

Examining the impact of cargo and ancillary revenues on net profit for full service carrier airlines

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ABSTRACT

In this study, the relationships between cargo revenues, ancillary revenues and net profitability of airline companies were examined in the examples of three full-service airline companies (Turkish Airlines, American Airlines, Delta Air Lines). Methodologically, a logarithmic econometric model was used in which cargo revenues and ancillary revenues were included as independent variables and net profit as the dependent variables. The data used for the period 2014Q1-2019Q4 were collected from the annual reports on the official websites of related airline companies and The International Air Transport Association (IATA). EViews 10 and STATA-15 versions, which are the most modern econometric analysis programs that can be used to control the stationarity, were used in the analysis of the data. In addition to econometric analyzes and general statistics, Cross Section dependency tests, CADF second-generation unit root tests, Delta slope homogeneity tests, Panel cointegration analysis, Westerlund Panel cointegration tests and Dumitrescu Hurlin Panel Causality tests and Breusch Pagan LM Tests were also performed. The study revealed that there is cointegration between cargo revenues, ancillary revenues and net profit, and there is a one-way causality relationship from both cargo revenues to net profit and from ancillary revenues to net profit. The study also indicated a positive correlation between cargo revenues and ancillary revenues and net profit. In other words, cargo revenues and ancillary revenues have a positive effect on the net profit of airline companies. In addition, the study found that aviation ancillary revenues provide an important resource for airline companies; furthermore, two US companies are among the top three companies with the highest revenues in the world in terms of cargo and ancillary revenues; also showed that Turkish Airlines' ancillary revenues are lower than those of these two US companies. On the other hand, the study showed that the contribution of Turkish Airlines cargo revenues to net profit is much higher than the other two companies.

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Introduction

The aviation industry is a sector with low profitability despite high investment costs and risks, which are quickly affected by increasing competition, economic, political and natural events. Airline companies have had to manage their capacities better and generate new revenues due to low profitability rates, high risk and increasing competition conditions. Even though the most important source of income for companies is undoubtedly passenger revenues, cargo revenues and ancillary revenues have become more important for airline companies. In other words, in order for airline companies to survive today in tight competition conditions, it is important that they gain ancillary revenues in addition to their main income.

In addition to all these, the coronavirus epidemic in the past period was another negative development that was very destructive for the aviation industry, threatening the survival and sustainability of airlines. The developments observed in the aviation industry in this period (recession, restrictive movements, weak tourism, limited income, large losses due to suspended operations, compressed commercial activities, fear psychosis reducing passenger demand from 30% to 60%) increased the commercial viability of the airlines' operation and ancillary revenues. increased its importance (Agrawal, 2021).

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Cargo revenues and other ancillary revenues constitute an important source of income for airline companies. For this reason, airline companies use revenue management systems in order to manage their revenues and capacities more accurately. Ancillary revenues, one of the revenue items of airline companies, are managed through revenue management systems to increase profitability. Revenue management aims to increase revenues and competitiveness by using Cargo and ancillary revenues correctly.

As a result of the sale of products and services offered free of charge to passengers by companies applying the traditional airline business model for a separate fee in order to increase the revenues of the companies applying the low-cost / low-cost airline business model, ancillary revenues have occurred. Sources of ancillary revenues are what airline companies offer to their passengers other than the tickets they have sold, services such as in-flight catering, baggage fees, loyalty programs, seat fees, advertising revenues, commission revenues and in-flight entertainment systems. In line with this, to reveal the relationships between cargo revenues, ancillary revenues and net profit of the airline companies is a must for right decision-making process.

In this study, the relationships between cargo revenues, ancillary revenues and net profitability of airline companies for the period 2014Q1-2019Q4 will be examined in the examples of three full-service airline companies (Turkish Airlines, American Airlines, Delta Air Lines). It is thought that there may be a direct relationship between the ancillary revenues and cargo revenues and the profitability of the airline companies. In addition, the fact that these two types of revenues can contribute to the passenger revenues, which is the main factor on the profitability of the airline companies, and thus affect the net profit of the company indirectly, is an issue that needs to be researched. So, in this study the objectives were determined as:

- i. To reveal the short-term relationships between ancillary revenues, cargo revenues and airline companies' net profit, to see if these variables are the cause of each other, in the examples of three full-service airline companies (Turkish Airlines, American Airlines, Delta Air Lines).
- ii. To reveal the long-term relationships between ancillary revenues, cargo revenues and airline companies' net profit, to see if these variables move together in the long term.

As far as it is known, there is no direct empirical study addressing the effects of cargo revenues and ancillary revenues on net profit for airlines. The study is considered to be a first in its subjects in this context. Methodologically, a logarithmic econometric model will be used in which cargo revenues and ancillary revenues are included as independent variables and net profit as dependent variable. The data used will be collected from the annual reports on the official websites of related airline companies and The International Air Transport Association (IATA) and Sorensen & Lucas (2020). EViews 10 and STATA-15 versions, which are the most modern econometric analysis programs that can be used to control the stationarity, will be used in the analysis of the data. In addition to econometric analyzes and general statistics, Cross Section dependency tests, CADF second generation unit root tests, Delta slope homogeneity tests, Panel cointegration analysis, Westerlund Panel cointegration tests and Dumitrescu Hurlin Panel Causality tests and Breusch Pagan LM Tests will also be performed.

The text of the study consists of 5 parts in terms of organization. In the first section, basic concepts and theoretical background was made broadly. In addition to ancillary revenues, cargo revenues and conceptual background, related studies were examined. The second section covers definition of civil aviation and the sectors of civil aviation both in the world and Turkey. Section three of the study focuses on business models, revenue management, ancillary revenues and cargo revenues in civil aviation sector. Fourth section was determined as the research methodology and analysis part. In this part, the relationships between cargo revenues, ancillary revenues and net profit of the airline companies for the period of 2014Q1-2019Q4 for three full-service carrier airline companies: Turkish Airlines, American Airlines and Delta Air Lines were examined with econometric models and tests, in connection with an application. The last section ends with the conclusion of the study, the recommendations and references list.

Literature Review

Conceptual and Theoretical Background

Ancillary Revenues and Conceptual Background

In addition to all these, the coronavirus epidemic in the past period was another negative development that was very destructive for the aviation industry, threatening the survival and sustainability of airlines. The developments observed in the aviation industry in this period (recession, restrictive movements, weak tourism, limited income, large losses due to suspended operations, compressed commercial activities, fear psychosis reducing passenger demand from 30% to 60%) increased the commercial viability of the airlines' operation and ancillary revenues. increased its importance.

Revenue management, in its most basic form, focuses managers on more careful observation of customers' purchasing behavior and regulating price and product availability to generate higher revenue. Revenue management is a disciplined process that enables companies to use large amounts of customer data to dynamically predict customer behavior at the micro-market level, with the support of information technologies. In any case, the goal of revenue management is to sell the right product to the right customer at the right price at the right time, and thus maximize revenue from a company's products (Cross, 2011). Revenue Management is the management of selling goods and services at a pre-determined price to customers in different service sectors (Emeksiz and Akođlan, 2002).

Revenue Management has an important place in airline and hotel businesses due to the development of the capacity limit encountered in the service sector. It is a form of management that includes not only the airline and hotel industry, but also the rail passenger transport sector, the car rental sector, the health sector, the communication sector, the transportation sector, and the television advertising sector. Revenue management has the following benefits not only in the service sector, but also in many other sectors: Provides forward date pricing, reservations can be kept, prices are known to customers, creates competition in the market, causes to be preferred by consumers, provide costs decrease, annual profit increases, saves time, provide opportunity to check and control the capacity (Gürel and Kayar, 2016).

As an important contribution to the literature, integration of short-term and long-term revenue management models have also been examined and introduced to readers by Dongling (2010).

Ancillary revenue is defined as the income earned as part of the travel experience through sales made to passengers directly or indirectly before, during or after the trip (Atik, 2019). With the emergence of ancillary revenue concept, airline companies had adopted the idea of selling each service or product piece by piece. Later, these services and products that would create added value were developed and diversified and started to be sold in packages. For example, Germanwings, the low-cost model brand of Lufthansa Airlines, put up for sale ancillary packages by grouping them as silver, gold and platinum. It has developed many different innovative methods in ancillary revenue applications. Apart from the classic services such as buying food, drinks, choosing the seat, extra baggage allowance sale, sale of especially flight related products from the website, trip flex (the right to have all kinds of hours, cancellations, refunds and routing up to the last minute in all ticket classes) applications, in-flight and off-air advertisements, baggage handling, and even extraordinary services such as renting for weddings to couples who want to get married during idle times are offered by airlines to provide ancillary revenue (Baran, 2014).

Ancillary revenues account for more than 40% of the total revenue for airlines like Spirit, VivaAerobus, and Frontier (Zhou, et al., 2020).

Airline companies that want to establish long relationships with their passengers and provide services not only during the flight but also outside the flight are trying to achieve their goals with frequent flyer programs (loyalty system) and mil-credit cards (Bockelie and Belobaba, 2017).

Cargo Revenues and Conceptual Background

Air cargo is defined as the transportation of any goods from one place to another by aircraft (Allaz, 1998). The term air cargo is broadly defined to include air freight. All cargo, except for the passenger baggage carried in the cargo compartment, is the subject of air cargo (O'Connor, 2000).

Air cargo transportation, on the other hand, is defined as packaging, labeling the goods other than mail and luggage, preparing the documents properly and shipping them by an aircraft, especially considering the country and carrier restrictions, depending on ICAO and IATA rules (Öztürk, 1993).

With the development of the global integration process and the rapid growth of international trade, air cargo has gained particular importance as it offers significant development opportunities (Jia, 2021).

The air cargo sector plays an important role in the increasing world trade. The volume of the air cargo market has increased by 2 times every 10 years since 1970 (Changa, et al., 2007). Recently, the efforts of businesses to reduce storage costs, their desire to shorten the time of movement of their goods in the market, and the short life span of products in many industries (computers, medical products) have revealed the importance of the concept of speed. The spread of e-commerce and the provision of logistics solutions have increased the competitiveness of businesses that want to do business on a global scale, so the demand for international goods has increased and air cargo transportation has come to the fore for an effective commercial order (Zhang and Zhang, 2002).

Air cargo transportation itself is considered to be a large sector in itself. It also has a structure that provides input to the production processes of other sectors (Hensher, 2001). Airline passenger transport companies allow passengers to carry a certain amount of cargo in addition to their tickets. Additional fees are charged for loads above the specified amount. These revenues constitute an ancillary income item for airline companies. In addition, cargo loads are carried independently of the passengers on passenger planes. In this way, airline companies earn cargo income in addition to their basic income (CAPA,2020).

In order to further increase and improve the positive impact and contribution of airline companies to revenue management, air cargo has recently been the subject of new forecasting models based on various parameters such as cargo order volume, profit coefficient, total revenue, efficiency of cargo revenue and so on (Jia, 2021).

Studies on Ancillary and Cargo Revenues in Aviation

O'Connell and Warnock-Smith (2013) examined passengers' attitudes towards ancillary products. In this context, a questionnaire was applied to the passengers and the field experts were interviewed. As a result of the study, it was determined that the airport parking lot and registered baggage fees were the most popular and accepted commission-based and unpackaged products for airline companies to sell.

Kılıç (2019) examined the data of 25 airline companies that carry out flight activities in different regions of the world and who disclose their ancillary revenues and their total revenues between 2010 and 2018. The researcher used trend analysis / trend percentage analysis method to examine the data. According to the results of the study, the researcher found that 23 of the 25 airline companies operating with different business model applications have increased their ancillary revenues. It has been found that increase in the ancillary revenues of companies applying different business models is an indication that ancillary revenue is an important revenue item for all airlines, regardless of business model.

Akpınar (2019) examined airline ancillary services in order to create an ancillary service management strategy in low-cost airlines. Data obtained from 17 airline employees who are experts in their fields were extracted and analyzed after each round in the three-round Delphi technique application. As a result of the research, it was observed that the sale of ticket changes right, ticket return right and excess baggage right were the most effective in-house ancillary services in airline selection, while airport transfer and private passenger lounges were the most effective third-party ancillary services. It has been determined that the passengers will consent to the easiest ticket change from the in-house ancillary services, and they will be willing to pay a fee for the easiest airport transfer and parking services from the third-party ancillary services. It has been observed that the sale of excess baggage allowance by the airline is the most important in-house ancillary service, while the sale of car rental and private passenger lounges are the most important ancillary services. While the most suitable in-house ancillary service to be sold with the package was seat sales, the third-party ancillary services were airport transfer. It has been observed that seat selection rights and in-flight entertainment system services are in-house ancillary services that passengers can purchase to increase their travel experience, even if they do not need them, while private passenger lounges and fast passage rights are third party ancillary services.

Atik (2019) aimed to reveal the effect that ancillary income practices of airlines adopting a low-cost business model have on their financial performance. In this study, the researcher has selected the OLS method to show the effect of side income practices of the airline company adopting the Low Cost Transportation Business Model on its financial performance. Only two of the activities of the airline companies in Turkey (Turkish Airlines, Pegasus) should be made public and that the two airlines is the only one (Pegasus) reducing the low-cost business model to adopt the data sets limits the number of methods that can be selected. As a result, it has been determined that the increase in occupancy rate positively affects the EBITDA (Earnings Before Interests, Taxes, Depreciation and Amortization) margin, while the increase in CASK (Cost of Available Seat Kilometer), which represents the cost per seat, negatively affects the EBITDA margin. However, it has been determined that diversifying the income sources of the airline company in question and concentrating more on ancillary revenues reduces financial performance.

Dongling (2010) studied air cargo RM (Revenue management) problems in spot market and long-term market. First, he considered a single-leg air cargo booking control problem on the spot market. The booking process was modeled as a discrete-time Markov chain and the airline's decision on accepting/rejecting booking request was based on a bid-price control policy. To avoid the complexity of high dimensionality, the bid prices were derived from maximizing a reward function of the Markov chain. Numerical experiments showed that the proposed model outperformed two existing booking control policies. Second, he studied the capacity allocation problem in long-term market, in which one airline served forwarders. He proposed a capacity bundling policy (CBP) to mitigate the negative impact of seasonal imbalance between supply and demand, and model the problem as a Stackelberg game. Numerical experiments showed that CBP could increase the airline's expected profit and reduce the risk under certain conditions. Last, he integrated the above two models and proposed a conceptual framework for an air cargo RM system.

Hao (2014) found that airlines had increasingly depended on ancillary revenue in response to rising fuel costs, decreased yields, and an increasingly competitive environment in his study. He mentioned it was estimated that U.S. airlines collected over \$8 billion in ancillary revenue in 2012 and ancillary revenue posed challenges for airlines, including revenue management (RM) and distribution since total revenue maximization required consideration of ancillary revenue and ticket revenue.

Smith, O'Connell and Maleki (2017) indicated that airline ancillary revenues had increased by 121% from 2010 to 2014 – and the trend was set to continue as carriers were quickly implementing structural changes to accommodate these revenues streams globally. They examined the performance of the two core classifications of ancillary revenues, which were unbundled products and commission-based income. They also investigated the willingness of passengers to pay (WTP) for those services together with what type of ancillary items were acceptable at a particular price point. They found that passengers valued a narrow range of perceived 'necessity' products and services such as food and drink, checked baggage and seat assignment as opposed to perceived 'optional' unbundled or commission-based products/services. They also found significant differences in WTP for specific ancillary services based on carrier type (FSC/LCC/Charter), length of flight (long and short haul) and journey purpose (business, leisure, VFR).

Bockelie (2019) developed models with a goal of providing a better understanding of how ancillary services affect the airline industry in his study. He tested his models using PODS (Passenger Origin-Destination Simulator) in a wide range of scenarios. In a network with competing airlines and hundreds of flights, his heuristics could increase total revenue by 2-3%. A consistent trend throughout his simulations was that the forecasting and optimization model that maximized total revenue was often not the model that maximized ancillary revenue, because models that maximized ancillary revenue often did so to the detriment of ticket revenue.

Another study (Zhou, et al., 2020) focused on one of the airline ancillary services, namely, paying extra to choose economy class seats. A method combining individual interviews and an online survey was used to explore factors influencing Chinese air consumers'

willingness to pay for economy class seat selection (ECSS). It was revealed that length of trip, seat comfort and convenience, payment and consumption situations have a significant impact on Chinese airline consumers' willingness to pay for ECSS.

In the survey conducted by Çetiner et al. (2019) with 160 airline managers and 188 airline passengers in 24 different countries, they stated that managers and passengers should use different ancillary revenue providing methods in different business models.

In the study of Bockelie and Belobaba (2017) it was revealed that airline companies that want to establish long relationships with their passengers and provide services not only during the flight but also outside the flight are trying to achieve their goals with frequent flyer programs (loyalty system) and mil-credit cards.

In a study by Okan and Aksoy (2022), the perception of Turkish Airlines Technic staff about the effect of proactive maintenance scheduling (PMS) on maintenance costs (MCs) and airline profitability (AP) was examined. In addition, it was also investigated whether there was a change in personnel perception according to the demographic characteristics and experience of the personnel. Methodologically, it was used a quantitative survey with a sample of 133 staff. Staff has been chosen among departments that takes place actively/directly in maintenance. The data were collected by online survey method and analyzed with SPSS-22. It was concluded that there is a strong correlation between PMS and the MCs. The study proved that PMS has a great decreasing effect on MCs and a great increasing effect on AP. The study also revealed that THYT personnel is like-minded that PMS reduces MCs and increases AP as well.

In another study (Abdi, et al. 2022) based on the collected data from 38 airlines worldwide for the period 2009 to 2019, it was revealed that contributions to governance initiatives improve a civil aviation firm's market-to-book ratio. It was also found that a firm's participation in social and environmental activities is positively and significantly rewarded by a higher level of financial efficiency in the airline industry.

In another study by Bachwich and Wittman (2017), it was revealed that airline companies operating with the low-cost model increased their ancillary income while reducing their ticket prices. It was pointed out that appealing to more customer segments together with the decrease in ticket prices increases the amount of per capita income. For this reason, it has indicated that low-cost airlines try to compensate for the loss in ticket prices with services and products that create ancillary income.

Civil Aviation Sector

Definition of Civil Aviation

The definition and classification of civil aviation activities has not been fully clarified and there is no consensus (Kaya, 2000). The International Civil Aviation Organization, which sets the necessary standards and makes definitions and classifications in order to ensure safe and effective conduct of civil aviation activities, cannot provide sufficient information on this issue. From this point of view, firstly the concept of "civil aviation" should be defined. Aviation covers activities that are directly or indirectly related to flying aircraft that are lighter than air or heavier in the sky. Civil aviation, on the other hand, includes all aviation activities performed without a military purpose (Gerede, 2006).

Civil aviation has an important characteristic structure in which advanced technology is used, intense competition is experienced, especially globally and economically, and it is one of the sectors that attracts the most attention among today's transportation types (Hine, 2000). Even if the definition and classification has not been made, ICAO specifies the scope of civil aviation activities as follows (Saldıraner, 1992).

- i. Aircraft manufacturing, maintenance and repair activities,
- ii. Operational activities with aircraft,
- iii. Construction and operation activities of airports,
- iv. Communication, navigation and air traffic services regulation and operating activities,
- v. Meteorological activities for aviators,
- vi. Environmental protection activities.

Developments in the field of civil aviation also show the change in passengers' preferences. It is seen that the passenger who chooses transportation with the airline company takes into account the factors of choosing a safe means of transportation, well-educated staff service, saving time, making use of technology as he/she wishes, allowing many alternatives related to his destination and reducing costs (Dincer et al., 2017; Sencer and Gürkan, 2009).

World Civil Aviation Sector

The civil aviation sector statistics for 2018 published by the International Air Transport Association (IATA) reveal how large the civil aviation industry is. The highlights within the scope of subject statistics are as follows (IATA, 2019a):

- i. As of 2018, the total number of passengers traveling by plane is 4.4 billion. When each flight is evaluated separately (if a passenger is included in more than one flight with a connecting flight), this number is 8.8 billion people. Compared to 2017, there was an increase of 6.9% in the number of passengers.

- ii. Airlines based in the Asia-Pacific region carried the highest number of passengers with 37.1% in 2018. This ratio is followed by European origin airlines with 26.2% and American origin airlines with 22.6%.
- iii. In 2018, savings of 12% were achieved in fuel consumption.
- iv. In 2018, 22,000 cities around the world were connected to each other by direct flights. Compared to 2017, the number of cities connected by direct flights has increased by 1,300.

It is seen that the individuals who travel the most are British, USA, China, Germany and France citizens respectively. Another important statistic that stands out in the 2018 data on the civil aviation sector is related to the largest airline companies determined under the passenger-kilometer criterion. These companies are as follows (IATA, 2019a):

- i. American Airlines (330.6 billion US dollars)
- ii. Delta Air Lines (330 Billion US dollars)
- iii. United Air Lines (329.6 Billion US dollars)
- iv. Emirates (302.3 Billion US dollars)
- v. Southwest Airlines (214.6 Billion US dollars).

Within the scope of 2018 statistics regarding the civil aviation sector, the busiest airports were also determined within the scope of international and domestic flight classification (IATA, 2019a).

Table 1: Busiest Airport According to Domestic and International Flights

Flight Type	Airport	Passengers (million)
International Flights	Hong Kong – Taipei Taoyuan	5,4
	Bangkok Suvarnabhumi – Hong Kong	3,4
	Jakarta Soekarno-Hatta – Singapore Changi	3,2
	Seoul Incheon – Osaka Kansai	2,9
	Kuala Lumpur – Singapore Changi	2,8
Domestic Flights	Jeju – Saoul Gimpo	14,5
	Fukuoka – Tokyo Haneda	7,6
	Melbourne – Sydney	7,6
	Sapporo – Tokyo Haneda	7,3
	Pekin Capital – Shanghai	6,4

Source: IATA, 2019.

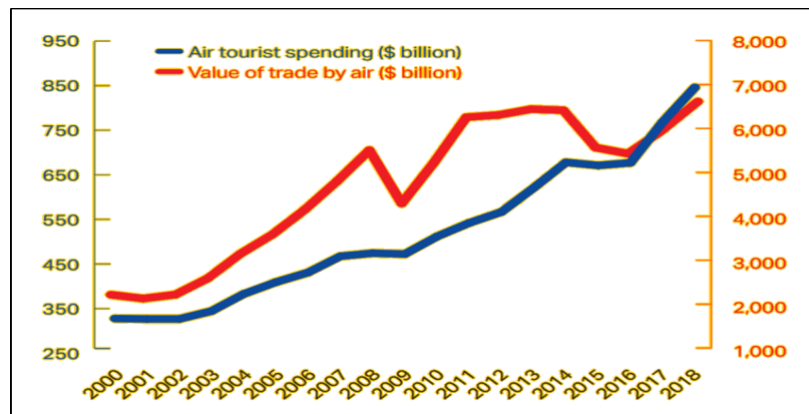


Figure 1: Air tourist spending and value of trade carried by air; Source: IATA, 2019b.

The figure above shows that the spending levels of airline users have increased dramatically in the last 20 years. In this context, while the spending levels of the passengers are approaching 0.85 trillion USD, the commercial capacity of the total airline transportation approaches 7 trillion USD. This proves that the airline industry has shown a significant improvement in the last 20 years. (IATA, 2019b)

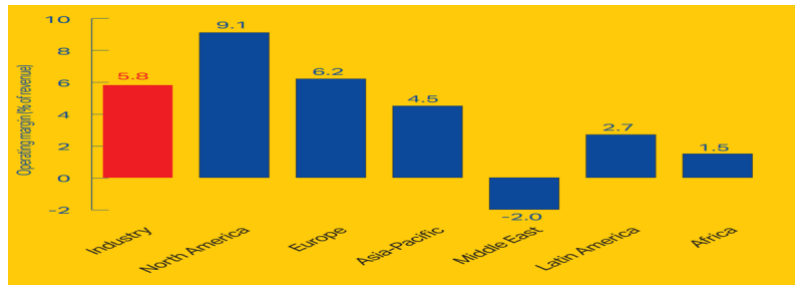


Figure 2: Regional profit performance; *Source:* IATA, 2019b.

Considering the regional profitability rates, it is seen that the highest profitability is achieved in the North America region. On the other hand, while profitability is observed in Europe, Asia-Pacific, Latin America and Africa regions, loss is observed in the Middle East region (IATA, 2019b).

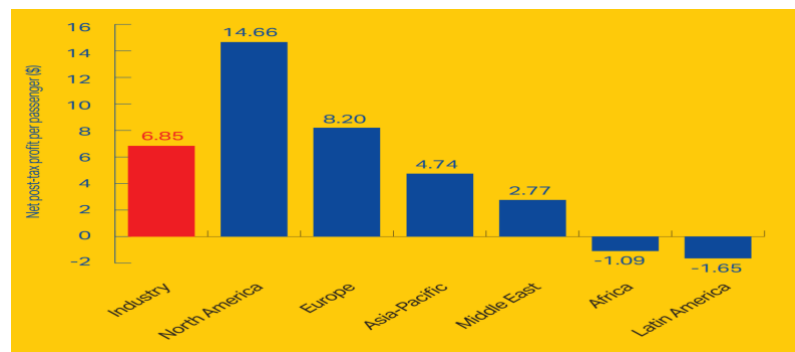


Figure 3: Airline profitability per passenger; *Source:* IATA, 2019b.

As seen in the figure above, the profitability level per passenger in the world airline industry is approximately 7 USD. In terms of profitability per passenger, the North America region is seen to be the most profitable region with around US \$ 15. Profitability per passenger is also observed in Europe, the Asia-Pacific and the Middle East regions. On the other hand, loss is observed in the African and Latin American regions. Although profitability per passenger is not provided in Africa and Latin America, it is understood from the figures that the sector is making a profit in total (IATA, 2019b).

Civil Aviation Sector in Turkey

Turkey, in the field of civil aviation in the world with growth shown last 17 years and particularly in our region is making a significant contribution to the development of civil aviation. In many reports published by international aviation organizations, it is seen that our country has developed in recent years and has been in the top ranks in the world aviation industry. According to the ICAO 2018 Year-End Report, Turkey has the following ranks in the World (Directorate General Civil Aviation, 2020):

- i. 12th in the RPK (Revenue Passenger Kilometers) ranking,
- ii. 10th in RTK (Revenue-Tonne Kilometers) ranking,
- iii. 11th in the FTK (Freight-Tonne Kilometer) ranking.

According to the International Airports Council (ACI) 2019 European Air Traffic Report, Istanbul Airport increased the number of passengers by 0.2% compared to the previous year and was among the five largest airports in Europe with 68.5 million passengers. According to the same report, Antalya Airport ranked 2nd in the category of airports with an annual passenger number of over 25 million, increasing the number of passengers by 12.8% compared to the previous period (ACI EUROPE, 2020).

According to the 2019 Airports Council International (ACI) Airport Connection Report, Turkey, has been ranked 5th in Europe in terms of number of connections (direct, indirect, airport and center (hub)) as seen in the table below. In 2019, it increased its direct connections by 2.5%, indirect connections by 13.7%, airport connections by 8.1% and center connections by 18.1%. Turkey has become the country that has developed the most direct and indirect aviation connections with new routes and new points added to its flight network in the period between 2009-2019. The Directorate General of Civil Aviation has held more than 500 bilateral aviation negotiations in 17 years. Travel increases and new flight points provided by these negotiations have become operational.

As a result, Turkey has risen to a position with 328 points and airline connections in 126 countries as of end 2019. Turkey has developed direct connections by 159.9%, indirect connections by 144.5%, airport connections by 151.5% and hub connections by 386% in the last decade (Directorate General of Civil Aviation, 2020).

Table 2: Number of Connections and Growth Rates by Airports

Code	Airport	2019		2013-2019 Growth			2014-2019 Growth			2009-2019 Growth			
		Direct	Indirect	Airport	Direct	Indirect	Airport	Direct	Indirect	Airport	Direct	Indirect	Airport
FRA	Frankfurt	5,098	14,145	19,243	0.0%	1.5%	1.1%	10.1%	3M%	4.8%	13.3%	25.6%	22.1%
AMS	Amsterdam	4,870	11,962	16,832	0.2%	5.1%	3.7%	16.8%	19.6%	18.8%	30.3%	33.9%	32.8%
CDG	Paris Charles de Gaulle	4,760	15,710	20,469	3.2%	4.4%	4.1%	6.4%	16.2%	13.8%	-0.3%	39.7%	27.7%
LHR	London Heathrow	4,682	21,244	25,925	0.3%	2.7%	2.3%	-0.7%	21.0%	16.4%	0.8%	49.8%	37.7%
IST	Istanbul	4,474	5,755	10,229	3.6%	11.3%	7.8%	12.6%	6.7%	9.2%	89.6%	70.4%	78.3%
MUC	Munich	4,051	10,735	14,786	-1.6%	12.8%	8.4%	15.1%	24.7%	21.9%	7.3%	69.3%	46.2%
MAD	Madrid-Barajas	3,977	8,999	12,976	4.2%	6.2%	5.6%	24.5%	24.2%	24.3%	-4.9%	50.6%	27.7%
SVO	Sheremetyevo International Airport	3,740	3,318	7,058	17.1%	-1.6%	7.5%	61.5%	36.0%	48.4%	178.2%	74.0%	117.1%
BCN	Barcelona-El Prat	3,453	7,768	11,221	1.9%	5.5%	4.4%	21.2%	35.5%	30.7%	24.5%	52.8%	42.8%
FCC	Rome Fiumicino	3,289	8,288	11,577	2.6%	2.3%	2.4%	1.0%	25.0%	17.1%	4.6%	43.1%	29.5%
LGW	London Gatwick	2,961	1,721	4,683	0.4%	-1.1%	-0.1%	10.1%	60.7%	24.5%	23.6%	37.1%	28.2%
VIE	Vienna	2,754	6,233	8,987	13.8%	7.8%	9.6%	16.4%	36.9%	29.9%	15.2%	70.2%	48.5%
CPH	Copenhagen	2,630	6,179	8,809	-2.3%	-1.0%	-1.4%	8.4%	12.0%	10.9%	16.2%	40.7%	32.4%
PMI	Palma de Mallorca	2,624	2,058	4,682	3.9%	12.2%	7.4%	33.6%	94.7%	55.0%	45.5%	218.1%	91.1%

Source: Directorate General Civil Aviation, 2020.

According to the Connection Report, Istanbul has increased its direct connections by 3.6%, its indirect connections by 11.3% and its airport connections by 7.8% in the last year. In the last 10 years, it has improved its direct connections by 89.6%, indirect connections by 70.4% and airport connections by 78.3%. Istanbul Airport, which is among the top 20 airports in the world according to its center (hub) connection, has grown by 16.9% in 2019 compared to the previous year. It ranks 21st in 2009, and 6th in 2019. Istanbul Airport, which is among the 20 airports that developed the center connection the most, is in the 9th place with a growth of 353% in the last 10 years (Directorate General Civil Aviation, 2020).

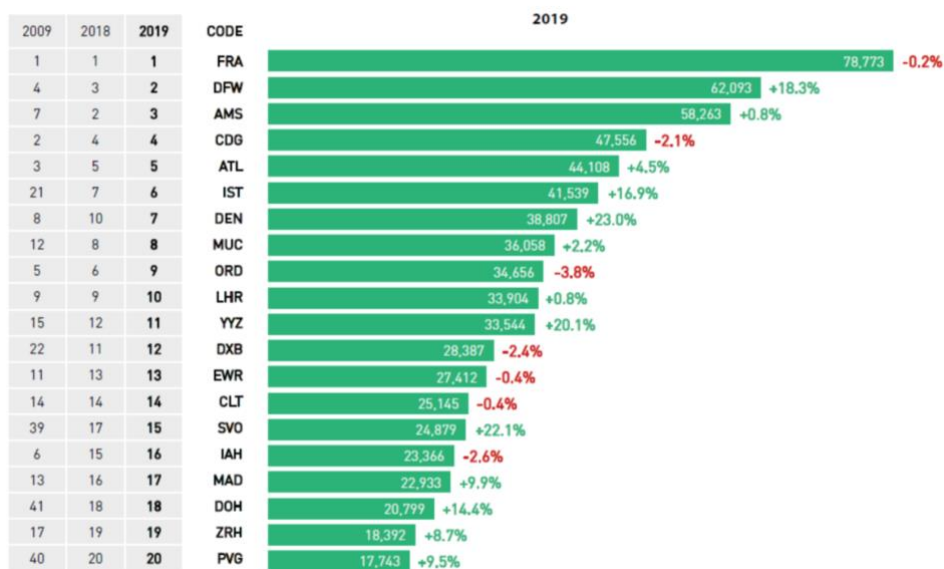


Figure 4: Top 20 Airports in the World by Center Connection (2009-2018-2019); Source: Directorate General Civil Aviation, 2020.

Business Models, Revenue Management and Ancillary Revenues in Aviation

Business Models in Aviation

In the digital age we live in, a wide variety of changes, new trends, developments, models, approaches and strategies have a profound and multidimensional impact on all strategic business functions and activities, including the business ecosystem (Dincer et al., 2016; Hacıoglu and Sevgilioglu, 2019; Aksoy and Hacıoglu, 2021).

Parallel to the great increase in competition, the importance of these new models, approaches and strategies, which stand out in all areas of the business ecosystem, in ensuring sustainability and increasing financial performance/profitability has increased tremendously (Hacıoglu and Aksoy, 2021).

In the civil aviation sector, which is one of the important components of the business ecosystem, airline business model is defined as the way resources are structured differently to reach the target audience (Holloway, 2012).

Until the 1970s, there was no concept such as business models in airlines that were completely under state control. In 1978, as a result of the deregulation in the domestic lines of the United States, the trend of liberalization and getting rid of the state monopoly started in the sector. State-owned airlines, whose monopoly positions were weakened as a result of the liberalization trend, had to struggle with their rivals in the private sector (Ozel & Hacıoglu, 2021).

As a result of increasing competition, airlines that want to regain their market shares and airlines aiming to get new shares from the sector have tended to break many taboos that have been accepted over the years. The airlines that go to revision and differentiation from the airports used to the in-flight catering point have started to differ from each other in the axis of value and experience offered to the passenger. As a result of this differentiation, new airline business models have started to emerge (Önen, 2016).

Airline business models have developed over time in the competitive environment that Michael Porter has specified in the competitive strategy model. Michale Porter defines the model as "Generic Competition Strategies", is seen to come to life in the axis of the tendency of businesses to develop positions against five basic forces, which are customers, existing competitors, new investors, replacement goods manufacturers and suppliers. It is an undeniable fact that Generic Competition Strategies, which are examined under three headings as Cost Leadership Strategy, Differentiation Strategy and Focusing Strategy, are used in creating new airline business models. (Porter, 1980)

Although Porter emphasizes that businesses should use only one of these strategies to achieve success, it appears that some airlines use more than one Generic Competition Strategy at the same time. (Johnson et al., 2014).

In this context, in this part of the study, airline business models will be examined under the headings of low-cost carriers, hybrid carriers and full-service carriers (conventional carriers).

Low-Cost Carriers

Low-Cost Carriers are airline companies that can offer services at cheaper prices by giving up some of the services adopted by traditional airline companies in order to reduce their costs. Among the reasons for the difference in cost with traditional airlines, it is shown that they use direct distribution channels, they generally have a uniform fleet and get high efficiency from this fleet (Hanlon, 2007). As the unit cost decreases when the number of seats increases, low-cost carriers ignore comfort in the cabin configuration and prefer a dense seat arrangement with a shorter knee distance. It is known that having a uniform fleet reduces the training costs of flight and technical personnel and reduces the number of ground support equipment and spare parts stock (Belobaba, 2009).

At the same time, as a result of the intense use of a single type of aircraft, a great experience and knowledge accumulates on that aircraft over time, and thus the airline company can be more successful in finding solutions to technical problems that may arise. On the other hand, it can implement more flexible programs for assigning aircraft and teams to different routes in case of extraordinary situations. In this way, low-cost carriers can use the fleet effectively, minimizing the time the aircraft stay on the ground and reducing their unit costs (Alamdari and Fagan, 2005). The low-cost airline business model has only economy class, seat width and spacing at the lowest possible values, and free food and drink facilities are not provided. Generally, eating and drinking takes place with the payment of an additional fee and an additional income is obtained by the airline (Koch, 2010). The global pioneer of low-cost airline business model is US Southwest Airlines. In Europe, it was first applied by Irish Ryanair. Pegasus Airlines, after bought by Esas Holding, started scheduled flights in 2005 and has been a pioneer of this business model in Turkey (Pegasus, 2021).

In this model, the focus is on cost and the main thing is to transport passengers from one place to another cost efficiently (Koch, 2010; Yilmaz et al., 2022). Kitchen areas are limited as low-cost airlines generally do not have free food and beverage services. Some of them use secondary airports to shorten turnaround times and extend the time the aircraft are in the air. In order to reduce cost and make unloading faster, instead of using passenger bridges at the terminal, they prefer to get on and off passengers from the front and rear doors on the apron (Budd and Ison, 2017). Other cost reduction strategies include keeping advertising and promotional messages short and simple, not using intermediaries such as travel agencies or global ticketing systems as much as possible due to commissions (Budd and Ison, 2017).

An airline that adopts this business model is an airline with a lower cost structure than others and demands lower prices from its passengers than others. Such a carrier may be an independent regional airline, part or subsidiary of a major airline, or in some cases the charter arm of an airline group (ICAO, 2016).

- i. Regional airlines: Regional airlines are airlines that connect smaller regions away from the main traffic flow. Nowadays, regional airlines are increasingly being integrated into the full-service airline system. This integration takes place in the form of purchasing and regional business partners (Koch, 2010).
- ii. Charter airlines: Charter airlines are airlines that operate non-scheduled flights. They usually carry passengers to Mediterranean countries as part of a tour package. Seasonal effects are very important in the flights of these airlines (Koch, 2010).
- iii. Business aviation (Air taxi): Business aviation (or air taxi) is carried out by small jet planes, propeller planes or helicopters on demand. Air taxis provide their customers with advantages such as time saving, flexibility, comfort, security and privacy (Wensveen, 2007).

Hybrid Carriers

In response to the success of low-cost airlines, traditional airlines, or in other words, full-service carriers, started to pull ticket prices to the same point as low-cost airlines. As a result of this change in ticket prices, passengers can get more service for the same price. This situation negatively affected the market shares of low-cost airlines temporarily (Çetiner et al., 2019).

A number of low-cost airlines, trying to catch up with their old power in decreasing market shares, created a new business model by bringing their business models closer to full-service carriers. In the new hybrid business model, while tickets are provided to passengers at an affordable price as in the low-cost carriers, services that increase customer satisfaction are provided as in the full-service airlines (Klophaus et al., 2012).

With its relatively low-ticket price and enriched service offer value proposition, hybrid carrier appeals to passengers who give equal importance to price and travel experience. These airlines follow mixed strategies for standardization in their aircraft fleet, in-flight catering, flight network and ancillary revenues. The fleet structure of hybrid airlines consists of mixed aircrafts. While some of the aircraft in its fleet have the same type and cabin layout as in low-cost airlines, some of its fleet can consist of wide body aircraft capable of long-haul flights. Airplane seat layout plans (LOPA) are designed with fewer seats than low-cost airlines, especially for passengers who value comfort and are also price sensitive. Thanks to this change in seat layout plans, additional comfort can be provided to passengers by increasing the seat pitch between the seats (Çetiner et al., 2019).

Full-Service Carriers

Traditional carriers (Network Carriers-Legacy Carriers) are the oldest and most well-known business model of the commercial airline transportation industry, that provide full-service. With its wide flight network, large aircraft fleets, quality catering and comfort understanding, the players with the highest market share in the commercial air transport sector are airlines that adopt the relevant business model. Although they are generally the flag carrier airline company (national state airline), they are companies that can operate under private sector ownership, especially after the 1980s, with the effect of the regulations in the sector (Bamber et al. 2009).

For this reason, for these companies, which are called traditional (legacy) airlines, the names of full-service or network airlines are also used in the relevant literature. These companies have a complex hub & spoke flight network structure. In the hub & spoke flight network structure, the low passenger potential of the surrounding airports is concentrated in the central airports. Passengers whose destination is another city transfer here. In this way, operations can be carried out from the main airport, which is a transit center, to other large cities by taking advantage of the economy of density. Again, by providing the line density between the center and smaller surrounding airports thanks to the transfer passengers, narrow body jets can be used with high occupancy on these lines. To add a new destination for an airline with a large hub & spoke network structure, it is enough to have a few people demand from there to a part of the cities in the network. Thus, the number of city pairs flown with the hub & spoke flight structure of traditional carriers increases and the number of points they serve increases. (Sarılgan, 2007).

Since there are many cities with different demand potentials and distances from the center on the wide flight network, traditional airlines need to use aircraft with different load and range capacities. Therefore, their fleets can include a wide variety of aircraft, from small-capacity regional jets used to transport a small number of passengers in surrounding cities to large wide-body aircraft flying on lines connecting the central airport to the world's major cities. On the other hand, it is observed that traditional carriers prefer to cooperate with regional airlines and benefit from their fleets rather than adding regional jets to their fleets. (Tenant, 2017).

At the same time, since they want to appeal to passengers from all segments of the society (students, passengers flying for holiday and visiting purposes, business people) and carry people from different countries and cultures, the configuration of the aircraft may change on a line basis according to the product variety and service quality to be offered on a line. Traditional airlines aim to excel in service perception rather than compete with their competitors in terms of price. For this reason, they aim to continuously improve their products to meet customer satisfaction. In order to be successful in this customer-oriented approach, arrangements focused on the comfort of the passenger such as the width of the seats, the length of the knee distance between the consecutive seats and the

variety of catering are at the forefront. These companies have been the pioneers of the revenue management system. With their dynamic pricing policy, they try to balance the average unit price (yield) and occupancy rate, especially in economy class, and not to widen the price difference with low-cost airlines (Adiloğlu-Yalçınkaya, 2019).

Due to the comfort-oriented product variety, traditional airlines can request a comprehensive customization of the aircraft from the manufacturer when they order a new aircraft. The manufacturer can arrange the cabin configuration in line with these demands.

Revenue Management in Civil Aviation Sector

Revenue management, in its most basic form, focuses managers on more careful observation of customers' purchasing behavior and regulating price and product availability to generate higher revenue. Revenue management is a disciplined process that enables companies to use large amounts of customer data to dynamically predict customer behavior at the micro-market level, with the support of information technologies. In any case, the goal of revenue management is to sell the right product to the right customer at the right price at the right time, and thus maximize revenue from a company's products (Cross, 2011).

Revenue Management is the management of selling goods and services at a pre-determined price to customers in different service sectors (Emeksiz and Akoğlu, 2002). Pfeifer defined revenue management as "the process of allocating discounted prices to scheduled flights with the aim of balancing demand and increasing revenue". Larsen, while agreeing with this definition, divided revenue management into two different functions and clarified the meaning of revenue management in the airline industry as the management of overbooking and discounts. Revenue management is a concept that integrates demand management, reservation and capacity management. It is a method that generates the highest revenue from available capacity by integrating managerial, financial and marketing strategies, pricing, capacity allocation, overcapacity reservation tactics. (Hacıoğlu, 2011)

Revenue Management has an important place in airline and hotel businesses due to the development of the capacity limit encountered in the service sector. It is a form of management that includes not only the airline and hotel industry, but also the rail passenger transport sector, the car rental sector, the health sector, the communication sector, the transportation sector, and the television advertising sector. Revenue management has the following benefits not only in the service sector, but also in many other sectors (Gürel and Kayar, 2016):

- i. Provides forward date pricing.
- ii. Reservations can be kept.
- iii. Prices are known to customers.
- iv. Creates competition in the market.
- v. Causes to be preferred by consumers.
- vi. Provide costs decrease, annual profit increases.
- vii. Saves time.
- viii. Provide opportunity to check and control the capacity.

The revenue management approach in the airline industry started with the liberalization law in 1978. With this law, the civil aviation board of the United States loosened the control of tightly regulated airline prices based on standardized price and profitability targets (Talluri and van Ryzin, 2006). Revenue management has emerged as a tactic for dealing with the tough pricing wars, with new low-cost competitors emerging as a result of liberalization. Revenue management approach has become a subject that attracts the attention of academics and business people in the period following the 1990s. In terms of air transport, the revenue management approach, which has the potential to produce solutions in order to survive the relative lowness of global profit rates in the sector, as well as the competitive environment created by increasing business models, has become used by all stakeholders of the aviation industry at different levels (Cross, 2011).

Revenue management refers to the practice of managing demand with computer support, using alternatives of price or product availability based on demand models to maximize profit or revenue. This term originated in the airline industry because of the low variable costs, high fixed costs and the difficulty of maximizing profits. Revenue management techniques are not limited to revenue optimization, but are used to maximize profit. Revenue management is an application that uses advanced computer systems that generate demand forecasts for sales and automatically process other relevant data (Strauss et al., 2018). Used in many industries, especially the airline industry, revenue management is the tactics and strategies used to divide reservation limits between different fare levels. In order for the revenue management to be implemented, the following conditions must be met (Philips, 2005):

- i. The seller must sell a fixed stock of variable capacity.
- ii. Customers make a reservation before departure from the determined capacity.
- iii. The seller maintains fare classes with fixed prices.
- iv. The seller can change the availability of the fare classes over time.

The revenue management system uses reservation records and market information to learn about customer behavior and predict demand. Using this information, it controls efficient choices to increase revenue in the booking process. The control of fare classes with their prices is dynamic pricing (Morales and Wang, 2010). Integrating inventory and price management to maximize the

profitability of a company can be defined as revenue management. For combined air carriers, that is, for airlines carrying both passengers and cargo, revenue management is the management of passenger seat fees and cargo rates (Kasilingam, 1997). Revenue management is the science of predicting real-time customer demand at the micro-market level and optimizing the price and availability of products. The demand for products and services changes in a short period of time. In order for companies to make profitable transactions, they need to adapt quickly to changes that occur in a short time in demand (Methapatara and Wynter, 2010). Airlines need to dynamically manage their inventory from the start of the booking process (usually one year before departure) to the day of departure, after determining their pricing plans and fare structures. It may be ideal for certain classes to be closed or open during the booking process, which the airline can use to re-evaluate its optimization depending on the booking patterns at each control stage (Hao, 2014).

Revenue management in Turkey started under the guidance of Turkish Airlines and was tried to be applied in other firms. It has been adopted by the price-responsive customers since providing price advantage. In Turkey especially at the beginning of 1980's revenue management which was developed as a solution against decreasing profits and income of the companies at intense competition environment, has become an important system in airlines companies. (Hacıoğlu, 2011).

Ancillary Revenue Resources in Aviation

Ancillary revenue is defined as the income earned as part of the travel experience through sales made to passengers directly or indirectly before, during or after the trip. The figure below shows the ancillary revenue areas of airline companies in general (Atik, 2019).

A la carte features: These features are services and products that the passenger can order before or during travel. If this ever-growing list is listed under general headings, it consists of food and beverages sold during the trip, excess baggage and control fees, credit card commissions during sales, priority check-in and seat selection fees, on-board internet and other entertainment tools.

Commission Based Products: These products consist of commissions obtained by airline companies from the sale of accommodation, car rental and travel insurance. Commission-based products are offered for sale on the airline's website. However, the sales of these products can be given to passengers duty-free and on board. The study by Connella and Smith (2013) showed that the most accepted commission-based and segregated products for airline companies to sell, respectively, are parking and baggage fees.

Advertisements: These revenues consist of the advertising revenues received for the traveling passengers. It consists of the revenues obtained from the advertisements received in the magazines distributed on the aircraft, advertising messages received on the aircraft, loading bridges, door areas, airport halls, and consumer products distributed on sample and commission basis.

Passenger programs: These programs consist of miles or bonus sales to program partners. Partners are hotel chains, car rental companies, joint credit cards, online shopping centers, retailers, companies that provide communication services. In this way, ancillary income is obtained by selling miles or bonus directly to program members.

Ticket Fee or Product Package: Airline companies can determine part of the price as product packages or ticket fares. It consists of revenues obtained by providing services such as checked baggage, pre-boarding, extra foot rest place.

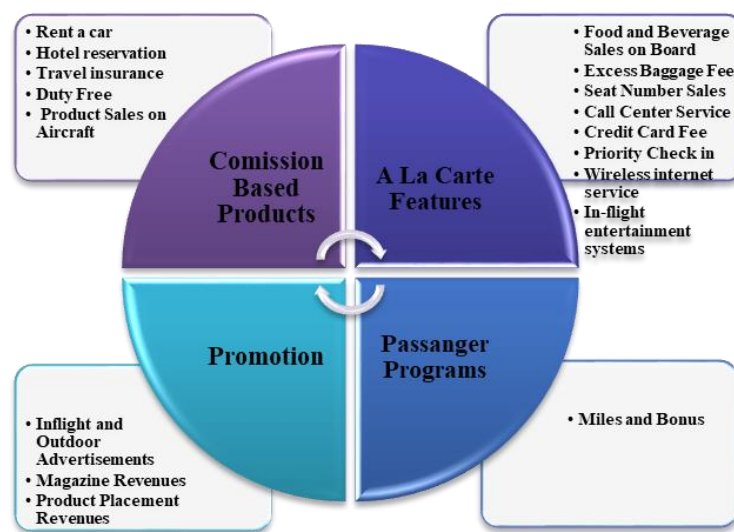


Figure 5: Ancillary revenues in aviation; *Source:* Atik, 2019.

Although ancillary revenue practices are limited to commission-based products, A la carte services, advertisements and passenger programs applied to customers, this rapidly spreading concept can change. In the survey conducted by Çetiner (2019) with 160 airline

managers and 188 airline passengers in 24 different countries, they stated that managers and passengers should use different ancillary revenue providing methods in different business models. With the emergence of ancillary revenue concept, airline companies had adopted the idea of selling each service or product piece by piece. Later, these services and products that would create added value were developed and diversified and started to be sold in packages. For example, Germanwings, the low-cost model brand of Lufthansa airlines, put up for sale ancillary packages by grouping them as silver, gold and platinum. It has developed many different innovative methods in ancillary revenue applications. Apart from the classic services such as buying food, drinks, choosing the seat, extra baggage allowance sale, sale of especially flight related products from the website, trip flex (the right to have all kinds of hours, cancellations, refunds and routing up to the last minute in all ticket classes) applications, in-flight and off-air advertisements, baggage handling, and even extraordinary services such as renting for weddings to couples who want to get married during idle times are offered by airlines to provide ancillary revenue (Baran, 2014).

Airline companies that want to establish long relationships with their passengers and provide services not only during the flight but also outside the flight are trying to achieve their goals with frequent flyer programs (loyalty system) and mil-credit cards (Bockelie and Belobaba, 2017). Aviation authorities such as IATA (International Air Transport Association) and ATPCO (Airline Tariff Publishing Company) are trying to set a standard for ancillary revenue definitions around the world. Therefore, according to the ancillary revenue standards set by these authorities, airlines can develop their own practices and the value of ancillary revenues for airline companies is gradually increasing (Atik, 2019). Airline companies operating with the low-cost model increase their ancillary revenues as they reduce their ticket prices. The fact that more customer segments are addressed with the decrease in ticket prices increases the amount of ancillary revenue per person. Therefore, low-cost airlines try to compensate the loss in ticket prices with services and products that generate ancillary revenue (Bachwich and Wittman, 2017). For example, in Turkey, one of the airlines to adopt the low-cost model of Pegasus, lowering ticket prices to reach more segments provide a competitive advantage compared to competitors increasing their ancillary revenue (Öncü et al., 2010).

Ancillary Revenues of Carriers

Annual reports on ancillary revenues in the aviation industry are published by Ideaworks Company LLC. In this context, ancillary revenues of airline company, given in the latest 2020 report are presented in the table below. In this context, it is observed that the highest ancillary revenue was obtained by three American Airlines (American Airlines, United Airlines and Delta Air Lines). On the other hand, the company that increased its ancillary revenue the most in 2019 compared to 2018 was Alaska Air Group with 47% (Sorensen and Lucas, 2020).

Table 3: Ancillary revenues of airline companies (2018-2019)

Rank	Top 10 Airlines Carrier	Total Ancillary Revenue		2019 Change
		2018	2019	
1	American Airlines	\$7,245,000,000	\$7,413,000,000	+2%
2	United	\$5,802,000,000	\$6,580,000,000	+13%
3	Delta Air Lines	\$5,570,000,000	\$6,198,000,000	+11%
4	Southwest (FF)	\$4,049,000,000	\$4,498,000,000	+11%
5	Ryanair Group	\$2,801,536,938	\$3,311,255,802	+18%
6	Air Canada	\$1,452,733,488	\$2,549,719,104	+76%
7	Alaska Air Group	\$1,388,000,000	\$2,033,560,500	+47%
8	Lufthansa Network Airlines	\$1,952,518,333	\$1,933,431,476	-1%
9	International Airlines Group	\$1,701,544,393	\$1,932,190,010	+14%
10	Emirates	\$120,898,570	\$1,927,297,481	+1,494%
	Totals	\$32,083,231,722	\$38,376,454,37	20%

2018 and 2019 carrier results were based upon 12-month financial period disclosures for each year. (FF) 80% or more of carrier's ancillary revenue is produced by its frequent flyer program.

Source: Sorensen and Lucas, 2020.

In the Ideaworks Company LLC ancillary revenue 2020 report, it was stated that there will be a decrease in ancillary revenues due to the decrease in passengers due to the Coronavirus pandemic in 2020. In the report published from August 2020, the ancillary revenue for 2020 was estimated as shown in the table below. Accordingly, it is estimated that there will be a loss of over 50% from the ancillary revenues of airline companies. In particular, it was stated that Air Canada (73%), Lufthansa (61%) and Emirates (60%) would experience much more losses than their competitors.

Table 4: Ancillary revenues of airline companies (2019-projected 2020)

Top 10 Airlines — 2019 Actual and 2020 Projected			Ancillary Revenue	2020 Change
Rank	Carrier	2019	2020	
1	American	\$7,413,000,000	\$3,881,316,754	-48%
2	United	\$6,580,000,000	\$3,387,653,171	-49%
3	Delta	\$6,198,000,000	\$2,917,882,417	-53%
4	Southwest (FF)	\$4,498,000,000	\$2,937,897,849	-35%
5	Ryanair Group	\$3,311,255,802	\$1,633,172,490	-51%
6	Air Canada	\$2,549,719,104	\$681,442,560	-73%
7	Alaska Air Group	\$2,033,560,500	\$1,141,875,458	-44%
8	Lufthansa Network Airlines	\$1,933,431,476	\$755,084,909	-61%
9	International Airlines Group	\$1,932,190,010	\$802,245,292	-58%
10	Emirates	\$1,927,297,481	\$778,629,528	-60%
	Totals	\$46,622,331,429	\$23,684,505,838	-49%

Projection is based upon 2019 results for the airline adjusted for passenger traffic for 2020. Traffic data is calculated for each airline based upon Cirium Core, schedules (data filed August 31, 2020)

Source: Sorensen and Lucas, 2020.

There has been a significant and regular increase in the aviation sector’s ancillary revenues over the years. Ancillary revenue, which was over USD 22 billion in 2010, reached approximately USD 110 billion in 2019. On the other hand, while ancillary revenues constituted 4.8% of the total income in 2010, this rate increased to 12.2% in 2019 (Cartrawler, 2019). Ranking of airlines in terms of ancillary revenues is given in Cartrawler 2020 report. Accordingly, the ancillary revenues of 81 companies were analyzed. In this context, it is seen that Spirit, Allegiant, Wizz Air, Viva Aerobus and Frontier airlines stand out in terms of the ratio of ancillary revenues to total income. The ratio of ancillary revenues of these companies to their total income is more than 40%. Even Spirit and Allegiant’s ancillary revenues are almost half of their total income. In terms of amount, the airline that earned the most per passenger from ancillary revenues in 2019 is Allegiant with USD 56.98. Spirit (\$ 52.14), Air Canada (\$ 49.47) and Frontier (\$ 48.22) are the other companies with the highest ancillary revenue per passenger (Cartrawler, 2019).

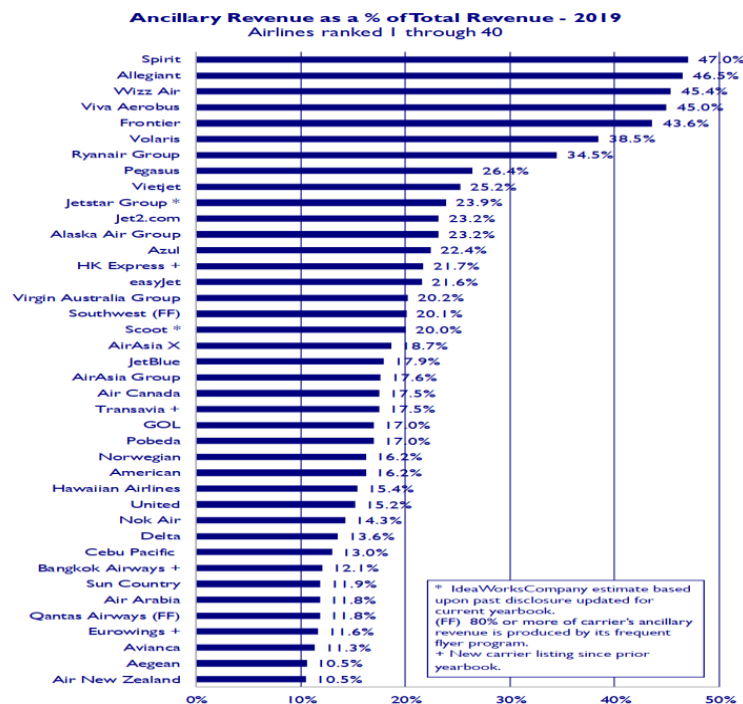


Figure 6: Ancillary Revenue as a % of Total Revenue – 2019; Source: Sorensen and Lucas, 2020.

Pegasus Airlines, operating in Turkey, has also become one of the leading companies in terms of ratio of ancillary revenue to total income. Pegasus, on the other hand, generated ancillary income of US \$ 17.02 per passenger in 2019. Pegasus generated a total of US \$ 518.9 million in side income in 2019 (Cartrawler, 2019). If the ancillary revenue levels according to the types of airline companies were examined, it was seen that low-cost airlines earned a total ancillary revenue of USD 13 billion, while traditional

airlines earned a total ancillary income of USD 44 billion. Both types of airline companies earned their ancillary revenues from a la carte services (Cartrawler, 2019).

Cargo Revenues

Air cargo is defined as the transportation of any goods from one place to another by aircraft (Allaz, 1998). The term air cargo is broadly defined to include air freight. All cargo, except for the passenger baggage carried in the cargo compartment, is the subject of air cargo (O'Connor, 2000).

Air cargo transportation, on the other hand, is defined as packaging, labeling the goods other than mail and luggage, preparing the documents properly and shipping them by an aircraft, especially considering the country and carrier restrictions, depending on ICAO and IATA rules (Öztürk, 1993). The air cargo sector plays an important role in the increasing world trade. The volume of the air cargo market has increased by 2 times every 10 years since 1970 (Changa, et al., 2007). Recently, the efforts of businesses to reduce storage costs, their desire to shorten the time of movement of their goods in the market, and the short life span of products in many industries (computers, medical products) have revealed the importance of the concept of speed. The spread of e-commerce and the provision of logistics solutions have increased the competitiveness of businesses that want to do business on a global scale, so the demand for international goods has increased and air cargo transportation has come to the fore for an effective commercial order (Zhang and Zhang, 2002).

Air cargo transportation itself is considered to be a large sector in itself. It also has a structure that provides input to the production processes of other sectors (Hensher, 2001). Airline passenger transport companies allow passengers to carry a certain amount of cargo in addition to their tickets. Additional fees are charged for loads above the specified amount. These revenues constitute an ancillary income item for airline companies. In addition, cargo loads are carried independently of the passengers on passenger planes. In this way, airline companies earn cargo income in addition to their basic income. Especially in the process that started with the COVID-19 pandemic process that started in late 2019, airline passenger transportation was severely interrupted. In this process, it has been observed that airline companies concentrate on cargo transportation. According to IATA reports, air cargo flights are likely to have 36% of all airline revenue in 2020. It has been also forecasted by IATA that air freight will have a third of airline revenue during 2021. Air Canada's air cargo revenue during the 2nd quarter of 2020 surpassed passenger revenue for the first time ever, reaching C\$269 million (\$207 million) yet shrank to C\$216 million during the third quarter (Risen, 2020). In this period, cargo revenues of China Airlines were up by 153% in May-2020, and cargo revenues of EVA Air's was up by 161% (CAPA, 2020).

The table below shows the rate of extra baggage fees in the side income of some airline companies. Accordingly, it is observed that the extra baggage fee is up to 85% of the ancillary income (Sun Country Airlines). On the other hand, it is observed that this rate remains as low as 18% for American Airlines, one of the major airlines (Sorensen and Lucas, 2020).

Table 5: Percentage of extra baggage fee revenues of some airlines

Airline Company	Total Revenue	Ancillary Revenue (AR)	Extra Baggage Fees/AR (%)
AirAsia X	\$1,062,730,177	\$198,455,655	40
American Airlines	\$45,768,000,000	\$7,413,000,000	18
Frontier	\$2,508,349,000	\$1,094,043,000	42
Hawaiian Airlines	\$2,832,228,000	\$436,838,000	20
Airline Company	Total Revenue	Ancillary Revenue (AR)	Extra Baggage Fees/AR (%)
Spirit	\$3,830,536,000	\$1,800,826,000	41
Sun Country	\$701,383,340	\$83,303,540	85
Air Astana	\$898,729,000	\$6,475,000	88
Jeju Air	\$1,182,967,068	\$102,811,760	21
Jin Air	\$782,435,317	\$51,233,954	15

Source: Sorensen and Lucas, 2020.

With the decrease in passenger traffic in Turkish Airlines with the Covid-19 outbreak, passenger revenues decreased by 66% compared to 2019, in 2020, and declined to 3.8 billion USD. THY compensated some of the loss in passenger income by focusing on exports and cargo. Cargo revenues increased by 61% in 2020, reaching US \$ 2.7 billion. Passenger revenues, on the other hand, decreased by 66% and remained at US \$ 3.8 billion. Total revenue decreased by 49.1% compared to the previous year and was

realized as 6.7 billion US dollars. While passenger revenues in 2020 constituted 56% of the total revenue, the share of cargo revenues reached 40% with a record increase in this period (THY, 2020).

Turkish Airlines reaped \$1.8 billion total revenue in the first quarter of 2021 and the cargo revenue of Turkish Airlines, which is 46% of the total revenue, Cargo revenue of the carrier posted a 77% increase compared to the same period in 2020 (Biçer, 2021).

The following table shows the traffic data of THY. It is observed that the cargo and postal revenues of the company have doubled in the last 5 years. It is seen that the extra baggage load was 6,677 tons in 2016, and this load reached 11,725 tons in 2019. However, it is observed that the extra baggage load has decreased by half with the passenger traffic decreasing by approximately 1/3 in 2020. It is understood that the decrease in passenger revenues in 2020, when the pandemic effect is particularly intense, prompted the company to increase cargo revenues (THY, 2021).

Turkish Airlines has become one of the top 10 airlines in the world with this cargo load. Apart from air cargo companies (such as FedEx, UPS), the leading airline company in terms of cargo load is Qatar Airways. On the other hand, Emirates and Cathay Pacific Airways companies have a significant cargo capacity (IATA, 2020).

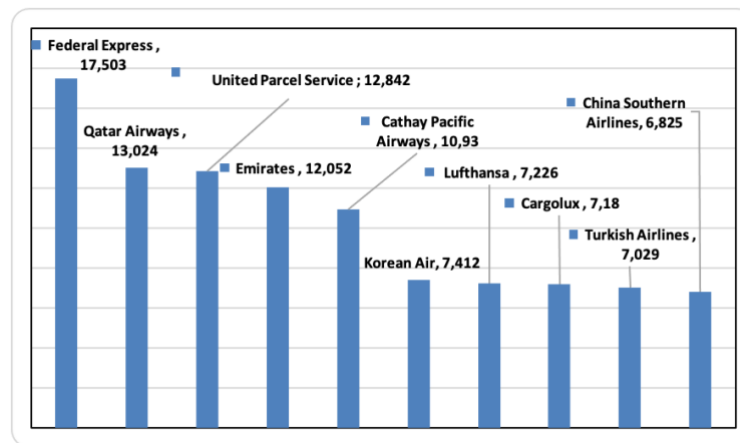


Figure 7: Top airlines by cargo tonne-kilometers (CTKs); *Source:* IATA, 2020.

In this process, it is seen that companies even allocate passenger aircraft for cargo transportation. An example of this is Lufthansa using the passenger plane as a cargo plane. Lufthansa has been operating the cargo flights to Munich via 4 Airbus A350 passenger aircraft and flying similar missions with 6 Airbus A330 planes based in Frankfurt. With these 10 passenger airliners, Lufthansa has created additional air freight capacity and expanded the Lufthansa Cargo fleet, which has 17 freight-only aircraft (Aviation Business News, 2020).

Research and Methodology

Data

In order for airline companies to survive today in tight competition conditions, it is important that they gain ancillary revenues in addition to their main income. In this context, cargo revenues and other ancillary revenues constitute an important source of profit for airline companies. In line with this, in this research it was aimed to see the effects of cargo revenues and ancillary revenues on net profit of the airline companies for the period of 2014Q1-2019Q4 for three full-service carrier airline companies: Turkish Airlines, American Airlines and Delta Air Lines.

Both in Turkish and foreign literature, no specific research about airline companies' cargo revenues and ancillary revenues made with econometric model was found. As far as it is known, this study is the first and the unique one in which the effects of airline companies' cargo revenues and ancillary revenues on the net profit were examined with the ultimate econometric test techniques. So for this reason, it is hoped that this research will contribute to the literature.

Within the scope of the research over 50 airline companies' data were examined. However, except the three ones (Turkish Airlines, American Airlines and Delta Air Lines) used in this research, not enough data could be found. So, the research was limited to the data of those three airline companies. Besides, the research is limited to the variables of cargo revenues, ancillary revenues and net profit of the chosen three airline companies.

Research Model

The equation formed for the research is seen in the following Equation. In the equation, cargo revenues and ancillary revenues are determined as independent variables and net profit is determined as dependent variable.

$$\Delta \ln_{net_profit} = \beta_0 + \beta_1 \Delta \ln_{cargo_rev} + \beta_2 \Delta \ln_{anc_rev}$$

In the equation, “Δ” indicates that first level difference of the related variable is used and “ln” indicates that logarithmic transformation is applied.

Data Collection

Data were obtained from the related airline company’s annual reports in its official website: [https:// investor.turkishairlines.com/en/ financial-and -operational/annual-reports](https://investor.turkishairlines.com/en/financial-and-operational/annual-reports), <https://ir.delta.com/financials/default.aspx> and <https://americanairlines.gcs-web.com/financial-results/financial-aal> (Access Date: April 19th, 2021).

Data Analysis

Classical estimation models were used in empirical econometric studies until 1980. It was noticed in the 1980s that classical estimation models performed with non-stationary data gave erroneous results and caused spurious regression (Yavuz, 2004).

The data used in this research are time series data. For this reason, since the SPSS program, which does not allow testing the stationarity of the data, will not give accurate results in the analyzes to be carried out, analyzes were carried out with EViews 10 and STATA 15, which are the most modern econometric analysis programs that can be used to control the stationarity. First, the graphs and the descriptive statistics for the research variables of the three selected airline companies were presented. Then econometric analyzes such as cross section dependent tests, second generation unit root tests, delta slope homogeneity test, cointegration test and casualty tests were made.

Analysis

Descriptive statistics for the research variables and their graphs were presented below. Descriptive statistics for cargo revenues of three full-service carrier airline companies between the period of 2014Q1-2019Q4 was presented in the table below.

Table 6: Descriptive Statistics for Cargo Revenues of the 3 Full-Service Carrier Airline Companies Between the Period of 2014Q1-2019Q4 (Million \$)

Airline Company	Min.	Max.	Mean	Std. Dev.
Turkish Airlines	211	471	311.63	85.95
American Airlines	152	264	210.79	31.02
Delta Air Lines	127	244	196.58	28.19

As can be seen in the table, between the period of 2014Q1-2019Q4; the mean of Turkish Airlines’ cargo revenues is 311.63 million dollars; the lowest value of cargo revenues is 211 million dollars (2016Q1) and the highest value of cargo revenues is 471 million dollars (2019Q3); the mean of American Airlines’ cargo revenues is 210.79 million dollars; the lowest value of cargo revenues is 152 million dollars (2016Q4) and the highest value of cargo revenues is 264 million dollars (2018Q2); the mean of Delta Air’s cargo revenues is 196.58 million dollars; the lowest value of cargo revenues is 127 million dollars (2017Q4) and the highest value of cargo revenues is 244 million dollars (2014Q2). The graph of cargo revenues of the three full-service carrier airline companies between the period of 2014Q1-2019Q4 were presented in the figure below.

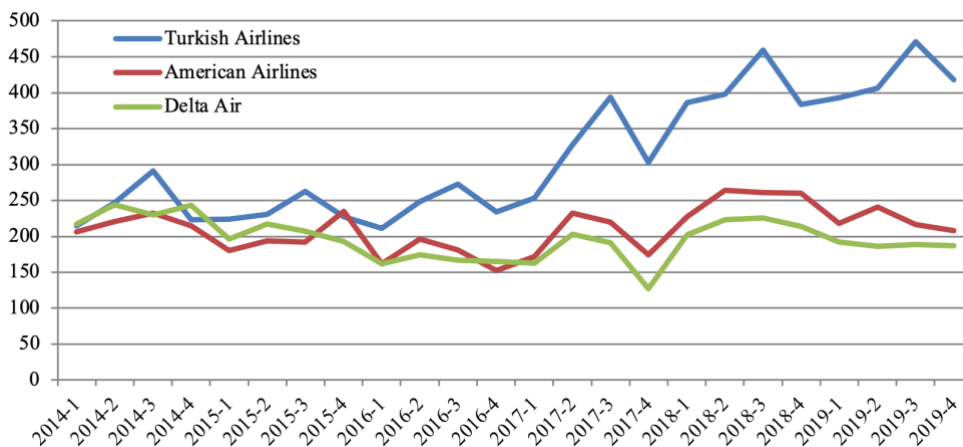


Figure 8: Cargo Revenues of the three Full-Service Carrier Airline Companies Between the Period of 2014Q1-2019Q4 (Million \$)

When the figure above is examined, a perfect seasonality is observed for Turkish Airlines. It is seen that the cargo revenues in the third quarter of the year are clearly higher than the other quarters. Although there is no such seasonality for American Airlines and Delta Air Lines, it is seen that the cargo revenues of these two airlines generally reach the highest value in the 2nd and 3rd quarters

of the year. In general, cargo revenues of Turkish Airlines have shown an increasing trend especially since 2016Q4, while cargo revenues of American Airlines and Delta Air Lines are observed to be more stable.

Descriptive statistics for ancillary revenues of three full-service carrier airline companies between the period of 2014Q1-2019Q4 were presented in the table below.

Table 7: Descriptive Statistics for Ancillary Revenues of the 3 Full-Service Carrier Airline Companies Between the Period of 2014Q1-2019Q4 (Million \$)

Airline Company	Min.	Max.	Mean	Std. Dev.
Turkish Airlines	53	168	96.83	34.32
American Airlines	694	1349	1053.67	249.06
Delta Air Lines	760	1361	1084.75	177.27

As can be seen, between the period of 2014Q1-2019Q4; the mean of Turkish Airlines’ ancillary revenues is 96.83 million dollars; the lowest value of ancillary revenues is 53 million dollars (2015Q2) and the highest value of ancillary revenues is 168 million dollars (2017Q4); the mean of American Airlines’ ancillary revenues is 1053.67 million dollars; the lowest value of ancillary revenues is 694 million dollars (2018Q1) and the highest value of ancillary revenues is 1349 million dollars (2017Q4); the mean of Delta Air’s ancillary revenues is 1084.75 million dollars; the lowest value of ancillary revenues is 760 million dollars (2017Q1) and the highest value of ancillary revenues is 1361 million dollars (2015Q2).

The graph of ancillary revenues of the three full-service carrier airline companies between the period of 2014Q1-2019Q4 was presented in the Figure above.

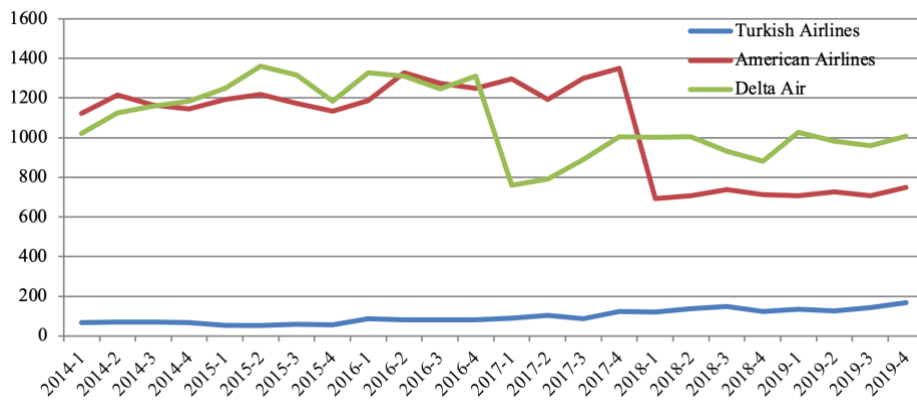


Figure 9: Ancillary Revenues of the 3 Full-Service Carrier Airline Companies Between the Period of 2014Q1-2019Q4 (Million \$)

When the figure above is examined, the first striking point is that ancillary revenues of Turkish Airlines are much lower than those of American Airlines and Delta Air Lines. Ancillary revenues of Turkish Airlines are very low and have a stable course. A sharp decrease after 2016Q4 for Delta Air Lines and a sharp decrease after 2017Q4 for American Airlines are clearly visible. Descriptive statistics for net profits of three full-service carrier airline companies between the period of 2014Q1-2019Q4 were presented in the table below.

Table 8: Descriptive Statistics for Net Profits of the 3 Full-Service Carrier Airline Companies Between the Period of 2014Q1-2019Q4 (Million \$)

Airline Company	Min.	Max.	Mean	Std. Dev.
Turkish Airlines	117	1281	520.58	343.95
American Airlines	159	3281	757.75	673.13
Delta Air Lines	213	1546	953.67	394.74

As can be seen in the table above, between the period of 2014Q1-2019Q4; the mean of Turkish Airlines’ net profits is 520.58 million dollars; the lowest value of net profits is 117 million dollars (2017Q1) and the highest value of net profits is 1281 million dollars (2018Q3); the mean of American Airlines’ net profits is 757.75 million dollars; the lowest value of net profits is 159 million dollars

(2019Q1) and the highest value of net profits is 3281 million dollars (2015Q4); the mean of Delta Air’s net profits is 953.67 million dollars; the lowest value of net profits is 213 million dollars (2014Q1) and the highest value of net profits is 1546 million dollars (2016Q2).

The graph of net profits of the three full-service carrier airline companies between the period of 2014Q1-2019Q4 was presented in the Figure below.

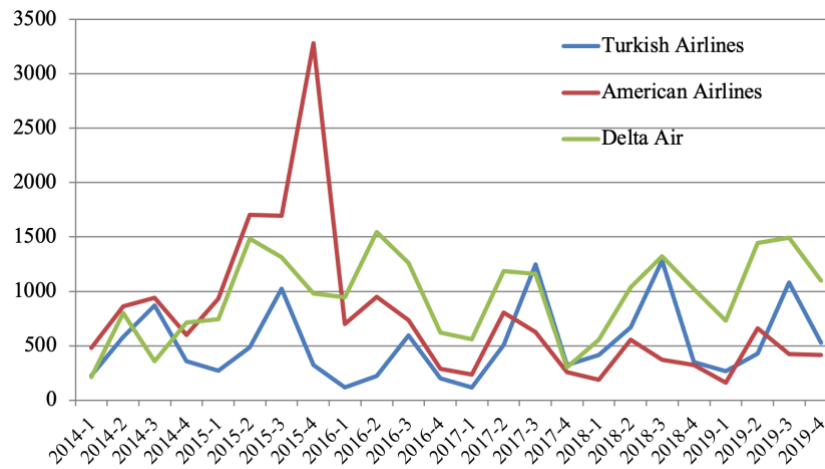


Figure 10: Net Profits of the three full-service Carrier Airline Companies Between the Period of 2014Q1-2019Q4 (Million \$)

When the figure above is examined, like in cargo revenues, a perfect seasonality is observed for Turkish Airlines. It is seen that the net profits in the third quarter of the year are clearly higher than the other quarters. Like in cargo revenues, although there is no such seasonality for American Airlines and Delta Air Lines, it is seen that the net profits of these two airlines generally reach the highest value in the 2nd and 3rd quarters of the year. In general, net profits of Turkish Airlines and Delta Air Lines are observed to be stable except some soft increases and decreases at some periods. But it can be said for Delta Air’s net profits that they have a soft decrease trend except the severe increase between 2015Q1-2015Q4 and severe decrease between 2015Q4-2016Q1.

Findings and Discussions

Cross Section Dependency, Unit Root and Delta Tests Results

Cross-section dependency test plays a role in deciding which generation root unit tests will be used in econometric analyzes for panel data sets. If there is no cross-section dependency in the variable, first generation root unit tests; if there is a cross-section dependency in the variable, second generation root unit tests are preferred (Doğru, 2014).

To decide which unit root test (First generation or second-generation unit root test) to apply, first the cross section dependency of the research data were checked. Because time dimension (T=6 years and 24 quarters) is higher than cross section dimension (N=3 airline companies) Breusch Pagan LM test was chosen as the cross-section dependence test (Breusch and Pagan, 1980). The results of Breusch Pagan LM tests are presented in Table below.

Table 9: Breusch Pagan LM Tests Results

	Test Stat.	Prob. (p)
cargo_rev	19.06705	0.0003
anc_rev	9.838856	0.0200
net_profit	15.832919	0.0012

As can be seen in Table, the results of Breusch Pagan LM tests results show that there are cross section dependencies for all 3 research variables ($p < 0.05$). The unit root test is used to determine whether a variable is stationary or not. Tests with variables with a unit root lead to erroneous results. Therefore, unit root tests are of great importance for the accuracy of the analysis (Yavuz, 2004). After determination of cross section dependencies, it was decided to use CADF second generation unit root tests to check for the existence of unit root in the research variables (Hansen, 1995).

Table 10: CADF Second Generation Unit Root Tests Results

	t-bar	cv10	cv5	cv1	Z[t-bar]	Prob. (p)
cargo_rev	-0.611	-2.210	-2.330	-2.570	2.051	0.980
$\Delta \ln_cargo_rev$	-3.557	-2.210	-2.330	-2.570	-3.209	0.001
anc_rev	-1.756	-2.210	-2.330	-2.570	0.006	0.502
$\Delta \ln_anc_rev$	-3.445	-2.210	-2.330	-2.570	-3.008	0.001
net_profit	-1.565	-2.210	-2.330	-2.570	0.329	0.486
$\Delta \ln_net_profit$	-4.550	-2.210	-2.330	-2.570	-4.982	0.000

As can be seen in the table above, all three variables are not stationary at level ($p > 0.05$) but they become stationary after logarithmic transformation and first difference applied ($p < 0.05$). The homogeneity test determines whether the other cross-sections are affected equally by the change in one of the cross-sections. From this point of view, it is expected that slope coefficients will be heterogeneous for airline companies with different economic structures; while they will be homogeneous for airline companies with similar economic structures (Günay et al., 2008). To test the homogeneity of the slope coefficients, Delta test was made. The results of the Delta test were presented in the table below. As can be seen, the slope coefficients aren't homogeneous in other words they are heterogeneous ($p < 0.05$).

Table 11: The Results of Delta Test

Delta Tilde		Delta Tilde Adjusted	
Test Stat.	Prob. (p)	Test Stat.	Prob. (p)
4.133	0.000	4.547	0.000

Panel Cointegration Analysis Results

Co-integration analysis is an analysis that examines whether there are long-term equilibrium relationships among the variables. Despite permanent shocks, there may be a long-run equilibrium relationship between variables. Panel cointegration tests are more powerful than time series cointegration tests (Selim et al., 2014). To test the long-term relationships between research variables, panel cointegration test was made. All the 3 research variables get stationary at first level, so panel cointegration test is appropriate for the variables. Westerlund panel cointegration test was chosen because of the variables' having cross section dependence (Westerlund, 2005). The results of Westerlund panel cointegration test were presented in the table below.

Table 12: The Results of Westerlund Panel Cointegration Test

Stat.	Value	Z-Value	P-Value
Gt	-3.642	-3.022	0.001
Ga	-14.622	-1.518	0.045
Pt	-6.097	-3.031	0.001
Pa	-14.800	-2.768	0.003

Interpretation of the Westerlund panel cointegration test is made in two ways: The first way is to take Pt and Pa into consideration when the slope coefficients are homogeneous; the second way is to take Gt and Ga into consideration when the slope coefficients are heterogeneous (Aytun and Akin, 2014). Because the slope coefficients are heterogeneous in this research, Gt and Ga were taken into consideration. As can be seen in the table above, the p-values of both Gt and Ga are less than 0.05 ($p < 0.05$). That means there is a cointegration in other words long-term relationships between the research variables.

From the point of view of economics, we can say that the ancillary revenues-net profit and cargo revenues-net profit series are cointegrated if they move together over time and the distance between them is stable. Hence, cointegration reflects the presence of a long-run equilibrium towards which the economic system converges over time. An increase in the cargo revenues and ancillary revenues will make the net profit of the airline companies increase in the long term.

Panel Causality Test Results

To test the short-term relationships and to see causality relationships between research variables, panel casualty test was made. Causality analysis is used to examine whether there is a causal relationship between two variables (Engeloğlu et al., 2015).

Dumitrescu Hurlin panel casualty test was chosen because of the variables' having cross section dependence and the slope coefficients are heterogeneous (Dumitrescu and Hurlin, 2012). The results of Dumitrescu Hurlin panel causality tests were presented in the table below.

Table 13: The Results of Dumitrescu Hurlin Panel Causality Tests

	W-Bar	Z-Bar	Prob. (p)
$\Delta \ln_cargo_rev \rightarrow \Delta \ln_net_profit$	11.2451	12.5476	0.0000
$\Delta \ln_net_profit \rightarrow \Delta \ln_cargo_rev$	1.5592	0.6849	0.4934
$\Delta \ln_anc_rev \rightarrow \Delta \ln_net_profit$	2.7804	2.1805	0.0292
$\Delta \ln_net_profit \rightarrow \Delta \ln_anc_rev$	1.3624	0.4438	0.6572

As can be seen, there are one-way causalities in other words short-term relationships between from cargo revenues to net profit and from ancillary revenues to net profit ($p < 0.05$). From this result, we can clearly understand that; even in a short time period, the increase in cargo revenues positively affects net profitability and increase in ancillary revenues increase net profit of the companies. In other words, cargo and ancillary revenues have a positive effect on increasing net profit for full-service carrier airlines (Aksoy and Bas, 2021).

Conclusions

Air transport has become an increasingly common tool used by the majority of people today and has been a constantly growing industry. As a result of the conceptual analysis, it has been understood that there is a tight competition in air transport and that in this context, airline companies have produced new strategies to increase their revenues. It has been concluded that the earnings provided by ancillary revenues, especially in aviation, provide an important resource for airline companies. In the research part, the relationships between cargo revenues, ancillary revenues and net profit of the airline companies for the period of 2014Q1-2019Q4 for three full-service carrier airline companies: Turkish Airlines, American Airlines and Delta Air Lines were examined. The results of cointegration analyses reveals that there is a cointegration between cargo revenues, ancillary revenues; these variables move together in the long run. An increase in the cargo revenues and ancillary revenues will make the net profit of the airline companies increase in the long term, too.

Besides, the results of causality analyses show that are one-way causality relationships from cargo revenues to net profit and from ancillary revenues to net profit; cargo revenues and ancillary revenues are the causes of net profit. An increase in the cargo revenues and ancillary revenues will make the net profit of the airline companies increase in the short term, too. According to the data provided by Sorensen and Lucas (2020), American Airlines and Delta Air Lines are among the top three companies with the highest ancillary revenue. It has been observed that THY's ancillary revenue is very low compared to the two American companies. It is considered that this situation has several different reasons. First of all, these two American Airlines serve a passenger group with high per capita income as the most passenger carrying companies in the world (IATA, 2020). Due to the high purchasing power of people in USA, the expenditures made on the plane are higher than the passenger profile in other countries. For this reason, it is expected that passengers will buy more services that will provide ancillary revenue.

THY, on the other hand, serves passengers with relatively low-income levels and is considered to be more disadvantaged in terms of ancillary revenue. Another reason for the differentiation of ancillary revenue may be personnel expenses of companies. Because the salaries of pilots, cabin and ground handlers in the USA are much higher than their counterparts in Turkey. For this reason, it is normal for two US companies to turn to more ancillary earnings in the tightly competitive market. In addition, as a result of the panel causality analysis, it reveals that there is a two-way causality relationship between both cargo revenues-net profit and ancillary revenues-net profit. It can be stated that with the increase in the number of passengers, ancillary income and extra baggage fees increase. This increase is directly reflected in net profits. As a result of the analysis, it is seen that Turkish Airlines has more cargo revenue than other two companies. It seems that this result is consistent with the data of IATA (2020). Since USA is ahead of many countries in the world in terms of aviation history, it would be a correct assessment to talk about a sharper distinction between passenger and cargo markets due to the large number and diversity of companies in the aviation market. Therefore, due to the superiority of cargo companies such as DHL, UPS, FedEx in the USA, the cargo market shares of other companies that are mainly based on passenger transportation remain low. According to IATA data, THY is among the top 10 carrier companies worldwide in terms of cargo revenues. The other two American companies are among the top three companies carrying the most passengers according to IATA (2020) data. Therefore, it is observed that these two American companies focus on passenger transportation rather than cargo.

As a result, it was observed that cargo revenues and other ancillary revenues directly contributed to net revenues in aviation. In this context, it is thought that airline companies should give enough importance to cargo and ancillary revenues in order to increase their profitability. For instance, showing the success of last years' cargo transportation in ancillary revenues will play an important role in

increasing the net profitability of Turkish Airlines. Similarly, to show the success of American Airlines and Delta Air Lines in terms of ancillary revenues in the cargo section will contribute positively to the high profitability of these companies

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Data Availability Statement: The data presented in this study are available on request from OB. The data are not publicly available due to privacy.

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