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# Determinants of Ticket Prices in Turkish Aviation Industry

## Türk Havacılık Sektöründe Bilet Fiyatlarının Belirleyicileri

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*Abstract: In this paper, we investigate the determinants of ticket prices in the Turkish aviation sector by mainly focusing on the role of competition using both cross-sectional and panel data approaches. Our results indicate that while the main determinant of the cross-sectional variation in average ticket prices is the distance of route; the degree of competition, flight frequency and plane capacity have statistically significant relationships with daily ticket prices alongside the distance. However, the set of determinants depend on the location of flight destination. For routes with a domestic destination, our results indicate that price levels are negatively affected from the degree of competition, exchange rate and crude oil price. On the other hand, ticket prices for routes with international destinations are negatively and significantly relate to flight frequency and plane capacity while the degree of competition does not exhibit a statistically significant relationship.*

*Keywords: Aviation Industry, Ticket Prices, Panel Data*

*Öz: Bu makalede Türkiye'nin havacılık sektöründeki bilet fiyatlarının belirleyicileri, özellikle rekabet derecesinin potansiyel rolü üzerinde durularak hem çapraz kesit hem de panel veri yöntemleri ile incelenmektedir. Tüm örneklemle yapılan analizin sonucunda bilet fiyatlarının uçuş mesafesi ile pozitif, rekabet derecesi, uçuş sıklığı ve uçak kapasitesi ile negatif ve istatitiki olarak anlamlı ilişkiye sahip olduğunu göstermektedir. Analiz sonuçları ayrıca bilet fiyatlarının belirleyicilerinin varış yerinin konumuna bağlı olduğunu göstermektedir. Varış yerinin yurt içinde yer aldığı uçuş rotalarında bilet fiyatlarının kur seviyesi, ham petrol fiyatı ve rekabet derecesi ile negatif ve anlamlı ilişkiye sahip olmasına karşın, varış yerinin yurt dışında yer aldığı uçuşların bilet fiyatlarının rekabet derecesi ile anlamlı bir ilişkiye sahip olmadığı ve bu bilet fiyatlarnın ana belirliyicelerinin uçuş sıklığı ve uçak kapasitesi olduğu gözlemlenmiştir.*

*Anahtar Sözcükler: Havacılık Sektörü, Bilet Fiyatları, Panel Veri*

## 1. Introduction

The degree of competition in the Tukish aviation industry has been steadiliy increasing due to the emergence of new domestic low cost carriers (such as Pegasus and Onur Air) and the increase in the number of international airlines that fly to various foreign destinations from Turkish airports as a result of expansion of Turkey's international linkages for various reasons during recent recent years. Furthermore, Turkey - and especially Istanbul - has been getting increasingly integrated to the international aviation system in general. According to Mastercard's 2015 Global Destination Cities Index, Istanbul has attracted 12.56 million overnight visitors in 2015 and has been ranked the fifth city with respect to this critertion, and ranked tenth with respect to the expenditure by overnight visitors with $9.37 billion. As a result, the aviation sector has become an even more integral part of the Turkish economy as the sector expanded and experienced a higher degree of domestic and international competition as a result of this expansion that has taken place during the recent years. However, the effect of the increase in the degree of competition in the Turkish aviation sector has not yet been quantitatively explored. In order to adress this gap, in this paper we explore the effect of competition - together with other key variables such as flight distance, regularity and plane capacity…etc. - on the ticket price heterogeneity of domestic airlines using both cross-sectional and panel data approaches.

The rest of the paper is organized as follows: Section 2 provides a literature summary on about recent developments in the Turkish aviation sector and the price heterogeneity literature. Section 3 describes the data and our empirical methodology. Section 4 displays the results of our empirical analysis and Section 5 concludes.

## 2. Related Literature

The literature related to ticket prices in the aviation industry focuses on various aspects of prices: such as the level of daily prices, average ticket prices in a given time period, standard deviation of the prices of tickets sold in a specific time interval and the Gini coefficient calculated by using the distribution of passengers flying in a specific route over the price they paid for their tickets. The most notable paper in this literature by Borenstein and Rose (1995) finds that the extent of price dispersion, which they define as the Gini coefficient of ticket prices, in a specific route in the US aviation industry depends on the market structure, i.e. the degree of competition, in this route. The authors find that high competition is associated with a higher degree of price dispersion, while a high total frequency of flights on a route is related to a low extent of price dispersion. For the US aviation industry Gailey (2009) also finds that market concentration, which is inversely related to the degree of competition, is negatively associated with price dispersion and a lower degree of price dispersion is observed on routes with a high number of passengers. Another study by Stavins (2001) finds a negative relationship between the extent of ticket price discrimination and the degree of airline market concentration. Siegert and Ublricht (2014) finds that average ticket price on a route increases as time approaches the flight date and this effect is stronger on flight routes where the market structure is monopolistic compared to other routes that have oligopolistic or even more competitive market structures. Bilotkach (2005), using ticket price data for the London-New York route, finds that prices of tickets targeted at customers flying due to business purposes shows heterogeneity across airlines whereas tickets targeted to customers travelling with leisure purposes does not exhibit this heterogeneity across airline companies.

For the case of Turkey, Acar and Karabulak (2015) provide a detailed description of the recent developments in the aviation industry. According to this, the degree of competition in Turkish aviation sector has increased substantially by the entrance of low cost carriers, namely Pegasus and Onur Air. These new entrants, through providing relatively lower service quality, adopting a high seat density strategy and using secondary airports (such as Sabiha Gokcen), achieved low costs and hence have been able to put a downward pressure on ticket prices.

## 3. Data and Methodology

Our dataset involves price information for 32 flights that depart either from Istanbul Ataturk Airport or from Sabiha Gokcen Airport and land in various domestic and foreign destinations[1] and are provided by more than one domestic airline. The main dependent variable in our analysis is the price of a flight that will take place on 5 April 2016 [2]. Starting from 7 March 2016, we keep track of the price of each flight daily until 4 April 2016 – hence for each flight we have 29 daily price observations. Price information is retrieved from each airline's official website. We have price data for three domestic airline companies, namely Turkish Airlines, Pegasus and Onur Air. The reason for the choice of these three airlines is that they possess about 95% of the market share in domestic destinations and about 85% market share in international destinations. Turkish Airlines operates in both airports, while Pegasus organizes flights only from Sabiha Gokcen Airport and Onur Air organizes flights only form Istanbul Ataturk Airport.

Our main explanatory variable is competition. We treat competition as a binary variable that takes the value 1 if there is a third airline operating that provides the same flight aside from those included in our dataset and 0 otherwise [3]. This variable is constructed by using the flight information provided in the official websites of the two airports. Next, we use the distance between the departure and destination airports measured in kilometers as an explanatory variable. We also explore the supply effects on price dispersion by using the flight frequency and passenger capacity as independent variables. Frequency corresponds to the number of times a flight is conducted each week. Data for frequency and seat supply is also retrieved from the official websites of related airline companies.

In addition to company specific explanatory variables we also explore the effect of two macroeconomic variables, namely exchange rate and crude oil price, on the flight price heterogeneity as well. Daily exchange rate data is retrieved from the CBRT's website, while the crude oil price corresponds to daily average of WTI and Brent variants.

Since not each flight is provided by every airline company and at each departure airport, and as we do not have exchange rate and crude oil price information for weekends, we have an unbalanced panel dataset with

[1] The alphabetical list of destinations is as follows: Adana, Amsterdam, Ankara, Antalya, Bahrain, Barcelona, Berlin, Bodrum, Diyarbakir, Dubai, Dusseldorf, Elazig, Erbil, Ercan, Frankfurt, Gaziantep, Gatwick, Izmir, Kayseri, Milano, Munich, Odessa, Paris, Rome, Samsun, Stuttgart, Tahran, Tel Aviv, Tiflis, Trabzon, Urfa and Vienna.

[2] As a robustness check, we also record the price information for the same set of flights on 5 May 2016 and repeat our analysis with this dependent variable as well.

[3] As an example, for the flight between Istanbul Ataturk Airport and Amsterdam the competition variable takes the value of 1 since aside from THY and Onur Air, there are other airline companies that organize the same flight as well. However, for the Amsterdam flight from Sabiha Gokcen Airport this variable takes the value of 0 since it is only provided by Turkish Airlines and Pegasus.

2368 observations for 5 April 2016 flights (and 2377 observations for 5 May 2016[4] flights). Table 1 provides the descriptive statistics of our dataset.

During our empirical analysis, we will focus on the interaction of i) average ticket prices during a month and ii) daily ticket prices with the flight distance, competition, flight frequency, plane capacity, exchange rate, crude oil price and days left until flight. As a result, by focusing on monthly average prices we will first conduct a cross-sectional analysis by estimating the variants of the following regression model using OLS:

$$Avg.Price_{i,j,k} = \alpha_1 + \alpha_2 Distance_{j,k} + \alpha_3 Competition_{j,k} + \alpha_3 Frequency_{i,j,k} + \alpha_4 Capacity_{i,j,k} + \epsilon_{i,j,k}$$

Where the dependent variable $Avg.Price_{i,j,k}$ corresponds to the monthly average price of the ticket for the flight from $j$'th departure to $k$'th destination that is organized by the $i$'th airline company. $Frequency_{i,j,k}$ and $Capacity_{i,j,k}$ are airline company specific variables, while $Distance_{j,k}$ and $Competition_{j,k}$ are only route specific variables. The cross-sectional regression equation does not involve macroeconomic variables such as exchange rate and crude oil price as the model does not have any time dimension.

Secondly, we conduct a panel data analysis by estimating the variants of a regression model via the fixed-effects linear panel estimation with an AR(1) disturbance. For the panel data analysis the Hausman test points us in favor of a fixed-effect regression and the Wooldridge test rejects absence of autocorrelation. Therefore, a fixed-effect model with AR(1) disturbances has been estimated using stationary data obtained after getting first differences for variables with an integration of order 1. Moreover, in order to check for possible endogeneity of our regressors we ran an instrumental variable estimation using one-period lagged values of the regressors as instruments. However, Hausman test rejects the presence of significant differences in the estimates.[5]

$$\begin{aligned} Avg.Price_{i,j,k,t} = \beta_1 + \beta_2 Distance_{j,k} + \beta_3 Competition_{j,k} + \beta_3 Frequency_{i,j,k} + \beta_4 Capacity_{i,j,k} \\ + \beta_6 Fx.Rate_t + \beta_7 Oil\ Price_t + \theta_i + \lambda_j + \mu_k + \epsilon_{i,j,k,t} \end{aligned}$$

Here $Avg.Price_{i,j,k,t}$ stands for the price of the ticket for the flight from $j$'th departure to $k$'th destination that is organized on 5 April 2016 by the $i$'th airline company at time $t$. Moreover, $\theta_i, \lambda_j, \mu_k$, represent company, origin and destination fixed-effects, respectively. Now the regression model involves time specific variables, namely $Fx.Rate_t$ and $Oil\ Price_t$. In panel data estimation, variables that contain a unit root have been first-differenced when used in estimation.

Table 1. Descriptive Statistics

| Variable | Average | Std. Deviation | Minimum | Maximum |
|---|---|---|---|---|
| Ticket Price – 5 April 2016 Flight – All Routes | 533.714 | 374.624 | 128.64 | 2005 |
| Ticket Price – 5 April 2016 Flight – International Routes | 743.821 | 317.082 | 168.64 | 2005 |
| Ticket Price – 5 April 2016 Flight – Domestic Routes | 170.623 | 30.941 | 128.54 | 398 |
| Ticket Price – 5 May 2016 Flight – All Routes | 497.138 | 318.83 | 105 | 1544 |
| Ticket Price – 5 May 2016 Flight – International Routes | 678.301 | 263.895 | 105 | 1544 |
| Ticket Price – 5 May 2016 Flight – Domestic Routes | 182.761 | 37.178 | 128.64 | 293 |
| Distance | 1382.244 | 728.959 | 323 | 2970 |
| Competition | 0.463 | 0.498 | 1 | 0 |
| Frequency | 26.280 | 30.984 | 2 | 175 |
| Capacity | 381.170 | 83.414 | 264 | 720 |
| Exchange Rate | 2.866 | 0.028 | 2.812 | 2.916 |
| Crude Oil Price | 38.399 | 1.407 | 35.7 | 41.45 |

[4] The research on the data collection process has been conducted by a research team consisting of senior economics major students at Bogazici University as a requirement for an elective course on research methodology in economics taught by Ceyhun Elgin in Spring 2016. The authors thank Furkan Narinoğlu, Bugrahan Cilsal, Mustafa Duman and Mehmet Misoglu in this regard.

[5] Results of these tests are available upon request from the corresponding author.

# 4. Empirical Results

We report our results under two sub-sections. First, we display and discuss the results of our cross-sectional analysis and then we proceed by focusing on the results of our panel data analysis.

## *4.1. Results from the Cross-Sectional Analysis*

Cross-sectional regression results with whole sample where the dependent variable is the monthly average price of a flight on 6 April 2016 are presented in Table 2. As a robustness check, we repeat the same exercise with adopting the monthly average price of a flight taking place on 5 May 2016 and display those results in Table A1.

According to Tables 2 and A1, the main determinant of average price turns out to be the flight distance. Specifically, the regression coefficient of distance is positive and statistically significant at 99% confidence level, and the significance of the distance variable does not depend on model choice. By itself only, distance seems to explain more than 50% of the sample variance in average ticket price. When we look at the effect of the degree of competition on the average price of a ticket, we find that the results depend on model choice. While model II shows that, there is a negative and significant relationship between the average ticket price and the degree of competition on the route associated with the ticket, the introduction of other explanatory variables result in the disappearance of the significance of this relationship. We observe the same pattern for flight frequency as well, by itself only frequency is negatively and significantly related to the average price of a ticket in model IV and seems to explain around 20% of the variance in average ticket price in our sample; however, the introduction of other explanatory variables makes this relationship statistically significant. Finally, plane capacity is negatively and insignificantly related to average price in models IV and V. Coefficient levels and signs, significance levels and $R^2$ terms do not change across Table 2 and table 3 substantially, which confirms that our results are robust to changing the date of the flight we select as our dependent variable in our empirical analysis.

Table 2. Cross-Sectional Regressions where the Dependent Variable is the Average Ticket Price of a Flight Taking Place on 6 April 2016

| | Model | | | | |
|---|---|---|---|---|---|
| Variable | I | II | III | IV | V |
| Distance | 0.357***<br>(0.033) | | | | 0.320***<br>(0.044) |
| Competition | | -230.652***<br>(76.796) | | | -43.712<br>(58.043) |
| Frequency | | | -5.411***<br>(1.255) | | -1.179<br>(0.963) |
| Capacity | | | | -0.648<br>(0.391) | -0.264<br>(0.191) |
| $R^2$ | 0.511 | 0.099 | 0.212 | 0.022 | 0.532 |
| # Obs. | 82 | 82 | 82 | 82 | 82 |

All regression models include a constant term that is not reported. ***, ** and * correspond to significance at 99%, 95% and 90% confidence levels. Standard errors of coefficients are shown in parantheses.

Table 3. Cross-Sectional Regressions where the Dependent Variable is the Average Ticket Price of a Flight Taking Place on 6 April 2016 – International Routes Only

| | Model | | | | |
|---|---|---|---|---|---|
| Variable | I | II | III | IV | V |
| Distance | 0.105<br>(0.084) | | | | 0.112<br>(0.079) |
| Competition | | -20.856<br>(76.029) | | | -9.712<br>(68.182) |
| Frequency | | | -5.149***<br>(1.871) | | -4.167**<br>(1.761) |
| Capacity | | | | -0.702*<br>(0.351) | -0.543**<br>(0.258) |
| $R^2$ | 0.040 | 0.001 | 0.062 | 0.034 | 0.119 |
| # Obs. | 50 | 50 | 50 | 50 | 50 |

All regression models include a constant term that is not reported. ***, ** and * correspond to significance at 99%, 95% and 90% confidence levels. Standard errors of coefficients are shown in parantheses.

According to the sample summary statistics displayed in Table 1, the distribution of observed ticket prices considerably differ across domestic and international routes. Especially the distribution of prices for international routes seems to exhibit a substantially longer right tail (as the maximum observed price is 2005) compared to domestic routes (for which maximum observed ticket price is 398 for the 5 April 2016 flight). Because of this, we divide our sample into two subsamples named “international routes” and “domestic routes” with respect to the location of the destination and repeat the cross-sectional analysis what we have conducted so far with the whole sample now with those two individual subsamples.

Cross-sectional regression results with the international route subsample are shown in Table 3. According to this table, the determinants of ticket prices for international routes are different from those of the whole sample. Specifically, we observe that again the regression coefficients of distance and the degree of competition again have negative signs, neither of the two coefficients display statistical significance. On the other hand, flight frequency and plane capacity have negative coefficients and now the significance of those coefficients do not seem to be dependent on the model choice. Results from models III, IV and V show that frequency and capacity are negatively and significantly associated with average ticket prices in both univariate and multivariate regression models. Hence, these cross sectional results indicate that average ticket prices are primarily associated with seat supply, while distance and the degree of competition do not seem to have statistically significant relationships with average ticket price in the international route subsample.

Table 4 displays the results of the cross-sectional regressions conducted with the domestic route subsample. Here, results seem to be in conformity with those shown in Table 1, i.e. in univariate regression models we observe that distance is positively and significantly related to average ticket price, while the degree of competition, flight frequency and plane capacity have negative and significant (in varying degrees of confidence) regression coefficients. In the multivariate regression model, we observe that the only variable that exhibits a statistically significant relationship with average ticket price is distance. Therefore, in contrast to the sample of international routes where the main determinants turns to be the seat supply, in the sample of domestic routes the main determinant of average ticket price seems to be the route distance – which is one of the primary components of the cost of a flight for an airline company.

Table 4. Cross-Sectional Regressions where the Dependent Variable is the Average Ticket Price of a Flight Taking Place on 6 April 2016 – Domestic Routes Only

| | Model | | | | |
|---|---|---|---|---|---|
| Variable | I | II | III | IV | V |
| Distance | 0.087***<br>(0.012) | | | | 0.090***<br>(0.017) |
| Competition | | -28.435***<br>(6.644) | | | -7.513<br>(8.972) |
| Frequency | | | -0.223*<br>(0.089) | | 0.124<br>(0.075) |
| Capacity | | | | -0.060*<br>(0.034) | -0.001<br>(0.024) |
| $R^2$ | 0.602 | 0262 | 0.212 | 0.050 | 0.631 |
| # Obs. | 32 | 32 | 32 | 32 | 32 |

All regression models include a constant term that is not reported. ***, ** and * correspond to significance at 99%, 95% and 90% confidence levels. Standard errors of coefficients are shown in parantheses.

### *4.2. Results from the Panel Data Analysis*

Panel regression results where the dependent variable is the daily price of a flight taking place on 6 April 2016 recorded during March 2016 are displayed in Table 5. Table A2 displays the results from the same exercise where now the dependent variable is the daily price of a flight scheduled to take place on 5 May 2016.

Table 5. Panel Regressions where the Dependent Variable is the Average Ticket Price of a Flight Taking Place on 6 April 2016

| | Model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Variable | I | II | III | IV | V | VI | VII | VIII |
| Time | 0.977<br>(0.836) | | | | | | | 0.040*<br>(0.029) |
| Distance | | 0.249***<br>(0.009) | | | | | | 0.292***<br>(0.010) |
| Competition | | | -187.234***<br>(12.092) | | | | | -29.179**<br>(15.513) |
| Frequency | | | | -4.320***<br>(0.981) | | | | -1.001***<br>(0.313) |
| Capacity | | | | | -0.403***<br>(0.073) | | | -0.225***<br>(0.066) |
| Exchange Rate | | | | | | -201.815<br>(318.048) | | -481.530<br>(408.410) |
| Crude Oil Price | | | | | | | -4.855<br>(6.238) | -4.433<br>(4.533) |
| $R^2$ | 0.09 | 0.576 | 0.111 | 0.257 | 0.044 | 0.012 | 0.020 | 0.490 |
| # Obs. | 2368 | 2368 | 2368 | 2368 | 2368 | 1714 | 1632 | 1632 |

All regression models include a constant term as well as fixed effects (whenever significant) that are not reported. ***, ** and * correspond to significance at 99%, 95% and 90% confidence levels. Standard errors of coefficients are shown in parantheses.

Interestingly, according to both Table 5 and Table A2 time [6], exchange rate and crude oil price are not statistically significantly related to the daily price of a flight ticket. In addition, we now observe that the variables for which statistical significance depended on model choice are always significantly related to daily price. Similar to our observation in the case of cross-sectional regressions, distance also seems to be the main determinant of the daily ticket price. Distance has a positive coefficient that is statistically significant at 99% confidence level and distance seems to explain around 49% of the variance in daily ticket prices. For competition, our coefficient estimates seem to be very close to their cross-section counterparts – however now competition seems to be always negatively and significantly related to the daily ticket price regardless of the regression specification (although the magnitude of competition's coefficient falls by 83% when we move from model III to model VIII). The same results also apply to flight frequency and plane capacity as well – they are

[6] The insignificant regression coefficient for time constrasts with the findings of Siegert and Ublricht (2014) which apply to Europe in general. Furthermore, when we introduce the interaction of time and the degree of competition to our regressions we do not obtain a significant coefficient for this interaction variable. The results are not reported in the article but available upon request.

negatively and significantly related to daily ticket price at 99% confidence level regardless of the regression model, while their coefficients magnitudes significantly decline when we move towards model VIII.

Our panel regression findings for whole sample are in conformity with the results established in this literature. Distance – through its direct effect on flight costs – seems to be associated with higher ticket prices. Competition, i.e. the existence of a multitude of firms that operate on the same route, seems to be negatively associated with ticket prices. The negative and significant coefficient signs for flight frequency and plane capacity imply that there are supply side effects on ticket prices as well – more frequent flights and higher plane capacities increase the supply of seats on a route and produce negative associations with ticket prices.

Due to the fact that ticket prices seem to exhibit considerably different distributions over price levels, similar to the methodology that we adopt during our cross-sectional analysis, we again divide our sample into two with respect to whether the flight takes place on an international route or not and repeat the panel regressions with each subsample.

Table 6. Panel Regressions where the Dependent Variable is the Average Ticket Price of a Flight Taking Place on 6 April 2016 – International Routes Only

| | Model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Variable | I | II | III | IV | V | VI | VII | VIII |
| Time | 2.341**<br>(0.993) | | | | | | | 0.473<br>(2.381) |
| Distance | | 0.164***<br>(0.016) | | | | | | 0.159***<br>(0.018) |
| Competition | | | 14.232<br>(15.304) | | | | | 16.580<br>(16.644) |
| Frequency | | | | -5.904***<br>(0.463) | | | | -5.228***<br>(0.502) |
| Capacity | | | | | -0.703***<br>(0.079) | | | -0.517***<br>(0.075) |
| Exchange Rate | | | | | | -757.041**<br>(333.968) | | -628.033<br>(692.604) |
| Crude Oil Price | | | | | | | -5.826<br>(7.104) | -5.838<br>(6542) |
| $R^2$ | 0.12 | 0.148 | 0.09 | 0.10 | 0.096 | 0.15 | 0.201 | 0.667 |
| # Obs. | 1500 | 1500 | 1500 | 1500 | 1500 | 1086 | 1034 | 1034 |

All regression models include a constant term as well as fixed effects (whenever significant) that are not reported. ***, ** and * correspond to significance at 99%, 95% and 90% confidence levels. Standard errors of coefficients are shown in parantheses.

Table 6 displays the results of the panel regressions with the international routes subsample. In contrast to the panel regressions with whole sample, time now seems to have a statistically significant coefficient in the univariate regression. Furthermore, now distance seems to be positively and significantly related to daily ticket prices – which slightly contrasts our findings from cross-sectional regressions with international routes subsample. Similar to our findings with whole sample, we observe negative and statistically significant coefficients for frequency and capacity in the case of international routes subsample. In contrast to the panel regression results with whole sample, the degree of competition does not seem to be significantly associated with daily price levels in international routes subsample (recall that this was also the case in cross-sectional regressions with international routes subsample as well.) The results of the multivariate model verify the conclusions from the cross-sectional multivariate model - which indicates that seat supply is a major determinant of ticket prices for international routes. Aside from the supply of seats, now distance is also a main determinant of ticket prices as well.

Panel regressions with domestic routes subsample are displayed in Table 7. Here we initially observe that time-dependent explanatory variables, namely exchange rate and crude oil price, are now negatively and significantly related to daily ticket prices in the domestic routes subsample. Similar to the pane regression results from the international routes subsample and cross-sectional results from the domestic routes subsample, distance is positively and significantly related to daily ticket prices. The sign of the coefficient of the flight frequency seems to be depending on the model choice. Most importantly, in conformity with the cross-sectional regression results, the degree of competition and daily ticket prices has a negative and statistically significant relationship.

Therefore, this finding helps us to support our cross-sectional result related to the degree of competition: the effect of competition on ticket prices in the Turkish aviation sector seems to depend on whether the route is a domestic route or not. The degree of competition is negatively and significantly related to ticket prices over domestic routes, while it does not have a statistically significant relationship with ticket prices in the case of international routes.

Table 7. Panel Regressions where the Dependent Variable is the Average Ticket Price of a Flight Taking Place on 6 April 2016 – Domestic Routes Only

| | Model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Variable | I | II | III | IV | V | VI | VII | VIII |
| Time | 0.233<br>(0.144) | | | | | | | 0.059<br>(0.113) |
| Distance | | 0.096***<br>(0.004) | | | | | | 0.323***<br>(0.009) |
| Competition | | | -22.421***<br>(3.922) | | | | | -10.302***<br>(1.342) |
| Frequency | | | | -0.087***<br>(0.021) | | | | 0.149***<br>(0.043) |
| Capacity | | | | | -0.059***<br>(0.008) | | | 0.014*<br>(0.008) |
| Exchange Rate | | | | | | -102.608***<br>(54.921) | | -107.130*<br>(65.479) |
| Crude Oil Price | | | | | | | -3.082***<br>(1.122) | -3.037***<br>(0.873) |
| $R^2$ | 0.14 | 0.788 | 0.39 | 0.111 | 0.12 | 0.009 | 0.019 | 0.493 |
| # Obs. | 868 | 868 | 868 | 868 | 868 | 628 | 598 | 598 |

All regression models include a constant term as well as fixed effects (whenever significant) that are not reported. ***, ** and * correspond to significance at 99%, 95% and 90% confidence levels. Standard errors of coefficients are shown in parantheses.

## 5. Conclusion

Turkish aviation sector has developed to a great extent in the last 20 years. However, the literature lacks empirical or even descriptive studies of the sector. To fill in the gap in the empirical literature on the Turkish aviation sector, in this paper, we studied the determinants of ticket prices in Turkish aviation industry using a self-collected and original dataset. Specifically, we made a special emphasis on effect of competition, along with other main explanatory variables, on average and daily flight ticket prices in Turkey.

Our empirical results first suggest that the determinants of ticket prices seem to differ with respect to the location of the destination. In cases where the route has a domestic destination, we observe that competition, exchange rate and crude oil price have negative and statistically significant relationships with ticket prices, while flight distance seems to exhibit a positive and significant relationship. However, for the ticket prices of routes with an international destination our results indicate that instead of the degree of competition and time-varying macroeconomic variables, ticket prices have negative and significant relationships with variables that are related to seat supply – such as flight frequency and plane capacity (the significance of distance depends on the analysis perspective, i.e. cross-sectional vs. panel). Hence, our findings generally imply that the extent of the effect of the degree of competition on ticket prices depends on the location of destination airport, i.e. the degree of competition is negatively and significantly related to ticket prices only in the case of domestic flights.

An immediate next step of our analysis might extend to a theoretical modeling of the sector, especially the effect of the degree of competition on ticket prices. A full-fledged industrial organization model with a closer look at the sector can be built to further understand the economic mechanism behind this observation in the sector. This we leave to future research.

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## APPENDIX

Table A1. Cross-Sectional Regressions where the Dependent Variable is the Average Ticket Price of a Flight Taking Place on 5 May 2016

| | Model | | | | |
|---|---|---|---|---|---|
| Variable | I | II | III | IV | V |
| Distance | 0.312***<br>(0.041) | | | | 0.263***<br>(0.056) |
| Competition | | -206.931***<br>(78.804) | | | -32.240<br>(58.938) |
| Frequency | | | -4.880***<br>(1.233) | | -1.605<br>(1.605) |
| Capacity | | | | -0.389<br>(0.346) | -0.033<br>(0.165) |
| $R^2$ | 0.507 | 0.107 | 0.278 | 0.014 | 0.537 |
| # Obs. | 59 | 59 | 59 | 59 | 59 |

All regression models include a constant term that is not reported. ***, ** and * correspond to significance at 99%, 95% and 90% confidence levels. Standard errors of coefficients are shown in parantheses.

Table A2. Panel Regressions where the Dependent Variable is the Average Ticket Price of a Flight Taking Place on 6 April 2016

| | Model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Variable | I | II | III | IV | V | VI | VII | VIII |
| Time | -1.409<br>(1.055) | | | | | | | -0.525<br>(1.450) |
| | | | | | | | | |
| Distance | | 0.305***<br>(0.006) | | | | | | 0.375***<br>(0.019) |
| Competition | | | -193.015***<br>(12.437) | | | | | -36.045***<br>(21.312) |
| Frequency | | | | -4.665***<br>(0.204) | | | | -1.099***<br>(0.335) |
| Capacity | | | | | -0.567***<br>(0.059) | | | -0.222***<br>(0.042) |
| Exchange Rate | | | | | | 44.923<br>(59.536) | | 112.956<br>(430.493) |
| Crude Oil Price | | | | | | | -1.001<br>(0.752) | -1.801<br>(3.930) |
| $R^2$ | 0.0103 | 0.686 | 0.151 | 0.295 | 0.132 | 0.091 | 0.084 | 0.723 |
| # Obs. | 2377 | 2377 | 2377 | 2377 | 2377 | 1721 | 1639 | 1639 |

All regression models include a constant term that is not reported. ***, ** and * correspond to significance at 99%, 95% and 90% confidence levels. Standard errors of coefficients are shown in parantheses.