Market Structure and Competition in the Airline Industry: Evidence from Emerging and Developed Economies

Havayolu Endüstrisinde Pazar Yapısı ve Rekabet: Gelişmekte Olan ve Gelişmiş Ekonomilerden Kanıtlar

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Abstract: The purpose of the study is to analyse the market structure in airline markets. The research examined at market structures in the aviation sector for the years 2011 to 2020 in both developing and developed economies.. We analysed market concentration and market structure of many countries for the period 2011-2020. Additionally, we examined the deterioration caused by the Covid-19 pandemic in the airline market structure. In the study, we used different analyses such as CR4, CR8 and Herfindahl-Hirschman index. The study's conclusions show that the spread of Covid-19 has had a significant impact on airline firms, and market structures have started to shift in several nations.. The level of competition and the market structure differed among countries. Due to the Covid-19, while some countries experienced more intense markets, other countries experienced markets that are more competitive.

Keywords: Competition, Market Concentration, Airline industry, Oligopoly, Herfindahl-Hirschmann Index

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Öz: Bu çalışmanın amacı havayolu pazarlarında piyasa yapısının analiz edilmesidir. Çalışmada gelişmekte olan ve gelişmiş ekonomilerde 2011-2020 dönemi için havayolu endüstrisinde pazar yapıları incelenmiştir. Ek olarak, Covid-19 salgınının havayolu piyasa yapısında meydana getirdiği bozulma da çalışmada incelenen unsurlar arasındadır. Çalışmada CR4, CR8 ve Herfindahl-Hirschman endeksi olmak üzere farklı analiz teknikleri kullanılmıştır. Çalışmanın bulgularına göre Covid-19'un yayılımının havayolu işletmelerini oldukça etkilediği ve bazı ülkelerde piyasa yapılarının değişmeye başladığı ortaya çıkarılmıştır. Ayrıca, rekabet düzeyi ve piyasa yapılarının ülkeler arasında farklılık gösterdiği görülmüştür. Covid-19 nedeniyle ortaya çıkan bu durum, bazı ülkelerde daha yoğun pazarları öne çıkarırken bazı ülkelerde daha rekabetçi piyasaları gündeme getirmektedir.

Anahtar Kelimeler: Rekabet, Pazar Yapısı, Havayolu Endüstrisi, Oligopol, Herfindahl-Hirschmann Endeksi.

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1. Introduction

The adoption of neoliberal economic policies ushered in a new era in rail transport, road transport and air transport. The neoliberal policy agenda being effective in the late 1970s and 1980s, resulted in structural changes in the transportation industry. The laissez-faire economic approach favoured by Hayek, Friedman, and the Chicago School of Economics suggested reducing government bureaucracies, free trade, opening markets to foreign investment and ownership, privatization, and other policies favouring the private sector (Goetz & Vowles, 2009). Neoliberal economic policies allowed the deregulation of the air transport industry in the USA in 1978 (Zhang et al., 2008). Thanks to deregulations, air transportation activities were liberalized. Airlines freely have had a chance to determine the ticket fare. Airlines' productivity on routes, service production, marketing and management increased (Adrangi et al., 1997; Goetz & Sutton, 2010). The number of aircraft in airlines' fleets increased and airlines have offered varied service options with more destinations to their customers. With less state intervention on airlines, the market have became more competitive. The competition among airlines has allowed ticket prices to decline, passenger demand to increase and consumer welfare to improve. Therefore, airlines have tried to achieve competitive advantage by making various tactical or strategic moves. In the airline transportation industry, where competition is intense, the airlines which have made the right strategic moves had the upper hand and their market shares increased.

The liberalization of the air transport market and the entry of low cost airlines into the market have had a significant impact on the market structure. (Alderighi et al., 2004, 2012; Babić et al., 2014; Evangelho et al., 2005). However, the situation is different regarding the degree of competition in the deregulated airline industry. Proponents of deregulation believed that the market would be highly competitive as a result of the deregulation. However, according to Abramowitz and Brown (1993), there is an evidence that competition could not be achieved sufficiently in the first years of the deregulation. In addition, the level of competition has differed from market to market in the post-deregulation airline industry (Yaşar & Kiracı, 2018). Therefore, airline deregulation, which began in 1978 in the United States, and the introduction of low cost airlines into the market have increased competition among airlines. On the other hand, these developments have not had the same effect in every market in terms of market share and market structure.

One of the most important signs of the level of competition among airlines is the market share. In other words, the distribution of the market shares between airlines in a market gives important insight about the competition in that market. In a market where many airlines operate, the competition in that market is low if only one airline dominates most of the market. Therefore, the existence of competition in the market is closely related to the number of players (airlines) in the market and the market structure. In the literature on airline market share, there are some studies on on-time performance and airline market (Suzuki, 2000), the effect of seat availability/aircraft size on market share (Wei & Hansen, 2005), airline market share relationship between long-haul routes (Mijovic et al., 2021) and the price determination of market share (Abramowitz & Brown, 1993). On the other hand, the current literature deals with code-sharing agreements (Yimga, 2022), impact of COVID-19 on aviation market performance (Fontanet-Pérez et al., 2022; Ng et al., 2022), and airline size, market share and profit margin relationship (Yilmazkuday, 2021).

Another important concept related to competition in the airline transportation industry is "market concentration". Market concentration is an indicator of market strength. An increase in market concentration in a market means that the market is controlled by a small number of firms and competition is reduced. Although there are many studies in the literature on market concentration, relatively few of these studies are related to the air transport industry. In one of the studies conducted in the aviation industry, Kiracı et al. (2017) investigated the concentration ratios and competition level of the five largest airports in Turkey. As a result of the research, it was concluded that the market was far from a competitive structure. Yaşar and Kiracı (2018) investigated the airline market structure and competition level using CRN and Herfindahl-Hirschman, Entropy and Condensation Index. According to the results of the study, it was concluded that there were significant changes in the market structure over the years

and that the market structure was generally competitive. Yaşar and Gerede (2018) investigated the market concentration in city-pair domestic routes in Turkey. As a result, it was understood that a very large part of the markets were monopoles, a significant part were duopolies, and very few city pairs had characteristics close to oligopolies. Dai et al. (2014) examined the price distribution and competition in the US aviation industry. They concluded that the price distribution increased due to competition in concentrated markets, but there was less price variation in competitive markets. Zhang et al., (2020) examined the impact of the high-speed rail (HSR) on airline market in China with the Herfindahl–Hirschman Index (HHI) and the Lerner index. HSR had a negative impact on the airline market in terms of competitiveness. Grosche et al., (2020) analysed the market concentration by including high-speed rail (HSR) and connecting flights for the period before and after Air Berlin's bankruptcy. According to the findings, Lufthansa became more dominant in the market. Hidalgo-Gallego and Mateo-Mantecón (2019) investigated the relationship between market concentration and airline efficiency for Spain. The results of Stochastic Frontier Analysis (SFA) indicate that the increase of market concentration increases the technical efficiency of the airport. Oliveira et al., (2021), on the other hand, examined the relationship between innovation adoption and market concentration in the Brazilian airline industry. They found that the increase in the market concentration affects the innovation adoption of airlines to a certain level (inverted-U-shaped). In addition, the increase in energy prices is accelerating the innovation adoption of airlines for the long term.

The extant literature has also many studies carried out to investigate the market concentration except for the aviation industry. Boutsioli (2007) examined the market structure of private hospitals in Greece and concluded that they presented the structural characteristics of oligopoly. Wenjie (2011), in his study focused on the automobile market in China, concluded that the concentration of the automotive industry in China has increased in recent years and the industry has presented the structural characteristics of oligopoly. Ipek and Ipek (2018) revealed that the pharmaceutical sector in Turkey had a low degree of concentration. Onder and Topatan (2018) analyzed the internet search engines in Turkey and concluded that the Google search engine, one of the internet search engines operating in Turkey, was positioned at level close to monopoly. Nguyen et al. (2020) examined the market concentration trend of the ten major container ports in Southeast Asia and concluded that these markets have became more competitive over the years Although there was considerable market concentration, Kruger et al. (2021) found no negative effects on project pricing or market development in their investigation of measures to counteract market concentration's effects in renewable energy auctions in the setting of South Africa. Azar et al. (2022) measured the concentration in the employment market of more than 8,000 geo-occupational workforces in the United States and found that the concentration was high. This situation has led to a decrease in a certain part of the average wages.

This study aims to reveal the market concentration in the airline industry for developing and developed economies. This study is expected to provide following contributions to the literature: The study analyzes the market concentration in the airline industry for both developing and developed economies. We assessed at market concentration over a long period of time. In addition, the Covid-19 pandemic has caused to deteriorate the market concentration in many airline markets. Accordingly, we also determined the effect of Covid-19 on airline market concentration for a wide group of countries. Therefore, the study fills this gap in the literature by analyzing the market concentration in the airline industry for a wide sample of countries and long analysis period.

2. Methodology

In this study, a concentration analysis was carried out to examine and compare the market structures of the airline industry in developed and developing economies in the period 2011-2020. In this context, "n-firm concentration index" and "Herfindahl-Hirschman index" (Dinler, 2013, p. 459), which are the two most commonly used market concentration criteria, were used to calculate concentration ratios. N-firm concentration ratio, also called CRn, refers to the sum of the market shares of the first n number of companies with the largest market share in an industry (Shy, 1996, p.172). The purpose of the n-firm

concentration index is to determine the competition in the market by considering the market shares of the first two, four or eight largest firms (Dinler, 2013, p. 459). The CRn index is calculated as follows

$$CRn = S1 + S2 + S3 + \cdots + Sn = \sum Si$$

The value obtained as a result of calculation in the CR4 concentration index has a value between 0-100 (Ünsal, 2010, p. 474). According to the values obtained by the CR4 concentration ratio, the market structure is classified in four categories (Hamurcu and Durukan, 2009, pp. 78-79):

0-30: Low concentration, high competition

31-50: Medium concentration, oligopoly structure.

51-70: High concentration, decreasing competition.

71-100: Very high concentration, monopoly structure.

Another concentration index used in the study is the Herfindahl-Hirschman index, which is calculated by summing the squares of the market shares of all companies in the market and is formulated as follows (Davis and Garces 2010, p. 288; Uysal and Öztürk, 2005, p. 276):

(S_i) market shares of companies as a percentage

$$HHI = \sum (S_i)^2 \qquad \text{i=n so}$$
$$HHI = s_1^2 + s_2^2 + s_3^2 + s_4^2 \ldots \ldots \ldots \ldots s_n^2$$

For example, $HHI = (10)^2 + (20)^2 + (20)^2 + (15)^2 (15)^2 + (15)^2 = 100+400+400+225+225+225 = 1575$

According to this formula, HHI takes a value between 0-10000. If there are many firms with small market shares, the index value approaches zero. According to the US Mergers Manual, market values are classified as follows (Pehlivanoğlu and Tekce, 2013, p. 375; Önder and Topatan, 2018, p. 36):

HHI<1000: Unconcentrated

1000<HHI<1800: Moderately concentrated

HHI>1800: Highly concentrated

There are also studies that classify the values to be obtained according to the market values given below, as opposed to the above classification (Su, 2003, p. 12):

0 <HHI ≤ 2000: Unconcentrated

2001 ≤ HHI ≤ 4000: Moderately concentrated

4001 ≤ HHI ≤ 10000: Highly concentrated

In addition to these two classifications, there are also studies that classify the market structure based on the values of 0-1500, 1500-2500 and +2500 (Pehlivanoğlu and Tekçe, 2013, p. 375).

HHI analysis is considered as a more accurate measurement tool for reasons such as taking into account changes between business sizes and including the entire distribution into account (Kaynak and Ari, 2011, p. 50). Moreover, since the squares of the firms in the market are taken, firms with a high market share have higher weights. Therefore, this index provides a more holistic view of the relevant market than the N-firm concentration index (Weinstock, 1982, p. 287). For the mentioned reasons, the HHI index has been one of the most popular market determination tools since the 1980s (Krivka, 2016, s. 525).

The data used in the study were taken from the passport database. Using mentioned indexes, the concentration and competitive structure of airlines in developed and developing economies were examined. The data of international organizations such as the UN, the IMF and the World Bank was used in the classification of developed and developing countries[4] [5].

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[4] https://www.imf.org/external/pubs/ft/weo/2008/02/weodata/groups.htm#ae
[5] https://web.archive.org/web/20051024075936/http://www.worldbank.org/data/countryclass/classgroups.htm#High_income

3. Findings

In this section of the study, we will include analysis findings for emerging countries and developed countries.

3.1. Emerging Countries

In n-firm concentration ratio, n denotes the number of players in the market. In this context, the market can be analyzed in different ways by n taking values such as 2, 4, 8, and 12. N-firm concentration ratio takes values between 0 and 100, and values more than 70 indicates a market that is far from a competitive structure. If the value reaches 100, there is only one player in the market. Accordingly, Table 1 includes the results of market concentration according to the CR4 analysis for developing countries between2011 and 2020.

Table 1: CR4 Analysis Results (Emerging Countries)

COUNTRY	Model	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
CHINA	CR4	87	84	82	80	82	80	81	80	79	83
INDIA	CR4	39	39	38	36	37	37	36	35	29	16
INDONESIA	CR4	73	73	75	86	87	88	84	82	77	81
RUSSIA	CR4	52	64	64	64	66	73	70	71	71	78
BRAZIL	CR4	89	93	93	92	92	93	93	94	96	97
MEXICO	CR4	74	77	74	71	72	71	73	73	74	75
SOUTH AFRICA	CR4	77	73	80	79	77	75	75	75	73	68
TURKEY	CR4	67	69	79	88	92	94	94	92	93	94
BULGARIA	CR4	61	65	67	65	68	66	72	71	70	70
HUNGARY	CR4	70	57	60	56	59	65	67	66	69	77
POLAND	CR4	66	66	69	69	66	70	66	67	73	84
ROMANIA	CR4	53	62	65	71	72	72	72	75	75	76
UKRANIE	CR4	40	44	49	63	65	32	33	32	32	43

Table 1 shows the results of the CR4 concentration analysis obtained by collecting the market shares of the 4 airlines with the largest market share on a country-by-country basis. Accordingly, the concentration values in Turkey and Brazil are quite high. There has been an increasing concentration in both countries over the years. In this context, it has been revealed that the Turkish and Brazilian airline markets are far from competitive compared to other countries. Moreover, markets in these two countries present the structural characteristics of an oligopoly since the four largest airlines in the market capture almost all of market share. On the other hand, at this point, as one of the developing country, India should be mentioned, whose market structure has evolved towards a competitive structure. India has the most competitive market structure among the mentioned countries. In fact, the value of CR4 was significantly below the value of 30, which indicates low concentration, in 2020. From a competitive market point of view, India is followed by Ukraine. Although the Ukrainian airline market with ups and downs evolved into high concentration market structure in the years between 2013 and 2015, then concentration values decreased and the market evolved into a more competitive structure.

In the Covid period, a high concentration market, in other words less competitive, was experienced compared to the previous year. When the other countries are examined, while some countries (South Africa and Bulgaria) have evolved into a more competitive market structure, others (China, Indonesia, Romania, Mexico) presented the structural characteristics of an oligopoly. It is observed that some countries showed a stable outlook over time, while others were ups and downs. There are examples in which the change in the market structure followed a stable trend. After discussion on the CR4 concentration results, Table 2 provides the market concentration results of developing countries based on the CR8 analysis between 2011 and 2020.

Table 2: CR8 Analysis Results (Emerging Countries)

COUNTRY	Model	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
CHINA	CR8	91	88	86	84	86	86	87	86	86	91
INDIA	CR8	50	47	45	43	43	43	42	41	36	31
INDONESIA	CR8	88	85	82	94	95	95	89	87	82	85
RUSSIA	CR8	65	75	76	78	78	83	81	83	84	86
BRAZIL	CR8	98	98	98	98	98	98	98	99	99	99
MEXICO	CR8	86	88	86	84	85	84	86	85	86	86
SOUTH AFRICA	CR8	84	80	85	84	83	82	82	82	80	76
TURKEY	CR8	67	70	79	88	93	94	95	93	94	94
BULGARIA	CR8	71	75	77	75	78	78	82	81	81	80
HUNGARY	CR8	81	73	76	73	76	76	83	82	85	90
POLAND	CR8	79	79	85	86	83	86	83	83	83	90
ROMANIA	CR8	73	82	86	85	89	91	93	93	92	93
UKRANIE	CR8	44	49	53	68	70	36	37	39	40	53

Table 2 shows the results of the CR8 concentration analysis obtained by collecting the market shares of the 8 airlines with the largest market share on a country-by-country basis. Evaluating the results of CR8 concentration analysis together with CR4, we reach similar results. Turkey and Brazil have high concentration values similar to the results of CR4 concentration analysis. In Brazil, 8 airlines capture almost all the market. Turkey's CR4 and CR8 concentration values are similar due the fact that only 4 airlines dominate the market in Turkey. On the other hand, according to the results of CR8, India evolves into a more competitive market structure.

During Covid-19 pandemic, concentration values have reached its lowest level. In addition, examining the other countries' conditions reveal the similar results. Another noteworthy result is that in some countries, such as Turkey, there are not much difference between the values of CR4 and CR8. In these countries, the number of airlines dominating the market is limited, and the market presents the structural characteristics of an oligopoly. After giving the results of the CR4 and CR8 analyses, Table 3 gives the results of market concentration of developing countries based on the HHI analysis.

Table 3: HHI Analysis Results (Emerging Countries)

COUNTRY	Model	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
CHINA	HHI	2213	2048	1938	1834	1895	1789	1777	1732	1694	1919
INDIA	HHI	497	470	431	385	413	413	408	373	303	260
INDONESIA	HHI	2077	2035	2216	3068	3310	3268	2939	3220	2817	3151
RUSSIA	HHI	813	1336	1357	1445	1685	2229	2112	2132	2139	2843
BRAZIL	HHI	3133	2941	2680	2630	2573	2578	2609	2799	2979	3044
MEXICO	HHI	2230	2373	2146	2031	1999	1907	1963	1846	1725	1721
SOUTH AFRICA	HHI	3321	2871	3311	3414	3193	2947	2879	2693	2354	1897
TURKEY	HHI	2676	2921	3861	4717	5175	5275	5374	5230	5944	6148
BULGARIA	HHI	1164	1328	1384	1287	1427	1353	1531	1485	1386	1393
HUNGARY	HHI	1675	978	1069	952	1087	1275	1346	1349	1540	2198
POLAND	HHI	1739	1728	1867	1888	1480	1688	1509	1580	1873	2499
ROMANIA	HHI	849	1147	1226	1373	1443	1437	1450	1548	1551	1625
UKRANIE	HHI	685	888	1230	2221	2260	369	368	331	308	696

HHI takes a value between 0-10000. As the value increases, the market structure becomes less competitive. The closer a market is to a monopoly, the higher the market's concentration. According to the results in the Table given above, the market structures of developing countries have varied. India and Ukraine have more competitive market structure compared to the other countries. In particular, India had low concentration values between 2011 and 2020. Ukraine had low concentration values except for the period from 2013 to 2015. When taking the average into account, it could be said that Bulgaria and Romania have low average concentration values compared to the other developing countries. On the

other hand, especially in recent years, Turkey has had high concentration values meaning that only a few airlines dominated the market.

Another important point to be emphasized about Turkey is that concentration values has increased over the years. However, in South Africa, the condition is the opposite. South Africa has decreasing concentration values. This means that more airlines gradually dominate the market. Comparing 2020 with the previous year in terms of the all developing countries, it is determined that 9 out of 13 countries have higher concentration values in 2020. This figures less competition for them. However, the difference in competition is obvious for 5 out of 9 countries.

3.2. Developed Countries

After the results of developing countries, in this part of the study, the results of developed countries are given. Table 4 includes the results of market concentration of developed countries based on the CR4 analysis for the years between 2011 and 2020.

Table 4: CR4 Analysis Results (Developed Countries)

COUNTRY	MODEL	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AUSTRALIA	CR4	81	81	80	79	78	77	77	76	79	78
AUSTRIA	CR4	72	72	71	71	70	69	69	70	70	74
BELGIUM	CR4	65	67	72	68	71	79	79	80	79	79
CANADA	CR4	82	83	82	82	80	80	80	79	78	77
CZECH REP	CR4	65	62	63	62	60	56	55	56	54	53
DENMARK	CR4	49	53	55	58	58	58	60	62	62	61
FINLAND	CR4	71	68	71	71	76	76	72	71	70	75
FRANCE	CR4	69	70	69	66	66	67	66	65	64	65
GERMANY	CR4	50	51	51	51	50	50	51	53	54	57
IRELAND	CR4	85	86	85	88	91	92	92	93	94	94
ISRAEL	CR4	44	47	46	48	48	49	45	42	39	39
ITALY	CR4	41	42	43	39	41	39	39	39	39	37
JAPAN	CR4	48	48	47	49	48	50	51	53	49	53
NETHERLANDS	CR4	75	76	77	74	76	76	76	75	78	79
NORWAY	CR4	81	82	80	82	85	85	86	87	88	84
PORTUGAL	CR4	49	49	50	51	52	54	56	59	59	64
SLOVAKIA	CR4	87	87	89	83	83	79	73	77	77	82
SLOVENIA	CR4	92	91	90	90	87	84	85	86	78	64
SOUTH KOREA	CR4	64	66	61	58	56	58	61	62	64	63
SPAIN	CR4	46	50	58	59	59	60	59	61	64	67
SWEDEN	CR4	54	56	58	59	57	59	59	59	59	61
SWITZERLAND	CR4	80	80	80	80	80	80	81	85	85	84
UNITED KINGDOM	CR4	40	43	42	43	48	50	49	49	52	52
USA	CR4	62	62	68	69	69	67	67	68	68	70

Table 4 shows the results of the CR4 concentration analysis obtained by collecting the market shares of the 4 airlines with the largest market share on a country-by-country basis. Among developed countries, Italy and Israel are two countries which have the most competitive market structure. These two countries are followed by Germany, Japan, the Czech Republic, and the United Kingdom. With the deregulation in 1978, the United States has pursued liberal policies and adopted the open skies policy through agreements with countries. Thanks to these agreements, the United States expanded more easily into foreign markets. This movement in the United States has triggered other countries, and the EU countries made similar agreements. In 1992, EU created a single market in aviation formed part of the move to a single internal market. This led to increasing competition on international airline markets in some EU member states. The results support the assumption that the competition among EU member states increase. On the other hand, based on the results of the CR4 concentration analysis, the Irish airline market has high concentration value and only 4 airlines dominate a very large part of the market (94%).

While 10 countries out of 24 are considered as highly concentrated markets, the rest is considered as moderately concentrated markets. Concentration values of Italy and Israel belonging to moderately concentrated markets are close to values of markets which are less concentrated. After the CR4 concentration results, Table 5 provides the market concentration results of developed countries based on the CR8 analysis between 2011 and 2020.

Table 5: CR4 Analysis Results (Developed Countries)

COUNTRY	MODEL	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AUSTRALIA	CR8	86	85	85	84	84	84	84	84	86	86
AUSTRIA	CR8	78	77	75	75	74	73	73	73	74	77
BELGIUM	CR8	80	83	88	87	85	88	88	89	89	89
CANADA	CR8	86	88	87	87	86	86	86	84	83	83
CZECH REP	CR8	74	69	74	74	72	75	68	70	67	67
DENMARK	CR8	61	65	66	69	69	68	71	73	74	73
FINLAND	CR8	81	80	83	81	83	82	79	78	77	82
FRANCE	CR8	76	77	76	73	73	74	73	72	71	72
GERMANY	CR8	58	58	59	59	58	59	61	61	63	67
IRELAND	CR8	89	89	88	90	93	94	94	95	95	96
ISRAEL	CR8	51	54	52	56	55	57	52	51	48	48
ITALY	CR8	51	53	54	50	50	48	48	48	48	45
JAPAN	CR8	51	50	50	52	51	53	54	56	52	56
NETHERLANDS	CR8	85	87	88	87	88	87	87	85	87	89
NORWAY	CR8	87	86	87	88	91	91	90	92	93	89
PORTUGAL	CR8	63	64	64	65	67	69	70	73	73	76
SLOVAKIA	CR8	87	94	96	90	91	89	82	85	85	91
SLOVENIA	CR8	94	95	95	96	96	94	95	95	91	85
SOUTH KOREA	CR8	66	68	64	61	60	63	68	69	70	68
SPAIN	CR8	64	65	70	72	73	73	71	74	76	80
SWEDEN	CR8	68	69	71	71	69	71	70	70	71	71
SWITZERLAND	CR8	91	91	91	91	91	91	91	93	93	91
UNITED KINGDOM	CR8	54	53	53	53	57	60	59	59	62	63
USA	CR8	77	78	78	79	79	77	78	79	79	81

Table 5 shows the results of the CR8 concentration analysis obtained by collecting the market shares of the 8 airlines with the largest market share on a country-by-country basis. Evaluating the results of CR8 concentration analysis together with CR4 gives similar results. It is seen that Israel and Italy have less concentrated markets. Japan follows these two countries in terms of its competitive market structure and shows features of moderately concentrated market structure. Comparison of the CR4 and CR8 values of Japan reveals that the difference between values is not much, and four airlines dominate the market. The market structures of Australia, the Netherlands, Sweden and Switzerland, have not changed much and the concentration values have not fluctuated. In countries such as Denmark, the United Kingdom, Spain and Germany, we see that the market became more concentrated from 2011 to 2020. After giving the results of the CR4 and CR8 analyses, Table 6 gives the results of market concentration of developed countries based on the HHI analysis.

Table 6: HHI Analysis Results (Developed Countries)

COUNTRY	MODEL	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AUSTRALIA	HHI	3700	3487	3506	3447	3324	3207	3141	3060	3273	3258
AUSTRIA	HHI	4009	3790	3713	3710	3592	3462	3605	4124	4089	4535
BELGIUM	HHI	1786	1925	2119	1823	1735	2402	2504	2565	2517	2432
CANADA	HHI	3406	3239	3123	3184	3090	3145	3146	3122	3015	2854
CZECH REP	HHI	1476	1259	1263	1243	1127	955	929	1387	1182	1117
DENMARK	HHI	1210	1435	1530	1690	1689	1696	1804	1853	1893	1789
FINLAND	HHI	2966	2915	3069	2856	3459	3411	3032	2890	2922	3519
FRANCE	HHI	3790	3916	3711	3325	3279	3333	3197	3037	2859	2920
GERMANY	HHI	1358	1341	1310	1298	1240	1262	1511	1719	1765	2015
IRELAND	HHI	3437	3647	3611	3815	4066	4093	4056	4127	4181	4276
ISRAEL	HHI	1285	1496	1431	1599	1607	1672	1351	1230	977	998
ITALY	HHI	820	852	822	672	665	607	539	548	531	522
JAPAN	HHI	1041	1017	995	1071	1070	1148	1198	1287	1115	1285
NETHERLANDS	HHI	3896	3802	3955	3666	3659	3778	3753	3660	3945	3774
NORWAY	HHI	3334	3432	2603	2729	2925	2910	3023	2983	2980	2399
PORTUGAL	HHI	1032	1067	1101	1144	1156	1141	1237	1355	1385	1491
SLOVAKIA	HHI	3179	3259	3411	3047	2948	2419	1910	2129	2049	2410
SLOVENIA	HHI	5955	5988	5971	5911	5587	5145	4472	4243	2711	1196
SOUTH KOREA	HHI	2019	2129	1854	1562	1402	1445	1564	1566	1605	1590
SPAIN	HHI	678	730	1181	1277	1306	1242	1158	1306	1418	1550
SWEDEN	HHI	1392	1425	1581	1690	1554	1563	1565	1516	1530	2009
SWITZERLAND	HHI	4027	4066	4031	4147	4206	4205	4386	4920	4958	4776
UNITED KINGDOM	HHI	680	780	746	766	1009	1014	1019	1005	1209	1177
USA	HHI	1100	1099	1252	1305	1285	1212	1210	1261	1254	1339

According to the results in table 6, Italy is one of the leading competitive markets in developed countries. Italy's HHI value indicates a low concentration market. Italy is followed by Israel, and these two countries are considered as competitive markets similar to two previous analysis. According to some HHI analysis classifications, Czech Republic, Portugal, Japan, Slovenia, the United Kingdom and the United States are considered as low concentrated markets. Based on N firm concentration ratio, Some of these countries are classified as moderately and high concentrated markets. On the other hand, due to the fact that the difference between the market shares of the airlines operating in these countries is not very large, different results are obtained in the HHI analysis. Moreover, HHI values of Austria, Switzerland and Ireland are over 4000. These countries are classified as high concentrated markets in all classifications. These countries are followed by Australia, the Netherlands and Finland. Along with these countries, Canada and France may also be considered as high concentrated markets. Markets in the United Kingdom, Belgium, Spain and Germany are becoming increasingly concentrated. On the other hand, markets in Italy and Israel evolve into low concentrated and competitive markets.

4. Discussion and Conclusions

Structural theories of market concentration examine the structural features such as concentration and nature of competition in industries. Factors such as the company's market share, market entry status and number of firms affect the severity and nature of competition. Therefore, there is a relationship between the level of competition and the structure of an industry. Determining market concentration is extremely important in determining the severity of competition in a particular market, in other words, whether the degree of competition is low or high (Mohammed et al., 2015). The level of competition in the airline industry affects many variables, such as consumer benefit, ticket prices, and the development potential of the market. In addition, the number of players in the market (airlines) and the issue of whether the market is favorable for the entry of a new airline may also be related to market concentration. In this context, there is evidence of a negative relationship between market size and market concentration (Oliveira & Oliveira, 2018). Therefore, the findings of this study on the market concentration of developed

and developing countries provide valuable insight into the size of the market and its growth trend by year.

In this study, we analyzed the market concentration for the developed and developing economies by employing different analysis methods for the years 2011-2020. In the study, we used CR4, CR8 and Herfindahl-Hirschman index as concentration analyses. Market concentration is closely related to the level of competition of firms. Therefore, in order to determine whether there is a competition in a market, it is necessary to determine the level of market concentration. The lack of competition provides clues that the market is not functioning well and that the lack of competition causes a range of negative outcomes for consumers (Ferrer, 2013). For this reason, it is extremely critical for government and airlines as industry stakeholders to take initiatives to increase competition. The lack of competition also has an impact on the tax policy and tax revenues of countries (Janeba, 1998). Therefore, policy makers should develop economic policies aiming at avoiding imperfect competition.

The findings of the study show that concentration values are very high in Turkey and Brazil, which are among the developing economies. Therefore, in Turkey and Brazil, airline markets experience imperfect competition. The low number of airline companies has been effective in the formation of this market situation in Turkey. Few airlines cover the entire market in this area. Although the Turkish Airlines Pegasus rivalry increases pricing competitiveness in Turkey, the low number of airline firms prevents rates from being as low as those offered by European carriers. A similar situation is encountered in Brazil. Three firms in this area dominate the majority of the market. It is advised to update economic regulations to boost competition in order for the market to develop into a more competitive structure. In addition, India as a developing country has the most competitive market structure. The Indian airline market has become more competitive over time. Moreover, the Ukrainian airline market evolved into high concentrated market structure between 2013 and 2015, then, concentration values decreased and the market evolved into a more competitive structure. Among developed countries, Italy and Israel are two countries which have the most competitive market structure. Several factors have contributed to these countries' competitive structures. The first of these is the liberalization of European economic rules. Aside from that, there are other factors that come into play, such as the flag carrier company's financial difficulties, the entry of new carriers, and the fact that since Italy is a well-known tourist destination, budget-conscious travelers often choose other, less expensive airline options when traveling there. When regarded in the perspective of Israel, the fact that several different airlines offer flights to that region in addition to Israel's existing airline is effective. The competitive structure has resulted from the large number of airlines and the close proximity of their market shares. These two countries are followed by Germany, Japan, the Czech Republic, and the United Kingdom. Three different methods were used in the analysis. The analyses gave different results for some countries. The reasons for the different results obtained in the study can be listed as follows.

The first reason for this difference is undoubtedly the degree of diversity of these three analyses. CR4 and CR8 take into account the market shares of the first 4 or 8 companies with the largest market share. On the other hand, HHI analysis considers the shares of all firms, whether they are large or small. The second reason is the difference in the market shares of airlines. Especially when the market share of even one of the firms included in the analysis in HHI is relatively large, the HHI value increases a lot disrupting the competitive structure of the market.

Covid-19, as is known, has become a pandemic that affected all industries as soon as it emerged. In order to control the spread of the outbreak, countries have taken some measures such as restrictions, closures, and air transport has been negatively affected. Airlines have also been heavily affected by the pandemic, and market structures have begun to change in some countries. In our research, when we examined the effects of the pandemic, we found that market structures changed in some countries. Due to the pandemic, while some countries experience more intense markets, the other countries experience more competitive markets. Further studies might examine the reason of this change.

It is expected that this study will guide to decision makers in the air transportation industry on determination of competition rules and policy design. The study some following strenghts: First, the

analysis period of the study and the large sample size provide significant comprehensiveness. The study examined the market concentration for many countries from the past to the present, even including the Covid-19 effect. Secondly, decision-makers can make legislative adjustments and give subsidies to make the market more competitive by evaluating the results of the study. Thirdly, airlines might benefit from the market concentration results of the study while deciding on market entry or market exit. Further studies on market concentration in air transport industry might focus on the causes of imperfect competition. In this way, the reasons for the imperfect competition in a specific market can be analyzed by conducting in-depth analyses.

There are a few limitations on this study. One of them is the time period the study was conducted. The study spans a 10-year span, which includes the years 2011 through 2020. The choice of these years was wisely made because of the data set's accessibility. On the other hand, both developed and developing countries are represented among the research's involved countries. This restriction, which also defines the research's scope, was necessary in order to compare two different economic groups. The analysis methods utilized to reveal the market structures are the research's final limitation. Analysis methods that are often utilized in the literature were applied in this investigation. In future research, more longitudinal studies can be carried out with the data set covering larger years. Simultaneously, countries from the group of less developed nations can be examined as well, and a comparison with the relevant economic groups can be given. Lastly, in addition to the analysis methods frequently employed in the literature, additional methods might be introduced that provide hints regarding the market structure.

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