wanted an airport which has a strong competition between network carriers and low-cost carriers (LCCs), and after the bankruptcy of Malév Hungarian Airlines in 2012, the passenger traffic of Budapest Airport changed significantly and the share of LCCs rose from 26% to over 50% (Budapest Airport, 2013). During the selection of destination cities, due to our limited resources, we selected three popular European short-haul travel destinations including London, Paris, and Barcelona. London and Paris were included in the study as these were the two top

destinations from Budapest Airport considering the number of weekly departures (88 to London, 50 to Paris weekly departures in summer 2015), while Barcelona was selected as a popular tourist destination from Hungary, with 18 weekly departures in summer 2015 (Hungarian Central Statistical Office, 2015). Besides, the low-cost airline traffic to these cities was also significant as these destinations were served by three or more LCCs - London by Ryanair, Norwegian, EasyJet, and Wizzair; Paris by EasyJet, Ryanair, and Transavia; Barcelona by Ryanair, Wizzair, and Vueling - from Budapest during the data collection period.

In the study, we checked the fare data for fixed departure dates but with flexible booking dates. At first, we divided the travel in Europe to 3 seasons: low season (off season) - November through March; shoulder season - April to mid-June and September through October; high season - mid-June through August. Considering this, data collection was conducted from February 2, 2015 to May 31, 2015 for shoulder season airfares and from February 2, 2015 to August 2, 2015 for high season airfares daily. In the study 7-day return tickets (return flights seven days after departure) were obtained (Dudás, Boros, Pál & Pernyész, 2016a, b; Law et al., 2011) and the departure dates were on each day during the period June 1 to 7, 2015 for shoulder season and August 3 to 8, 2015 for high season. For each flight, we recorded the listed lowest ticket price for an economy class flight. We did not consider any additional costs (e.g. checked-in baggage, seat reservation, administrative charges, etc.). Although we have to note that some carriers in the economy fare include the checked-in baggage price while others not, however, the focus of this study was to compare the cheapest ticket prices listed on the selected sites, so we did not make a distinction if the checked-in baggage price was included or not in the cheapest fare. To increase the efficiency of the data extraction, we used a software called iMacros, which is an extension for web browsers (Mozilla Firefox, Google Chrome, and Internet Explorer) developed by iOpus/Ipswitch. It can "import or export data to and from web applications using CSV and XML files, databases, or any other source" (iMacros, 2016), and can perform tasks such as "finding and extracting text (prices, product description stock quotes, etc.) and images from websites" (iMacros, 2016). This program was run at scheduled intervals, extracted pricing data, and stored the results into a database for further analysis according to pre-defined parameters (e.g. departure and arrival airport, departure and return date, direct or indirect flight, cabin class, passenger numbers etc.). Altogether, we collected over 31 thousand ticket prices over a period of 182 days for three different destinations. Finally, we performed statistical analyses (one-way ANOVA) on the retrieved data and compiled the necessary diagrams and charts for further analysis.

Analysis and findings

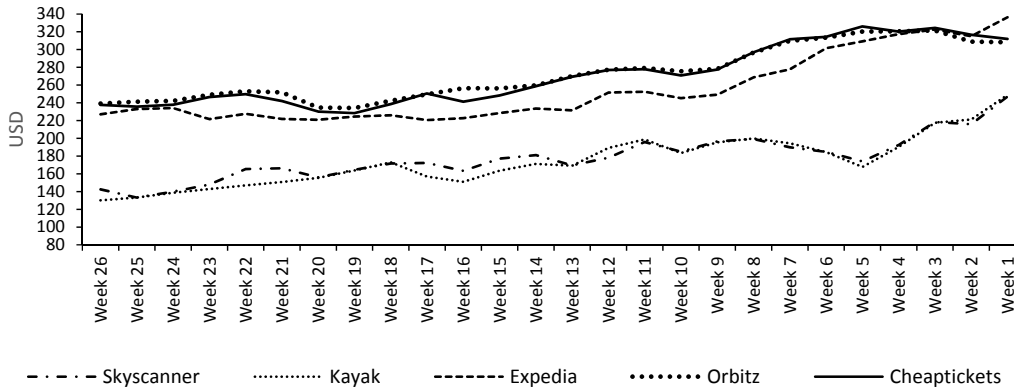
Weekly airfares

Figure 1 and 2 present the average weekly lowest airfares from Budapest to London for high and shoulder season during the data collection period. The figures highlight unambiguously that ticket prices are more expensive for high season and outline significant differences between airfares offered by OTAs and metasearch sites. The diagrams present that metasearch sites outperformed OTAs in any cases by offering lower airfares throughout the study period but none of the websites offered lowest airfares uniformly. This discrepancy in airfares is presumably due to that metasearch sites list also tickets from low-cost carriers while on OTA sites they are rarely or not listed and the price difference between network carriers and low-cost carriers might cause such a gap in airfares.

Ticket prices for high season (Figure 1) showed moderate growth with low price fluctuations. Kayak offered the cheapest flights to London in week 26 prior to departure (130.1 USD), while Skyscanner the second lowest in week 25 (133.2 USD). Based on Figure 1 consumers can save money if they book

flights as early as possible on metasearch engines. However, till week 14 they can purchase tickets for less than 180 USD. Considering OTAs, the lowest price was offered by Expedia in week 17 prior to departure (220.53 USD) and it also offered lower airfares (15 USD cheaper on average) consistently till week 3 than Orbitz or Cheaptickets.

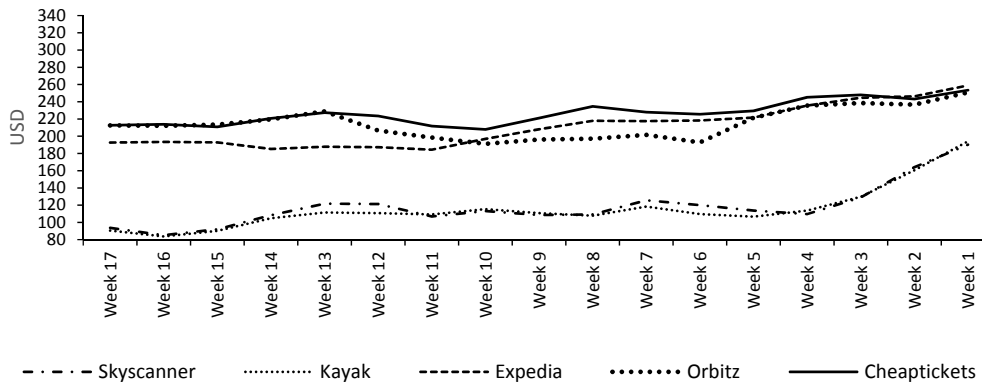
Figure 1
Average weekly lowest airfares to London on different websites (high season)



Shoulder season airfares to London (Figure 2) were significantly cheaper (approximately 50 USD on the average) than high season fares and consumers could find flights for less than 130 USD till week 3 on a metasearch website. Likewise, prices on metasearch sites were lower and the cheapest tickets were also offered at the beginning of the study period: the lowest in week 16 (83.71 USD) and second lowest in week 15 (85.18 USD) prior to departure by Kayak.

Based on the findings, significant price increase can be outlined on metasearch sites within the last 4-5 weeks in both seasons as ticket prices rose about 80 USD, so it would be the best interest for budget-conscious consumers to avoid booking within the last few weeks in both seasons. In contrast, OTA prices showed low or no price increase in the same period.

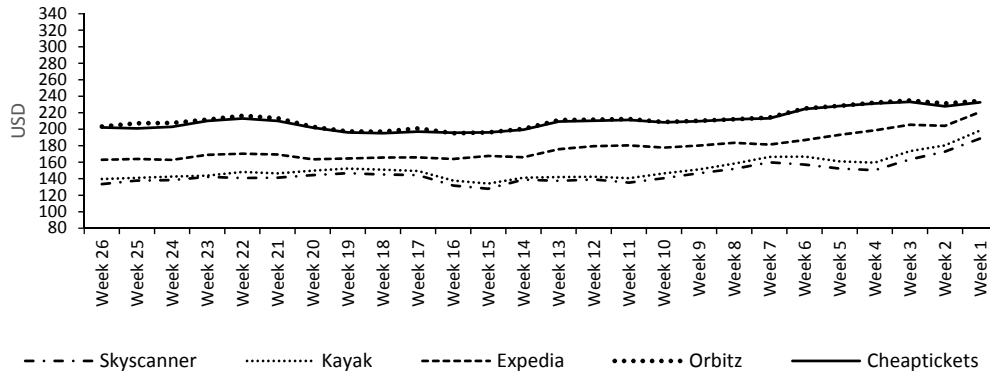
Figure 2
Average weekly lowest airfares to London on different websites (shoulder season)



In contrast to the airfares to London lowest airfares from Budapest to Paris (Figure 3 and 4) signal minor fluctuations and outline three different price levels. Skyscanner and Kayak offered lower airfares continuously, but Expedia outperformed significantly the other two OTAs forming a second price level.

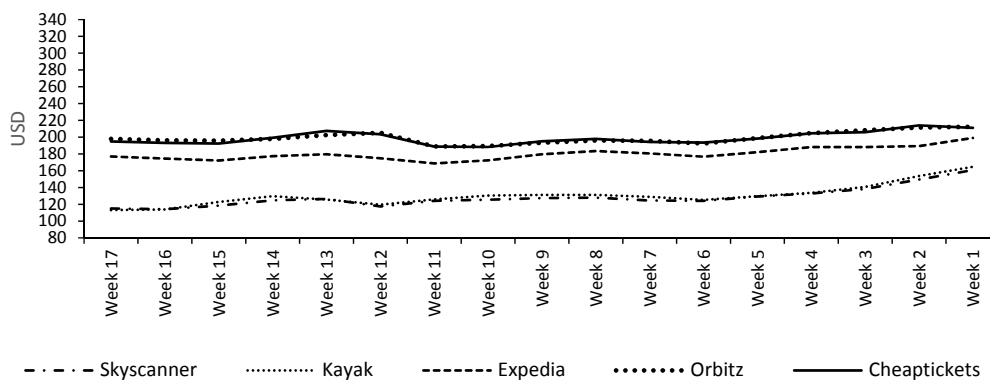
Apparently, Skyscanner offered the lowest airfares for both high- and shoulder seasons consistently except week 13, 16 and 17 in shoulder season when booking on Kayak was cheaper.

Figure 3
Average weekly lowest airfares to Paris on different websites (high season)



Based on our findings, the best time for price sensitive consumers to make their purchases to Paris for high season (Figure 3) was not at the beginning of the study period, but in the 15th and 16th week before departure, as the lowest fares were offered by Skyscanner in the 15th week (127.9 USD) and the second lowest in the 16th week (131.7 USD) prior to departure. Till week 9 consumers can book tickets on metasearch engines for less than 150 USD but as the departure date approaches a sharp increase in airfares was experienced and prices rose approximately 40 USD in the last four week. Similar to Figure 1, Orbitz and Cheaptickets performed the worst and Expedia offered about 30 USD cheaper tickets on the average. Despite the two price levels among OTAs, Figure 3 highlight a minor increase in airfares from the beginning till week 22, lower values between week 20 to 14 and slow increase from week 14 till departure.

Figure 4
Average weekly lowest airfares to Paris on different websites (shoulder season)



Shoulder season tickets to Paris (Figure 4) outlined similar trends as in high season. Small or no difference was between prices offered by Orbitz and Cheaptickets as well as between prices of Skyscanner and Kayak. The price gap between Expedia and the other two OTA was lower in shoulder season (20 USD) than in high season (30 USD) on the average. Apparently, prices on metasearch sites were lower and Kayak listed the lowest airfare in week 17 prior to departure (113.14 USD), while the second lowest

in week 16 (113.93 USD) Skyscanner. Airfares were below 120 USD in week 17, 16 and 12 for the metasearch engines and until week 4 they remained below 130 USD except week 8 and 9 for Kayak.

Figure 5 and 6 presents the weekly average lowest airfares from Budapest to Barcelona for high and shoulder season during the data collection period. Small or no difference was between prices offered by OTAs as well as between prices of Kayak and Skyscanner. Although the figures highlight significant differences between the price trends of the two season's airfares, the dichotomy between price levels of OTAs and the metasearch sites is present at Barcelona too. During high season (Figure 5) the price trend of OTAs and the metasearch engines signal different pattern. Similarly, metasearch sites outperformed OTAs by offering lower prices. The cheapest airfares were offered by Kayak in week 26 (148.9 USD) and the second lowest in week 25 (150.1 USD) prior to departure. Apparently, airfares in the first six weeks offered by metasearch engines showed a moderate increase and rose to a level of 180 USD. Between week 20 and week 8, the value fluctuated around this level when a second, sharper increase was experienced and airfares rose approximately 80 USD in the last seven weeks. In contrast, a minor increase was outlined on OTA sites from week 26 till week 22 but then between week 22 and week 18 airfares dropped from 240 to 205 USD. That was followed by a steady rise of airfares till week 6 when Orbitz and Cheaptickets started to decrease slowly while Expedia continued the rise.

Figure 5
Average weekly lowest airfares to Barcelona on different websites (high season)

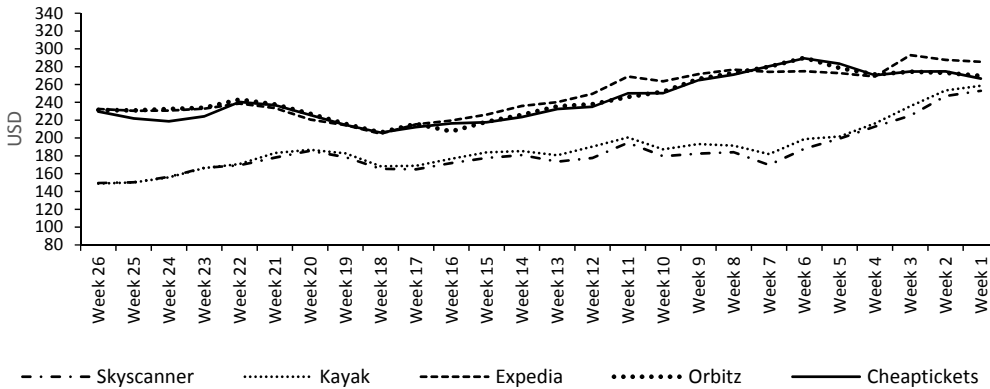
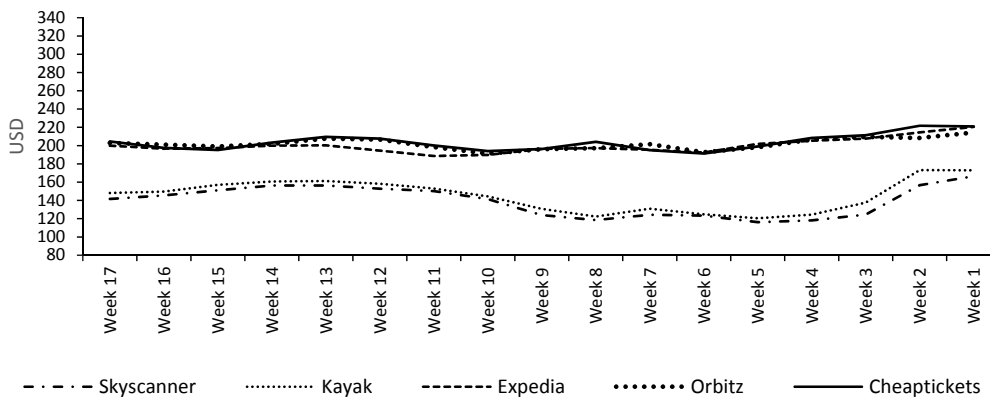


Figure 6
Average weekly lowest airfares to Barcelona on different websites (shoulder season)



Shoulder season tickets to Barcelona (Fig. 6) highlight that OTAs offered almost the same prices with no or minor price changes. Ticket prices moved around 200 USD and increased only with approximately 20 USD during the data collection. Airfares by metasearch sites showed a minor increase between week 17 and week 13 which was followed by a minor decrease between week 13 and week 5. Different from the shoulder season values of London and Paris, the lowest prices were not accessible at the beginning of study period as Skyscanner offered the lowest fares in week 5 (116.2 USD) and second lowest in week 8 (118.5 USD) prior to departure. This indicates that budget-conscious consumers could save money if they make their purchases between week 10 and week 3 in shoulder season while for high season they have to book as soon as possible on metasearch sites to get the best fares to Barcelona.

Daily airfares

In figures 7 to 9, we present the average daily airfares to the three destination cities on different days of the week according to data from the five websites included in the study. Apparently, airfares differ for each day of the week; furthermore average daily airfares for shoulder season were lower throughout the study period, but significant differences can be observed between OTAs and metasearch values similarly to the weekly trends (Figure 1 to 6).

Figure 7
Average lowest airfares to London on different days of the week on different websites

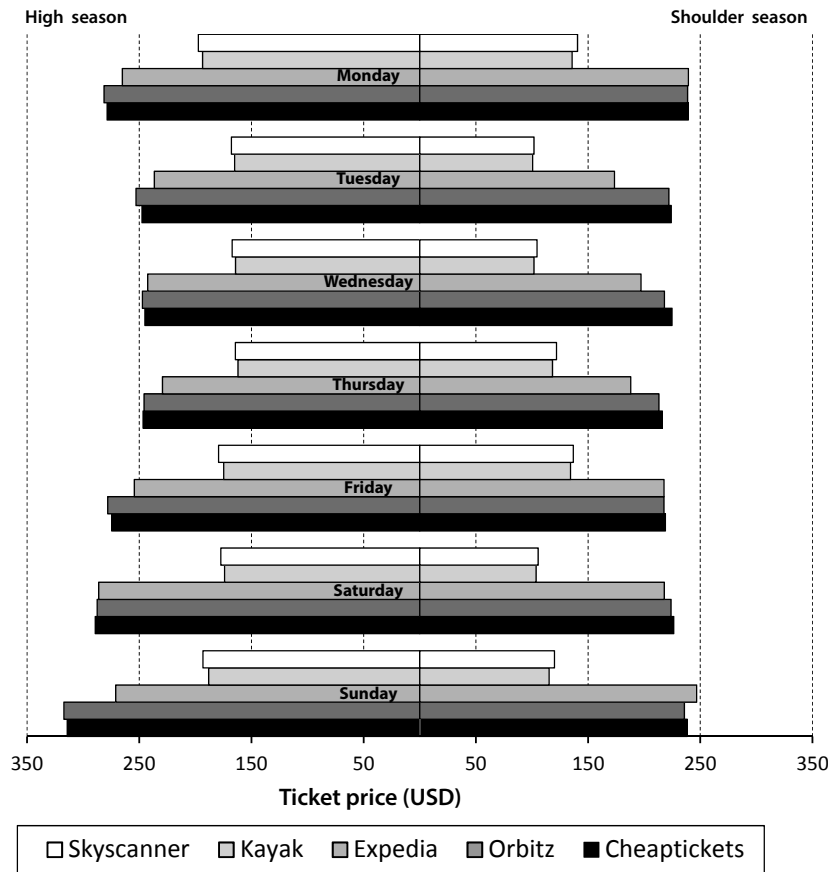
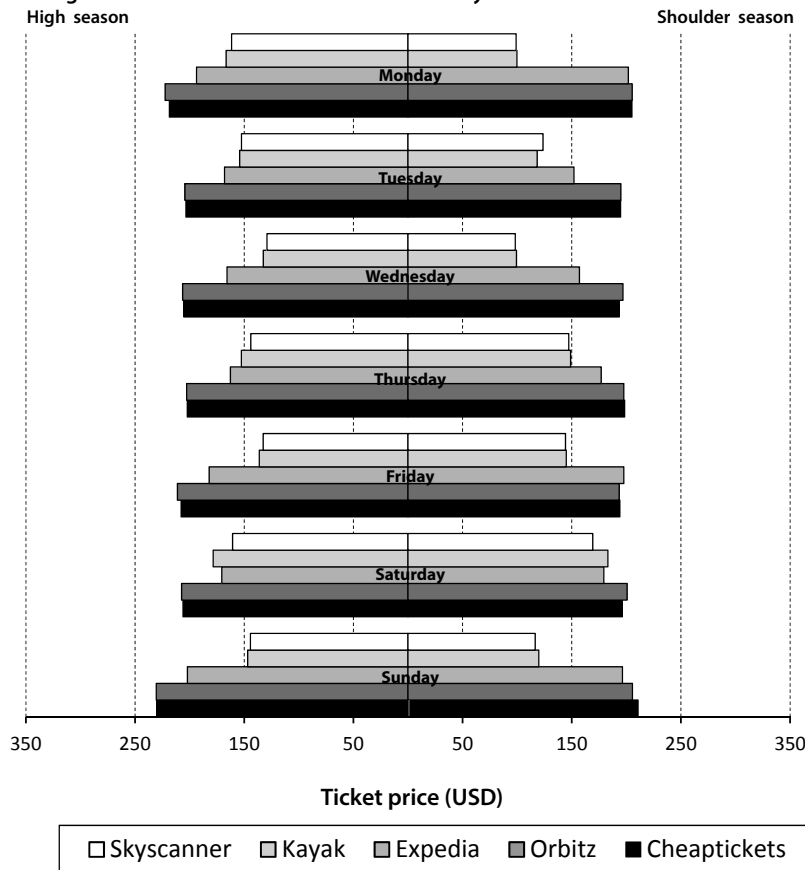


Figure 7 indicates that Kayak offered the cheapest tickets for every day of the week in both seasons during the study period. High season airfares on metasearch sites are more expensive on the first day

(approx. 195 USD) and last day of the week (approximately 190 USD), while lowest airfares are offered on Thursdays (approx. 163 USD). In shoulder season budget-conscious consumers can save money if they book flights for Tuesdays (approx. 100 USD) or for Wednesdays (approx. 102 USD) and try to avoid flying on Mondays (approximately 137 USD) and Fridays (approx. 135 USD). A similar trend showed the daily numbers of the OTAs for high season outlining a Thursday low-point (approx. 240 USD) and a Sunday peak (approx. 300 USD). The only difference is that highest fares on Expedia were on Saturdays not on Sundays. Likewise, OTA values for shoulder season outline a Monday (approx. 239 USD) and Sunday (approx. 240 USD) peak with a Thursday low-point (approx. 205 USD), but Expedia offers the cheapest flights for Tuesdays.

Figure 8 presents the daily airfares to Paris. No single website offered the lowest airfares consistently. Nevertheless, ticket prices on metasearch sites showed considerable fluctuations for both seasons. For high season the weekly peaks are on Mondays and Saturdays, while the cheapest tickets are offered on Wednesdays and Fridays. For shoulder season the weekly high end is on Saturday with two low points on Mondays and Wednesdays. Interestingly, our empirical findings showed that for Fridays and Sundays shoulder season ticket prices are higher than for high season and budget conscious consumer have to take into account, that price difference between the lowest daily average airfare (Wednesday 99 USD) and the highest (Saturday 175 USD) could be more than 76 USD in shoulder season to Paris.

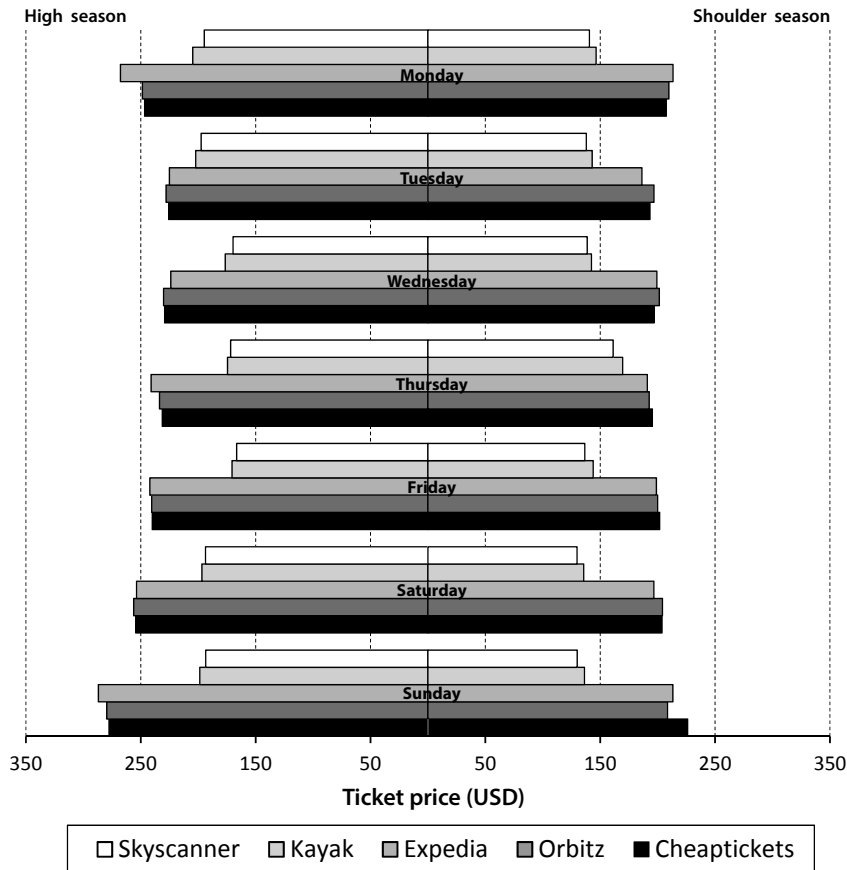
Figure 8
Average lowest airfares to Paris on different days of the week on different websites



Considering OTA values, Expedia outperformed significantly the other two OTAs on a daily basis similarly to weekly values (Figure 3 and 4); furthermore, for Saturday flights it is cheaper than Kayak for both seasons. Besides, ticket prices offered by OTAs showed a Monday and Sunday peak, while in the case of Cheaptickets and Orbitz no clear low point is outlined rather airfares moved around approximately 205 USD in high season and 195 USD in the shoulder season.

Figure 9 shows that Kayak offered the cheapest tickets for every day of the week in both seasons to Barcelona. High season airfares on metasearch sites were cheaper (around 170 USD) in the middle of the week (Wednesday, Thursday, Friday), while on the other days were around 200 USD. For shoulder season quite the opposite trends could be observed as ticket prices for Thursday flights were the highest (approx. 165 USD) and consumers could save money if they travel on Saturdays or Sundays. Figure 9 also highlighted that OTAs offered almost the same prices per day per season and the values indicate lower fares for Tuesdays in high season and for Thursdays in shoulder season with Sunday peaks for both season.

Figure 9
Average lowest airfares to Barcelona on different days of the week on different websites



Discussion and implications

The research is unique in the sense that no previous studies investigated the difference between the offerings of OTAs and metasearch sites as former studies of Law et al. (2010, 2011) were focusing only

on OTA offerings using Hong Kong as departing city. The inclusion of metasearch sites in the study eliminated also a deficiency of the papers of Law et al. (2010, 2011) namely, that airfares of low-cost carriers were not included in their analysis.

To test the difference between the offerings of OTAs and metasearch sites ANOVA was used and the results showed (Table 1) that among the included websites Skyscanner and Kayak ranked 1st and 2nd in turn in terms of lowest airfares while Expedia was ranked 3rd (except Barcelona in high season) for all destinations, while in almost all cases Orbitz and Cheaptickets returned the highest fares. According to the work of Law et al. (2010), our results show some similarities to these findings as the Orbitz affiliate Cheaptickets outperformed its "conglomerate" in high seasons and in Paris in the shoulder season.

In London, the Tukey HSD post hoc analysis indicated a huge price gap between the offerings of metasearch and OTAs. Metasearch sites listed approximately 89 USD (in high season) cheaper tickets, while the gap in shoulder season was even higher approximately 103 USD. This is probably due to that metasearch sites list also airfares from low-cost carriers and they offer significantly cheaper tickets than network carriers. The same test shows that the price gap in case of Paris is smaller than in London. It also confirms the three price levels of Figure 3 and 4. The two metasearch site provided approximately 28 USD (in high season) and 50 USD (in shoulder season) cheaper tickets than Expedia, while the other two OTAs offered more than 60 USD higher prices in both seasons. The Tukey HSD post hoc analysis of the Barcelona numbers also showed that metasearch sites outperform OTAs in offering cheaper fares, but in contrast to the other two cities the difference between the means of the two season is negligible, namely 58 USD in high season and 59 USD in the shoulder season.

Table 1
ANOVA analysis for lowest airfares on different websites

		Skyscanner	Kayak	Expedia	Orbitz	Cheaptickets	df	F ratio
London high season	Mean	178.21 (2)	174.51 (1)	254.92 (3)	272.65 (5)	270.76 (4)	4	439.24*
	Std.	26.46	29.69	38.51	30.1	33.48		
	Min.	130.57	127.14	172.43	226.43	221.43		
	Max.	259.86	263.86	350	331.71	337.71		
London shoulder season	Mean	118.52 (2)	115.76 (1)	211.54 (3)	224.11 (4)	226.84 (5)	4	826.56*
	Std.	26.01	26.88	23.83	12.59	14.82		
	Min.	76.57	77.71	165.42	204.29	200.86		
	Max.	213.71	218.71	278.57	267	268.57		
Paris high season	Mean	146.44 (1)	152.5 (2)	177.89 (3)	212.15 (5)	210.48 (4)	4	902.107*
	Std.	13.68	15.02	15.78	12.47	12.44		
	Min.	114.14	132.14	148.29	191	190.86		
	Max.	195	201.29	231	239.29	237.43		
Paris shoulder season	Mean	128.31 (1)	130.62 (2)	180.21 (3)	199.26 (5)	198.93 (4)	4	1392.7*
	Std.	12.35	13.25	8.42	8.09	8.63		
	Min.	106	104.86	163.29	176.86	174.86		
	Max.	170	174.86	211.29	223	221.43		
Barcelona high season	Mean	183.9 (2)	189.13 (1)	248.56 (5)	245.16 (4)	243.68 (3)	4	276.51*
	Std.	25.97	27.94	26.9	25.1	25.96		
	Min.	145	145.14	199.17	199.43	197.86		
	Max.	258.86	270.14	309.14	295.71	293.57		

Table 1 Continued

		Skyscanner	Kayak	Expedia	Orbitz	Cheaptickets	df	F ratio
Barcelona shoulder season	Mean	139.24 (1)	145.29 (2)	199.84 (3)	201.92 (4)	203.54 (5)	4	692.48*
	Std.	17.51	18.29	9.3	7.48	11.4		
	Min.	111.43	113.86	181.71	186.43	185.43		
	Max.	180.57	187.43	232.43	224	255.57		

1) numbers in parentheses after mean values represent the ranking of the site in a destination

2) *denotes significant difference at a 0.05 level

Based on our empirical, data timing is an important factor that consumers should consider when they search and book airfares. Our empirical results decisively confirmed the findings of Mantin and Koo (2010) that price-sensitive travellers should purchase their tickets as soon as possible but they should use multiple channels (e.g. Kayak and Skyscanner) to get the best prices as none of the websites offered lowest fares consistently. Our findings also indicate that travellers should be aware of prices on metasearch sites as the prices show a significant increase in the last few weeks before departure but they are still lower than of the OTAs.

Table 2 presents the average daily lowest airfares of the five websites on different days of the week. The ANOVA results strengthen the previous research, which highlight that ticket prices tend to be cheaper in the middle of the week and the weekly high ends are on Mondays and Sundays. In our study, the only exception is the shoulder season data for Paris, as the low points are on Tuesdays and Wednesdays, but the high ends are not at Monday and Sunday but on Friday and Saturday.

Table 2
ANOVA analysis for lowest airfares on different days of the week

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	df	F ratio
London high season	Mean	243.1 (6)	214.03 (3)	213.19 (2)	209.62 (1)	232.21 (4)	242.7 (5)	256.82 (7)	6	89.78*
	Std.	54.16	48.5	45.94	46.88	59.9	71.78	72.14		
	Min.	135	116	115	83	129	113	135		
	Max.	394	360	311	363	382	449	429		
London shoulder season	Mean	198.78 (7)	164.39 (1)	169.74 (2)	171.58 (3)	185.33 (5)	175.79 (4)	191.45 (6)	6	27.68*
	Std.	58.84	61.52	59.13	47.79	45.42	62.21	67.58		
	Min.	89	59	59	79	92	65	80		
	Max.	317	281	282	272	279	341	390		
Paris high season	Mean	192.58 (7)	176.58 (4)	167.88 (1)	172.94 (2)	173.94 (3)	184.69 (5)	190.7 (6)	6	68.55*
	Std.	37.99	27.78	36.82	26.57	38.47	23.43	44.9		
	Min.	92	121	76	132	93	127	108		
	Max.	305	260	254	223	243	287	280		
Paris shoulder season	Mean	162.08 (3)	156.75 (2)	148.9 (1)	173.76 (5)	174.74 (6)	185.73 (7)	169.53 (4)	6	59.19*
	Std.	53.2	34.68	47.39	25.67	31.69	15.91	50.24		
	Min.	67	108	59	120	90	141	86		
	Max.	250	221	212	239	260	237	306		
Barcelona high season	Mean	232.35 (6)	215.63 (4)	205.72 (1)	210.28 (2)	211.78 (3)	230.87 (5)	246.99 (7)	6	109.87*
	Std.	43,26	29.21	39.54	39.8	44.29	46	55.46		
	Min.	145	149	130	127	115	145	148		
	Max.	415	306	284	313	305	331	379		

Table 2 Continued

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	df	F ratio
Barcelona shoulder season	Mean	183.35 (7)	171.25 (1)	175.58 (3)	181.9 (5)	176.11 (4)	173.9 (2)	182.74 (6)	6	10.78*
	Std.	39.19	31.49	34.13	24.87	32.44	38.65	44.23		
	Min.	102	77	83	111	104	82	94		
	Max.	283	212	249	278	284	294	263		

1) numbers in parentheses after mean values represent the ranking of the days in a destination.

2) *denotes significant difference at a 0.05 level.

Conclusions

This study contributed to previous research investigating the temporal changes of airfares toward fixed departure date (Law et al., 2010, 2011) but extended the data sources by including data from metasearch sites. Despite the limited scope, it contributed to tourism literature as it compared lowest daily airfares of OTAs and metasearch sites for three popular destinations from Budapest in a period of 182 days.

The results indicated (and confirmed previous studies) that tickets for shoulder season were significantly cheaper than for high season and ticket prices tend to be more expensive on Mondays and Sundays. Our empirical findings also showed that people should book flights as soon as possible, as airfares would be toward the high end if the purchase is made in the last few weeks prior to departure. Nevertheless, our data highlighted that consumers should use multiple channels (especially metasearch sites) to get the best fares as no single website offered lowest fares consistently but metasearch sites outperformed OTAs in almost any cases by offering lower airfares throughout the study period.

Like other researches, this study has some limitations, which may not allow us to generalize the conclusions to all OTA and metasearch site and for all destination. The major limitation of this study is the use of only three European short-haul destinations. Future research could enlarge the scope of the study by including long-haul destinations and more short-haul destinations from various continents too. Another limitation is the relatively small number of OTAs and metasearch sites, which expansion could give a more detailed picture of when the best time is and on which site to purchase airline tickets. In spite of the limitations of this study, our findings can offer relevant information for tourism researchers and practitioners to better understand the online pricing practices of OTAs and metasearch sites. Consumers can also learn from the findings as they got an estimation about when the best time is to purchase airfares from online travel websites.

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