Panel Data Analysis Of Turkey's Air Export Demand Function

Etimad Rahimli, Ilkin Mammadov, Javid Suleymanli, Tural Valiyev

Abstract: Istanbul Airport, opened in the recent period, has brought a lot of questions in line with creating economic contribution to Turkey. As a result of numerous literature reviews, developments in air transport might be thought to have a positive impact on the economy of the country by accelerating exports. This issue has been the main source of motivation for the determination of export demand by air. In order to determine the model of export demand by air 20 countries, to which Turkey mainly exports, were identified and data regarding to these exports between the years 2000-2017 is collected. As the explanatory variables for panel data modeling, the Real Gross Domestic Product, The Relative Price Index and The Population of these 20 countries were included in the model. In order to determine the consistent model, firstly the correlation between the units was tested and it was concluded that the model structure was homogeneous. In the following stages, Fixed Effects Model and Random Effects Models were developed for homogeneous panel structure and the most relevant model was determined. After testing the assumptions of the appropriate model, necessary corrective actions were taken and the model was interpreted economically. As a result, while the independent variables are fixed, it is determined that the increase in real GDP of the country exported by air will increase the amount of exports by air, the increase in the population of the exporting country will increase the amount of exports by air, and the relative prices of the exporting country will decrease the amount of exports by air.

Index Terms: Turkey, air, transport, air transport, export demand function, panel data analysis.

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1. INTRODUCTION

THE production of modern goods can be characterized by cross-border investment and the division of labor. Air transport is an indispensable logistics tool in modern production. Due to efficient, effective and reliable transportation services, the manufacturing sector will be able to prevent inventory risk and quickly enter target markets. Transportation distance and cost are important for international trade, but which one is more important is unclear. The impact of transport policies such as the Open Sky on trade costs is another area of interest. The aviation industry has been developing rapidly over the past 50 years. It has become one of the important sectors in the world in the 21st century. Along with the World becoming a common market, the development of transportation networks and increasing the number of airports and the number of flights, millions of people travel by air. According to the estimations made by the International Air Transport Association, the number of passengers will reach 7 million at the beginning of the 2030s and the sector will grow with the increase of passengers [1]. Along with the development of international trade, it is known that the most used form of transportation in business and tourism trips is the airline [2]. In addition, developing airline companies are an important sector that affects the structure of countries, contributes economically to the development of societies and creates employment [3]. In Turkey, because of the number of people travelling by airline, transport companies, airports and their strategic position, the sector is very important in terms of the development, promotion of the country, and employment. If it's population is also taken into consideration, Turkey can be an important market for air transportation enterprises.

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Although the concept of Air Cargo Transportation started shortly after the beginning of civil air transportation, it has entered into a trend of development with the process of differentiation of passenger transportation and strategies, which developed in line with the low-cost transportation strategy. This trend of development includes passenger airlines carrying cargo alongside luggage, combination airlines operating with cargo planes alongside passenger planes, air cargo companies that only carry the cargo from the airport to the airport, and companies such as FedEx, DHL, UPS and TNT which also operates the integrator (carrier-to-door) delivery strategy. With the understanding of globalization in the trade since the beginning of 2000s, international air cargo transportation has shown a great upward trend under the concept of supply chain and continues to do so. Since the beginning of 2000s, cargo transportation in the world has increased by 4.5% -5.0% per year [4,5]. Especially since the early 2000s, air cargo transportation has been a vital part of the logistics of many companies to carry cargo worldwide. Consequently, air cargo demand has shown steady growth and this trend still continues despite the economic crisis in the early 2010s. When the reported data of Airbus and Boeing for 2014 are analyzed in 2015 and the sample is taken for the last 20 years rather than the beginning of 2000s, an annual increase of 4.4%-4.7% is observed [4,5]. Air cargo transportation with the potential to continue its progress in the coming years with the strategy of liberalization (understanding of freedom in the economy) developed with the understanding of globalization and the supply-demand balance continues to develop on the basis of the implementation of the open skies agreement on increased long-haul flights and the liberalization of airspace use on international flights [6,7,8]. Airlines are the main providers of air cargo transportation and implement the from the airport to the airport transportation strategy. The main providers of air cargo transportation are cargo forwarders, air freight companies, customs brokers, cargo terminals and ground handling companies. In the air cargo transportation system, the first process is to go through the customs process, and in the following processes, the packing, packaging and loading of the cargo are applied. Most airlines carry out both passenger and cargo transportation together. However, the

process of air cargo operations after the cargo is unloaded from the aircraft ensures that it is sent to the buyers by outsourcing under the name of air cargo carriers, air freight forwarders. As a result, the air cargo transportation process, which includes a large number of providers and procedures, is based on the ability to make decisions using different strategies at the international level, which are in high demand. The decision of which airlines can use their air cargo strategies more effectively in order to increase their loading capacity and financial income is of great importance in order to carry out the operations in the most accurate way. Contrary to the fixed and known capacity of the passenger seats, the concept of utilizing cargo space in terms of allocation and demand is more uncertain [9]. It will be possible for airline companies to hold in this market and increase their market share by improving the quality of cargo service with a competitive understanding and keeping customer satisfaction at the highest level. The fact that satisfying foreign trade companies by cargo services can play an important role fort he airlines. This article tries to provide empirical evidence to answer these questions.

2 LITERATURE REVIEW

Sarılgan (2007) [10], in his work revealed in Turkey what should be done to improve regional air transportation by using semi-structured interviews with industry executives. In his study, Yamaguchi (2008) [11] obtained the US export data for 21 trade partners for air transportation between 1998-2002, first showing that the airline is more important than the distance to export, and its export flexibility is f0.571. Secondly, he stated that unit cost level and market intensity have a significant positive effect on the flight ticket. Thirdly, air cargo markets with Open Sky Agreements have higher market density, although the unit cost is lower, and these agreements have been found to have a negative dynamic effect on the combined index of unit cost and market concentration. Ateş ve Isık (2010) [12] in their study, examined whether developments in services provided in the logistics industry have an effect on Turkey's exports. They formed the basis of the established econometric model from the relations between Logistics - export - economic growth. Findings obtained from developed econometric model were interpreted. No relationship has been found between the logistics sector and exports in the short term, but Granger causality relationship has been found in the long term from logistics to export. In addition, a one-way causality relationship has been found from the revenues of the logistics sector to the industrial production index and a two-way causality between the revenues of the logistics sector and the gross national product. As a result, the Granger causality relationship has been established in the long run between the logistics industry and exports. Bayraktutan and Özbilgin (2012) [13] investigated the importance of air freight transport in the logistics industry. Evaluating the current situation and potential in Turkey with the data in the study, the position of the airline industry in Turkey were compared with the leading countries in the field of logistics. As a result, for nationwide dissemination of the freight airline in Turkey and safe landing and takeoff of large-bodied aircraft, they stated that the airports should be expanded and sufficient infrastructure should be provided in terms of freight traffic. In his study, Erkan (2014) [14] stated that the importance of logistics services and strategies increased in terms of competitiveness in the global trade arena, where production costs converge and price competition

does not make sense alone. Countries moving from transportation to logistics management nowadays have a higher share in international markets. It is concluded that with the adaptations to be made on logistics activities and comprehensive logistics strategies, it is possible to get a clearer understanding of this field by the countries. In a study by Tunç and Kaya (2016) [15], a strategic sector in Turkey, the logistics industry and its interaction with foreign trade, which is the most important factor for its development, were examined. The reasons that influence the development of the logistics industry in Turkey were discussed and developments of these reasons in Turkey were studied analytically. Emphasis was placed on the increase in the number of shopping malls and the increase in e-commerce volume, which are effective in the context of the development of warehousing activities; it was tried to be explained how the development of foreign trade in Turkey affects positively the logistics sector by its reasons and support of literature. Hakim and Merkert (2016) [16] examined the causal relationship between air transport and economic growth in the context of South Asia. It covers a period of 42 years in the panel dataset (1973-2014). As a result, it confirms a long-term one-way Granger causality from GDP to air passenger traffic as well as air cargo volumes. The absence of causality in the short term and lag lengths of 3-4 years suggested that airline companies and policymakers should also guide the preparation of the necessary infrastructure to support the growth potential of air transport. Tosun (2017) [17] has examined the development and the place of air transport in the economy of Turkey, emphasized the economic importance of this transportation and determined that it could develop further with the support of the state. AK (2018) [18] in his study, has evaluated commercial and transport relations between Russia and Turkey, at the end of the study, objectively revealed the situation with the figures, described trade relationship between Russia and Turkey. The direction and acceleration of this trade in the field of transportation have also been interpreted. Setiawan and others. (2018) [19], analyzed the correlation between airport performances and gross domestic product-regional (GDP-regional) performance. In this study, a quantitative research method with the correlation study approach was used. Based on the T test result, it is stated that the estimated variable of the airport has a significant correlation with the GDP-regional. Nasution and others. (2018) [20] analyzed the causal relationship between air transport and economic growth in Indonesia. The data used in the analysis cover between 1990-2017 and the Vector Error Correction Model (VECM) method was used as the data analysis method. Their results also show that there is a relationship between air transport tax and economic growth in Indonesia. Based on the test results of the Granger variable or passenger variables, the GDP variable indicates that it remained related to Granger with an action of 1 percent. Gümüş Akar et al. (2019) [21] analyzed the causality relationship between growth and airline transportation liberalization representing deregulation of the process for the gradual elimination of restrictions on air transport agreements and destination established by the relevant regulations, appointment, capacity, frequency, and tariff adjustments in Turkey. Analysis results indicate that there is causality in 2005, 2008 and 2012 from the Aviation Liberalization Index calculated for Turkey to economic growth. The study of Brida and others. (2019) [22] focuses on defining the nonlinear relationship between Chile and Uruguay air transport

development and economic growth, and a model to represent this relationship is proposed. The methodology used in this article combines the concepts of cointegration with asymmetric adjustment threshold models. In both cases, the nonlinear

TABLE 2
TESTING THE ASSUMPTIONS IN THE FIXED EFFECTS MODEL

Assumption	Test statistic	Prob.	Decision
Heteroscedasticity	Modified Wald test Ki-Kare2 (20) = 1684	0.000	H0 is rejected, heteroscedasticity problem exists.
Autocorrelation	Modified Bhargava et al. Durbin-Watson = 1.022 Baltagi-Wu LBI = 1.260	1.022<2 1.260<2	H0 is rejected, autocorrelation problem exists.
Inter-unit Correlation	Breusch-Pagan LM: Ki-kare(90) = 549.443 Pesaran CD= 2.002 Friedman's test = 25.860 Frees' test = 0.654	0.000 0.045 0.1341 0.654>0.22(%5)	H0 is rejected, inter-unit correlation exists. H0 is rejected, inter-unit correlation exists. H0 is cannot be rejected, inter-unit correlation does not exist. H0 is rejected, inter-unit correlation exists.

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model is modelled from the transient states of imbalance on the dynamics of adaptation to the long-term cointegration path between variables. The long-term equilibrium m-TAR adjustment mechanism has been shown to be suitable for describing the long-term relationship in the case of Uruguay. However, in the case of Chile, the established evidence is not clear in favor of a nonlinear model with asymmetric adjustment.

3 DATA AND ANALYSIS
Turkey's 20 largest trading partners were considered in order for the determination of the export demand functions performed by air* in Turkey. For panel data modelling, the amount of airborne exports covering the years 2000-2017 was considered as the dependent variable, and the amount of exports was made real by dividing it by the export unit price index. Real Gross Domestic Product of 20 countries covering 2000-2017, Relative Price Index (the ratio of export unit price index to the partner country's consumer price index) and the population of the countries are included in the model as independent variables. While the amount of export carried by air and the export unit price index were obtained from TURKSTAT, other data were obtained from the World Bank. In order to bring the data to the same scale logarithms of all variables were taken. For Panel Data Analysis, the existence of time and unit effect was tested first and it was determined that time effect is not a significant in the model (F and LM test), as a result, one-way unit effects model was estimated using Fixed Effects (In-group estimator) and Random Effects (Generalized OLS estimator) methods. In Table1, Fixed Effects and Random Effects model has been estimated by in-group and generalized least squares method, respectively.

According to the Hausman test result, the H0 hypothesis which states that fixed and random effects model are both consistent but the random effects model is more effective, is rejected and it is determined that the fixed effects model is more suitable for modelling the export demand function by air. According to F test, the fixed effects estimator is more effective than the pooled OLS estimator. The Fixed Effects model was tested for heteroscedasticity, autocorrelation and inter-unit correlation.

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The Fixed Effects model was tested for heteroscedasticity, autocorrelation and inter-unit correlation and it was decided that all three assumptions were not met. In this case robust estimators proposed by Driscoll and Kraay (1998) were derived According to the F test, the hypothesis which states that all the variables included in the model are equal to 0, is rejected and at least one independent variable is different from 0 and it explains the export quantity variable by air significantly. According to the results of t test, all parameters were found to be significant separately. The independent variables included in the model explain the variable of export by air, which is the dependent variable, by 54%. It appears that the unit effect has

TABLE 1
UNITS FOR MAGENTIC PROPERTIES

Dependent Variables	Fixed Effects Model	Random Effects
Real GDP	1.576***	1.457***
Population	3.205***	-0.663***
Relative Price	-0.571***	-0.910***
Constant Coefficient	-85.671***	-14.371***
F.stat / Wald Chi-Square	134.61***	296.42***
R^2	0,54	0,68
δ_u	5,479	0,64
δe	0,536	0,536
Rho	0,991	0,588
F test/ LM test	32.45***	737.13***
Hausman Test: Chi-square (3)=76.37 prob=0.000		

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a rho = 0.99 (99%) share in total variance. When other independent variables are 0, the amount of export by air is equal to antilog (-85.671) = 0. While other independent variables are fixed, an increase of 1% in the real GDP of the country exported by air will increase the amount of exports by air by 1.58%, an increase of 1% in the population of the exported country will increase the amount of export by air by 1% and increase in the relative prices of the exported country will reduce the amount of export by 0.57%.

4   CONCLUSION

It is known that air transportation cargo and its current situation and development in the last 20 years has been examined in many theoretical and empirical ways. In this study, the Istanbul Airport, which opened in the recent period, in line with the contribution to Turkey's economy caused to rise a lot of questions. As a result of many literature reviews carried out in the context of answering these questions, it is concluded that developments in air transportation are expected to have a positive effect on the national economy by accelerating exports. In the study identified the top 20 export partners of Turkey and 18-year data related to these exports by air was obtained. Real gross domestic product of 20 major countries, Relative Price Index and population of the countries are included in the model as panel model data. As a result, the increase in the amount of export by air varies depending on the population (demand) of the country of export. While the economic growth of the country where the export is made from has a positive effect on the amount of exports, the increase in the relative price (consumer price index) decreases the amount of exports by air.

TABLE 3
DRISCOLL-KRAAY ESTIMATOR OF FIXED EFFECTS MODEL

Dependent Variables	Fixed Effects Model	Driscoll-Kraay Standard Errors t.	t statistic
Real GDP	1.576	0.157	10.070***
Population	3.205	0.382	8.400***
Relative Price	-0.571	0.245	-2.330**
Constant Coefficient	-85.671	5.494	-15.590***
F.stat	182.76***		
R^2	0.54		
δ_u	5.479		
Δe	0.536		
Rho	0.991		
*** 1% significance level ** 5% significance level			

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