Price Discrimination in Online Airline Tickets based on Customer Profiling?

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ABSTRACT

Customer Profiling is a practice of price discrimination enabled through new technologies, such as cookies, and is referred to as behavioral tracking. In recent years customers seem to perceive that the ticket prices of flights on the Internet are adapted through the profiling of their personal data. A month-long experiment analyzing the ticket prices of four European carriers (two Full Service Carriers and two Low Cost Carriers) on four different routes found no evidence of price discrimination based on customer profiling. Therefore, in this particular case the usage of personal data of consumers for ticket pricing purposes is not confirmed.

However, significant price differences during the observation period of one month show that price discrimination in general is used by airlines. Full Service Carriers are found to be the airlines applying more price discrimination than Low Cost Carriers. Nevertheless, in 50% of the cases the price adaptions led to price reductions for the travelers.

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1. INTRODUCTION

Price discrimination is a method to maximize revenue for organizations with charging different prices to customers for the same product or service. It aims at setting "each buyer a price equal to his or her maximum willingness to pay" (Daripa & Kapur, 2001, p.209). Passenger air travel has proven to be the most delicate segment for the application of price discrimination (Hazledine, 2010) as well as one of the first industries to apply this technique online (Kung, Monroe & Cox, 2002). Airlines use this technique, which is referred to as yield management, to maximize their profits as well as to fill the seats on planes as much as possible. This is a popular technique in today's 'digital age' where it is very easy and fast to modify prices of goods or services online. However, this strategy is not always perceived as fair by the customers (Bolton, Warlop & Alba, 2003; Odlyzko, 2003, Lii & Sy, 2009), particularly provided that customers recognize that the carrier uses the pricing strategy to increase their profits (Da Silva, 2011). Booking online at different times during one week or even one day can in some cases mean a significant increase in the ticket price, and more and more customers come to notice these price changes. The question arises whether these changes are attributed to the airlines' profiling of customers, since online shopping customers perceive that airlines use their personal information to adapt the fare prices (Alreck & Settle, 2007) and airlines possess the technical ability to offer different prices based on consumer information from previous purchases (Fudenberg & Villas-Boas, 2007). With the increasing number of visits to the airlines website in case of a present interest for a specific flight, customers sense that the prices are augmenting due to their great observable interest. Nevertheless, this perception has yet to be proven.

The goal of this study is thus to determine if airlines use personal information obtained from the computers of their customers in order to offer different prices to the different price-sensitive consumers. Therefore, the research question presenting the main issue of this paper aims at testing *if airlines use customer profiling as a tool for online price discrimination*.

By answering this research question this paper aims at filling the literature gap of the customer's perception on profiling regarding price discrimination as an online marketing technique in the airline industry. This research will contribute to the existing literature in relation to approaches of price discrimination and customer profiling. Even though these topics have already been studied in the literature, there is only little information available on this area solely in relation to the airline industry. The outcome is academically relevant since it combines the knowledge of previous studies from scientific articles with the results of an experiment conducted over a period of one month for the purpose of solving the question of whether airlines apply customer profiling or not.

The paper contains a quantitative research on the basis of a literature review and an experiment meant to test whether customer profiling plays a part in the airline ticket process for flights booked online.

The information used in this review is based on previous studies in academic literature retrieved from the Web of Science and Google Scholar. The focus lies on the most recent literature, starting from the year 2000.

2. LITERATURE REVIEW

2.1 Online Price Discrimination

Price Discrimination in the airline industry mainly started after the Airline Deregulation in Europe in the late 90s, which freed the airlines from government intervention and allowed them to charge any fare they wanted (Toh & Raven, 2003). This was the beginning of what is known as yield management. A common definition of yield management describes it as the process of obtaining the best possible revenue from the right customer at the right place and at the right time (Yeoman et al., 2001). Due to the airline industry deploying only perishable inventory, this type of price discrimination is an established technique for carriers to secure certain revenue gains from their flights. This is the reason for this capacity management strategy to be most often applied by airlines to date (Da Silva, 2011). The rise of the Internet certainly augmented the usage of this pricing strategy. Moreover, the exclusive use of the Internet as a marketing distribution channel, which the largest Low Cost Carriers in Europe created, appears to have intensified the phenomenon of price discrimination (Piga & Bachis, 2006). Lee, Illia and Lawson-Body (2011) suggest that the phenomenon is also attributed to the emergence of advanced search engines and Online Travel Agencies. These give the customers the opportunity to be involved in and influence the price determination (Lee et al., 2011). Thus, the ticket purchasers are able to play an active part in the pricing decision with having the possibility to compare ticket prices and choose for their best option in an easy accessible way.

There are numerous possibilities on how to price discriminate. Airlines have a choice between two main strategies of price discrimination, namely the inter-temporal segmentation, i.e. the time before departure, as well as the implicit segmentation, i.e. the duration of the stay (Alderighi, Cento & Piga, 2011). The prices for the tickets therefore vary within the flight date coming closer as well as the duration of the stay varying in length. A case study of Alderighi et al. (2011) investigating the ticket prices for the route between Amsterdam and London of five different carriers revealed that inter-temporal segmentation tends to be the most prominent feature of airline pricing. They found an increase in the fare of 3% each day as departure nears as well as an overall augmentation of 80% of the ticket price in the last 20 days prior to the flight. Furthermore, a difference of 50% in ticket prices was seen in favor of long-term travelers compared to short-term travelers (Alderighi et al., 2011). This is most likely attributed to the airlines' strategy of obtaining more revenue from business travelers than leisure travelers (Odlyzko, 2003), since the former tend to book more short mid-week trips whereas the latter tend to stay for a longer period. This point is also in accordance with the following technique of price discrimination, namely day-of-week purchase. With this approach, ticket fares differ between weekdays and weekends. Puller and Taylor (2012) found that booking airline tickets on the weekend tends to be cheaper than during the week. This is based on the fact that business travelers are seen to book their tickets on weekdays rather than on the weekends, on which rather the leisure travelers purchase tickets. The airlines tend to decrease ticket prices on the weekend because customers buying on the weekend are considered to have a higher price elasticity of demand (Puller & Taylor, 2012), which means that their demand is more likely to change with modified prices. Thus, the airline increases its profits with selling more tickets in the case of a reduction of fares, since in this way the leisure travelers' demand grows. Gerardi and Shapiro (2009) support this statement with their assumption that leisure travelers' demand is in general more price elastic than the business travelers' demand, which presents a prerequisite for price

discrimination. This may also be attributed to the fact that most of the business travelers purchase tickets on corporate accounts (Toh & Raven, 2003) and have a smaller scope in which they need to travel. Hence, their demand cannot be as price elastic as leisure travelers who have a more flexible schedule. Marmorstein, Rossome and Sarel (2003) add that the leisure segment in the airline industry is willing to accept sacrifices in terms of scheduling due to the present priority of gaining the most economical fares possible. Moreover, cheaper tickets through advance purchase discounts rely on the fact that leisure travelers are usually willing to commit themselves well in advance to a trip, whereas business travelers often do not decide to book a week or days prior to the flight (Hazledine, 2010; Gaggero & Piga, 2011). Advance purchase discounts are according to Escobari (2006) also explained by flights' capacity constraints, thus he describes peak-load pricing as a relevant factor in the strategy of airlines. This denotes that with the departure date coming closer the demand for the tickets grows and the airlines augment their fares to realize the highest possible profit. Thus, with the advance purchase discounts carriers try to overcome periods in which demand or travelers' preferences are uncertain (Dana, 2001). Nocke, Peitz and Rosar (2011) established a further explanation for the usage of advance purchase discounts, which is that consumers face individual uncertainty over their future valuation for goods and this uncertainty is resolved over time. Therefore, consumer with a high expected valuation will purchase the airline ticket in advance at a discount, whereas consumers with a low expected valuation will postpone their purchasing decision and buy at a higher price, provided that their realized valuation turns out to be high (Nocke et al., 2011). However, Piga and Bachis (2006) found that during the four weeks prior to the departure date there was a higher volatility of fares while many Low Cost Carriers state on their websites that the "best deals are available before 28 days before departure" (Piga & Bachis, 2006, p, 14). This technique again aims at attracting the demand certain travelers and most likely appeals to consumers without secure demand through the differing prices, representing price promotions, preceding the flight.

Another form of price discrimination is the Saturday-night stay-over requirement (Giaume & Guillou, 2004; Stavins, 2001). This practice also aims at targeting different types of passengers. Whereas leisure travelers are more flexible in the possibility to stay away over the weekend, business travelers tend to desire to be with their families on weekends. This is the main reason why airlines augment ticket prices for returning flights before the weekend and lower the fares for tickets including a Saturday-night stay-over. Conversely, Piga and Bachis (2006) indicate that Low Cost Carriers have already eliminated this price discriminative method, since they found evidence that tickets for departing on a Monday and returning on a Thursday are likely to cost less than tickets for returning on a Sunday.

Not only the time before departure but also the time of the year, in which customers decide to book a flight can influence the ticket price. Gaggero and Piga (2011) found in their long-term observation of online airline ticket prices in the U.K. and Ireland that price discrimination is also dependent on seasons, especially in the case of high demand periods. They investigated that fares of flights departing during Easter and Christmas are on average less dispersed due to the ability of the airlines to focus their pricing strategies on a specific group of passengers with high willingness to pay (Gaggero & Piga, 2011). This implies that the inter-temporal price discrimination does not apply, and regardless of time before departure, the fares in these periods tend to always be high.

The question arises why price discrimination is profitable for airlines, since in many cases the consumers are therewith able to purchase an airline ticket for a very low price. The reason for this technique to be lucrative is primarily because the marginal costs are in general much lower than the average costs in this industry; to have an additional passenger on a seat in a plane that would otherwise not be taken, therefore just costs little (Lesk, 2008). In addition, the majority of costs per flight do not vary with the number of passengers on a flight (Borenstein & Rose, 2013), since the airline industry is a high fixed cost and low variable cost industry (Toh & Raven, 2003). Toh and Raven (2003) outline that fixed costs include rental costs of leased planes, landing fees and administrative costs such as salaries, whereas variable costs include ticket commissions and baggage handling. Hence, it is advantageous for the airline to sell seats even at a low price. A further reason why price discrimination is working for airlines is the fact that airline tickets are not transferable (Lesk, 2008). Therefore, it is not possible to purchase tickets from someone else who received a better offer from the airline.

Furthermore, Odlyzko (2003) states that price discrimination as a marketing technique offers sellers a higher rate of return than any targeted marketing campaign. Lesk (2008) however states that the airline could not proceed if every customer was able to purchase low cost tickets, since it would then stop being profitable for the airline to fly the route without the coverage of their basic costs. This again explains the strong variation in ticket prices. Furthermore, the Internet reduces the menu costs of changing prices significantly as well as the time foregone to adapt fares, which makes it so economical and appealing for companies (Kung et al., 2002).

Grewal, Hardesty and Iyer (2004) identify a further pricing technique referred to as buyer identification strategy. With this tactic companies attempt to offer prices based on customer's past preference, i.e. firms offer new customer price discounts whereas known customers receive a higher priced offer. This is also referred to as behavioral tracking and will be explained in more detail in the following section.

Concerning online price discrimination, Daripa and Kapur (2001) indicate that there are observable consumer attributes that may correlate to the customers' willingness to pay, for instance the profession of a customer. In the case the customer is a student several airlines charge them with a discounted price, provided that the customers can prove their identity with for example a student card.

A further strategy of price discriminating is called bundle pricing. Price discounts are herewith applied provided that the consumer purchases a larger amount of products at the same time (Kannan & Kopalle, 2001). In the airline industry this would imply a price reduction for travelers who decide to book more than one ticket at the same time. Another variation of the bundle pricing tactic includes a price discount for a single product that has to be purchased in a bundle of several different goods (Kannan & Kopalle, 2001). This technique exists in vacation packages, which offer flights and accommodation together and tend to be cheaper than purchasing each part individually.

Research shows that to what extent airlines apply price discriminative methods is also dependent on the market concentration in the industry (Giaume & Guillou, 2004; Stavins, 2001; Gerardi & Shapiro, 2009). Stavins (2001) testing the hypothesis whether price discrimination increases with competition in the airline market found that price discrimination is higher on routes with more competition. The research also established that airlines with higher market share on a given route tend to price discriminate more than others (Stavins, 2001). Giaume and Guillou (2004) as well as Hernandez Garcia

(2009) found that price discrimination decreases with the market concentration in the airline industry. This finding is explained by the structure of the European airline market, since the routes mainly consist of a small number of carriers on each route (Giaume & Guillou, 2004). They add that the more concentrated routes in Europe are characterized by "duopoly with high inequality of market share leading to strong price competition between the carriers" (Giaume & Guillou, 2004, p.309). In contrast, the results of Gerardi and Shapiro's (2009) research imply that an increase in competition leads to a decrease in price discrimination. Moreover, Hernandez Garcia (2009) investigated the impact of market concentration on different ticket categories. His findings imply that as concentration increases, the ratio of high priced fares to low priced fares decreases.

2.2 Customer Profiling in Online Price Discrimination

Price discrimination is popular in e-commerce nowadays; airlines have the technical capabilities to use customer profiling in order to adapt the prices depending on the customers' different willingness to pay. Collecting and analyzing personal information is particularly easy in the online world (Acquisti & Varian, 2005; Lee et al., 2011).

Internet-enabled technologies such as 'cookies', memberships or user logins can be used to identify consumers and track their purchase history and intentions (Iyer et al., 2002; Taylor, 2004; Fudenberg & Villas-Boas, 2007). Retailers then tend to base their offer according to the recent price preferences of the customers. These web-based technologies enable a firm to apply more precise targeting advertising and promotion offers (Iyer et al., 2002; Lewis, 2005), which can also lead to price reductions for customers.

Cookies are defined as a "packet of data sent by an Internet server to a browser, which is returned by the browser each time it subsequently accesses the same server, used to identify the user or track their access to the server" (Oxford Dictionaries, 2013).

With the aid of these 'cookies' the accessible knowledge of companies about their consumer attributes becomes more detailed. Through these technologies the company can access the browser history and track the previous purchases of the customers (Daripa & Kapur, 2001). This allows them to gain knowledge about whether the customer is rather price sensitive or not. Furthermore, companies utilizing price discriminative methods tend to target introductory offers towards new customers whereas returning or loyal customers receive higher prices (Daripa & Kapur, 2001; Grewal et al., 2004).

Acquisti and Varian (2005) explain that the HTTP protocol allows 'cookies' to persist after the session has ended, so that the next time the user returns to the website, the server can retrieve identification which can be matched with details of past interactions and purchases. Consequently, every time a customer returns to a certain website, which is using 'cookies', the company gathers more and more information about the individual for their own good. Thus, the customers provide accurate market information at virtually no cost to the firm (Marmorstein et al., 2003). When customers visit a website they are offered a price and the company operating the site is observing their decision about whether they purchase at this price or not (Acquisti & Varian, 2005). The second time they come back to the website the price they are offered can be conditioned on their earlier behavior (Acquisti & Varian, 2005). Acquisti and Varian (2005) further outline possible actions that a seller can undertake, firstly in the case there is a cookie that shows the customer bought the item at the offered price, the seller offers a price that depends on the details of the previous purchase. Provided that the cookie discloses that the customer did not buy at the offered price, the seller can then reduce the price according to his estimation at which price the customer is likely to make the purchase. Thus, the offers for products or services on the Internet do in many cases not represent the real cost for the goods, but instead are only the prices available at this particular time for the particular visitor with that certain browser history (Alreck, Settle, 2007).

There are several technologies available nowadays that support companies with collecting what used to be private information. Ulph and Vulkan (2000) elucidate that online retailers are increasingly collecting consumer-specific data with the aid of personalization technologies, such as agents. Through these agents websites can be individually redesigned and customized according to a customer's requirements. Therefore, prices can be changed in the personalization process to match what the customer is expected to be willing to pay (Ulph & Vulkan, 2000). In this way retailers certainly increase their profit margin. Although in several cases the personalization may present a helpful aid for consumers, by the websites' ability to therewith offer products that match their regular interests, customers are most certainly not willing to accept price increases with having this feature.

The existing technologies further allow companies to distinguish between customers regularly visiting price-comparison sites and those that access the websites offering the good in demand directly (Daripa & Kapur, 2001). Thus, companies apply this behavioral tracking method to analyze customer information beyond the behavior of the user on their own website. Daripa and Kapur (2001) add that the companies' assumption that people who tend to visit comparison websites are likely to be more price sensitive, leads to them being offered a lower price, whereas the customers who approach the website directly are charged with a higher price.

Another consequence of the appliance of personalization technologies is the fact that companies have thereby the ability to send promotional offers to very specific individuals based on their online behavior (Marmorstein et al., 2003). These offers may include e-coupons, which are online gift cheques, or price reductions specifically targeted at that certain customer. The responses of the consumers towards these promotions are then again analyzed by the companies and provide them with further information for more precise online marketing (Marmorstein et al., 2003).

Not every company collects customer information necessary for pricing strategy reasons. These companies, which do not possess the ability or the resources to collect these data, do still have the possibility to purchase relevant information through specialists (Ulph & Vulkan, 2000; Taylor, 2004). These specialized firms collect customer information for the sole aim of reselling it to other companies.

This access into the privacy of customers remained certainly not undiscovered. Consumers are becoming increasingly aware of the fact that their purchase history in the internet is stored, analyzed and even sold in some cases (Taylor, 2004). Customers are even aware that the information concerning their online activity can be applied to individual price targeting methods (Alreck & Settle, 2007). Grewal et al. (2004) found that customers are feeling more fairly treated when the firm uses price discrimination based on the purchase timing rather than based on buyer identification tactics. Possible consequences from behavioral discrimination, such as usage of 'cookies', may lead to customer's resentment towards the company as well as a decrease in their repurchase intentions (Grewal et al., 2004).

With the augmenting amount of data firms collect via their websites, it seems that firms are now gathering more information about their customers than they are even able to process (Fudenberg & Villas-Boas, 2007). This could imply that even though companies know a lot about the consumers, they might not be able to adapt all of this knowledge for their own purposes.

The reasons for companies to apply behavioral tracking are numerous and all based on the goal to increase profits. Alreck and Settle (2007) identify several reasons why companies choose to apply this price discriminative technique. Firstly, it is supposed to attract new customers, through providing new visitors with special deals such as discounted prices (Alreck & Settle, 2007). With offering an attractive deal these people are more likely to return to the website for future purchases. Another benefit that sellers can get from tracking their customers' online behavior is to increase their sales, since this is an even more precise version of targeted marketing in which not only specific segments but individuals can be addressed (Alreck & Settle, 2007). Chen and Zhan (2009) conclude that customer recognition based on consumer browser behavior and purchase history is one of the most common ways to implement targeted pricing in practice. Moreover, this tactic is used for the purpose of experimenting with prices and therewith estimating the demand for certain items (Alreck & Settle, 2007; Klein & Loebbecke, 2000; Marmorstein et al., 2003).

The creation of fingerprinting through the recording of WLAN signals is a further method of customer profiling (Lackner, Teufl & Weinberger, 2010). Taking such a behavioral fingerprint of any user enables companies to find characteristic features that describe customers' online behavior and thereby allows the identification and tracking of the user (Lackner et al., 2010). The process however is seen to violate the consumers' privacy, since it can be used to determine the location of a user (Lackner et al., 2010). Furthermore, this type of behavioral tracking is actually possible on devices where the appliance of 'cookies' has been refused by the user.

Reacting to current discussions, the European Union revised the regulations on using 'cookies' for storing information with a renewed European Directive in 2011. In the former rule the websites had to disclose the usage of 'cookies' and give the users the opportunity to refuse the storage of or the access to that information (PECR, 2011). The new requirement is essentially that 'cookies' can only be placed on machines where the user or subscriber has given their consent (PECR, 2011). In this way online customers are able to decide before entering a website about whether they want to accept the firms having access to their privacy or not. With the new regulation becoming effective, it is thus more difficult for firms to collect customer information, nevertheless it is still possible.

While some research shows that customer profiling and behavioral tracking is in fact applied to enable dynamic pricing for companies (Taylor, 2004; Kannan & Kopalle, 2001), it is not yet proven that airlines as well use this technique to base their prices on their customers' online information.

3. METHODOLOGY

The experiment aimed at testing the hypothesis that behavioral patterns of online shopping are related to airline price differences. It was decided to conduct a month long experiment measuring the variation between prices offered online to two different types of customers: a known customer traceable by the airline and a new customer unknown to the airline searching for a ticket in the same flight.

The setting of the experiment was decided to be based on the use of two computers requesting air ticket prices from four European airlines, three times a day on workdays simultaneously, in fixed times and for four destinations in Europe and overseas. The airline tickets requested were flights during the month of August of the same year. Two of the carriers were Full Service Carriers while the other two were Low Cost Carriers. It was initially planned to check the prices of all four airlines for the same routes, however this was not possible due to the numerous differences in destinations of all carriers. The destinations chosen for both Full Service Carriers were New York, Barcelona, Bali and Istanbul. The destinations for Low Cost Carrier 1 were Stockholm, Barcelona, Rome and Dublin, whereas the destinations for Low Cost Carrier 2 were Zakynthos, Barcelona, Luxor and Istanbul. The computers were two identical notebooks simulating two different conditions. In the first condition the notebook was a "normal" one that is to say a computer that could belong to any random online user who was searching for an air ticket fare. In this notebook 'cookies' were enabled and in principle any behavioral or other type of tracking from the part of the website accessed by the user was possible. In the second condition the notebook was a "clean" one where no behavioral or other type of tracking information was available for fingerprinting of previous behavior online. If the behavioral tracking hypothesis was true then differences between the prices offered to the two users of these computers would be observed. To make the comparison even more realistic all search queries were executed simultaneously so that price variations due to yield management influence would also be impossible; in this case every difference in the price between the two computers would be for all intents and purposes due to user tracking.

The experiment was conducted in the month of April 2011 on eighteen different dates and resulted in 432 observations per airline, therefore 3.465 observations in total: 18 days x 3 queries per day x 4 airlines x 4 destinations x 2 prices (to the destination and return) x 2 passengers. The routes, which were observed, started from two different airports in the Netherlands (Amsterdam and Eindhoven). The prices found per search query were recorded in Excel sheets; the spreadsheets calculated the total price of each ticket. Price differences were also recorded (whenever this happened) between prices offered in different parts of the day, even when the price offered to the two conditions was equal. This would offer also some insights in variation of prices due to yield management.

Thus, this experiment aimed at investigating the outcome of the following two questions, first *if there are price differences between the two computers* and if so, *whether the usage of behavioral tracking and cookies is the reason for those price differences.*

4. DATA ANALYSIS

The experiment found no evidence of customer profiling in the airline industry. Hence, there were no price differences between the traceable and the non-traceable computer. All ticket prices retrieved from the carriers' websites on both devices were equal. Thus, the question if there are price differences between the two computers can be rejected. The airline fares among the different carriers and routes however varied within the observation period of one month. This indicates that even though the carriers use price discrimination and consequently adapt their ticket prices in certain time intervals, such as after several days, or even twice a day, the carriers did not use consumer-specific data, such as purchase history or customer's browser behavior, to adjust their fares on the analyzed routes and in the analyzed period.

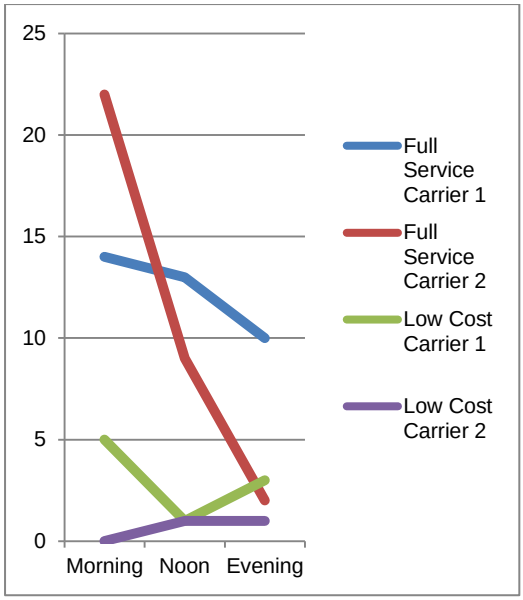

Figure 1. Amount of Price Adaptions.

Figure 1 provides an overview of the number of price adaptions that have been undertaken by the carriers during the time of observation. One can see that the Full Service Carriers present the airlines with the highest amount of price changes. During the experiment executed in the month of April in 2011, a total of 82 price adaptions were detected. These price adaptions are divided into 71 adaptions among the Full Service Carriers and 11 among the Low Cost Carriers. While the Low Cost Carriers changed their prices only 2 and 9 times during the whole month of observation, the Full Service Carriers adapted their fares 34 and 37 times. The price changes were most frequently executed during the morning by both Full Service Carriers and Low Cost Carrier 1. Table 1 (see Appendix) shows that half of all price changes were executed in the morning, namely 51,2%. 28,1% of all price changes were executed at noontime and 20,7% of all adaptions were executed in the evening. This can be seen as a possible consequence attributed to the airlines' analyzing the bookings and the related demand for flights from the previous day in the morning and therefore adapting price changes immediately to have the highest outcome of their decision to change the ticket prices.

Table 3 (see Appendix) illustrates that 34 of the price adaptions (about 41%) meant a price change of less than 1% of the total ticket price. This implies that only little price increases or decreases (around 1€) were undertaken.

41 price adaptions were below 5% of the total ticket price and 61 price adaptions meant a ticket price change of less than 10% of the total ticket price. Hence, about 74% of all price adaptions were price changes below 10% of the total ticket price. 12 price changes meant an increase or decrease in ticket price of 10 to 20% and 7 price adaptions meant a change in ticket price of 20 to 50%. Only 2 price adaptions by Full Service Carrier 1 denoted a ticket price increase of more than 70% of the total price. Thus, about 97,5% of all price adaptions were price changes below 50% of the total ticket price.

Table 2 (see Appendix) displays an overview of the division of price changes into price increases and price reductions. With 41 price increases and 41 price reductions the ticket prices augmented in 50% and decreased in the other 50% of the cases. This leads to the conclusion that consumers can benefit in the same amount of cases as they have a disadvantage from the airlines' yield management.

In Figure 2 up to and including Figure 5 (see Appendix) the price development of each roundtrip ticket to every destination by all four carriers analyzed are visible. The greatest price fluctuations can be seen in Figure 2 on the Bali curve of Full Service Carrier 1. The Full Service Carrier 2 routes to Istanbul and New York also show several price changes throughout the whole month of observation (Figure 3). Figure 4 displays price fluctuations in 3 out of 4 routes of Low Cost Carrier 1, whereas Figure 5 demonstrates the price development of Low Cost Carrier 2 with only two slight price changes on the route to Barcelona in the first week of the experiment. With these two price changes consisting of one price reduction and one price increase of the exact same amount, the Low Cost Carrier 2 is the only airline that finalizes the experiment with the initial ticket prices on all four routes. Price ranges between Low Cost Carriers and Full Service Carriers are though not quite comparable since the Low Cost Carriers operate in a lower price category and therefore their price increases or decreases would account for only a very low price change in the price class of Full Service Carriers.

5. CONCLUSIONS

For the reason of no detection of the practice of customer profiling by the airlines in this particular case, common price discrimination techniques are accountable for the observed fluctuations in ticket prices. The literature revealed that there are several different methods of price discrimination. The techniques described and applied the most frequently are price discrimination regarding the time prior to the flight, the duration of the trip and the segmentation of customers into leisure and business travelers. The analysis of the experiment shows that with the departure date coming closer and similarly the experiment finalizing, the prices augmented in several cases, mainly on a route of Full Service Carrier 1. This is in accordance with the technique of airlines deploying advance purchase discounts and consequently increasing their fares when departure dates are approached.

Furthermore, more than 86% of all price adaptions observed during the experiment were executed by the Full Service Carriers. This may be connected to the fact that Full Service Carriers have to target all kinds of travelers, whereas Low Cost Carriers are seen to primarily target more price sensitive travelers. Therefore, Full Service Carriers appear to adapt their ticket prices more often to gain the highest possible profits out of every customer. The long period of about four months between the experiment and the actual flight dates might present an explanation for the low amount of price adaptions undertaken by both Low Cost Carriers. It is possible that the Low Cost Carriers start to price discriminate more frequently in periods closer to departure in order to attract the more price elastic demand of their main target, the leisure travelers.

The literature finding that price discrimination increases with competition is supported with the outcome of the experiment regarding the only route that was flown by all four carriers, namely Barcelona. All observed carriers show price fluctuations on the route to Barcelona. Nevertheless, more extensive research should investigate if competition is in fact accountable for these fluctuations.

Moreover, about 50% of all price adaptions accounted for a price increase or decrease below 5% of the total ticket price, which represents merely a slight monetary change in fares. These price changes are not seen to have a big financial impact on each individual customer, though in total the revenues of the airlines are still affected by these price adaptions.

Finally, the literature implying that price discrimination can also be beneficial for customers appears to be proven in this

case, since the ratio of price increases versus price reductions equals 1.

6. DISCUSSION

These findings show that price discrimination in the airline industry is, contrary to expectations, not based on customer profiling. Even though the academic part of this paper indicates that airlines have the technical abilities to apply the purchase history and browser information of their customers to their dynamic pricing, in this particular case they do not. Thus, if consumers have the impression that airlines use their information to set prices, it is most likely a consequence of a lack of communication on the side of the airlines. If they improved their information flow concerning their intentions in collecting data of customers (Lii & Sy, 2009), those would not believe that airlines use tracking methods to adapt the ticket fares.

The study has a number of limitations; one limitation is the coverage of the experiment. With only four carriers as well as four routes observed, the outcome of this research covers only a small part of the whole airline industry and therefore cannot be seen as generalizable. Furthermore, only European airlines were observed. The usage of customer profiling might be different at other carriers or even at different routes. The result of this experiment, that airlines do not apply customer profiling, is thus reliable within the sample of airlines and destinations used and for the time period covered.

For the purpose of observing price discrimination in airline tickets in general, a longer observation period would have been advantageous. With only one month of checking fares of flights departing in the distant future, one cannot easily draw conclusions about the intended methods used by the airlines.

With taking these limitations into account the experiment represents a valuable method for detecting customer profiling in future research. For further studies it is recommendable to undertake the experiment with more carriers as well as more destinations from different areas of the world, for example the U.S. or Asia. The attitude towards customer profiling in price discrimination might be different in other parts of the globe, and might also be a culture related issue. Further research possibilities include that one might investigate if for example Online Travel Agencies use customer profiling to discriminate their airline ticket prices, since it has been observed that these agencies in fact use discriminatory methods for their prices (Clemons, Hann & Hitt, 2002). Hence, one might research if their appliance of customer profiling creates the perception of travelers feeling tracked online in general.

Moreover, it is considerable to use more than two computers in similar experiments in the future to check the ticket prices, and additionally devices that have already purchased airline tickets in the past as well as undertaken further online shopping actions. This might deliver new insights into customer profiling due to the greater contact surface.

For future research it might as well be useful to see if other aspects are involved as a cause for the price discrimination. It is worth investigating if price differences in airline tickets may also be a consequence of the brand of the devices used for the online booking process. It may be possible that an Apple device using a Mac operating system instantly offers higher prices, because their customers tend to be less price sensitive than regular PC users with Windows operating systems. Furthermore, accessing the airlines' website with different devices such as laptops, tablet computers or smart phones may also cause differences in ticket prices and thus represents a valuable recommendation for future research.

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APPENDIX

A. DATA ANALYSIS OF THE EXPERIMENT

Table 1: Overview of Price Changes per Time of Day (absolute numbers and percentages)

	Full Service Carrier 1	Full Service Carrier 2	Low Cost Carrier 1	Low Cost Carrier 2	Total
Morning	**14** (37,8%)	**23** (67,6%)	**5** (55,6%)	0	**42** (51,2%)
Noon	**13** (35,1%)	**9** (26,5%)	**1** (11,1%)	0	**23** (28,1%)
Evening	**10** (27,1%)	**2** (5,9%)	**3** (33,3%)	**2** (100%)	**17** (20,7%)
Total	**37** (100%)	**34** (100%)	**9** (100%)	**2** (100%)	**82** (100%)

Table 2: Overview Price Reductions vs. Price Increases (absolute numbers and percentages)

	Full Service Carrier 1	Full Service Carrier 2	Low Cost Carrier 1	Low Cost Carrier 2	Total
Price Reductions	**16** (43,2%)	**19** (55,9%)	**5** (55,6%)	**1** (50%)	**41** (50%)
Price Increases	**21** (56,8%)	**15** (44,1%)	**4** (44,4%)	**1** (50%)	**41** (50%)
Total	**37** (100%)	**34** (100%)	**9** (100%)	**2** (100%)	**82** (100%)

Table 3: Price Changes in Percentage of Ticket Price per Airline per Route

		Destination											
Full Service Carrier 1		**New York**			**Barcelona**			**Bali**			**Istanbul**		
		Morning	*Noon*	*Evening*	*Morning*	*Noon*	*Evening*	*Morning*	*Noon*	*Evening*	*Morning*	*Noon*	*Evening*
Price Changes (% of ticket price)	less than 1%	**5**	0	**2**	0	0	0	**4**	**2**	**2**	**1**	0	**2**
	1-5%	0	**2**	0	0	**2**	0	0	0	0	0	**2**	0
	5-10%	0	0	0	**1**	**2**	0	0	0	0	**1**	**1**	**1**
	10-20%	**1**	0	**2**	0	0	0	0	0	0	0	0	0
	20-50%	0	0	0	0	0	0	0	**1**	0	0	0	**1**
	50-70%	0	0	0	0	0	0	0	0	0	0	0	0
	>70%	0	0	0	0	0	0	**1**	**1**	0	0	0	0

		Destination											
Full Service Carrier 2		**New York**			**Barcelona**			**Bali**			**Istanbul**		
		Morning	*Noon*	*Evening*	*Morning*	*Noon*	*Evening*	*Morning*	*Noon*	*Evening*	*Morning*	*Noon*	*Evening*
Price Changes (% of ticket price)	less than 1%	**3**	0	0	**1**	0	0	**6**	0	0	**3**	0	0
	1-5%	0	**1**	0	0	0	0	0	0	0	0	0	0
	5-10%	**4**	**4**	**1**	0	0	0	0	0	0	**4**	**1**	0
	10-20%	**1**	0	0	**1**	0	0	0	0	0	0	**3**	**1**
	20-50%	0	0	0	0	0	0	0	0	0	0	0	0
	50-70%	0	0	0	0	0	0	0	0	0	0	0	0
	>70%	0	0	0	0	0	0	0	0	0	0	0	0

		Destination											
Low Cost Carrier 1		**Stockholm**			**Barcelona**			**Rome**			**Dublin**		
		Morning	*Noon*	*Evening*	*Morning*	*Noon*	*Evening*	*Morning*	*Noon*	*Evening*	*Morning*	*Noon*	*Evening*
Price Changes (% of ticket price)	less than 1%	**2**	**1**	0	0	0	0	0	0	0	0	0	0
	1-5%	0	0	0	0	0	0	0	0	0	0	0	0
	5-10%	0	0	0	0	0	0	0	0	0	0	0	0
	10-20%	0	0	0	**1**	0	0	0	0	0	0	0	0
	20-50%	0	0	**3**	**1**	0	0	**1**	0	0	0	0	0
	50-70%	0	0	0	0	0	0	0	0	0	0	0	0
	>70%	0	0	0	0	0	0	0	0	0	0	0	0

		Destination											
Low Cost Carrier 2		**Zakynthos**			**Barcelona**			**Luxor**			**Istanbul**		
		Morning	*Noon*	*Evening*	*Morning*	*Noon*	*Evening*	*Morning*	*Noon*	*Evening*	*Morning*	*Noon*	*Evening*
Price Changes (% of ticket price)	less than 1%	0	0	0	0	0	0	0	0	0	0	0	0
	1-5%	0	0	0	0	0	0	0	0	0	0	0	0
	5-10%	0	0	0	0	0	0	0	0	0	0	0	0
	10-20%	0	0	0	0	0	**2**	0	0	0	0	0	0
	20-50%	0	0	0	0	0	0	0	0	0	0	0	0
	50-70%	0	0	0	0	0	0	0	0	0	0	0	0
	>70%	0	0	0	0	0	0	0	0	0	0	0	0

Figure 2: Full Service Carrier 1: Price Development

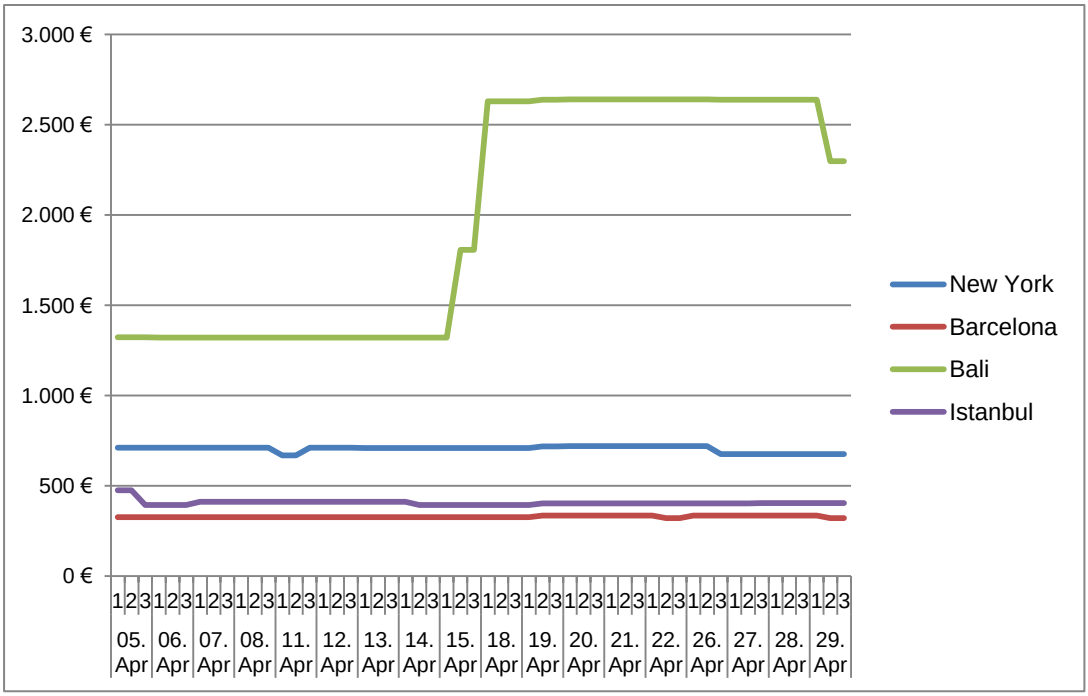

Figure 3: Full Service Carrier 2: Price Development

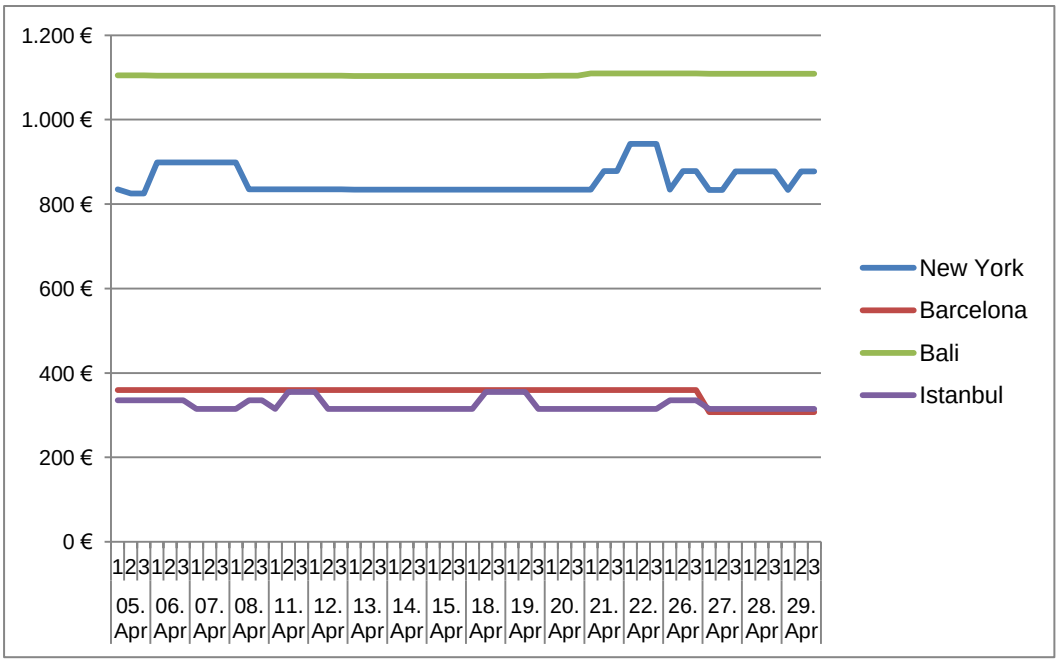

Figure 4: Low Cost Carrier 1: Price Development

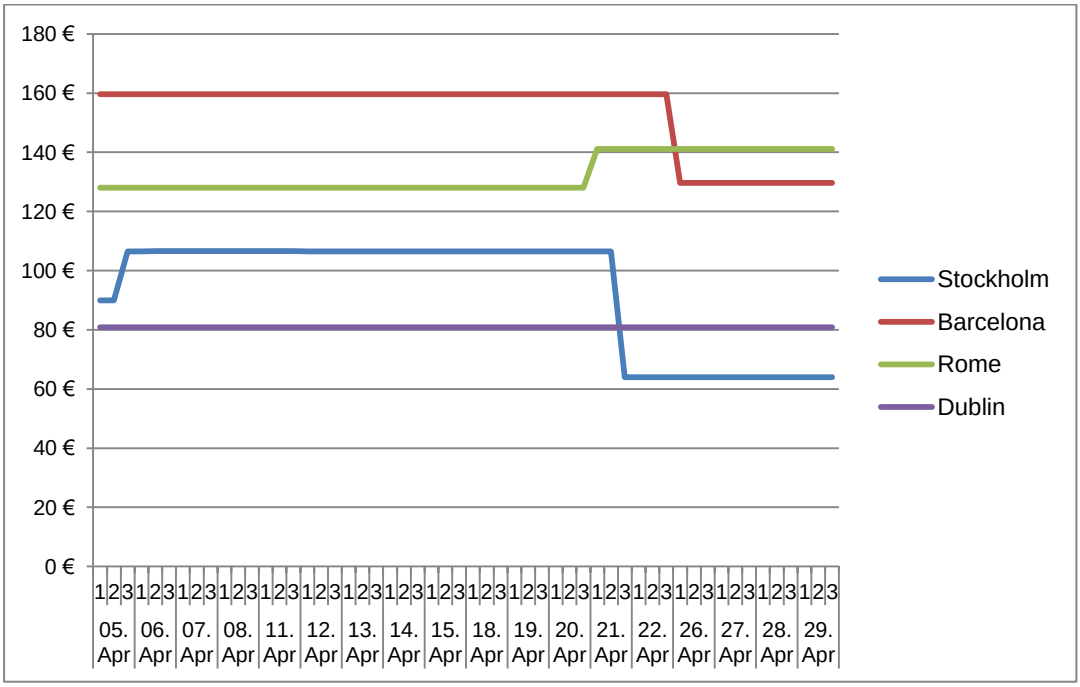

Figure 5: Low Cost Carrier 2: Price Development