

## The Dynamic Relationship Among the Air Transport, FDI and the Financial Development: An Empirical Analysis of Türkiye Under Structural Break

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DOI: <https://doi.org/10.19275/RSEPCONFERENCES192>

### Abstract

This study aimed to reveal the effects of air transport, foreign direct investments (FDI), and financial development on the economic growth of Türkiye from the period 1980 to 2020. We used Zivot & Andrews (1992) structural break unit root test, Gregory & Hansen's (1996) structural break cointegration test, and the FMOLS coefficient estimator in the empirical analysis as the method. Zivot & Andrews's (1992) unit root test results show that all variables have unit root at level, however, at first, the differences in all variables are stationary. As the second step, we run Gregory & Hansen's (1996) cointegration test. It results in the display that there is a cointegration relationship in the model at 5 % percent which is statistically significant. The breakpoint was observed in 2006. The result of FMOLS demonstrates that the air transport effect on economic growth is positively at a 1 % percent significant level. A 1 % increase in air transport rises the economic growth to 0.362 % percent. On the other hand, FDI and financial development have significant effects on economic growth. Although the coefficient FDI is positive, financial development coefficients are negative.

**Keywords:** air transport, economic growth, Türkiye.

**Jel Codes:** C01 L91, O47

### 1. Introduction

Economic growth, with its many benefits, is extremely important for human life and well-being. For this reason, governments should design their economic policies in the direction of realizing the ultimate economic growth that can promote living standards. At this point, it is important to correctly identify the economic growth dynamics that will maximize human welfare. Especially in the last few decades, the increase in international capital flows with globalization, the developments in logistics, international transportation networks, and the financial system have revealed how important global dynamics are in terms of economic growth, as well as national dynamics.

In this context, we should also note the location advantage of Turkey. It has a good location for both passenger transportation and logistics transportation, which has economic development and growth dynamics. In a few decades, the investment of Türkiye in transport has been important for the economy. In this article, we investigated the relationship between air transportation, FDI (direct foreign investment), financial development, and economic growth for Turkey in the period from 1980 to 2020. The difference of this study from previous studies is that, in addition to structural break methods, it adds foreign direct investments and financial development to the model together with air transportation. This study consists of five sections; introduction in section 1, literature in section 2, data and methodology in section 3, found in section 4, and conclusion in section 5.

### 2. Literature Review

The study, which examines air transport from an economic point of view, mostly investigated the relationship between air transport and economic growth in the literature. However, the study investigating the combined effect of foreign direct investment, financial development, and air transport on economic growth is limited. For instance, Marazzo et al. (2010), using time-series analysis, researched the linkage between air transport and economic growth by ARDL bound test approach for Brazil in the period 1966-2006. The findings suggest that GDP and air transport are cointegrated. The Impulse-response analysis shows a strong positive reaction.

Kiracı (2018), using Toda-Yamamoto (1995) and Hatemi-J's (2012) asymmetric causality technique, investigate the causal relationship between air transport and economic growth in Türkiye from 1960 to 2015. There are no causal relationships for the Toda-Yamamoto causality test. There is a bi-directional causality relationship between air transport and economic growth as a result of the Hatemi-J asymmetric causality test

Chi and Baek (2013), using ARDL bound test approach, investigate the dynamic linkage between air transport and economic growth in the United States. The empirical analysis demonstrates that in the long term, air transport increases economic growth. In short term, only air passenger transport impacts economic growth. Similarly, Adedoyin et al. (2020) researched the relationship between the air transport FDI, ICT, and the economic growth in the United States during the period 1981-2017. It displays that air transport affects economic growth positively.

Baltacı et al. (2015) researched the impact of the air transport activity on the regional economic development for 26 sub-regions of Türkiye from 2004 to 2011, using the 2OLS method. Its results show that the increased active air transport has a positive effect on regional economic growth.

Hakim and Merkert (2016) examined the causal relationship between economic growth and air transport for the period from 1973 to 2014 in South African countries. It found a uni-directional causal relationship between economic growth and air transport.

Iqbal et al. (2020) investigate the linkage between air transport, FDI, innovation, and economic growth in BRIC-MT countries for the period from 2000 to 2019. Using panel cointegration, FMOLS, DOLS, and Granger causality technique to realize empirical analysis. The result shows that air transport, innovation, and FDI have a significant and positive impact on economic growth.

Balsalobre-Lorenta et al. (2020) investigated the impact of air transport on economic growth via the tourism-led growth hypothesis for Spain from 1970 to 2015. The empirical analysis was realized with asymmetric ARDL and Diks and Panchenko's (2006) causality technique. The findings show that air transport, urbanization, and globalization significantly promote economic growth. And there is bi-directional causality between GDP and air transport.

Eren et al. (2020) examined the impact between air transport and the economic growth in Türkiye during the 1980-2018 period. The result of the empiric analysis shows that air transport has a positive impact on economic growth. On the other hand, there is an un-directionally causality between air transport and economic growth.

Using ARDL bound test approach, Altuntaş and Kılıç (2021) investigated the relationship between air transport and economic growth in the period from 1960 to 2017 in Türkiye. The results indicated that air transport and economic growth cointegrated. A significant relationship among the variables is not found in long term. However, in the short run, air transport increases economic growth. Most of the studies revealed that air transport has a positive impact on economic growth. In this study, we expect air transport to have a positive effect on economic growth.

### 3. Data and Methodology

This paper aims to examine the effect of air transport, FDI, and financial development on the economic growth in Türkiye from 1980 to 2020. The data set is annually frequent and derived from World Bank and International Money Found (IMF). The information about the data set is shown in Table 1.

**Table 1.** The descriptive of variables

Series	Symbol	Database
Economic Growth (current, \$)	logGDP	World Bank
Air Transport freight (million ton-km)	logAIR	World Bank
Foreign Direct Investment (%GDP)	FDI	World Bank
Financial Development (financial development index)	logFIN	IMF

The relationship can be displayed as follows equation 1:

$$\log GDP_t = \mu_t + \beta_1 \log AIR_t + \beta_2 FDI_t + \beta_3 \log FIN_t + \varepsilon_t$$

Where,  $t$ , time,  $\mu$ , constant;  $\beta$ , coefficient;  $\varepsilon$ , error term, represent.

As the empirical analysis was used as a structural break time series method. That methods, Zivot & Andrews's (1992) unit root test, Gregory & Hansen's (1996) cointegration test, and the FMOLS estimator.

Zivot & Andrews (192) improved an alternative to Perron's (1989) unit root test. Zivot & Andrews's (1992) test allows an internal estimation of the break in the series. It is calculated as one structural break date. It was calculated in three models: the Constant model, the trend model, the trend, and the constant model.

As a cointegration test, we run Gregory & Hansen's (1996) cointegration test. Hence, in standard or traditional cointegration tests, it is assumed that there is no change in the vector indicating cointegration over time. Gregory and Hansen (1996) introduced the cointegration test, which reveals the structural breaks in which the break date is determined internally, based on the fact that the vector showing cointegration can change over time, that is, breakage may occur. This test can also observe a break in the series. Obtained test statistics are compared with the critical values table. In contrast to the basic hypothesis, which shows that there is no relationship among the variables in the model, the alternative hypothesis that there is cointegration among the variables with a break in the model is tested.

#### 4. Empirical Findings

The Zivot & Andrews unit root test results are displayed in Table 2. As seen in Table 2, all series are non-stationary in the level under the structural break for model A. The first difference in series is stationary under the structural break for Model A. Except for FDI, other series are nonstationary in level value under the structural break for Model C. However, the variables first difference values are stationary. As Model C, FDI is stationary at the level under the structural break. We can express the series stationary level I(1) as Model A under the structural break.

**Table 2.** Zivot & Andrews (1992) unit root test results

Series	Model	Lag length	t-İst	TB
logGDP	Model A	0	-2.619	2014
	Model C	0	-3.441	2010
logAIR	Model A	0	-3.818	2001
	Model C	0	-4.073	2001
FDI	Model A	0	-4.742	2005
	Model C	0	-6.892***	2005
logFIN	Model A	0	-2.376	2010
	Model C	0	-4.467	1998
D(logGDP)	Model A	0	-6.821***	
	Model C	0	-7.502***	
D(logAIR)	Model A	0	-7.674***	
	Model C	0	-7.863***	
D(FDI)	Model A	0	-6.151***	
	Model C	0	-6.073***	
D(logFIN)	Model A	0	-5.543***	
	Model C	0	-5.475***	

Note: \*\*\*, %1 level of significance.

The Zivot & Andrews unit root test result shows all variables cointegrated at I(1). In the second step, we examined the cointegration relationship in the model using Gregory & Hansen's (1996) structural break cointegration test. Cointegration results are displayed in Table 3. Gregory & Hansen's (1996) cointegration results show that there is a cointegration relationship in the model at 1 % statistically significant. Gregory & Hansen cointegration test calculated break time as 2006.

**Table 3.** Gregory & Hansen (1996) cointegration test results

Dependent variable	Model	TB	ADF-statistic
logGDP	Model 4	2006	-5.286***

Note: \*\*\*, %1 level of significance.

In the last step, we calculated the long-run coefficient using the FMOLS technique. The FMOLS results are demonstrated in Table 4. As the FMOLS coefficient results, air transport increases economic growth by 1 % statistically significant. In other words, an 1 % increase in air transport, and a rise in the economic growth of 0.362 %. On the other hand, the FDI has a positive impact on economic growth, significant statistically at 1 %, however, financial development has a negative impact, significant statistically at 1 %. The break time that derives from the cointegration test is included in the model as dummy 2006. The coefficient result dummy 2006 hurts the economic growth. Table 4. FMOLS estimator test results in Independent variables

**Table 4.** FMOLS estimator test result

Independent variables	Coefficient	t-Statistic	Prob.
logAIR	0.362***	1.524	0.000
FDI	0.252***	1.728	0.000
logFIN	-0.002***	-3.069	0.004
Dummy2006	-0.562***	-8.526	0.000
R <sup>2</sup> :0.91			
R <sup>2</sup> adj:0.90			

Note: \*\*\*, %1 level of significance.

## 5. Conclusion

This paper investigates the effects of air transport, FDI, and financial development on the economic growth of Türkiye during the period from 1980 to 2020. The empiric analysis realized structural break methods. We used Zivot & Andrews (1992) structural unit root test, Gregory & Hansen's (1996) structural break cointegration test, and the FMOLS coefficient, estimator. The series are nonstationary at level value, however, at first difference all series are stationary. And Gregory & Hansen's cointegration test display that there is a cointegrated relationship among variables. As the FMOLS coefficient, the air transporter and FDI rise the economic growth, although the financial development hurts the growth of Türkiye. As the result, air transport promotes economic growth in Türkiye, parallel with Marazzo et al. (2010), Chi and Baek (2013), and Baltacı et al. (2015). In case of the advantage, Türkiye's location for both passenger transport and logistic transporter offers significant advantages. Especially, at this point, İstanbul Airport is an important investment. Türkiye must make stronger transport infrastructure, not air transporter but also highways and railways. The stronger infrastructure will offer new opportunities for tourism, logistic, transport, and the economy.

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