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Civil aviation and tourism demand in Montenegro: A panel data approach

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Abstract:

***Purpose**: The purpose of the paper is to investigate the role of civil aviation in the case of Montenegro, one of the smallest countries in Europe and one whose economy heavily relies on tourism.*
***Methods**: For this research, a dynamic panel data approach is used, where five models are proposed for modelling tourism demand. Available seats per kilometer, the Herfindahl–Hirschman index, jet fuel prices, exchange rates, and seasonality are used as the models' explanatory variables, in line with the available litetrature.*
***Results**: The econometric results show that all suggested models are valid, the explanatory variables are statistically significant, and their coefficients have the expected sign, suggesting a strong relationship between tourism demand and civil aviation.*
***Implications**: Apart from being one of the first attempts to highlight the civil aviation and tourism nexus in the context of Montenegro, this paper contributes to the literature by suggesting a way forward for destination managers and policymakers in small countries with great tourism potential.*

Keywords: *aviation, tourism, tourism demand, Montenegro, panel data*

JEL Classification: *L83, C23, C1*

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1 INTRODUCTION

Tourism is a complex system, and transportation plays a vital role in enhancing the accessibility of destinations. Transport for tourism demand is of a derived nature, as few people travel for the sake of travelling: most people travel to go somewhere and engage in tourism activities while spending time at a destination.

Among transport modes, air transport is of primary importance (Inkson & Minnaert, 2018; Leiper, 1990; Page, 2019). International tourists travel mainly by air and that share had increased drastically since 2000 (UNWTO, 2019). Liberalization (Graham, 1998), alliances (Morley, 2003), improvements, and innovation in the air transport industry have affected destinations all over the world (Koo, Lau, 2019), particularly their accessibility (Halpern & Bråthen, 2011; Hao et al., 2020; Hooper, 2015; Sellner, Nagl, 2010), economic development (Küçükönal & Sedefoğlu, 2017; Lenaerts, et al., 2021), social inclusion (Smyth, et al.,2012) and, in line with these, tourism competitiveness (Khan et al., 2017; Yağmur & Aksu, 2022). From tourists' perspective, these changes are key triggers of purchase decisions, in addition to money available and time (Papatheodorou, 2001). Moreover, the civil aviation industry becomes even more important in economies that are highly dependent on tourism development (Dobruszkes et al., 2016; Papatheodorou, 2021; Spasojevic et al., 2017; Warnock-Smith & Morrell, 2008).

To the best of the authors' knowledge, this relationship has never been explored in the context of Montenegro, the key region of this research. The research aims to present state-of-the-art tourism in Montenegro, to propose and test models for

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predicting tourism demand at both national and regional levels, and to recommend policies for further development. From an academic perspective, the research presents a solid foundation for testing models in the context of other tourism destinations, especially small (island) developing states, which rely heavily on air transport accessibility to realize their tourism potential. In this context, the paper also contributes to the wider literature on tourism development, at least from an economic perspective.

The paper is divided into five sections. After the introduction (section one) comes section two, which reviews some of the available literature on the relationship between aviation and tourism. Section three presents Montenegro as a case study, and section four discusses the empirical methodology of the paper, which is based on panel data analysis with monthly data between January 2009 and December 2018. Subsequently, section five elaborates on the results of the study, commenting on the most significant aviation-related determinant factors of tourism demand in Montenegro, and concludes by acknowledging study limitations and providing recommendations for future research.

2 BACKGROUND LITERATURE

2.1 Tourism demand, civil aviation, and panel data analysis

Tourism demand modeling has been one of the most explored topics in the destination management literature (Law et al., 2022; Eugenio-Martin, Patuelli, 2022; Dogru et al., 2021; Tsui, et al., 2021; Xie et al., 2021; Polyzos et al., 2021; Li et al., 2021; Broeder & Gkogka, 2020; Permatasari et al., 2019; Koo et.al., 2017; Yazdi, 2017; Tsui, 2017, 2019, 2021; Hu et al., 2015; Ibrahim, 2013; Surugiu et al., 2011; Donzelli, 2010; Habibi et al., 2009; Garin-Mun, 2006). Given that inbound tourism in several countries strongly relies on air transport, it is crucial to design a tourism development strategy along with air transport liberalization (Shaw, 1982) to establish solid foundations for further economic growth in the context of sustainability (Papatheodorou et al., 2019). Civil aviation and tourism are interconnected, and tourism is typically treated as the driving force of air transport transformations (Bieger, Wittmer, 2006; Duval, 2013; Graham, 2006; Papatheodorou, 2021; Tsui et al., 2021).

On the other hand, air transport liberalization can also act as a trigger of tourism demand (Koo et al., 2017; Papatheodorou, 2002). For instance, Koo et al. (2017) have explored in their research causality in direct air transport and tourist arrivals, while Rey, Myro, and Galera (2011) have investigated interconnection between low-cost carriers (LCCs) and tourism demand in the context of Spain. Moreover, Donzelli (2010) has tested the relationship between LCCs and economic growth in the case of Southern Italy, and Tsui (2017) has gone one step further and proposed a model to investigate the relationship between LCCs and domestic tourism demand here.

Alsumairi and Tsui (2017) have explored impacts of LCCs on inbound tourism in Saudi Arabia. Additionally, Tsui et al. (2019, 2021) have been working on developing econometric models using different sets of variables. Among the researchers who have focused on LCC impacts on tourism development and economic growth are Graham and Dennis (2010), Chung and Whang (2011), Santos and Cincera (2018), and Álvarez-Díaz, González-Gómez, and Otero-Giráldez (2019).These authors take varying approaches to their research, but they all identify relationships between tourism demand and civil aviation based on panel data analysis. Tourism demand can be defined as a "measure of visitors' use of a good or service" (Frechtling, 2012, p. 4) or as the quantity of tourist goods or services that tourist, guests, or visitors aim to purchase during their stay at a particular destination (Song et al., 2008). Key determinants of tourism demand are the number of international tourist arrivals, number of international tourists nights (Lim, 1997; Santos, Cincera, 2018), tourists' income, tourist product prices, and exchange rates (Cao, et al., 2017; Hu et al., 2021; Massidda, Etzo, 2012; Song et al., 2019; Kankam-Kwarteng et al., 2021).

Tourism demand forecasting is pivotal for tourism policymakers (Li et al., 2020; Song et al., 2019). Time series models (basic and advanced), static and dynamic econometric models, and artificial intelligence models have typically been used for modelling tourism demand (Peng et al., 2014; Korol & Spyridou, 2020; Nuryyev et al, 2021;). It has become common to use panel data analysis for tourism demand modelling purposes (Albaladejo et al.,2016). Panel data analysis is defined as "the statistical analysis of data sets consisting of multiple observations on each sampling unit" (Lavrakas, 2008, p. 568). Panel data is generated by cross-referencing time-series observations for different units, such as countries, companies, and individuals (Baltagi, 2015). The benefits of panel data analysis are two-fold: it controls individual heterogeneity and is much more informative (Baltagi, 2008). However, it has its limitations. For instance, panel data research design problems or panel dataset distortion can arise (Lavrakas, 2008).

In terms of modeling tourism demand, panel data regression is often conducted in research (Song, Li, 2008; Song, Witt, 2000). For example, Rey et al. (2011) have applied a panel data random effect model in their research. They have used as variables the number of tourist arrivals, gross domestic product (GDP) per capita, relative price, distance between origin country and destination, price of crude, percentage of LCC passengers, host region infrastructure, and relative per capita income. Tsui (2017) has used panel data regression model and a two-stage least square model. As variables, the author has used the number of domestic nights, available seat kilometers (ASK), GDP per capita, aviation fuel price, petrol price, Herfindahl–Hirschman index (HHI), and regional tourism indicators for the accommodation, and food and beverage sectors. Koo et al. (2017) have used a panel data linear additive model and the following variables: the number of tourist arrivals, Australian departures, GDP per capita, consumer price index (CPI), exchange rates, air liberalization index, total number of available flights, and permanent resident arrivals.

Alsumairi and Tsui (2017) have proposed the Box–Jenkins SARIMA-X models for forecasting tourism demand. Their variables are the number of international tourist arrivals, total ASK for regular and LCCs, CPI, exchange rate, aviation fuel price, and the HHI. Finally, Tsui et al. (2019) have executed a three-stage least square model for panel data. The main variables here are the number of guest arrivals, ASK, GDP per capita, population size, total hotel capacity, exchange

rates, interest rates, net migration, number of new houses, regional tourism indicator for accommodation, and food and beverage sectors, transport, and domestic infrastructure. Tsui et al. (2021) have explored tourism demand and aviation in the context of Hong Kong. They have used tourist arrivals as the dependent variable and ASK as the explanatory variable. Their results show a strong relationship between tourism arrivals and scheduled airline services (Tsui et al., 2021a). This is an expected but important finding, which has also been tested in the case of Montenegro, as discussed in the following sections of this paper.

2.2 Montenegro as a case study

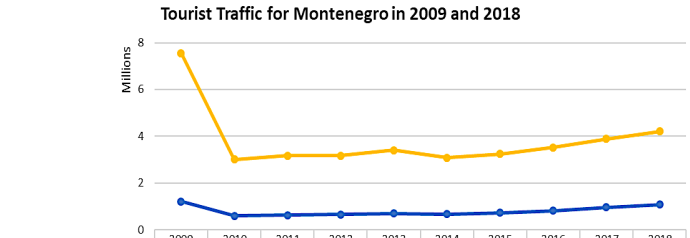
Montenegro, one of the smallest European countries, is in Mediterranean Europe, on the coast of the Adriatic Sea. With a population of less than 650,000, Montenegro covers an area of nearly 14,000 km2 (Monstat, 2019a) and is surrounded by Albania, Croatia, Bosnia and Hercegovina, and Serbia. Montenegro is an EU candidate country (European Commission, 2021) and has been known as a "wild beauty" (its official slogan) destination (NTO Montenegro, 2020) since its proclamation of independence in May 2006 (Vitic, Ringer, 2008). In addition, Montenegro is an emerging tourist destination (Terzibasoglu, 2015) that bases its economy on tourism development (Ministarstvo Ekonomije, 2014). Tourism plays an important role in the country's economy, supported by facts such as the following: the total contribution of tourism to GDP was 12.16% ($0.51 billion) in 2009 and 21.59% ($1.18 billion) in 2018, while the direct contribution was 6.52% ($0.27 billion) in 2009 and 10.38% ($10.38 billion) in 2018 (WTTC, 2019).

The total contribution of tourism to employment was 10.74% in 2009 and 17.15% in 2018, while the direct contribution was 5.68% in 2009 and 6.83% in 2018 (WTTC, 2019). Put differently, the average growth rate of total tourism contribution to national GDP has been 4.56% per year, while the growth rate of total tourism contribution to employment has been 2.71% for the abovementioned period.

Montenegro was visited by 1.07 million tourists in 2018 (Monstat, 2019b). Due to economic crisis, the Montenegrin economy was attacked dramatically, and the consequences are still felt. The consequences were slightly noticed in 2008 and 2009 (Figure 1). The real estate market was booming due to foreign investments, which had increased from $400 billion (2000) to $1833 billion (2007) (Fabris, Kilibarda, Radunovic, & Rakocevic, 2008). Most real estate was bought by Russians, which is why Montenegro became known as "Moscow on the water" (Bilefsky, 2008). This led to an increase in the number of tourists from Russia. The first real signs of adverse conditions emerged in 2010 (Figure 1). While other economies have been recovering since 2010, Montenegro's economy has declined, despite emerging destinations typically experiencing more rapid recovery than mature locations (Laws, Prideaux, 2005).

Inbound tourism contributed to Montenegrin tourism at 84% in 2009 and 89% in 2018 (Monstat, 2019a). One of the main characteristics of Montenegrin tourism is high seasonality (Bigović, 2012; Petrevska, 2014), and the destination is mainly visited during summer months (June, July, and August) (Figure 2).

Figure 1: Tourist Traffic for Montenegro in 2009 and 2018

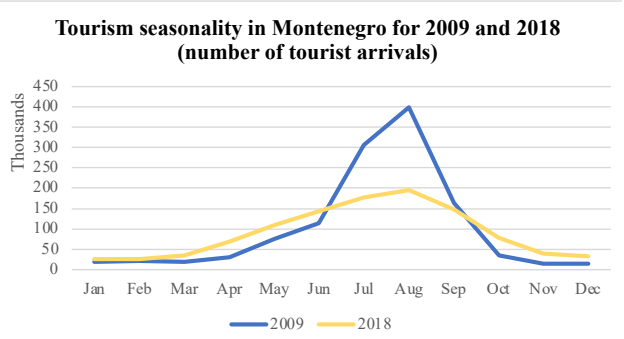


	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Tourists' arrivals	1,207,784	593,187	625,981	651,291	694,101	676,342	733,850	808,788	955,499	1,076,848
Tourists' overnight stays	7,552,006	3,014,418	3,170,519	3,172,900	3,397,308	3,085,634	3,247,820	3,521,897	3,890,370	4,208,955

Source: Monstat (2019b)

The top 10 inbound markets have not changed significantly since 2009 (Table 1). Serbia and Russia are still the key tourism source markets. Thanks to new strategic orientation, Montenegrin tourism development is now more focused on both Western markets and Russia (Bulatovic, Vujicic, 2018). According to the Travel and Tourism Competitiveness Index, in 2018 Montenegro was positioned at 67, five positions higher than in 2016 (WEF, 2019). Although Montenegro is a new and fast-growing tourist destination (Cerović Smolović et al., 2018; Statista, 2014), its competitiveness indexes are not comparable with leading, more mature destinations such as Malta or Cyprus. Destination management, as well as tourism development planning and policy, is recognized as critical in tourism development (Bulatović et al.,2018).

Figure 2: Tourism Seasonality in Montenegro (2009 and 2018)



Source: Monstat (2019b)

Table 1: Top 10 Source Markets for Montenegro in 2009 and 2018

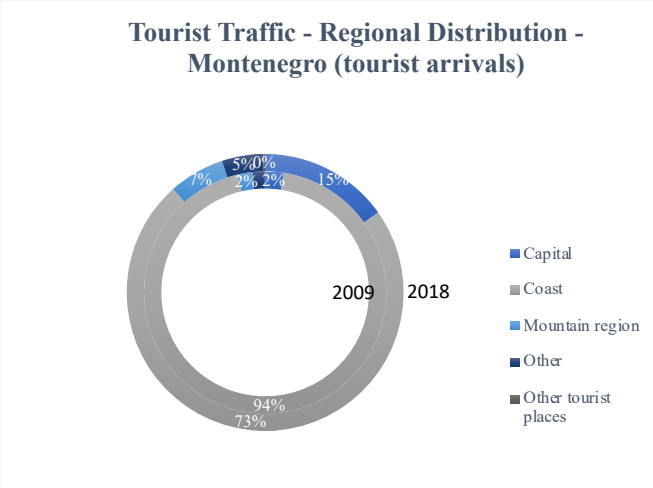
Top 10 Source Markets				
N	2009	%	2018	%
1	Serbia	26.3	Serbia	19.7
2	Russia	15.3	Russia	16.3
3	Bosnia and Herzegovina	9.2	Bosnia and Herzegovina	9.3
4	Kosovo	5.2	Germany	4.3
5	Italy	3.1	France	3.7
6	France	2.9	Poland	3.3
7	Albania	2.4	Albania	3
8	Hungary	2.3	UK	3
9	Czech Republic	2.1	Ukraine	2.7
10	North Macedonia	1.8	Kosovo	2.1

Source: Monstat (2019b)

Montenegro is mainly a sea, sand, and sun destination (Bulatović, Stranjančević, 2019b), as reflected by its tourist arrivals distribution (Figure 3). Tourism development in Montenegro is focused on its coastal areas. However, it is noticeable that in the last nine years, tourist arrival distribution has changed. Podgorica, Montenegro's capital, has exhibited increased levels of visitation since 2009 due to its emergence as a key business tourism destination. The coast and the capital are the most developed regions in Montenegro, while the mountain region is often deemed the most beautiful and unspoiled area. However, this region is underdeveloped, which causes population migration (Rajovic, Bulatovic, 2013; Rajović, Bulatović, 2016). Besides sea, sand, and sun tourism, the most developed types of special interest tourism are MICE tourism and nautical (Mitrovic, Gloginja, 2019).

The marina Porto Montenegro is recognized as a world-class marina, the first and only Platinum Marina award holder in the world (Porto-Montenegro, 2017). Despite significant potential for the development of cultural and historical tourism (Milošević, 2014; Moric et al., 2021; Vučetić, 2011), ecotourism (Bulatović, Rajović, 2017a; Bulatović, Tripković-Marković, 2015; Ratkovic, Bulatović, 2013; Vujacic, 2013), sport tourism (Bulatović, Rajović, 2017b; Klaric, 2008), religious tourism (Bulatović, Stranjančević, 2019a), casino tourism (Bulatović et al.,2017), and MICE tourism (Benner, 2020) are still at an early developmental stage. Montenegro has aligned its tourism development policy with the UN Agenda 2030 and set its strategic goals in line with the Sustainable Development Goals (Galli et al., 2018).

Figure 3: Tourist Traffic: Regional Distribution in Montenegro (%)



Source: Monstat (2019b)

During 2019, Montenegro recorded its highest number of tourist arrivals and tourist overnight stays. More specifically, the number of tourist arrivals increased by 19.97% (2,645,217 arrivals), while the number of tourist overnight stays increased by 11.79% (14,455,920 stays) (Monstat, 2021). There was no change to the top 10 source markets, while minor changes emerged for regional distribution in favor of the mountain region (Monstat, 2021).

2020 was an extremely difficult year for the Montenegrin economy due to the COVID-19 pandemic, similarly to other countries. However, in May 2020, the Montenegrin government announced that the country was "the first Europe's coronavirus-free state" (Reuters, 2020). Later, in June 2020, the European Commission published a list of countries that were safe for travel (Petrelli, 2020). That Montenegro was included in this list proved important, as it mitigated the risk of state bankruptcy given that the country's economy is highly dependent on tourism.

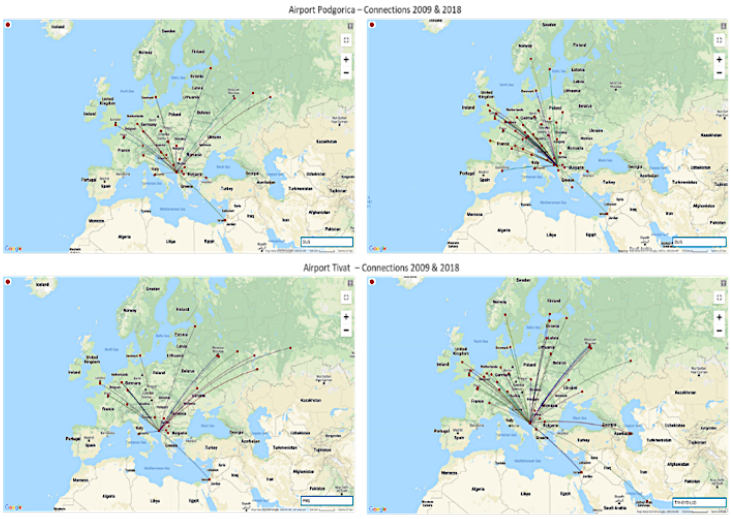
In spite of the government's efforts to save the economy, Montenegrin tourist traffic in terms of the number of tourist arrivals dropped by over 95% in 2020 (Monstat, 2021). The situation was slightly better for the number of tourist overnight stays. These dropped by 82.1% (Monstat, 2021). In 2021, 1,670,879 tourists visited Montenegro, while the number of tourist overnight stays reached 9,872,573 (Monstat, 2021). It is clear that Montenegro is recovering slowly but steadily from the COVID-19 pandemic impacts. During 2022, tourism in Montenegro has been affected by additional factors, such as the war between Russia and Ukraine (the top source markets), high inflation, and political instability in the country.

From a transportation perspective, Montenegro is not easy to reach. First, there is no highway that connects Montenegro to the key regional roads. The highway Bar-Boljari is under construction; however, further investments are needed to link Montenegro with highways of neighboring countries. Water and rail transport are both underdeveloped and unsafe for travelers. Therefore, tourism in Montenegro is highly dependent on air transport (Radulovic, 2012).

There are two international airports. One is located in the capital, Podgorica Airport (IATA: TGD; ICAO: LYPG), and the other in the coastal region, Tivat Airport (IATA: TIV; ICAO: LYTIV). Podgorica has one runway, 2500 m long and 45 m wide, six parking positions for category C aircraft (airspeed range: 121–140 knots—airline jet), and the possibility of parking category D aircraft (airspeed range: 141–165 knots—large jet/military jet) in parking positions 5 and 6. Furthermore, there are three parking positions for general aviation aircraft (wing span ≤20m), one parking position for aircraft (category C). A passenger terminal (5500 m2) has eight check-in counters and eight exits (Stathopoulos et al., 2019).

On the other hand, Tivat Airport has only one runway. Tivat Airport has seven parking positions for categories C and D aircraft. Its passenger terminal (4050 m2) has twelve check-in counters and six exits (Stathopoulos et al., 2019, p. 63). How these two airports connect to the rest of the world is illustrated in Figure 4. Podgorica Airport, in 2009 had 23 connections, while it had 44 in 2018 (OAG, 2019). Tivat Airport had 20 connections in 2009, jumping to 35 in 2018 (OAG, 2019). Montenegrin airports' capacity expansion is planned, with a new strategy of traffic development extending to 2035 (Stathopoulos et al., 2019). During 2020, airports in Montenegro were closed to passengers until June 1st (Novi Početak, 2021) due to the COVID-19 pandemic. Currently, airports in Montenegro serve 21 different routes (Figure 4), according to Flightradar 24 (2021).

Figure 4: Montenegro Airport Connections in 2009 and 2018



Source: (OAG, 2019)

The country's first national airline, Montenegro Airlines, started operating in 2000. It had six aircraft and 43 regular lines in 2018, jumping to 46 in 2019. The number of seats was 692 (Monstat, 2020). Due to radical changes on the political stage of Montenegro following parliamentary elections in 2020 (Utjesinovic, 2020), Montenegro Airlines was liquidated by the new government, as the company was not profitable (Fabinger, 2020). A new airline, Air Montenegro, was launched in May 2021 (Rains, 2021), but due to the COVID-19 pandemic, air transport in Montenegro was closed for some time.

3 METHODOLOGY AND DATA

For the purposes of research, panel data regression analysis was used. Creating panel data regression models has been popular among researchers in several study areas (Baltagi, 2006; Tsionas, 2019). As mentioned in the literature review, panel data analysis is commonly used for forecasting and modeling tourism demand (Albaladejo et al., 2016; Alsumairi, Tsui, 2017; Song, Li, 2008). Dynamic panel data analysis was undertaken using EViews 9, a well-recognized software for general econometric analysis (McKenzie, Takaoka, 2012). We applied two-stage least squares analysis to estimate our empirical models. Due to the high seasonality of tourism in Montenegro (Bigović, 2012) as well as the uneven distribution of tourist arrivals regionally (Bulatović et al., 2018), we established five different models, to test whether the number of tourist arrivals, total and per tourist regions identified by Monstat (2019b), could be determined by the explanatory variables listed below.

ASK: commonly used in research as an indicator of airlines' growth capacity and the distance between tourists' origin country and preferred destination (Alsumairi, Tsui, 2017; Belobaba et al., 2015; Mhlanga, 2019; Papatheodorou et al.,2012). According to Salarzadeh Jenatabadi (2013), ASK can be used as a latent variable to measure airline capacity and predict airline performance. As discussed in the literature review, ASK is commonly used in exploring tourism demand models and testing the relationship between tourism and aviation (Alsumairi, Tsui, 2017; Song, Li, 2008; Song, Witt, 2000; Tsui, 2017; Tsui et al., 2019; Tsui et al., 2021).

Jet Fuel Prices (JFP): impact on tourism demand, since travelers are price sensitive. Moreover, JFPs can serve as an airfare proxy (Alsumairi, Tsui, 2017; Atems et al., 2019; Tsui, 2017; Tsui, Balli, 2016; Tsui et al., 2021; Wadud, 2015).

Exchange Rates (EXCHRATE): another economic variable frequently used in modelling tourism demand (Albaladejo et al., 2016; Alsumairi, Tsui, 2017; Baltagi, 2015; De Vita, Kyaw, 2013; Dogru et al., 2017; Irandoust, 2019; Peng et al., 2014; Song, Li, 2008; Song et al., 2019; Song et al., 2008; Zhang et al.,2020). As discussed above, Montenegro's top source tourist market is Russia. Therefore, we chose the exchange rate variable US dollar per euro (the official currency of Montenegro) monthly average because there is an extremely strong correlation between dollar appreciation and the Russian ruble (Urbanovsky, 2015).We did not consider other top sources of tourist markets, such as Serbia, Bosnia and Herzegovina, Albania, and Kosovo or their currency because tourists from these countries typically travel by car, not plane, so they would not be relevant.

HHI: extensively used as an indicator of airlines' market concentration: a highly concentrated market is likely to be less competitive (Alsumairi, Tsui, 2017; Hao et al., 2020; Tsui, 2017; Wang et al.,2018). In our case, the HHI illustrates competition for the Montenegrin aviation market. The HHI values vary from 0 to 10,000, where 0 indicates the most competitive aviation market (Alsumairi, Tsui, 2017). It was expected that we would have negative HHI coefficient in our econometric model for several reasons directly and indirectly related to the aviation market. First, Montenegro is a small, developing country and its aviation infrastructure is quite poor, as explained in the previous chapter.

Seasonality (SEASON): determines tourism demand (Chan, Lim, 2011; Dobruszkes et al., 2019; Goh, Law, 2002; Petrevska, 2014; Vatsa, 2020). In our case, SEASON was inserted as a dummy variable and calculated based on tourist traffic and flight statistics. In other words, we identified the months May, June, July, August, and September as those when tourism seasonality is evident.

In line with the literature review, for the purposes of our research, an unbalanced panel or longitudinal (Longhi, Nandi, 2015; Park, 2015) dataset was created. Due to a lack of data in our panel dataset, we included monthly data from February 2009 to December 2018 for the top 30 airlines that flew to Montenegro. The total number of observations considered for panel data regression was 3570. Data were collected from different sources, as illustrated in Table 2. According to the central limit theorem, a sample size with over 30 observations is considered normally distributed (Chang et al.,2006). Stationarity was tested by panel unit root tests, namely the Im, Pesaran, and Shin test (Breitung, Pesaran, 2008; Im et al., 2003) and an approximate degree of freedom (ADF) test (Choi, 2001), as these are appropriate tests for unbalanced data (Levin et al., 2002). We also tested multicollinearity through correlation between independent (explanatory) variables. Once defined, the empirical models of tourism demand were tested by the Durbin–Watson statistic (Brown et al.,1975).

Table 2: Descriptive Summary

CODE	Variables	Definition	Source	Mean	Median	Maximum	Minimum	Std. Dev.
ARR	Total number of tourist arrivals	logarithmic form	Monstat	10.72187	10.61945	12.8986	9.242033	0.900779
ARRCOAST	Number of tourist arrivals for coastal region	logarithmic form	Monstat	10.63488	10.31972	13.816	8.720787	1.391771
ARRCAP	Number of tourist arrivals for capital	logarithmic form	Monstat	8.748958	8.600902	9.861936	7.945201	0.474238
ARMOUN	Number of tourist arrivals for mountain region	logarithmic form	Monstat	8.223283	8.224524	9.813727	6.520621	0.685021
ARROTTOUR	Number of tourist arrivals for other tourist places	logarithmic form	Monstat	7.80866	7.884577	9.145909	5.402677	0.606426
ASK	Average seats per km	logarithmic form	OAG	14.89336	14.95403	17.89716	10.56824	1.255589
JFP	Jet fuel prices	logarithmic form	IndexMundi	0.506648	0.494696	0.936093	-0.150823	0.273692
EXCHRATE	Exchange rates (US dollar per euro monthly average)	logarithmic form	X-Rates	-0.224876	-0.249192	-0.052311	-0.399225	0.094484
HHI	Herfindahl–Hirschman Index	logarithmic form	OAG	-1.416197	-1.405567	-0.607862	-2.239028	0.45021
SEASON	Seasonality	Dummy	Personal approximation based on statistical data	0.420168	0	1	0	0.493655

Source: EViews output

Proposed tourism demand models

Model 1:

$$ARR_t = c + b1*ASK_{it} + b2*JFP_t + b3*EXCHRATE_t + b4*HHI_t + b5*SEASON_t + e_{it}$$

Model 2:

$$ARRCOAST_t = c + b1*ASK_{it} + b2*JFP_t + b3*EXCHRATE_t + b4*HHI_t + b5*SEASON_t + e_{it}$$

Model 3:

$$ARRCAP_t = c + b1*ASK_{it} + b2*JFP_t + b3*EXCHRATE_t + b4*HHI_t + b5*SEASON_t + e_{it}$$

Model 4:

$$ARRMOUN_t = c + b1*ASK_{it} + b2*JFP_t + b3*EXCHRATE_t + b4*HHI_t + b5*SEASON_t + e_{it}$$

Model 5:

$$ARROTHTOUR_t = c + b1*ASK_{it} + b2*JFP_t + b3*EXCHRATE_t + b4*HHI_t + b5*SEASON_t + e_{it}$$

i: airlines
t: the period of concern (February 2009 to December 2018),
c: constant
e: error term
b1,2,3,4,5 – two-stage least square coefficient

4 EMPIRICAL RESULTS AND DISCUSSION

Both models, with fixed and random effects, were tested. The results of the Hausman test (Baltagi et al., 2003; Chen et al., 2018; Frondel, Vance, 2010) show that it is preferable for further analysis to use models with fixed effects ($\chi2$ 1(7) = 137,216, $p < 0.01$; $\chi2$ 2(7) = 60,073, $p < 0.01$; $\chi2$ 3(8) = 58,526, $p < 0.01$; $\chi2$ 4(7) = 76,336, $p < 0.01$; $\chi2$ 5(7) = 135,417, $p < 0.01$).

As discussed in the methodology section, stationarity was tested by panel unit root tests, namely the Im, Pesaran, and Shin test and an ADF test. The results in Table 3 show that time series are stationary and the necessary requirements for performing unbalanced panel data regression analysis are met.

The results presented in Table 4 show that all proposed models are statistically significant ($p < 0.0000$). Moreover, R-squared in all cases is above 0.60, which represents a good model fit (Gordon, 2015; Weisberg, 2005; Westfall, Arias, 2020). The ASK coefficients were positive in all tested models, which means that by opening new air routes, Montenegro will become more attractive to international travelers. These results correspond with the results of Alsumairi and Tsui (2017), Tsui (2017), Tsui et al. (2019), and Tsui et al. (2021).

Table 3: Panel Unit Root

CODE	Meaning	Im, Pesaran, and Shin test		Approximate degree of freedom (ADF) test	
		Individual intercept	Individual intercept and trend	Individual intercept	Individual intercept and trend
ARR	Total Number of Tourist Arrivals	-29.0342*	-37.4488*	867.39*	1084.04*
ARRCOAST	Number of Tourist Arrivals for Coastal Region	-51.9685*	-53.6855*	1059.81*	1626.45*
ARRCAP	Number of Tourist Arrivals for Capital	-3.67941*	-21.4938*	82.8402*	516.965*
ARMOUN	Number of Tourist Arrivals for Mountain Region	-23.6773*	-28.7756*	651.258*	765.048*
ARROTTOUR	Number of Tourist Arrivals for Other Tourist Places	-29.0342*	-37.4488*	867.39*	1084.04*
ASK	Average Seats Per km	-7.00695*	-8.04967*	201.211*	278.297*
JFP	Jet Fuel Prices	-1.51841*	-2.36941*	459.217*	562.302*
EXCHRATE	Exchange Rates (US Dollar per Euro Monthly Average)	-18.6455*	-21.0387*	432.958*	560.962*
HHI	Herfindahl–Hirschman Index	-8.72019*	-13.7168*	274.086*	354.548*

* Statistical significance at 1%

Table 4: Empirical Results

Independent (Explanatory) Variables	Dependent Variables				
	ARR	ARRCOAST	ARRCAP	ARMOUN	ARROTTOUR
	Total Number of Tourist Arrivals	Number of Tourist Arrivals for Coastal Region	Number of Tourist Arrivals for Capital	Number of Tourist Arrivals for Mountain Region	Number of Tourist Arrivals for Other Tourist Places
ASK	0.256811*	0.408658*	0.098163*	0.196856*	0.307187*
JFP	-0.403465*	-0.248918*	-0.331055*	-0.392124*	-0.400976*
EXCHRATE	-1.451567*	-0.732018*	-0.566482*	-0.700805*	-0.592713*
HHI	-0.646195*	-0.204351*	-1.007969*	-0.445428*	-0.574439*
SEASON	1.16984*	2.098494*	0.102369*	0.783898*	0.45195*
C	5.462086*	3.404138*	5.952744*	4.437216*	2.380277*
R-squared	0.838455	0.802257	0.871768	0.685781	0.633285
Adjusted R-squared	0.834568	0.79707	0.868404	0.677422	0.623782
Prob (F-stat)	0	0	0	0	0

* statistical significance at 1%
** statistical significance at 5%
*** statistical significance at 10%

Another explanatory variable that is significant for tourism demand modeling is JFP. When JFP increase, air fares increase, which can negatively impact inbound tourism development. These results are in line with previous research on a similar topic (Alsumairi, Tsui, 2017; Tsui, 2017; Tsui et al., 2019; Tsui, Balli, 2016; Tsui et al., 2021). Ma, Zhang, Zhang, and Xu (2021) have stated that "higher market concentration is associated with lower passengers' flow" (p. 7) and vice versa. Our research confirms this (negative HHI). This is closely related to the fact that most competitive airlines do not see the advantage to opening their routes to Montenegro, since it is neither a tourist hub nor business center and is not of high economic or political importance.

Moreover, inbound tourism in Montenegro is seasonal, with tourism demand highest during the summer months. Our results match those of Koo et al. (2017), Peng et al. (2014), Alsumairi and Tsui (2017), Tsui et al. (2019), Tsui and Balli (2016), and Tsui et al. (2021).

Table 5: Multicollinearity Test

Correlation					
Probability	ASK	JFP	EXCHRATE	HHI	SEASON
ASK	1				

JFP	-0.017949	1			
	0.4877	-----			
EXCHRATE	0.181638	-0.521572	1		
	0	0	-----		
HHI	-0.308621	0.119016	-0.615633	1	
	0	0	0	-----	
SEASON	0.214276	0.073729	-0.011082	-0.316179	1
	0	0.0043	0.6683	0	-----

There is no multicollinearity between the independent (explanatory) variables, as the correlation values are below the threshold (0.8) that suggests the presence of multicollinearity (Gujarati, 2009) (see the correlation matrix).

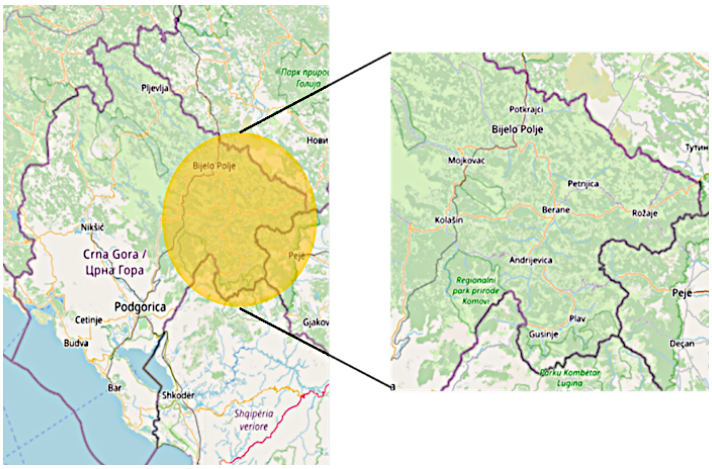
As such, the proposed models of tourism demand are valid and can be accepted for further testing and elaboration. Our research confirms a strong relationship between civil aviation and tourism development. To be more precise, tourism in Montenegro is highly dependent on the civil aviation sector due to poor land transport accessibility (lack of motorways and railroads). It means any even minor fluctuations in air traffic could reflect on tourism demand in Montenegro. By shaping tourism demand models for an entire destination (Model 1) and then for particular tourist regions (coastal region, Model 2; capital city, Model 3; northern region, Model 4; and other tourist places, Model 5),we verified that tourism demand can be explained by variables combined, as was the case for prior studies (Cao et al., 2017; Frechtling, 2012; Goh, Law, 2002; Koo et al., 2017; Li et al., 2020; Lim, 1997; Massidda, Etzo, 2012; Santos, Cincera, 2018; Song, Li, 2008; Tsui et al., 2019; Vatsa, 2020; Y.Zhang, Li, Muskat,Vu, & Law, 2021).

As other researchers have focused on LCCs and destination development (Alsumairi, Tsui, 2017; Álvarez-Díaz et al., 2019; Chung, Whang, 2011; Donzelli, 2010; Graham, Dennis, 2010; Henderson, 2009; Tsui, 2017; Hsu et al., 2016; Rey et al., 2011; Santos, Cincera, 2018; Wang et al., 2018),we considered both regular and LCCs, since this is one of the first studies on this topic in the context of Montenegro. It is of note that all tourism demand models have been validated in spite of not all parts of Montenegro being developed tourist regions. In other words, the current economic development strategy in Montenegro mainly focuses on tourism, and it is just matter of time until all subregions become more exposed to international tourists. Moreover, the revitalization and internationalization of Berane Airport (in the mountain region) can be seen as potential springboard that will launch a new era in tourism development, not only in Montenegro but also in neighboring countries (Albania and Serbia). As expected, municipalities, such as Mojkovac, Kolasin, Berane, Andrijevica, Plav, Rozaje, and Bijelo Polje (Figure 5), will start crafting their tourist product intensively, which will increase airline capacity, as was the case in previous studies (Tsui et al., 2019). Moreover, Montenegro has started opening its borders to LCCs, offering a new opportunity to shape tourism demand (Alsumairi, Tsui, 2017).

Furthermore, private arrangements between hotels and airlines can boost tourism demand, focusing on special interest tourism, as was the case with casino tourists from Italy who used to fly on charter flights to Montenegro every Friday and Sunday (Bulatović et al., 2017). High summer seasonality will remain for years to come, especially in times of the COVID-19 pandemic, where each destination that keeps the spread of the virus under control attempts to attract as many tourists as possible to boost its economy.

Our research confirms that fundamental econometric theory is still valid. Considering the facts that the tourism sector in Montenegro has started recovering rapidly from the low 2020 levels and that tourism is still regarded as the priority for economic development in Montenegro, we expect that the proposed econometric model for forecasting tourism demand will be also relevant in the post-COVID-19 era. However, it is hard to predict any significant special interest tourism demand changes in the context of Montenegro. Assuming the world's trends (Bulatovic, Iankova, 2021), there is great opportunity for creating completely new tourism demand, such as for medical purposes or even digital nomads. However, it may prove difficult for the Montenegrin tourism system to adapt quickly and create the necessary tourist offer, due to the lack of collaboration between public and private sectors and between Air Montenegro and hoteliers, the unstable political scene, and the unsteady ground in terms of foreign investments.

Figure 5: Map of Montenegro



Source: OpenStreetMap (2021)

5 CONCLUSIONS

In this paper, we explored the relationship between civil aviation and tourism demand in the context of Montenegro. We tested five tourism demand models with fixed effects, considering as dependent variables the number of international tourist arrivals to Montenegro and the number

of international tourist arrivals to different regions in Montenegro (coastal regions, mountain regions, capital, and other tourist places). Likewise, we utilized a set of explanatory variables: ASK, the HHI, exchange rates, and JFP, and the dummy variable SEASON. Only ASK differs at the airline level; all other variables exhibit variability solely over time. However, this is not regarded as a problem as our dynamic panel data analysis confirms a strong explanatory power of the above-mentioned variables in modelling tourism demand at both national and regional levels.

To the best of the authors' knowledge, this research is the first of its kind undertaken in the context of Montenegro. From a scientific perspective, it can serve as a foundation for future analysis on the same or a similar topic. However, the proposed models of tourism demand can be extended. For example, we did not test the impacts of civil aviation on tourism growth, or special interest tourism demand models, which are research limitations. In line with research trends, it is highly recommended to monitor impacts of LCCs on tourism demand in Montenegro to explore both sides of the coin: impacts on inbound and outbound tourism. Although the quantitative analysis is based on pre-COVID-19 data, it is believed that the identified attributes are and will remain relevant when a new post-pandemic state of normality is reached.

Since the research is mainly quantitative, which is considered an additional limitation, detailed qualitative analysis is also needed to consider the impact of COVID-19 and the current war between Russia and Ukraine on inbound tourism in Montenegro. In any case, the current research represents a good starting point for decision-makers at all levels, especially those at the top. It can also prove of interest to low-cost and regular airlines interested in flying to Montenegro, as well as to airport infrastructure providers and other tourism stakeholders. In fact, open skies can boost inbound tourism traffic and generate tourism development, provided that the destination does not end up becoming a victim of its own success due to environmental sustainability issues.

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