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The Effects of The Vertical Cooperation Strategy Between Airports and Airlines on The Operating Performance of Airlines[1]

Armağan Macit[1] I Mehmet Başar[2]

[1] Lect. Dr., Armağan Macit, Ege University, İzmir /Türkiye
ORCID: 0000-0002-5694-8285
E-Mail: armagan.macit@ege.edu.tr

[2] Prof. Dr., Anadolu University, Eskişehir / Türkiye
ORCID: 0000-0003-4989-0502
E-Mail: mbaser@anadolu.edu.tr

Corresponding Author: Armağan Macit

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Abstract

It is aimed to determine the effects of the strategic cooperation between airport operators and airlines on the operational performance of airlines. In addition, it is also among the other aims of the study to deal with all aspects of airport-airline strategic cooperation, which is rare, to develop the relevant literature and to make suggestions to airlines. In the research, cooperation of Pegasus Airlines, the largest private airline company of Turkey, with Istanbul Sabiha Gökçen Airport, which is the fastest growing airport in Europe, is discussed. In the research, in which the mixed method was used, the dimensions of cooperation were revealed primarily through interviews with middle-level managers. Panel regression analysis was used as a quantitative analysis method in the study. It was tried to determine the effect of vertical cooperation on performance with 3 different models established. The impact of the Covid-19 pandemic and the cooperation dummy variables were added to the models and the effects of the cooperation, and the pandemic were revealed. As a result of the study, even though the Covid-19 pandemic has created a structural break on airline performance, the positive effect of cooperation shows that vertical cooperation is an important strategy that can be preferred by airlines. It has been understood that with the airport-airline vertical cooperation strategy, competitive advantage can be created, costs can be kept under control, the activities of idle airports can be increased, and an advantage can be created in providing passenger guarantees given in projects in which the public-private sector cooperates.

Keywords: *Airport-Airline Cooperation, Airline Operating Performance, Vertical Strategic Cooperation*

Öz

Havaalanı işletmecileri ile havayolları arasındaki stratejik iş birliğinin havayollarının operasyonel performansı üzerindeki etkilerinin belirlenmesi amaçlanmaktadır. Ayrıca nadir görülen havalimanı-havayolu stratejik işbirliğinin tüm boyutlarıyla ele alınması, ilgili literatürün geliştirilmesi ve havayollarına önerilerde bulunulması da çalışmanın diğer amaçları arasındadır. Araştırmada Türkiye'nin en büyük özel havayolu şirketi Pegasus Hava Yolları'nın Avrupa'nın en hızlı büyüyen havalimanı olan İstanbul Sabiha Gökçen Havalimanı ile yaptığı işbirliği ele alınmıştır. Karma yöntemin kullanıldığı araştırmada işbirliğinin boyutları öncelikle orta düzey yöneticilerle yapılan görüşmelerle ortaya çıkarılmıştır. Araştırmada niceliksel analiz yöntemi olarak panel regresyon analizi kullanılmıştır. Kurulan 3 farklı model ile dikey işbirliğinin performansa etkisi belirlenmeye çalışılmıştır. Modellere Covid-19 salgınının etkisi ve işbirliği kukla değişkenleri de eklenerek işbirliğinin etkileri ortaya çıkarılmıştır. Çalışma sonucunda, her ne kadar Covid-19 salgını havayolu performansı üzerinde yapısal bir kırılma yaratmış olsa da işbirliğinin olumlu etkisi sebebiyle dikey işbirliğinin havayolları tarafından tercih edilebilecek önemli bir strateji olduğu görülmektedir. Havalimanı-havayolu dikey işbirliği stratejisi ile rekabet avantajı yaratılabileceği, maliyetlerin kontrol altında tutulabileceği, atıl havalimanlarının faaliyetlerinin artırılabileceği, kamu-özel sektörün işbirliği yaptığı projelerde verilen yolcu garantilerinin sağlanmasında avantaj yaratılabileceği anlaşılmıştır.

Anahtar Kelimeler: *Havaalanı-Havayolu İşbirliği, Havayolu İşletme Performansı, Dikey Stratejik İşbirliği*

[1] *This research is derived from the doctoral thesis study conducted by the 1st author under the supervision of the 2nd author.*

Introduction

The increasing number of airlines after deregulation and the emergence of different business models have intensified the competition in the aviation sector. Airline operations, which are currently operating with low profit margins, have made strategic moves to reduce their costs in an intensely competitive environment, to ensure their continuity, to increase their revenues, to increase the number of passengers and load factors by opening to new markets. One of these strategic moves is cooperation strategies (Gillen & Hinsch, 2001). Many airlines are trying to open to different markets, gain competitive advantage, expand their transportation network, etc. cooperated with other airlines for this purpose. In fact, airline alliances such as Star Alliance, One world and SkyTeam, in which many airlines are involved, have been established (Kanbur & Karakavuz, 2017). In an environment where competition has increased in recent years, it is seen that airlines focus on the basic building blocks of the aviation system. Airports come to a central and important position in the system for airlines because they create various costs for airlines and provide compulsory services for airlines (Albers et al., 2005). In terms of creating competitive advantage, airlines have turned to the strategy of creating strategic cooperation with airport operators.

Strategic collaborations began to emerge between low-cost carriers and secondary airports, as carriers adopting the low-cost transportation business model preferred secondary airports, which are far from central airports, far from city centers, where transportation is relatively difficult, to reduce their costs (Barbot, 2006). After liberalization, traditional carriers and network carriers have turned to the hub & spoke system, which allows them to collect passengers to the central airports they have determined and distribute them together with the passengers going to other destinations from this airport. This situation has led to the importance of airports that act as pick-and-distribution centers and to establish a relationship with the airport for the airline business (Barbot, 2009).

Vertical collaborations between airports and airlines provide significant advantages to both businesses (Albers et al., 2005). Vertical collaborations are considered as a long-term assurance for airports and airlines. Airports can plan facility investments in the long term, and the airline can eliminate the uncertainties about airport costs (Goetsch & Albers, 2007).

The aim of this study; The aim of this study is to determine the effect of vertical cooperation between airlines and airport operators on airline business performance indicators. It is aimed to determine to what extent the advantages obtained by airlines because of vertical cooperation established as a strategic practice affect the operational performance of the airline company. In addition, considering the effect of the pandemic on airline performance, it is aimed to reveal this effect. There are limited studies discussing the effects of airport and airline collaborations, especially demonstrating empirical evidence. Presenting empirical outputs in this field to all researchers constitutes the main motivation of the research.

Conceptual Framework and Literature Research

The cooperation of airlines with the airport to create a competitive advantage against their competitors is of strategic importance (Albers, Koch, & Ruff, 2005). The airline company, which cooperates with the airport, gains significant advantages over the flights to be made at that airport against its competitors by obtaining different services at more affordable prices, gaining advantages in terms of terminal capacity utilization, and gaining advantages in slot allocation in terms of flight density. Cooperation between the airport and the airline is a long-term assurance for both parties. While airport operators see the long-term plans of the airline and realize their facility and service investments with this assurance, the airline business eliminates the uncertainty about future passenger revenues and the costs incurred for that airport (Goetsch & Albers, 2007).

It has been stated by Erdoğan (2018) that airport-airline vertical collaborations are formed in eight different ways. These; signatory airline status, commercial revenue sharing agreements, long-term lease agreements, special facility income bonds, airport ownership rights, traffic and line increase incentives, load factor guarantee, discount applied to aviation fees.

It guarantees break-even costs to the airline that has obtained the status of a signatory airline. While this prevents loss for the airport, it reduces the costs considerably by allowing the signatory airline to pay the airport fees in very small amounts in case the break-even costs are met with the revenue from other airlines. The cooperation established through the acquisition of the shares of the airport operators that offer their shares to the public or the shares of the airport operators that sell their shares and the airline operator's having a say on some terminals and facilities is called airport ownership right. While the airport provides financial resources with the transfer of shares, the airline can optimize the flights. In some airports, it may be possible to offer discounts on airport aviation fees to the airline with which they want to cooperate. The airport-airline relationship is strengthened by the incentives to be made in this way for the airline that organizes intensive flights and can increase the line (Fu, Homsombat, & Oum, 2011).

With the increase in privatization, the importance of non-aviation commercial revenues in airports has increased. The way to increase such revenues is to increase the number of passengers, and the way to increase the number of passengers is through the airline business. For this reason, in the vertical cooperation established, the airport operator receives a share of the commercial income obtained in return for increasing the number of passengers (Zhang, Fu & Yang, 2010). It is seen that some airline operators make long-term leasing transactions to use the terminal capacity with the airport operation, as they want to gain superiority over their competitors and to operate for a long time at the airport they have determined. In such collaborations, the airline company gains a significant advantage over its competitors and stands out at that airport, while the airport operator provides long-term income assurance (Barbot, 2009).

In airport facility investments, special facility income bonds are a cooperation for the airlines, which are the project guarantors, to have rights in the facility or project by selling the bonds issued by the local governments to the airlines to create the necessary financial resource for the construction of that facility (Oum & Fu, 2008). Although the demand situation related to traffic and lines belongs entirely to the airline, some airport operators try to increase traffic and lines by reducing air traffic and airport fees (Auerbach & Koch, 2007). Some airport operators that want to establish a long-term relationship with the airline operators form cooperation by making an agreement with the airline operator to guarantee the load factor. In this case, in cases where the airline company does not provide the specified load factor, it makes a compensation payment, while in the opposite case, it can receive a share of the profit of the airline company (Hihara, 2012).

When the academic literature is examined; Before 2010, it is seen that there are many studies on cooperation between airlines, which are horizontal applications of strategic cooperation in the field of aviation. Academic studies on the airport-airline relationship in 2010 were limited by restrictions such as government interventions in airports, and the non-contractualization of collaborations. Today, however, the intensification of privatization in airport businesses has led to the formation and strengthening of cooperation by removing the constraints in front of establishing different cooperations against airlines. For this reason, airport-airline vertical cooperation has become an area where current academic studies are directed but still limited.

Tinoco and Sherman (2014) emphasized in their study that airport and airline consortia emerged after deregulation. They said that airlines are looking for private partners to improve terminal facilities and equipment, update services, as well as reduce costs. Yang, Zhang and Fu (2015) concluded in their study that airport-airline vertical cooperation is made when airlines want to have more market power, when they have higher costs, when the fees they pay to airports are higher, or when the social welfare of the airport is more important. they have reached. Zhang, Fu, and Yang (2010) investigated the consequences of privileged revenue sharing between airports and airlines in their study. They concluded that while revenue sharing increases the total profit of airport-airline cooperation, it reduces social welfare.

In their study, Minato and Morimoto (2017) discussed that successful coexistence between an airline and an airport is important for the realization of the target load factor, in short, airports should guarantee target load as a subsidy. They mentioned that such subsidies will guarantee a long-term airline-airport relationship, even if there is a temporary financial loss for the airport. Starkie (2008) stated in his study that the cooperations made differ due to the legal regulations of the countries. It was said that there are cooperation agreements for terminal and gate rentals in Australia and the USA, while the focus is on airport fees in Europe. It has been emphasized that airport-airline cooperation is becoming increasingly common in Europe and that such contracts are a contemporary innovation for the civil aviation industry. In their study, Saraswati, and Hanaoka (2014) focused on the airport-airline cooperation model in which an airport shares a portion of its revenue with the airline company in the face of a fixed income commitment. In the study, which was carried out by considering many airlines and airports with game theory, it was concluded that the airport preferred to share its revenue with the dominant airline to obtain the optimum benefit. Tunčikienė and Katinas (2020) emphasized that partnerships between airports and airlines should be further encouraged to improve the quality of air transport services. They established criteria for determining the factors of an effective partnership between airports and airlines and evaluating the positive effects of airport cooperation activities.

Methodology

The study examines the cooperation between Turkey's largest private airline, Pegasus Airlines, and Europe's fastest growing airport, Istanbul Sabiha Gökçen Airport. Mixed method was preferred in the research. This method, in which qualitative and quantitative research methods are used together, makes it easier to obtain data and information for quantitative interpretation of qualitative research data and vice versa. For many years, it has been proven that using quantitative and qualitative methods together in a single study produces effective results (Creswell et al., 2004). In the qualitative research dimension of the mixed method, the dimensions of airport and airline cooperation were first revealed through interviews with mid-level managers. By determining the topics on which the collaboration took place, the independent variables to be used in the quantitative analysis were determined.

Following the completion of the qualitative research, the data set reflecting the cooperation between 2012 and 2021 and showing the operational performance of the airline was included in the empirical analysis. In the quantitative research, in order to investigate the effect of cooperation, data from Izmir Adnan Menderes Airport, which Pegasus Airlines uses as its hub airport but does not cooperate with, was also included in the analysis.

Within the scope of quantitative research, panel regression analysis, one of the econometric analysis methods, was carried out. All applications within the scope of the analysis were made using EViews 10 and Stata 14.2 programs. The variables used and their abbreviations are listed in Table 1. The variables mentioned in the table are ready for analysis as they are a monthly compilation of the airline's activities at the specified airports. Relevant data was obtained from the websites of Turkey's airport operators, DHMI and Pegasus Airlines, upon request.

The data selected for this research covers both airport activities and shows the performance of the airline company. Revenue per Seat Kilometer, Cost per Seat Kilometer, etc. Vertical Passenger Number, which shows the ratio of the number of passengers at the airport with which the airline cooperates, to the total number of passengers at the airport and Vertical Traffic variables. The table showing the ratio of the number of flights at the airport with the cooperation of the airline to the total number of flights at the airport was created to give an idea about vertical cooperation, as well as the data used in many studies.

***Table 1:** Variables*

Variable Name	Variable Abbreviation
Revenue Per Seat Kilometers	LOGRASK
Cost Per Seat Kilometers	LOGCASK
Number of Passenger Counters	LOGPADE
Airline Passenger	LOGAPAS
Vertical Number of Passengers	LOGDPAS
Airline Traffic	LOGATRF
Vertical Traffic	LOGDTRF

Cost Per Seat Supplied	LOGPASK
Passengers Per Flight	LOGPPPA
Total Traffic	LOGPTTR
Total Passengers	LOGPTPS
Counter Rate	LOGPDER
Counter Used	LOGPDES
Accommodation Fee	LOGPSTY
Landing Fee	LOGPTOC
Pegasus Number of Passengers	LOGPPAS
Pegasus Traffic Count	LOGPTRF
Load Factor	LOGPLF

In the econometric method part, variance inflation test (VIF) and Spearman correlation analysis were performed to investigate the multicollinearity problem related to independent variables. Dependency between the horizontal sections (airports) that make up the panel, Breusch-Pagan (1980) (Lagrange Multiplier-LM Test) LM test and Peseran, Ullah, Yagamata (2008) Adjusted LM Test and Pesaran (2004) (Cross-section) Dependence) tested with CD-LM tests.[2] Panel homogeneity and homogeneity of the series were tested with Pesaran and Yamagata (2008) Slope Homogenity.[3] Then, for the series used in the analysis, the stationarity test was carried out according to the results of cross-section dependence and homogeneity.[4] For heterogeneous series with cross-section dependence, the CADF test (Cross-Sectionally Augmented Dickey-Fuller) second generation and third group unit root tests developed by Peseran (2007) were used. For homogeneous series with cross-section dependence, Breitung unit root test and Harris-Tzavalis unit root tests were applied resistant to cross-section dependence. Since the series without cross-section dependence exhibit a heterogeneous structure, the IPS test developed by Im, Pesaran and Shin (2003) and Fisher ADF and Fisher PP tests [5], which are in the second group of first-generation unit root tests, were applied to these series.[6] F test, Hausman Test and Breusch-Pagan Lagrange Multiplier Tests were used for selection of suitable models. To test the deviations from the assumption;7 For classical models, White's test and Breusch-Pagan/Cook-Weisberg tests were used to test heteroscedasticity (Differing Variance), and Wooldridge's tests were used to test the existence of autocorrelation. After all these tests, it was revealed that the results obtained with the models established would be reliable, and the model results were found and interpreted.

Findings

It was aimed to reveal the dimensions of cooperation by taking the opinions of middle level managers from both the airport and the airline company. Based on the qualitative research, (İ.S.G.) and Pegasus Airlines are defined by the Managers as businesses that grow together. It has been stated that Pegasus Airlines has used the advantages of Sabiha Gökçen Airport very well and that this has been significantly effective in its growth. It is stated that Pegasus Airlines has a large share in making İ.S.G. the fastest growing airport in Europe in recent years.

According to the evaluation made by airport managers in the qualitative research, the allocation of check-in counters, ticket-sales and lost property offices, staff rooms, etc. between the airline and the airport. It is stated that there are long-term protocols for terminal usage areas. At the same time, the placement of equipment in the terminal such as kiosk check-in and self-luggage, which Pegasus Airlines started to use in the digitalization process, There are also protocols for the infrastructure services to be provided by the company. It was stated that Pegasus Airlines has fixed check-in counters in the most central location at the airport, and it was emphasized that this central counter location contributes to the airline operation in matters such as passenger transportation to the counter, passenger orientation and time management. Due to the large number of flights and routes, Pegasus Airlines carries out many joint operations with the airport management, which strengthens the communication between all managers and personnel. There are plans for Pegasus Airlines in the airport's short and long-term infrastructure investments, and in these plans reason, Pegasus Airlines use Sabiha Gökçen Airport as its central airport, turn the airport into a hub and spoke point,

[2] For test results, Appendiks-1 and Appendiks-2
[3] For cross-section test results, Appendix -3.
[4] For homogeneity test results, Appendix -4.
[5] For the results of unit root tests, Appendix -5.
[6] For the results of unit root tests, Appendix -5.
[7] For the test results of the deviations from the assumption in the model results, Appendix -7.

and take a leading position in terms of the number of flights and number of lines. It is stated that it is effective.

According to the evaluation made by airline managers, it is stated that it becomes easier for the airline to be successful in the sector with various airport-based advantages. The fact that it is an airport in Istanbul and that it is suitable for use as a hub and spoke can be given as an example. It has been stated that operating busy flights at the airport 24 hours a day, 7 days a week, positively contributes to communication with airport personnel. It was mentioned that especially the counter areas and kiosk areas at the airport contribute positively to the digitalization of the airline and passenger satisfaction. They stated that the airline's activities at Sabiha Gökçen Airport created a competitive advantage, and at the same time, there was an opinion that it would be difficult for new airlines to operate and hold on to this airport. It was pointed out that more advantageous dimensions of cooperation may emerge in the long term, especially after the capacity constraints of the terminal building are eliminated.

As a result of the qualitative research, independent variables that would reflect the impact of collaboration were determined and quantitative analysis was initiated.

According to the Spearman correlation results, it is seen that some of the variables examined have multicollinearity problems (ATRF with APAS, DPAS with DTRF, PTRF with PPAS). When VIF values are examined, it is seen that most of the VIF values of the independent variables used in the analysis are above the specified standard value of 10. It can be said that there is a multicollinearity problem between these independent variables. To solve the multicollinearity problem, the series can be differentiated, or variables can be removed from the model. Variables with high correlations were removed from the model and the multicollinearity problem was solved by taking the difference of the series. Appropriate models were also determined based on these variables.

Within the scope of the analysis, three basic models were created to measure the operational performance of the airline business and these models were expanded with dummy variables to reveal the unit and time effects.

Model 1: LOGPTPSit = β0it + β1itDLOGDPAS +β2itDLOGPTOC + β3itDLOGPPAS + β4itDLOGPDES + β5itDLOGPDER + β6itDLOGATRF + β7itDUVT + β8itDUVi + Ɛit

Model 2: LOGRASKit = β0it + β1itDLOGDPAS +β2itDLOGPTOC + β3itDLOGPPAS + β4itDLOGPDES + β5itDLOGPDER + β6itDLOGATRF + β7itDUVT + β8itDUVi + Ɛit

Model 3: LOGPLFit = β0it + β1itDLOGDPAS +β2itDLOGPTOC + β3itDLOGPPAS + β4itDLOGPDES + β5itDLOGPDER + β6itDLOGATRF + β7itDUVT + β8itDUVi + Ɛit

DUVt and DUVi dummy variables were included in the models examined in the analysis, and they were tested in both unit effect (cooperation) and time effect (Covid-19 pandemic) models.

According to Pesaran (2004) CD test, H0 hypothesis states that there is no cross-section dependency. Accordingly, according to the results of the cross-section dependence test results based on the series to be included in the analysis; It is revealed that Pegasus passenger number (PPAS), number of touchdowns (PTOC), number of counters used (PDES) and counter ratio (PDER) series do not have cross-section dependence, while there is cross-section dependence in other series. According to these results, stationarity tests for PTOC, PDER and PDES series will be performed with first generation unit root tests and for other series with second generation unit root tests. Within the scope of the analysis, the cross-section dependence was tested both based on models and based on the studied series. If there is no cross-sectional dependence between the series while performing the analysis with panel data, homogeneity tests and unit root tests to be used for stability testing should be determined. As with the testing of cross-sectional dependence, homogeneity testing is examined both based on models, that is, based on panels, and based on series.

According to the basic hypothesis of Peseran Yamagato (2008) Slope Homogeneity Test, “slope coefficients are homogeneous”. Accordingly, H0 is rejected for the first two of the panel models according to the 1% significance level. These models used are heterogeneous. The basic hypothesis for Model 3 cannot be rejected. This model has a homogeneous structure. According to the test results in the table where homogeneity is tested based on series, the H0 hypothesis (slope coefficients are homogeneous) is rejected for all series except DLOGDPAS (vertical passenger number) and DLOGATRF (air traffic) according to 10% significance level. Since the basic hypothesis cannot be rejected in the DLOGDPAS and DLOGATRF series, they are homogeneous. Other series to be included in the regression analysis have a heterogeneous structure.

According to the unit root test results based on first generation heterogeneity assumption, DLOGPTOC, DLOGPDER, DLOGPPAS and DLOGPDES series are stationary and do not contain unit root (H0, unit root hypothesis is rejected at 1% significance level). Stationarity is tested in the homogeneous DLOGDPAS and DLOGATRF series using the Breitung Test and the Harris-Tzavalis test, which are in the first group of the second-generation unit root tests and based on the homogeneity assumption. Since these series also have cross-section dependence, the unit root tests performed were used in a resistant structure that took this into account. According to Breitung (2000) and Harris-Tzavalis (1999) panel unit root test results for DLOGDPAS and DLOGATRF series, the basic hypothesis (H0, contains unit root) is rejected and the series is stationary in both fixed and trend models.

According to the results of the cross-sectional dependence and homogeneity tests, the CADF (Cross-Sectionally Augmented Dickey-Fuller) test, which is one of the second-generation unit root tests that takes these into account, was applied for the LOGPTPS, LOGRASK, LOGPLF, DLOGPSTY series, which have both cross-section dependence and heterogeneity. Pesaran (2007) In case the CADF test statistic is greater than the absolute critical values, the H0 hypothesis is rejected, and the series is assumed to be stationary. Similar results are obtained when probabilities are examined. It is concluded that the series in the table are stationary.

In Model 1, to determine the factors affecting the operational performance of the airline, the fixed effects model, random effects model and pooled models are used in the F test, Hausman test and Breuch- Pagan LM (1980) tests were applied. According to the model specification results, it is appropriate to use the classical model for regression estimation for model 1. For Model 1, tests such as the Breusch-Pagan (1979) / Cook-Weisberg (1983) test and the White test can be used to test heteroscedasticity in the classical model. In Model 1, according to both test results, the basic hypothesis is rejected, and it is concluded that there is a varying variance problem. The deviation from another assumption in panel regression analysis is the autocorrelation problem. Wooldridge's test results were used to test the existence of autocorrelation in the models. According to the autocorrelation test performed with Wooldridge's test, the basic hypothesis (H0, no first-order autocorrelation) is rejected for 5% significance levels. There is an autocorrelation problem in the model. Since deviations from the assumption are detected for the model under consideration, robust estimators are needed in the estimation of the classical model. In this context, since there is a need for a more resistant estimator, the model was estimated with Arellano, Froot and Rogers and Newey-West estimators, which are used in the presence of heteroscedasticity and autocorrelation and enable estimation with resistant standard errors. The table shows the resistive estimator results for model 1.

Table 2. *Model 1 Prediction Results*

Pooled EKK, *Arellano, Froot, and Rogers* Resistive Standard Errors **Dependent variable** LOGPTPS				
Arguments	**Coefficient**	**Standard Error**	**t-Statistics**	**Probability Value**
DLOGDPAS	-1.384515	0.4971153	-2.79	0.219
DLOGPTOC	0.637184	0.036761	17.33	0.037**
DLOGPDES	-0.3461551	0. 4343573	-0.80	0.572
DLOGPDER	-0.3182619	0.0202123	-15.75	0.040**
DLOGATRF	0.6085387	0.1193644	5.10	0.123
DLOGPPAS	0.1208309	0.4922268	0.25	0.847
DUV_t	-19.52638	7.824089	-2.50	0.243
DUV_i	0.0446917	0.0042268	10.57	0.060***
C	14.26872	0.134288	106.25	0.006
R-squared = 0.6901 Prob > F = 0.0000				
Pooled ICC, Newey-West Resistant Standard Errors Dependent variable LOGPTPS				
DLOGDPAS	-1.384515	1.913323	-0.72	0.470
DLOGPTOC	0.637184	0.5444888	1.17	0.243
DLOGPDES	-0.3461551	0.2086483	-1.66	0.098***
DLOGPDER	-0.3182619	0.2326336	-1.37	0.173
DLOGATRF	0.6085387	0.8203426	0.74	0.459
DLOGPPAS	0.1208309	1.203991	0.10	0.920

DUV_t	-19.52638	8.062182	-2.42	0.016**
DUV_i	0.0446917	0.2368415	0.19	0.850
C	14.26872	0.1391828	102.52	0.000
DLOGDPAS	-1.384515	1.913323	-0.72	0.470
Prob > F = 0.0000				

**It shows that the significance of coefficients is rejected at the level of 1% significance, ** at the level of 5% significance, and at the level of 10% significance.*

When the model results in the table are examined, it is seen that the F statistical value is significant for both estimation results. This means that the model is meaningful. The R2 value, on the other hand, shows the power of explaining the effect of the variables considered in the model on the independent variable. The variables included in the analysis explain the model at the level of approximately 70%.

According to the main results of Model 1; A 1% change in the number of landings (DLOGPTOC) increases the total number of passengers by about 0.6% in the short run. A 1% change in the number of counters used (DLOGPDES) reduces the total number of passengers by approximately 0.3% in the short term. A 1% change in the counter rate (DLOGPDER) reduces the total number of passengers by approximately 0.3% in the short run. The time dummy variable DUVt added to the model is statistically significant and reveals that the Covid-19 pandemic created a structural break in 2020:03 and 2020:04, resulting in a reduction of approximately 20% on the total number of passengers. In addition, the DUVi dummy variable added to represent cooperation is also statistically significant and shows that the airline's activities at the airport with which it is in vertical cooperation increase the performance by 4%.

The same problems were tested for Model 2 and Model 3, and the model was estimated with Beck-Katz (PCSEs), which is used in the presence of autocorrelation and cross-sectional dependence and allows estimation with resistant standard errors. Model 2 in Table 3 and model 3 resistant estimator results in Table 4 are given.

***Table 3.** Model 2 Prediction Results*

Pooled ICC, *Beck-Katz (PCSEs, Prais-Winsten regression)* Resistive Standard Errors
Dependent variable
LOGRASK

Arguments	**Coefficient**	**Standard Error**	**t-Statistics**	**Probability Value**
DLOGDPAS	-1.208276	0.5566	-2.17	0.030**
DLOGPTOC	0.3158426	0.1247407	2.53	0.011**
DLOGPDES	-0.1074491	1.429882	-0.08	0.940
DLOGPDER	0.0185257	1.557865	0.01	0.991
DLOGATRF	0.4204747	0.2019674	2.08	0.037**
DLOGPPAS	0.1804708	0.3407555	0.53	0.596
DUVt	-16.75459	1.523573	-11.00	0.000*
DUVi	-0.0077921	0.1859577	-0.04	0.967
C	11.75108	.1842127	63.79	0.000
R-squared = 0.6143				
Prob > chi2 = 0.0000				

** Indicates that the significance of coefficients is rejected at the level of 1% significance ** at the level of 5% significance *** at the level of 10% significance.*

While the variables included in the analysis in Model 2 explain the model at a level of approximately 62%, the variables included in the analysis in Model 3 explain the model at a level of approximately 25%. This situation can be interpreted as Model 1 and Model 2 results are more valid.

***Table 4.** Model 3 Prediction Results*

Pooled ICC, *Beck-Katz (PCSEs, Prais-Winsten regression)* Resistive Standard Errors
Dependent variable
LOGPLF

Arguments	**Coefficient**	**Standard Error**	**t-Statistics**	**Probability Value**
DLOGDPAS	-0.5663516	0.1628278	-3.48	0.001*
DLOGPTOC	-0.099074	0.0309359	-3.20	0.001*
DLOGPDES	-0.4576722	0.390535	-1.17	0.241
DLOGPDER	0.4626976	0.4151063	1.11	0.265
DLOGATRF	-0.1802537	0.0765047	-2.36	0.018**
DLOGPPAS	0.3589938	0.1017776	3.53	0.000*
DUVt	-1.639899	0.4094044	-4.01	0.000*
DUVi	-0.0063773	0.0765178	-0.08	0.934
C	3.602613	0.1502777	23.97	0.000
R-squared = 0.2551				
Prob > chi2 = 0.0000				

** H_0 shows that the hypothesis is rejected at the level of 1% significance, ** at the level of 5% significance, and at the level of 10% significance.*

According to the main results of Model 2; A 1% change in the number of landings (DLOGPTOC) increases revenue per seat supplied (LOGRASK) by about 0.3% in the short run. A 1% change in vertical passenger numbers (DLOGDPAS) reduces revenue per seat supplied by approximately 1.2% in the short run. A 1% change in the number of airline traffic (DLOGATRF) increases the revenue per seat served by approximately 0.4% in the short run. The time dummy variable DUVt added to the model is statistically significant and reveals that the Covid-19 pandemic's structural break in 2020:03 and 2020:04 caused a reduction of approximately 17% on the income per seat supplied. The DUVi dummy variable, which was added to represent cooperation, was not statistically significant.

According to the main results of Model 3; A 1% change in the number of touchdowns

(DLOGPTOC) reduces the load factor (LOGPLF) by about 0.09% in the short run. A 1% change in vertical passenger numbers (DLOGDPAS) reduces the load factor by 0.5% in the short run. A 1% change in the number of airline traffic (DLOGATRF) reduces the load factor by about 0.1% in the short run. A 1% change in the number of Pegasus passengers increases the load factor by approximately 0.3% in the short term. The time dummy variable DUVt added to the model is statistically significant and reveals that the Covid-19 pandemic caused a structural break in 2020:03 and 2020:04, resulting in a 1.6% reduction in the load factor. The DUVi dummy variable, which was added to represent cooperation, was not statistically significant.

Conclusion and Evaluation

The main objective has been to reveal the effects of vertical strategic cooperation between airport operators and airlines on airline business performance. In this context, a research model in which qualitative and empirical research are used together was chosen. In the qualitative research, three middle managers of Sabiha Gökçen Airport and Pegasus Airlines, which constitute the research sample, were interviewed. With the interview, the answers to the questions of whether there is cooperation, how it is reflected in the performance of the airline if there is cooperation, and in which areas the airline company gains advantage if there is cooperation, were sought.
As a result of the qualitative research, Pegasus Airlines, the airline that organizes the most flights to Sabiha Gökçen Airport, and the Terminal Operator of Sabiha Gökçen Airport, İ.S.G. It has been determined that there is a cooperation based on long-term contracts between These long-term contracts usually include check-in counter, space allocation for digital equipment, office, etc. for terminal area use. Pegasus Airlines is the most active airline at Sabiha Gökçen Airport. This situation causes airport and airline personnel to work in cooperation during the intensive operation process. Although there is no official basis, it has been concluded that there is an impression of communication cooperation between the personnel. It has been concluded that Pegasus Airlines' cooperation with Sabiha Gökçen Airport will continue to develop.
A model for 3 dependent variables was established to test the relevant variables determined by qualitative research and literature research. The effects of the independent variables in the model on the dependent variables were investigated by regression analysis and the results were obtained. Significance was questioned by adding a dummy variable related to cooperation and pandemic to the models.

It can be said that the cooperation between Pegasus Airlines and Adnan Menderes Airport operator has an impact on the number of passengers and aircraft traffic. Although the high landing fee at Sabiha Gökçen Airport does not provide an advantage in terms of cooperation, it does not adversely affect airline performance. The capacity constraints of the airport may adversely affect the performance. It can be said that the number of counters is insufficient at the cooperating airport and the number of passengers per counter is high, which negatively affects airline performance. It has been clearly demonstrated that the Covid-19 pandemic negatively affects airline performance. Qualitative research results support empirical analysis results. Concerning the number of flights and passengers referred to in the qualitative research findings, the results that cooperation improves airline performance agree with the empirical analysis. In addition, the reflections of capacity constraints were emphasized in both qualitative and empirical analysis. In the qualitative research, it was stated that there was no cooperation regarding landing fees. The fact that the high landing fees do not reduce the number of passengers has resulted in the high landing and accommodation fees for Sabiha Gökçen Airport.

With this study, it has been proven that airport-airline cooperation can have a positive effect on airline performance. The establishment of closer relations between airlines and airports will create advantageous situations for airlines. For this reason, it can be suggested that airline businesses should turn to vertical cooperation agreements as a new strategy at important flight destinations and airports with high flight density. For airlines operating in an intensely competitive environment, cooperating with airports with high flight densities can provide an important competitive advantage. Airport-airline collaborations can be used as an alternative to cost reduction strategies, especially needed by low-cost carriers.

Many airports in our country and in the world cannot be used for various reasons and remain idle. The fact that airports built with high investment costs remain idle is also considered as a public loss. Vertical collaborations can be suggested as a solution to this situation. Vertical cooperation between idle airports and airlines with growth potential can be a good model to improve the performance of airports and airlines in the long run. Especially at airports operated under public ownership, vertical cooperation of the airline company with the airport can be ensured with incentives that will create an advantage for the airline company. Thus, the airport and airline business can benefit from the cooperation with a win-win result. Within the scope of Public-Private Partnership, a vertical cooperation strategy can be encouraged, especially for the projects carried out by the State with the Build-Operate-Transfer model with a passenger guarantee, in cases where the target number of passengers cannot be reached.

In future studies, the effects of airport-airport vertical cooperation on airline performance can be tested with different variables and larger data sets. In addition, the effects of collaborations between central airports and traditional carriers, and vertical collaborations established by charter airlines on airline operating performance can be analyzed. The effects of vertical collaborations on airport performance, of which there are few examples in the literature, are also very suitable to be investigated.

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Appendix 1: Spearman Correlation Analysis Results

	LAPAS	LATRF	LDPAS	LDTRF	LPADE	LPDER	LPDES	LPPAS	LPSTY	LPTOC	LPTRF
LAPAS	1.0000										

LATRF	0.9868*	1.0000									
	94.200	-----									
	0.0000	-----									
LDPAS	0.7493	0.7552	1.0000								
	17.459	17.776	-----								
	0.0000	0.0000	-----								
LDTRF	0.7646	0.7887	0.9395*	1.0000							
	18.306	19.795	42.340	-----							
	0.0000	0.0000	0.0000	-----							
LPADE	-0.2794	-0.3329	-0.4110	-0.4112	1.0000						
	-4.4897	-5.4477	-6.9553	-6.9612	-----						
	0.0000	0.0000	0.0000	0.0000	-----						
LPDER	0.7991	0.8237	0.6727	0.7025	-0.3032	1.0000					
	20.510	22.417	14.026	15.230	-4.9090	-----					
	0.0000	0.0000	0.0000	0.0000	0.0000	-----					
LPDES	0.6982	0.7158	0.7700	0.7878	-0.5262	0.8421	1.0000				
	15.047	15.816	18.623	19.733	-9.5477	24.088	-----				
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-----				

LPPAS	0.6815	0.6670	0.7168	0.7605	-0.0987	0.7391	0.8423	1.0000			
	14.369	13.811	15.860	18.068	-1.5305	16.929	24.110	-----			
	0.0000	0.0000	0.0000	0.0000	0.1272	0.0000	0.0000	-----			
LPSTY	-0.2203	-0.2027	0.0370	0.1093	-0.1342	-0.0267	0.2754	0.2617	1.0000		
	-3.4853	-3.1949	0.5722	1.6968	-2.0907	-0.4132	4.4198	4.1833	-----		
	0.0006	0.0016	0.5677	0.0910	0.0376	0.6798	0.0000	0.0000	-----		
LPTOC	0.6392	0.6546	0.7215	0.7400	-0.4960	0.7343	0.8271	0.7222	0.3025	1.0000	
	12.823	13.360	16.078	16.977	-8.8138	16.692	22.704	16.111	4.8974	-----	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-----	
LPTRF	0.6950	0.6858	0.7119	0.7687	-0.122	0.7512	0.8525	0.9920*	0.2714	0.7296	1.0000
	14.914	14.537	15.641	18.545	-1.8976	17.558	25.162	121.41	4.3513	16.459	-----
	0.0000	0.0000	0.0000	0.0000	0.0590	0.0000	0.0000	0.0000	0.0000	0.0000	-----

Appendix 2: Variance Inflation Factor (VIF) Values

Variable	VIF Value	Variable	VIF Value
LPPAS	4203.25*	DLDPAS	2.26
LPADE	3027.11*	DLATRF	1.81
LPTRF	1643.81*	DLPTOC	1.68
LPDES	1624.13*	DLPPAS	1.23
LDTRF	1367.16*	DLPDES	1.01
LDPAS	557.04*	DLPDER	1.01
LATRF	542.26*		
LPTOC	403.99*		
LPDER	13.63*		
LPSTY	5.46		
PAGE	2.49		
Average VIF 1217.30		Average VIF 1.50	

**Indicates a multiple linear connection problem.*

Appendix 3: Horizontal Section Dependency Test Results

Panel Model Based				
Models	CD_{LM} (Breusch-Pagan, 1980)		LM_{adj} (Pesaran-Ullah-Yagamata, 2008)	
	Statistics	*Probability Value*	*Statistics*	*Probability Value*
Model 1	1.212	0.2709	0. 6137	0.5394
Model 2	5.66	0.0174	18.67	0.0000*
Model 3	83.29	0.0000*	333.8	0.0000*
By Variables				
Variables	Pesaran (2004)		Breusch-Pagan (1980)	
	CD Test	**Probability Value**	**CD_{LM}**	**Probability Value**
LOGPTPS	10.95385	0.0000*	119.9868	0.0000*
LOGRASK	10.95445	0.0000*	120.0000	0.0000*
LOGPLF	10.90897	0.0000*	119.0057	0.0000*
DLOGDPAS	-2.74929	0.0060*	7.558646	0.0060*
DLOGPTOC	0.020827	0.9834	0.000434	0.9834
DLOGPSTY	10.90871	0.0000*	119.0000	0.0000*
DLOGPDES	-0.07921	0.9369	0.0062	0.9369
DLOGPDER	0.128902	0.8974	0.0166	0.8974
DLOGPPAS	1.611991	0.1070	2.598516	0.1070
DLOGATRF	10.59806	0.0000*	112.3188	0.0000*

**Shows that the H_0 hypothesis is rejected at the 1% significance level*

***The H_0* hypothesis is rejected at the *5% significance level of the H_0 hypothesis*

****H_0 is rejected at the 10% significance level.*

Appendix 4: Homogeneity Test Results

Panel Model Based				
Models	*Delta*	*Probability Value*	*Corrected Delta*	*Adjusted Probability Value*
Model 1	5.689	0.000*	5.944	0.000*
Model 2	4.375	0.002*	4.571	0.001*
Model 3	-1.370	0.171	-1.431	0.152
By Series				
Series	*Delta*	*Probability Value*	*Corrected Delta*	*Adjusted Probability Value*
LOGPTPS	-1.731	0.083***	-1.769	0.077***
LOGRASK	-1.732	0.083***	-1.770	0.077***

LOGPLF	-1.688	0.091***	-1.725	0.085***
DLOGDPAS	-0.868	0.385	-0.887	0.375
DLOGPTOC	-1.716	0.086***	-1.754	0.079***
DLOGPPAS	-1.731	0.084***	-1.769	0.077***
DLOGPDES	-1.716	0.086***	-1.754	0.079***
DLOGPDER	-1.730	0.084***	-1.769	0.077***
DLOGATRF	-1.533	0.125	-1.567	0.117

**Shows that the H_0 hypothesis is rejected at the 1% significance level*

***The H_0* hypothesis is rejected at the *5% significance level of the H_0 hypothesis*

****H_0 is rejected at the 10% significance level.*

Appendix 5: First Generation Panel Unit Root Test Results (IPS, ADF, PP)

Series	IPS Lyrics			
	Constant		*Constant and Trending*	
	Statistics	*Probability Value*	*Statistics*	*Probability Value*
DLOGPTOC	-11.4667	0.0000*	-11.4805	0.0000*
DLOGPDER	-15.4571	0.0000*	-16.0802	0.0000*
DLOGPDES	-15.4133	0.0000*	-16.0604	0.0000*
DLOGPPAS	-7.46384	0.0000*	-7.79442	0.0000*
	Fisher ADF Lyrics			
	Statistics	*Probability Value*	*Statistics*	*Probability Value*
DLOGPTOC	85.8755	0.0000*	79.1490	0.0000*
DLOGPDER	139.223	0.0000*	129.933	0.0000*
DLOGPDES	138.855	0.0000*	129.790	0.0000*
DLOGPPAS	78.4132	0.0000*	-7.58442	0.0000*
	Fisher PP Lyrics			
	Statistics	*Probability Value*	*Statistics*	*Probability Value*
DLOGPTOC	134.105	0.0000*	124.816	0.0000*
DLOGPDER	139.226	0.0000*	130.028	0.0000*
DLOGPDES	138.860	0.0000*	129.838	0.0000*
DLOGPPAS	36.8414	0.0000*	36.8414	0.0000*

***Note**: When calculating the long-term consistent error variance in the specified tests, the Barlett method was used as the "Kernel" estimator and the bandwidth was selected according to the "bandwidth" Newey-West method. The delay length was taken as 4 and the optimal delay length was determined according to the Akaike information criterion.*

**Shows that the H_0 hypothesis is rejected at the 1% significance level*

***The H_0* hypothesis is rejected at the *5% significance level of the H_0 hypothesis*

****H_0 is rejected at the 10% significance level.*

Second Generation Panel Unit Root Test Results (Breitung and HT)

Seri			*Statistics*	*Probability Value*
DLOGDPAS	Breitung	lambda* (Fixed)	-13.2831	0.0000**
		lambda* (Constant and Trend)	-11.7430	0.0000**
	Harris-Tzavalis	rho* (Sabit)	-0.4596	0.0000**
		rho* (Constant and Trend)	-0.4632	0.0000**
DLOGATRF	Breitung	lambda* (Fixed)	-10.9206	0.0000**
		lambda* (Constant and Trend)	-10.6138	0.0000**
	Harris-Tzavalis	rho* (Sabit)	-0.0199	0.0000**
		rho* (Constant and Trend)	-0.019	0.0000**

* Lambda and rho are resistant to cross-sectional correlation.

***Shows that the H_0 hypothesis is rejected at the 1% significance level*

**** the H_0* hypothesis is rejected at the *5% significance level*

*****H_0 hypothesis is rejected at the 10% significance level.*

Second Generation Panel Unit Root Test Results (CADF)

Series		*t statistics*	*Probability Values*
LOGPTPS	Constant	-3.927	0.0000*
	Constant and Trending	-4.160	0.0010*
LOGRASK	Constant	-3.136	0.017**
	Constant and Trending	-3.157	0.087***
LOGPLF	Constant	-6.190	0.0000*
	Constant and Trending	-6.420	0.0000*

***Note: Critical values** are taken from Pesaran (2007), Critical values table. For the fixed model, 1% significance level was -2.92, 5% significance level was -3.24 and 10% significance level was -3.88. In the fixed and trendy model, it is -3.41, -3.72 and -4.35, respectively.*

**H_0 is rejected at the level of 1% significance*

*** at the level of 5% significance*

**** at the level of 10% significance.*

Appendix 6: Appropriate Model Selection Test Results

Model 1		
Test	**Test Result**	**Decision**
F Texts	Prob > F = 0.8507 R^2= 0.6901	H_0 Irrefutable
Hausman Lyrics	Prob>chi2 = 1.0000	H_0 Irrefutable
Breuch-Pagan LM Test	Prob > chibar2 = 1.0000	H_0 Irrefutable
Model 2		
Test	**Test Result**	**Decision**
F Texts	Prob > F = 0.9896 R^2= 0.6143	H_0 Irrefutable
Hausman Lyrics	Prob>chi2 = 1.0000	H_0 Irrefutable
Breuch-Pagan LM Test	Prob > chibar2 = 1.0000	H_0 Irrefutable
Model 3		
Test	**Test Result**	**Decision**
F Texts	Prob > F = 0.8468 R^2= 0.1733	H_0 Irrefutable
Hausman Lyrics	Prob>chi2 = 1.0000	H_0 Irrefutable
Breuch-Pagan LM Test	Prob > chibar2 = 1.0000	H_0 Irrefutable

Appendix 7: Deviations from Assumption Test Results

Varying Variance Test Results		
	Model 1	
	chi2(1)	**Prob**
Breusch-Pagan/ Cook-Weisberg Testi	101.82	0.0000*
White Testi	125.32	0.0000*
	Model 2	
	chi2(1)	**Prob**
Breusch-Pagan/ Cook-Weisberg Testi	3167.99	0.0000*
White Testi	237.99	0.0000*
	Model 3	
	chi2(1)	**Prob**
Breusch-Pagan/ Cook-Weisberg Testi	101.82	0.0000*
White Testi	168.07	0.0000*

**H*$_0$ *is rejected at the level of 1% significance*

*** at the level of 5% significance*

**** at the level of 10% significance.*

Autocorrelation Test Results

Autocorrelation Test Results	
Model 1	
F(1, 1)	**Prob**
204.500	0.0444***
Model 2	
F(1, 1)	**Prob**
101.756	0.0629***
Model 3	
F(1, 1)	**Prob**
204.500	0.0444**

**H_0 is rejected at the level of 1% significance*

*** at the level of 5% significance*

**** at the level of 10% significance.*