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Quantity price discrimination in the air transport industry: The easyJet case

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ABSTRACT

This paper extends the literature on low-cost carriers' pricing strategies by investigating the presence of quantity price discrimination implemented through a two-part tariff in offered fares. By analysing Internet fares for all easyJet flights departing from the Amsterdam Schiphol airport between March and April 2015, we search for price differentials based on the number of seats booked by a single consumer. We find that the lowest average unit price is associated with a single consumer reserving 5 seats. On average, the per-seat discount for a single consumer reserving 5 seats is €9.48, which is 14% of the single-seat fare. Additionally, a multivariate analysis shows that quantity discounts are greater for flights with a larger fraction of available seats at the time of booking, the seats are booked longer in advance, and the destination's gross domestic product per capita is greater. Conversely, quantity discounts are lower for longer routes, larger destination airports, and routes for which easyJet's market share is higher.

1. Introduction

In the airline industry, price discrimination is known to play a crucial role in setting profitable strategies. Traditional carriers have begun to maximise profits by use of a yield management approach, in which they provide different travel classes (business vs. leisure) to suit passengers' various willingness to pay (Giaume and Guillou, 2004; Shapiro et al., 1999). However, this type of price discrimination, namely third-degree price discrimination, cannot generally be implemented by low-cost carriers (LCCs), since they tend to provide the same level of service for all passengers[1] (Moreno-Izquierdo et al., 2015). Instead, LCCs generally rely on inter-temporal price discrimination (e.g. Alderighi et al., 2015). They differentiate between highly price-inelastic business passengers, who typically book just a few days before departure, and price-elastic leisure travellers, who often book in advance, and then they maximise revenues by increasing the fares offered as the day of departure approaches (Bergantino and Capozza, 2015). Furthermore, LCCs have been also found to segment the market with regard to some route features, such as length and frequency, and departure day being on a weekend, bank holiday, or other high-demand period (e.g. Malighetti et al., 2010; Piga and Bachis, 2007; Salanti et al., 2012). Interestingly, only a few recent studies have mentioned that airlines appear to vary fares depending on the number of tickets booked on the Internet by a single consumer, thus relying on nonlinear price discrimination (Alves and Barbot, 2009; Lii and Sy, 2009). To the best of our knowledge, no empirical studies on LCCs have thoroughly investigated the presence of quantity discounts[2] implemented as a part of nonlinear price discrimination.

In this paper, we make a straightforward contribution to the literature by providing evidence of LCCs' nonlinear price discrimination exemplified by easyJet's two-part tariff strategy. Specifically, ticket prices are composed of i) a fixed fee (€17) per booking and ii) a dynamic component that characterizes almost all LCCs' pricing strategies. Moreover, by use of a multivariate framework, we investigate the joint effect of these two components on unit price at the single-flight level.

We use a unique dataset, which includes fares booked on flights from the Amsterdam Schiphol airport (AMS) towards 20 European different destinations during the period between January and April 2015 (1868 flights). Data on ticket prices and characteristics of the flights (destination airport, date of departure, and hour of

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[1] LCCs' service level is the same for all passengers, aside from the opportunity to board the aircraft first or to choose a specific seat.

[2] In this paper, quantity and volume discount are considered as synonyms (Philips, 1983).

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departure) are gathered daily from easyJet's website. Unit prices are collected for reservations composed of 1 seat, 5 seats, and multiples of 5 seats, up to the maximum reservation that can be booked through easyJet's website, 40 seats.

The remainder of this paper is organised as follows. Section 2 presents the theoretical model that merges the nonlinear price discrimination approach with the dynamic pricing structure implemented by LCCs. Section 3 describes the research methodology, Section 4 reports the results of the empirical analysis, and Section 5 summarizes the conclusions and proposed directions for further research.

2. Dynamic pricing strategy and quantity discounts in the LCC industry

The literature regarding air transport economics has highlighted that low-cost carriers generally are not able to directly segment the market by offering various transport classes to passengers (Alves and Barbot, 2009). Although recently some low-cost airlines have undergone a hybridization process of differentiating themselves from other LCCs by introducing various fare classes (Morandi et al., 2015), most LCCs' pricing strategies mainly consist of intertemporal price discrimination in order to profit from the different price elasticities of business passengers and leisure passengers (Salanti et al., 2012). Indeed, this strategy discriminates passengers according to their willingness to pay. Because leisure travellers generally have lower willingness to pay, they are accustomed to booking tickets in advance in order to pay lower prices. In contrast, business passengers have lower demand elasticity, because they usually decide to fly only a few days before the flight's departure, when ticket prices are higher.

Generally, the literature in the field (Alderighi et al., 2011; Malighetti et al., 2009) expressed the unit price of a seat on a flight as follows:

$$P_{it}(1) = f(a_{it}, d_{it}, c_i) \tag{1}$$

in which the unit price for a seat, purchased by a single consumer at time t, on a flight on route i ($P_{it}(1)$), is a function of the number of days of advance booking at time t (a_{it}) (e.g. Alderighi et al., 2011; Bergantino and Capozza, 2015; Malighetti et al., 2009), the number of seats available at time t (d_{it}) (Alderighi et al., 2011), and other characteristics of the carrier and route (c_i), such as the route concentration (Giaume and Guillou, 2004; Malighetti et al., 2009; Moreno-Izquierdo et al., 2015; Stavins, 2001), the size of the destination airport, (Malighetti et al., 2009, 2010; Salanti et al., 2012), and the destination's gross domestic product (GDP) (Malighetti et al., 2009, 2010; Moreno-Izquierdo et al., 2015; Salanti et al., 2012).

Although the topic has received much attention during the past decade (Alderighi et al., 2011; Dana, Jr. 1998; Li et al., 2014), few studies have suggested that fares may change according to the number of tickets reserved by a single individual (e.g. Lii and Sy, 2009). An experiment carried out by Alves and Barbot (2009) reported the presence of surges in prices offered by Ryanair for flights from London-Stansted to Alicante during November 2007: Per-seat prices varied from £49.99 for 14 seats up to £149.99 for 21 reserved seats. However, no studies have thoroughly analysed the possibility of LCCs utilizing nonlinear price discrimination, in which the unit fare changes according to the quantity of seats being booked by a single consumer. LCCs could instead discriminate passengers by offering quantity discounts, thus falling into the nonlinear price discrimination case (Armstrong and Vickers, 2010). Specifically, LCCs may implement a two-part tariff, introducing a fixed, per-booking fee (i.e. a charge that does not depend on the number of seats included in the booking).

Applying the typical two-part tariff rationale to airlines' dynamic pricing strategies, the resulting total fare is made up of two components:

$$P_{it}(q) = \overline{p_{it}^{v}}\, q + F \tag{2}$$

in which the total amount of money paid by a single consumer at time t for a flight reservation consisting of q seats on route i ($P_{it}(q)$) is a function of the average variable price component charged to a consumer booking one seat ($\overline{p_{it}^{v}}$),[3] and the fixed fee (F). The quantity discount becomes evident when considering the unit price $p_{it}(q)$ (Ho and Zhang, 2008) as equal to $\overline{p_{it}^{v}} + F/q$. Due to the complexity of the LCCs' pricing system, $\overline{p_{it}^{v}}$ is not a fixed, easily computable variable. In fact, it depends on different factors, such as the number of seats booked, as well as the other attributes ($a_{it},\ d_{it}, c_i$) previously described.

Accordingly, the unit price is ultimately equal to the following:

$$p_{it}(q) = P_{it}(q)/_{q} = \overline{p_{it}^{v}}(q;\ a_{it},\ d_{it}, c_i) + F/q \tag{3}$$

Considering the interdependence between the number of seats that are available at the time of booking and the price at which the seats are offered (Alderighi et al., 2015; Escobari, 2012; Li et al., 2014; Puller et al., 2008), when a consumer books two or more seats than just one seat, two effects arise simultaneously. On one side, the component d_{it} brings to a more rapid saturation of the flight's available seats, which may cause the unit price to increase. On the other side, the F/q component causes the unit price to decrease, because the fixed component of the total booking fare is divided among a greater number of reserved seats. Hence, when the effect of F/q prevails over the effect of d_{it}, the unit price for a single consumer reserving more than one seat is lower than the unit price for a single booked seat; this is a quantity discount.

Our objective is to identify whether and how an average percentage quantity discount ($\overline{D_{it}}(q)$) is present, by use of the following formula:

$$\overline{D_{it}}(q) = \frac{p_{it}(1) - p_{it}(q)}{p_{it}(1)} \tag{4}$$

in which $p_{it}(1)$ and $p_{it}(q)$ (see Equation (3)) are the unit fares offered to a single consumer reserving 1 or q seats, respectively, at time t for a flight on route i.

In this regard, easyJet represents a valid example. In addition to having instituted a dynamic pricing strategy according to advance booking (e.g. Koenigsberg et al., 2008; Malighetti et al., 2015; Salanti et al., 2012), the company has stated that it charges a €17 fixed fee per reservation,[4] automatically divided among the number of seats booked in a single reservation.

In order to empirically analyse the effects of the applied two-part tariff strategy under a typical LCC's framework, in the next sections we first investigate the existence of quantity discounts in the easyJet case (Section 3.2). Second, by relying on single-flight observations, we investigate the determinants of the value of the quantity discount implemented by easyJet (Sections 3.3 and 4); these include the number of days in advance of departure the consumer books the reservation, the number of seats that are

[3] For the sake of clarity, p_{it}^{v} in Equation (2) represents only the variable component, while $P_{it}(1)$ in Equation (1) stands for the entire unit price. This allows us to make explicit the presence of a fixed component, F, which has not been yet highlighted in the previous literature.

[4] This information is available at *http://www.easyjet.com/en/terms-and-conditions/fees-and-charges*.

available at the timing of booking, and the level of competition, in addition to features of the destination airport.

3. Research design

3.1. Sample and data

We collected data on daily Internet fares for 1868 flights scheduled by easyJet and departing from AMS towards 20 European destinations between 8 March 2015 and 22 April 2015.[5] Booking fares were collected daily from the easyJet website during the 45 days prior to each flight. The booking fare values (1,133,092 unit fare records) reflect the full prices paid by passengers for one-way trips, including easyJet's standard tariffs, airport charges, and other compulsory taxes and fees. Data was also collected about flight characteristics (destination, departure date, and departure hour), the date on which each fare was collected, and unit prices for reservations of 1 seat, 5 seats, and multiples of 5 seats up to the easyJet's website maximum of 40 seats. To gather the exact number of seats available on a specific flight at the time of the reservation, we checked the daily sold-out quantity in the 1–40 range. In particular, when the flight was sold-out for a specific quantity n (a multiple of 5), we controlled for the fare offered for $n-1$ seats, up to the number of seats for which that price was available. The ultimate number of seats for which the price was available thus represents the number of available seats.

Information was gathered from various sources: 1) Unit fares were obtained from easyJet's website; 2) the annual number of total passengers was obtained from the website of each destination airport; 3) the GDP per capita of each destination's surrounding area was obtained from Eurostat and the Organisation for Economic Co-operation and Development (OECD) library; 4) the share of flights operated by easyJet compared to its competitors was obtained from AMS's website.

3.2. The relation between price and quantity

Given the two opposite effects potentially affecting unit price, namely the two-part tariff and the saturation of available seats, this section of the paper examines the existence of a quantity discount - a percentage discount in unit price for reservations composed of a larger number of seats. Specifically, the dataset enables us to determine the number of seats in a reservation at which easyJet offers the lowest unit fare.

Reporting the proportion of reserved seats at which it is offered the minimum daily unit fare for reservations of 1 seat, 5 seats, and multiples of 5 seats, up to easyJet's website maximum of 40 seats, Fig. 1 highlights that the minimum daily unit price is generally offered when 5 seats are booked in a single reservation (74% of the 76,195 daily reservations) and that the price for single-seat bookings is the cheapest in only 4169 cases (5% of the daily 76,195 reservations). Moreover, the unit prices for 1 seat and 5 seats are almost never equal (they are equal in only 1% of the cases), and the latter is rarely (only 4% of the cases) higher than the former. For even greater numbers of reserved seats, the quantity discount decreases: The cheapest daily unit fares are for reservations of 10 seats in 14% of cases but for reservations of 15 seats and 20 seats only in 6% and 1% of cases, respectively. We find no case in which booking more than 20 seats in a single reservation gives the cheapest daily unit fare. Interestingly, this evidence suggests that unit prices are significantly lower for reservations that include 5 seats than for single-seat reservations. As shown in Fig. 1, a U-shaped relationship exists between average unit prices and the number of seats booked in a single reservation. This finding confirms our expectation of how $p_{it}(q)$ varies according to the booked quantity: The effect of the F/q component prevails over the effect of the saturation of the number of available seats (d_{it}), up to 5 seats booked in a single reservation.

In order to obtain the same average unit price (€84) for a multi-seat reservation as for a single-seat reservation, it is necessary to book more than 20 seats in a single booking. The average unit prices for 5 seats and 10 seats are equal to €73 and €75, respectively.

Next, we test whether quantity discounts are related to the number of seats available, to the number of days in advance of departure the reservation is being booked, or to other flight characteristics, such as departure time. Fig. 2 illustrates that for various numbers of available seats (from 5 seats to 10 or more seats), the lowest fare is still usually associated with reservations of 5 seats. Concerning the effect of advance booking, Fig. 3 shows that, on average, in 60% of the cases the lowest fare is associated with reservations of 5 seats, almost independently from the number of days in advance the booking occurs.

Even when varying the departure day of the week or hour, the minimum fare is still associated with reservations of 5 seats. As illustrated in Fig. 4, in more than 50% of cases the lowest fare is associated with reservations of 5 seats; by day of the week, this proportion ranges from 57% on Tuesdays to 84% on weekends. Fig. 4 also shows that quantity discounts are greater during weekends (including Monday) and smaller during mornings. The high occurrence of minimum daily unit fares in presence of 5 reserved seats during weekends suggests that easyJet offers a type of ‘family discount’ (a cheaper unit fare for groups of 5 people in the same booking). During mid-week (Tuesday, Wednesday, and Thursday), the lowest unit fare is more frequently associated with larger groups.

3.3. The value of the discount and its determinants

Since we find that the highest discounts are usually associated with reservations of 5 seats (74% of the cases), we specifically use the 5-seat discount as the dependent variable in the following empirical analysis. We compute this average percentage discount, based on Equation (4), as follows:

$$\overline{D_{it}}(5) = \frac{p_{it}(1) - p_{it}(5)}{p_{it}(1)} \tag{5}$$

in which $p_{it}(1)$ and $p_{it}(5)$ are the unit prices offered by easyJet at time t for a 1-seat and 5-seat reservation, respectively, for a flight on route i. On average, the results show a 5-seat quantity discount of €9.48 per seat, which accounts for 14% of the single-seat reservation fare.

Fig. 5 shows how fares for various reservation sizes and the related average percentage quantity discount varies in relation to the number of advance booking days. Given the LCCs' intertemporal price discrimination strategy, average unit prices for reservations of 1, 5 or 10 seats increase as the departure date approaches. That variation ranges from minimums of €70, €60, and €63 at 45 days before departure to maximums of €115, €108, and €100 on the day before departure for 1-, 5- and 10-seat reservations, respectively. The average unit price for 10-seat reservations ranges between the unit price of 1-seat and 5-seat reservations until the 7th day before

[5] These 20 European destinations are as follows: Prague (PRG) in the Czech Republic, Bordeaux (BOD) in France, Hamburg (HAM) and Berlin (SXF) in Germany, Rome (FCO) and Milan (MXP) in Italy, Lisbon (LIS) in Portugal, Basel (BSL) and Geneva (GVA) in Switzerland, and Belfast (BFS), Bristol (BRS), Edinburgh (EDI), Glasgow (GLA), London (LGW, LTN, and STN), Liverpool (LPL), Manchester (MAN), Newcastle (NCL), and Southend (SEN) in the United Kingdom.

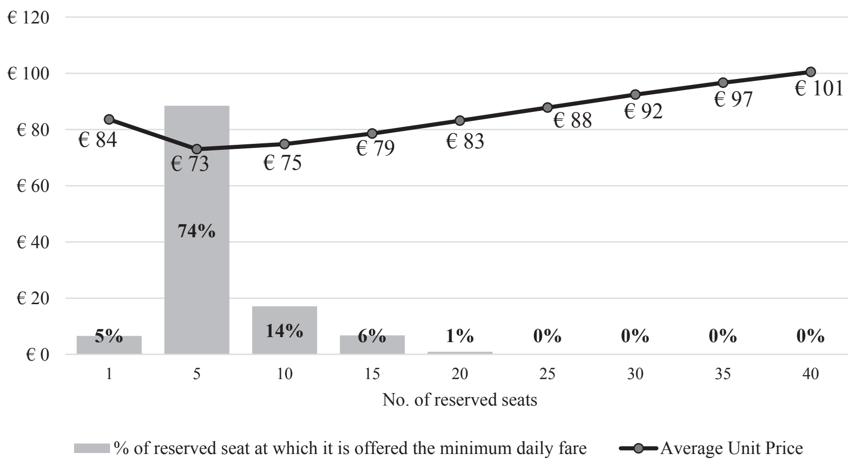

Fig. 1. Average unit fare and proportion of reserved seat at which it is offered the minimum daily fare. Source: easyJet's website.

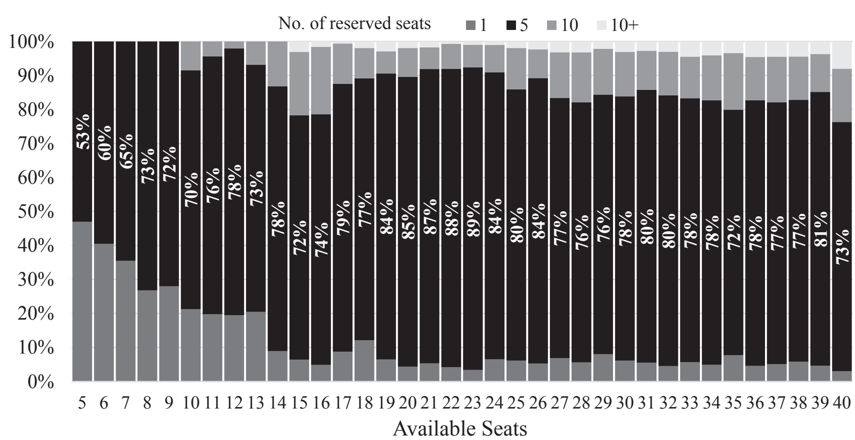

Fig. 2. Proportion of reserved seats at which it is offered the minimum daily fare, by available seats. Source: easyJet's website.

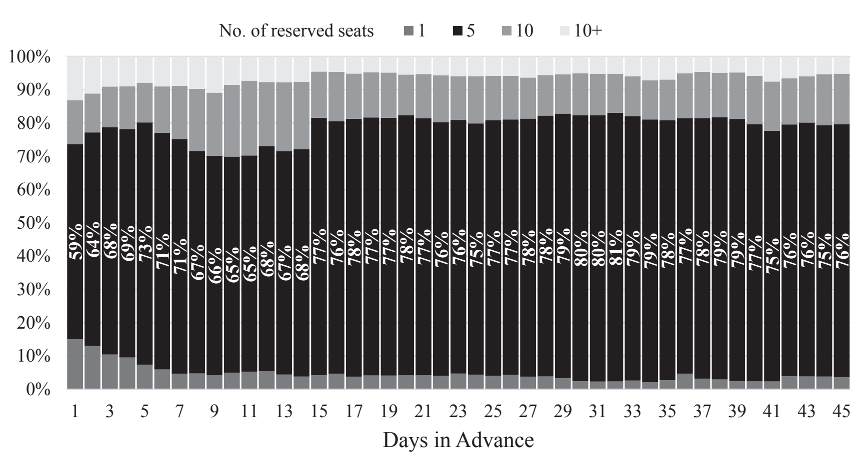

Fig. 3. Proportion of reserved seats at which it is offered the minimum daily fare, by advance booking. Source: easyJet's website.

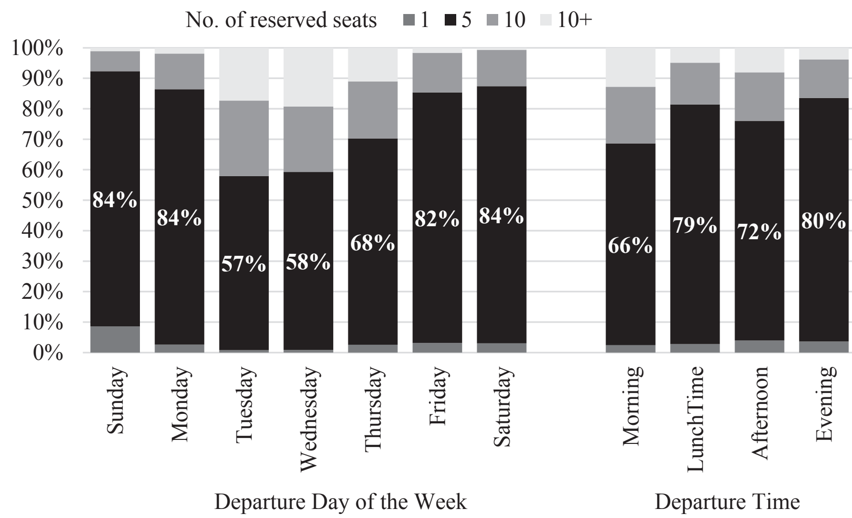

Fig. 4. Proportion of reserved seats at which it is offered the minimum daily fare, by departure day and day-time. Source: easyJet's website.

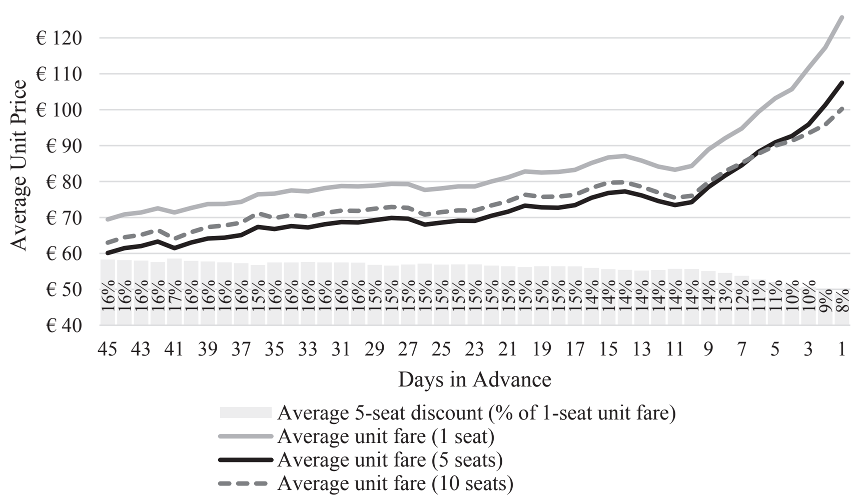

Fig. 5. Average 5-seat discounts and unit fares for 1-seat, 5-seat, and 10-seat reservations, by advance booking. Source: easyJet's website.

departure, while afterwards it is lower. This exception may be due to the fact that during the last days before departure, data are limited to routes having a higher spare capacity (Alderighi et al., 2015). Corresponding to those average unit prices, the 5-seat percentage quantity discount decreases from 17% (€9.95) at 45 days before departure to 8% (€7.76) on the day before departure.

Having illustrated the presence of the easyJet's 5-seat quantity discount, we investigate their determinants by using the following pooled ordinary least squares (OLS) model with robust standard errors,[6] including departure-date dummy variables:

$$\overline{D_{it}}(5) = \alpha X_{it} + \beta Z_i + \gamma T_i + \varepsilon_{it} \tag{6}$$

in which $\overline{D_{it}}(5)$ is the percentage average 5-seat quantity discount enjoyed by a consumer when reserving 5 seats rather than only 1 seat in a single reservation at time t for a flight on route i, as detailed in Equation (5); the X_{it} vector represents a set of time-variant explanatory variables at time t; Z_i represents a set of time-invariant explanatory variables for route i; T_i is a vector of dummy variables for departure date; and ε_{it} is the error term.

We rely on previous literature (Alderighi et al., 2011; Bergantino and Capozza, 2015; Giaume and Guillou, 2004; Malighetti et al., 2009, 2010, 2015; Moreno-Izquierdo et al., 2015; Stavins, 2001) to select the following potential time-variant and time-invariant determinants of quantity discounts.

Time-variant explanatory variables:

- Five dummy variables that identify the number of available seats on the flight at the time of the reservation. Respectively, they are equal to 1 when the number of available seats is between 5 and 9 (*AS5-9*), between 10 and 19 (*AS10-19*), between 20 and 39 (*AS20-39*), and greater or equal to40 ($AS \geq 40$). The reference case is the case in which the number of available seats is between 1 and 4 (*AS1-4*).
- *Advance* is the number of days in advance of departure the reservation is booked.
- *DepWeek* is a dummy variable equal to 1 if the departure date is on a weekday (i.e. Monday through Friday).

[6] We preferred to use a pooled ordinary least square model because of the time varying and routes characteristics of the dataset. In particular, we do not use a panel approach since each observation differs not only in terms of departure day and route, but also in terms of departure hour and advance booking.

- Four dummy variables that identify the hour of departure. Respectively, they are equal to 1 when the departure time is between 11 a.m. and 1.59 p.m. (*LunchTime*), between 2 p.m. and 5.59 p.m. (*Afternoon*), and between 6 p.m. and 9.59 p.m. (*Evening*). The reference case is the case in which the departure time is between 7 a.m. and 10.59 a.m. (*Morning*).

Time-invariant explanatory variables:

- *Distance* from AMS to the destination airport (in thousands of kilometres).
- The number of total passengers (*Passengers*) at the destination airport in 2014 (in millions).
- The GDP per capita (*GDPperCapita*) of the destination's surrounding area (NUTS 3 classification level), at 2014 market prices, measured in million Euros.
- The market share of easyJet on the route, defined as the number of flights operated by easyJet divided by the total number of weekly flights for a specific route in 2015 (*MarketShare*). Specifically, we compute this variable for each of the 21 routes considered, independently from the fact that the city of destination is the same for different airports (London case: LGW, LTN and STN).

3.4. Descriptive statistics

Table 1 reports summary statistics for the dependent and explanatory variables included in the model and described in Section 3.3. The average percentage discount $\overline{D_{it}}(5)$ as computed in Equation (5) varies from −52% on the 14th of March for the flight to Rome-Fiumicino departing on the 10th of April, to a maximum of 48% for reservations booked from the 20th of February to the 3rd of March for flights departing on the 10th and 17th of March for Hamburg. The percentage discount has an average value of 14%. The majority of flights are scheduled for departure during the morning (33%) or evening (39%), and fewer flights (28%) depart between 11 a.m. and 6 p.m. (lunchtime and afternoon). Airport sizes, in terms of total annual passengers, vary from more than 38 million (Rome-Fiumicino and London-Gatwick) to fewer than 3 million (smaller airports such as Southend and Belfast). The average number of total annual passengers at the 20 destination airports included in this study is approximately 17 million. On average, the length of a route is approximately 580 km. The longest distances, almost 2000 km, are for the Lisbon and Rome-Fiumicino routes, and the shortest distances are for flights towards Great Britain (all of the London airports) and Hamburg, Germany. The average market share for easyJet on the routes studied is 60.5%, ranging from 7.7% for the Lisbon route to 100% for the routes to Belfast, Liverpool, London-Luton, Milan-Malpensa, Southend, London-Stansted, and Berlin-Schoenefeld, where easyJet is the only airline that operates. Lastly, the average GDP per capita of the destination's surrounding area is approximately €35,000 per capita, with the highest being €56,000 for Switzerland.

Table 1
Summary statistics for the variables in the model.

Variable	Mean	Std. Dev.	Minimum	Maximum
Discount	0.144	0.092	−0.516	0.480
AS1-4	0.013	0.114	0	1
AS5-9	0.018	0.134	0	1
AS10-19	0.059	0.235	0	1
AS20-39	0.910	0.287	0	1
AS $\geq$ *40*	0.744	0.437	0	1
Advance (days)	23.257	12.970	1	45
DepWeek	0.753	0.431	0	1
Morning	0.326	0.469	0	1
LunchTime	0.090	0.286	0	1
Afternoon	0.199	0.399	0	1
Evening	0.386	0.487	0	1
Distance (thousands of km)	0.579	0.284	0.291	1.847
Passengers (millions annually)	17.407	12.771	1.100	38.507
Market share (%)	60.515	37.370	7.692	100
GDP per capita (thousands of €)	35.453	9.553	19.949	55.900

Sources: easyJet's website, website of each destination airport, Amsterdam-Schiphol airport's website, Eurostat, the Organisation for Economic Co-operation and Development (OECD) library.

4. Results

Table 2 reports the results of the pooled OLS regression. Quantity discounts are positively and significantly associated with the number of seats available at the time of booking, suggesting that the fewer seats available, the smaller is the discount offered by easyJet. For example, in the case when 5–9 seats are available at the time of booking, the 5-seat discount increases of 1.81% compared to the case of 1–4 seats available. This increase is equal to 8.73% if 20–39 seats are available at the time of booking. For more than 40 seats available, there is still an increase in the quantity discount, but it is only 3.67%. Interestingly, when passengers book their tickets earlier, they receive greater quantity discounts, all else being equal. In terms of magnitude, compared to the number of seats available,

Table 2
The determinants of quantity discount.

Variable	Quantity discount
AS5-9	0.0181***
	(0.0056)
AS10-19	0.0559***
	(0.0053)
AS20-39	0.0873***
	(0.0053)
AS $\geq$ *40*	0.0367***
	(0.0007)
Advance	0.0001***
	(0.0000)
DepWeek	0.0487***
	(0.0028)
LunchTime	−0.0177***
	(0.0009)
Afternoon	−0.0289***
	(0.0008)
Evening	−0.0340***
	(0.0006)
Distance	−0.0001***
	(0.0000)
Passengers	−0.0006***
	(0.0000)
Market share	−0.0120***
	(0.0008)
GDP per capita	1.1836***
	(0.0294)
Constant	0.0709***
	(0.0058)
Number of observations	75,315
R-squared	0.4628

Sources: easyJet's website, website of each destination airport, Amsterdam-Schiphol airport's website, Eurostat, the Organisation for Economic Co-operation and Development (OECD) library.
Notes: the regression estimated by use of the ordinary least squares (OLS) method. Robust standard errors are shown in parentheses. ***, **, and * indicate significance at the less than 1%, 5%, and 10% levels, respectively. Data is based on Internet fares for 1868 flights scheduled by easyJet and departing from the Amsterdam-Schiphol airport towards 20 European destinations between 8 March 2015 and 22 April 2015.

the number of days the reservation is booked in advance of the departure date plays a marginal role in determining the quantity discount.

The departure days of the week cause significant variation in the magnitude of the quantity discount. Specifically, flights departing on Monday through Friday have discounts of almost 5%. Similarly, compared to flights departing in the morning, those departing at lunchtime, in the afternoon or during the evening register lower discounts. Focusing on the set of time-invariant variables, the quantity discount is negatively correlated to the distance between AMS and the destination airport, with the effect ranging from −2% in the case of a 291 km route (Southend) to −12% for a 1847 km route (Lisbon). The negative relationship between quantity discount and distance may suggest that higher marginal costs for longer routes limit the possibility for easyJet to easily implement price discrimination (Malighetti et al., 2015). At the same time, the scope for pricing to stimulate new traffic is indeed more limited for long-haul routes than for short routes (Francis et al., 2007), since passengers flying long-haul routes have generally lower price elasticities. For short routes, the fixed component of the booking price (€17) represents a higher proportion of the total fare and thus increases the intensity of quantity discounts.

The size of the destination airport, in terms of the annual number of total passengers, seems not to play a crucial role, given the small magnitude of its coefficient. Even considering the largest number of passengers (38.5 million for Rome-Fiumicino) the quantity discount decreases by about 2%. The market share variable is highly significant, suggesting an average 0.12% decrease in quantity discounts for each 10 percentage-point increase in easyJet's market share for that route. Therefore, it seems that, consistent with the findings of Giaume and Guillou (2004) and Stavins (2001), the greater the competition and the consequent pressure on prices (Gudmundsson, 2002), the greater the attempt by airlines to price discriminate. This conclusion is also consistent with the findings of Borenstein (1989), who specifies how a greater market share on a route allows airlines to increase airfares, and of Malighetti et al. (2015) who highlight, specifically for the case of easyJet, how competition reduces average fares while increasing the intensity of dynamic pricing. Finally, GDP per capita of the destination's surrounding area is positively associated with the quantity discount. Basically, the quantity discount increases with the GDP per capita of the destination: A €10,000 increase in GDP per capita results in an increase of approximately 1 percentage point in the discount. This result may suggest that easyJet is more interested in discriminating passengers who travel to richer areas.

To conclude, results confirm our expectations about discount's changes in relation to demand shocks, since the variation of the 5-seat discount is aligned with the usual pricing strategy of LCCs already studied in literature. Specifically, the 5-seat discount decreases with bookings closer to departure date, when, all things being equal, demand shocks usually generate substantial increases in prices (Li et al., 2014). From a consumer's point of view, discounts seems to be addressed to price-sensitive passengers. First, they occur, to a greater extent, when the number of reserving seats is equal to 5, thus suggesting the presence of a sort of ‘family discount’; second, they are higher for reservations made with more advance and for shorter trips, which are two conditions under which passengers are usually more elastic.

5. Conclusions

Taking a consumer perspective, this study has analysed the two-part tariff adopted by easyJet, composed by a fixed fee of €17 per reservation and a variable component. By using an extensive dataset of fares offered for flights during 8 March 2015 to 22 April 2015, our analysis highlights that the minimum daily unit price is usually offered for 5-seat reservations (74% of the 76,195 daily reservations), thus showing an evident 5-seat quantity discount. We do not observe significant differences in this quantity discount for various numbers of seats available at the time of booking or for the number of days the reservation is booked in advance of the departure date. On average, the 5-seat discount is equal to €9.48, which is 14% of the single-seat fare.

Deepening the analysis by the use of multivariate analysis, we find significant variation in the value of the average percentage quantity discount associated with characteristics of flights and routes. In particular, the quantity discount is greater for reservations made more in advance, for flights on which a greater number of seats is available at the time of booking, and for flights departing during weekdays and in the morning. The quantity discount is lower for longer routes, routes with larger destination airports, routes for which easyJet's market share is higher, and routes with poorer destination areas.

Although dynamic pricing literature has highlighted that the implementation of intertemporal price discrimination may enable passengers to save money by booking their flights in advance, to the best of our knowledge, no study has pointed out that fares are, on average, lower for (small) groups of consumers, independently from the advance-booking factor. Of particular interest in our work is that, in providing evidence of quantity discounts, no ‘old theory’ has been dismantled: Prices still increase as the departure date approaches and vary according to the day of the week and the hour of departure. Thus, the usual attempt of third-degree price discrimination, generally carried out by segmenting the market into business passengers and leisure passengers, still takes place, independently from the quantity-discount effect. In fact, quantity discounts are rather steady, ranging from €8 to €10, even in correspondence to the usual last-day fare surges.

However, this paper does not come without limitations, which can be properly addressed in future research. First, our findings may be corroborated by considering other easyJet routes, rather than only those departing from AMS, and by analysing a longer time period. Second, determining whether other airlines are implementing this type of pricing strategy could be of interest. This could enable a better understanding of the competitive dynamics of the air transportation industry. Other directions for future research may include issues related to strategic consumers such as whether passengers' knowledge about the presence of quantity discounts could lead to different booking patterns (the “joining-together” effect) and thus a reduction in airlines' revenues.

References

Alderighi, M., Cento, A., Piga, C.A., 2011. A case study of pricing strategies in European airline markets: the London–Amsterdam route. J. Air Transp. Manag. 17, 369–373.
Alderighi, M., Nicolini, M., Piga, C.A., 2015. Combined effects of capacity and time on fares: insights from the yield management of a low-cost airline. Rev. Econ. Stat. 97, 900–915.
Alves, C.F., Barbot, C., 2009. Price discrimination strategies of low-cost carriers. J. Transp. Econ. Policy 43, 345–363.
Armstrong, M., Vickers, J., 2010. Competitive non-linear pricing and bundling. Rev. Econ. Stud 77, 30–60.
Bergantino, A.S., Capozza, C., 2015. One price for all? Price discrimination and market captivity: evidence from the Italian city-pair markets. Transp. Res. Part A Policy Pract. 75, 231–244.
Borenstein, S., 1989. Hubs and high fares: dominance and market power in the US airline industry. RAND J. Econ. 344–365.
Dana Jr., J.D., 1998. Advance-purchase discounts and price discrimination in competitive markets. J. Polit. Econ. 106, 395–422.
Escobari, D., 2012. Dynamic pricing, advance sales and aggregate demand learning in airlines. J. Ind. Econ. 60, 697–724.
Francis, G., Dennis, N., Ison, S., Humphreys, I., 2007. The transferability of the low-cost model to long-haul airline operations. Tour. Manag. 28, 391–398.
Giaume, S., Guillou, S., 2004. Price discrimination and concentration in European

airline markets. J. Air Transp. Manag. 10, 305–310.
Gudmundsson, S.V., 2002. Airline distress prediction using non-financial indicators. J. Air Transp. 7, 3–24.
Ho, T.-H., Zhang, J., 2008. Designing pricing contracts for boundedly rational customers: does the framing of the fixed fee matter? Manag. Sci. 54, 686–700.
Koenigsberg, O., Muller, E., Vilcassim, N., 2008. easyJet pricing strategy: should low-fare airlines offer last-minute deals? Quant. Mark. Econ. 6, 279–297.
Li, J., Granados, N., Netessine, S., 2014. Are consumers strategic? Structural estimation from the air-travel industry. Manag. Sci. 60, 2114–2137.
Lii, Y.-S., Sy, E., 2009. Internet differential pricing: effects on consumer price perception, emotions, and behavioral responses. Comput. Hum. Behav. 25, 770–777.
Malighetti, P., Paleari, S., Redondi, R., 2009. Pricing strategies of low-cost airlines: the Ryanair case study. J. Air Transp. Manag. 15, 195–203.
Malighetti, P., Paleari, S., Redondi, R., 2010. Has Ryanair's pricing strategy changed over time? An empirical analysis of its 2006–2007 flights. Tour. Manag. 31, 36–44.
Malighetti, P., Paleari, S., Redondi, R., 2015. EasyJet pricing strategy: determinants and developments. Transp. A Transp. Sci. 11, 686–701.
Morandi, V., Malighetti, P., Paleari, S., Redondi, R., 2015. Codesharing agreements by low-cost carriers: an explorative analysis. J. Air Transp. Manag. 42, 184–191.
Moreno-Izquierdo, L., Ramón-Rodríguez, A., Perles Ribes, J., 2015. The impact of the Internet on the pricing strategies of the European low cost airlines. Eur. J. Oper. Res. 246, 651–660.
Philips, L., 1983. The Economics of Price Discrimination. Cambridge University Press.
Piga, C., Bachis, E., 2007. Pricing strategies by European traditional and low cost airlines: when is it the best time to book on line?. In: Lee, D. (Ed.), Advances in Airline Economics. The Economics of Airline Institutions, Operations and Marketing, vol. 2. Elsevier, pp. 319–343.
Puller, S.L., Sengupta, A., Wiggins, S.N., 2008. Testing Theories of Scarcity Pricing and Price Dispersion in the Airline Industry (Working paper).
Salanti, A., Malighetti, P., Redondi, R., 2012. Low-cost pricing strategies in leisure markets. Tour. Manag. 33, 249–256.
Shapiro, C., Varian, H.R., Becker, W., 1999. Information rules: a strategic guide to the network economy. J. Econ. Educ. 30, 189–190.
Stavins, J., 2001. Price discrimination in the airline market: the effect of market concentration. Rev. Econ. Stat. 83, 200–202.