The Relationship between Financial Development, Trade Openness and Economic Growth in Turkey: Evidence from Fourier Tests

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Abstract

In this study, the effects of financial development and trade openness on economic growth were investigated using annual data for Turkey over the period 1960–2017. The financial development variable is represented as the ratio of financial system deposits to GDP. The trade openness variable is represented as the ratio of the sum of exports and imports of goods and services to GDP. To examine the long-run relationship between financial development, trade openness and economic growth; Fourier-based stationarity test and its complementary Fourier-based cointegration test are used. Finally, Fourier-based causality tests are also used to examine the causality relationship between the variables. As a result of cointegration tests, a long-term cointegration relationship was found between variables. According to the Fourier Toda-Yamamoto causality analysis results, it is seen that there is a one-way causality relationship from financial development to economic growth and from financial development to trade openness.

Keywords	***DOI***	***JEL code***
Financial development, trade openness, economic growth, unit root, cointegration, causality, Fourier	*https://doi.org/10.54694/stat.2021.46*	*O1, G0, C4*

INTRODUCTION

As the concept of growth is an important macroeconomic factor, there is a large literature on which factors are affected or which factors affect it. Herein, especially after the economic transformation

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process in Turkey after 1980, the concepts of financial development and trade openness came to the fore. In the economic literature, it is accepted that financial development is one of the most important internal variables that significantly affect the economic growth of countries. Goldsmith (1969), McKinnon (1973) and Shaw (1973) pioneered the relationship between financial development and economic growth. While early economic growth theories did not explicitly include financial development as a variable, a growing theoretical and empirical literature shows that financial intermediation makes a significant contribution to economic growth by mobilizing savings, reorganizing the allocation of resources, and diversifying risks. Endogenous growth models claim that financial institutions and markets contribute to long-term economic growth by reducing information and transaction costs, influencing decisions in favor of more efficient activities, and efficiently utilizing the most promising investments (Salahuddin and Gow, 2016).

There are various views in the literature that tries to explain the channels of financial development affecting growth. Some economists focus on the view that financial development directly affects economic growth. Some economists, on the other hand, emphasize that financial development indirectly affects economic growth by fulfilling various functions in providing financial intermediation and reducing transaction costs. (Tadesse and Abafia, 2019). In contrast, some empirical studies suggest that financial development does not affect poverty (Chaouachi and Chaouachi, 2021). At this point, the main functions of financial institutions are considered as efficient allocation of economic resources, improved capital accumulation and improvement in sufficiency (Tadesse and Abafia, 2019).

The concept of financial development is defined as the increase in the services of financial intermediaries, especially banks. The transformation and development in financial markets led to sophisticated financial development. This situation has brought the concepts of financial development and growth to be discussed further (Hussain and Chakraborty, 2012).

The development of the financial system encourages "optimal capital allocation" as well as providing information on investments, which are considered as an important dynamic of growth (Guru and Yadav, 2019). Thus reduces the cost of information in the economy (Greenwood and Jovanovic, 1990). Levine (1997), and Guptha and Rao (2018) pointed out "production growth and capital accumulation" and "productivity increase" while drawing the theoretical framework between financial development and growth. Especially, Guptha and Rao (2018) stated in their studies that financial development leads to economic growth by mobilizing excess funds for the financing of investment projects. Secondly, innovation in financial technologies leads to efficient allocation of resources by reducing the asymmetric information.

Financial development makes a positive contribution to growth by affecting capital accumulation. This implies that the intersectoral specialization and thus structure of trade flows is determined by the relative level of financial intermediation. A well-developed financial sector affects growth through technological development channel. Thus increases the capacity of an economy to benefit from international trade to stimulate economic growth. However, international trade enables efficient allocation of internal and external resources. The shift of technological development to developing countries, thus less developed countries benefiting from the innovations of developed countries, contribute to economic growth through "learning by doing" (Shahbaz, 2012).

Most of the studies in the literature have analyzed the relationship between trade openness and growth. The relationship in question, which has an important place in the international economic literature, has been discussed with the hypotheses of "export-led growth", "import-led growth" or "trade-led growth". The validity of the hypothesis was investigated in various country groups.

Bencivega and Bruce (1991), Greenwood and Jovanic (1990) suggested that financial development wasis one of the major factors affecting economic growth in the long run because financial development

leads to capital accumulation, efficient allocation of resources and technological innovation. Along with these developments, economic growth is positively affected in the long run. Supply-pull and demand-pull hypotheses come to the fore in the analysis of the relationship between the financial system and growth. In the study of King and Levine (1993), the financial system is considered as the primary condition for growth. On the other hand, Aydın et al. (2013) state that an effectively functioning financial system can meet the need for funds, which play an important role in economic growth. In the light of all these evaluations, the theoretical expectation was also confirmed empirically in this study. A causal relationship from financial development to economic growth has been determined. In other words, financial development positively affects economic growth.

Studies on the relationship between financial development, trade openness and economic growth have been carried out by a wide audience over the years. The literature on the relationship between financial development and economic growth mostly supports a positive relationship between the two variables. However, there are differing views on the direction of the causal link between them. While some authors argue that the causality relationship runs from financial development to economic growth, others argue that it runs from economic growth to financial development. There are also few studies suggesting the existence of a bidirectional relationship between the variables.

Svaleryd and Vlachos (2002), Rajan and Zingales (2003), and Baltagi et al. (2009) argued in their study that commercial development was an important determinant for financial sector development. At this point, the direction of the relationship between financial development and trade openness is from trade openness to financial development. However, according to Beck (2003), economies increase their international trade volumes as they benefit from developments in the financial sector, technology and economies of scale. That is, the direction of the relationship is from financial development to trade openness. In our study, as emphasized in Beck's (2003) study, a causality from financial development to trade openness was determined. In addition, it has been revealed that both financial development and trade openness have a positive effect on economic growth.

Most panel and cross-country studies have found a positive relationship between financial development and economic growth when controlling for other growth determinants and also taking into account variable neglect bias, concurrency, and country-specific effects. These studies also support a causality running from financial development to economic growth. On the other hand, most of the time series studies have found both unidirectional and bidirectional causality between financial development and economic growth. Different results have also emerged when different proxy measures are used for financial development. However, the general literature supports the positive impact of financial development on long-term economic growth.

This study aims to analyze the relationship between trade deficit, financial development and growth by considering the subject from a different perspective and with up to date methods. Our study contributes to the existing literature by using the recently introduced Fourier-based cointegration (FSHIN) test developed by Tsong et al. (2016) and Fourier Toda-Yamamoto Causality Analysis proposed by Nazlioglu et al. (2016) which takes into account the structural changes in the model. The remainder of this article is organized as follows. The first section briefly explains the relevant literature. In the second section, the data set and the econometric methodology used are presented. The third section presents the empirical findings and the study is completed with the conclusion and recommendations section.

1 RELATED LITERATURE

Table 1 provides a brief summary of the studies on relationship between financial development, trade openness and economic growth.

Table 1 Literature review

Authors	Countries and time period	Methodology	Results
Omoke (2009)	Nigeria 1970–2005	Cointegration and Granger causality test	There is no cointegration relationship between financial development, trade openness and economic growth. Results shows that trade openness and financial development have a causal effect on economic growth.
Kenani and Fujio (2012)	Malawi 1970–2009	VECM and causality analysis	Trade openness affects economic growth and financial development indirectly affects economic growth in the short run.
Tash and Sheidaei (2012)	Iran 1966–2010	Johansen cointegration test	The joint impact of trade liberalization and financial development on economic growth is positive.
Arouri et al. (2013)	Bangladesh 1975Q1–2011Q4	ARDL bounds test, cointegration and causality	Series move together in the long run. Financial development causes economic growth. There is a feedback mechanism between trade openness and economic growth.
Lacheheb et al. (2013)	Algeria 1980–2010	ARDL bounds test, cointegration	There is a long-run relationship between trade openness, financial development and economic growth.
Menyah et al. (2014)	21 African countries 1965–2008	Panel causality test	The results show that recent attempts at financial development and trade liberalization have no significant impact on growth.
Zombe and Seshamani (2014)	Zambia 1965–2011	Cointegration VECM and causality	In the short run, it is concluded that economic growth and trade openness are the causes of financial development.
Kar et al. (2014)	Turkey 1989M1–2007M11	Linear and nonlinear causality	There is unidirectional causality between economic growth and trade openness. Economic growth leads to financial development. It has been found that financial development leads to trade openness.
Rehman et al. (2015)	Saudi Arabia 1971–2012	Cointegration and causality	Financial development, trade openness and economic growth move together in the long run. There is a one-way causality relationship from trade openness to economic growth and from economic growth to financial development.
Saaed and Hussain (2015)	Kuwait 1977–2012	VAR, cointegration and Granger causality test	According to Granger causality results based on VAR models, it was concluded that there is a causal relationship between economic growth and financial development, and between trade openness and economic growth.
Lawal et al. (2016)	Nigeria 1981–2013	ARDL bounds test	Economic growth financial development and trade openness level move together in the long run.
Ayad and Belmokaddem (2017)	16 MENA Countries 1980–2014	Panel cointegration, panel VAR model, Toda, Yamamoto, Dolado and Lutkepohl Granger causality tests	The results show that financial development and trade liberalization do not have a significant effect on economic growth.

Table 1 (continuation)

Authors	Countries and time period	Methodology	Results
Sönmez and Sağlam (2018)	Transition economies 2001–2014	Principal component analysis, panel cointegration and causality tests	An economic growth based on financial development and trade openness is realized.
Xie et al. (2018)	China 1978–2015	Bootstrap ARDL and causality analysis	There is a unidirectional causality between trade openness and economic growth, and between trade openness and financial development.
Atgür (2019)	Turkey 2004–2017	Cointegration and causality	It was concluded that there is no long-term relationship between financial development and trade openness levels and economic growth. In addition, a unidirectional causality relationship from trade openness to economic growth has been determined.

Note: ARDL, VECM and VAR, respectively, refer to autoregressive distributed lag model, vector error correction model and vector autoregressive model.
Source: Own construction

2 DATA SET AND ECONOMETRIC METHOD

In this study, the effects of financial development (FD) and trade openness (TO) on economic growth (GDP) are investigated using annual time series data for Turkey in the period 1960–2017. To examine the long-run relationship between financial development, trade openness and economic growth; Fourier-based stationarity test and its complementary Fourier-based cointegration test are used. Finally, Fourier-based causality tests are also used to examine the causality relationship between the variables. The investigated model is as follows:

$$GDP_t = \beta_0 + \beta_1 FD + \beta_2 TO + \varepsilon_t. \tag{1}$$

The variables used in Formula (1) were obtained from the official database of the World Bank. The financial development variable is represented as the ratio of financial system deposits to gross domestic product (as %). The trade openness variable is represented as the ratio of the sum of exports and imports of goods and services to gross domestic product. And per capita gross domestic product (GDP, constant 2010 US$) is used to represent the economic growth variable.

Table 2 Definition of variables and acronyms

Data			Source
Per capita gross domestic product	Gross domestic product	GDP	World Bank
The ratio of financial system deposits to gross domestic product	Financial development	FD	World Bank
The ratio of the sum of exports and imports of goods and services to gross domestic product	Trade openness	TO	World Bank

Source: Own construction

Descriptive statistics of the variables used in the study are presented in Table 3.

Table 3 Descriptive statistics of variables

	FD	TO	GDP
Mean	24.093	31.344	7 119.606
Median	21.119	33.178	6 389.336
Maximum	46.335	55.762	14 975.090
Minimum	8.679	5.727	3 134.577
Standard deviation	11.460	16.5241	3 113.956
Skewness	0.649	–0.090	0.842
Kurtosis	2.351	1.472	2.826
Jargue – Bera	5.096 (0.078)	5.723 (0.057)	6.931 (0.031)

Note: Values in parentheses indicate probability values.
Source: Own construction

According to the Jarque-Bera normality test results, it can be seen that variables considered in the model do not exhibit normal distribution. In addition, it is found that the variables have a kurtosis below the normal.

2.1 Data set and model analysis

The subject of structural break was first introduced to the literature by Perron (1989) and it was stated that ignoring these sudden changes in the series could lead to false and misleading results. However, with the developing literature, it has been emphasized that the change in the series may not be sudden but soft, and many Fourier-based tests have been proposed in order to catch these soft changes (Enders and Lee, 2004; Becker et al., 2004; Becker et al., 2006; Christopoulos and Leon-Ledesma, 2010, 2011; Enders and Lee, 2012; Omay, 2015; Bozoklu et al., 2020). Sometimes some tests lose their validity in cases where the structure of the breaks is not sharp and smooth transitions are experienced. For these cases, nonlinear and smooth transition unit root tests have been developed. In unit root tests where the breaks are sharp or the break structures are determined by nonlinear models, the number of breaks and the structure of the nonlinearity are determined beforehand. However, in cases where the structure and number of breaks cannot be determined beforehand, both test groups cannot provide sufficient power for stability tests. Incorrect determination and modeling of the number and location of the breaks present a problem just like the neglect of the fractures. In this context, unit root tests based on frequency component selection have been developed by using the Fourier function approach, where there is no requirement to predetermine the refraction numbers and structures (Chi-Wei, 2012: 22). Becker et al. (2006), using Fourier functions, extended the KPSS stationarity test developed by Kwiatkowski et al. (1994). In this way, the situation where the number of structural breaks in the functional form is not known is allowed. These Fourier functions are intended to capture a large number of smooth changes whose number, position and shape have no effect on the strength of the test. Data creation process for Becker et al. (2006) Fourier KPSS (FKPSS) test is as follows:

$$y_t = X_t^{'}\beta + Z_t^{'}\gamma + r_t + \varepsilon_t \; r_t = r_{t-1} + u_t \; . \tag{2}$$

Here ε_t shows stationary errors and u_t shows the error process for the independent identical distribution (iid) with variance σ_u^2 . $Z_t = \left[\sin\left(2\pi kt/T\right), \cos\left(2\pi kt/T\right)\right]'$ is defined like this. T represents sample

size considered and k represents the number of frequency. To investigate whether the y_t series is level or trend stationary, respectively $X_t = [1]$ ve $X_t = [1, t]'$ determined. In this test based on KPSS null hypothesis expresses the stationarity. In order to calculate the test statistic for the constant or with trend model under this null hypothesis assumption, the following models are estimated at first and the residuals are obtained:

$$y_t = \alpha_0 + \gamma_{1k} \sin\left(\frac{2\pi kt}{T}\right) + \gamma_{2k} \cos\left(\frac{2\pi kt}{T}\right) + e_t, \tag{3}$$

$$y_t = \alpha_0 + \beta t + \gamma_{1k} \sin\left(\frac{2\pi kt}{T}\right) + \gamma_{2k} \cos\left(\frac{2\pi kt}{T}\right) + e_t. \tag{4}$$

Respectively for constant, constant and trend models are determined as $\tau_\mu(k)$ and $\tau_\tau(k)$. In order to determine the optimal frequency number, frequency values from 1 to 5 are tried for Formulas (3) and (4). The value at which the sum squares residual is minimum is selected as the appropriate frequency value.

The test statistic for the two models is calculated in the same way and is expressed as:

$$\tau(k) = \frac{1}{T^2} \frac{\sum_{t=1}^{T} \tilde{S}_t(k)^2}{\tilde{\sigma}^2}. \tag{5}$$

Here $\tilde{e}_j$ represents residuals from constant and constant and trend models and determined as $\tilde{S}_t(k) = \Sigma_{j=1}^{t} \tilde{e}_j$. Before proceeding to the stationarity testing phase, the significance of the Fourier functions included in the model is tested. To use here, Becker et al. (2006) obtained the F statistic for the significance test of the terms as follows:

$$F_i(k) = \frac{\left(KKT_0 - KKT_1(k)\right)/2}{KKT_1(k)/(T-q)}, i = \mu, \tau \tag{6}$$

Here k is the number of frequencies and q is the number of independent variables. In Formulas (3) and (4), KKT_0 without trigonometric terms and $KKT_1(k)$ are calculated by considering trigonometric terms. The F test can only be used when the stationarity basic hypothesis cannot be rejected. It is important that the coefficients included in the model are statistically significant. Otherwise, it is recommended to use the standard KPSS test (Yılancı, 2017: 57).

2.2 Fourier Shin cointegration analysis[4]

The concept of cointegration, which was first proposed by Engle-Granger (1987), has shown a rapid development like unit root tests and many tests have been added to the literature. One of them is the cointegration test proposed by Shin (1994), which is an improved version of the KPSS stationarity test to the cointegration form. In the following process, similar to the unit root test literature, the importance of considering structural changes in long-term relationships for cointegration tests has been mentioned. Therefore, tests taking into account the structural changes are proposed for the long-term relationship between the series (Gregory and Hansen, 1999; Johansen et al., 2000; Arai and Kurozumi, 2007; Hatemi-J, 2008). One of these tests is the Fourier-based cointegration (FSHIN) test developed by Tsong et al. (2016). The feature that distinguishes this test from other tests is that, as in Fourier structures, the number

[4] Tsong et al. (2016).

and form of structural changes are not determined a priori. Therefore, strong results are obtained (Yılancı, 2017: 58). The null hypothesis of this extended version of Becker et al. (2006) FKPSS test to cointegration form is the existence of cointegration. The FSHIN test procedure is defined as follows:

$$y_t = d_t + x_t^{'}\beta + \eta_t,\ \eta_t = \gamma_t + \upsilon_{1t},\ \gamma_t = \gamma_{t-1} + u_t,\ x_t = x_{t-1} + \upsilon_{2t}. \tag{7}$$

Here u_t~iid$(0, \sigma_u^2)$ and y_t has a random walk process. Therefore as v_{1t} and v_{2t} exhibit a stationary process y_t and x_t are stationary at the first difference. d_t in Formula (7) is for both constant and constant and trend model respectively defined as $d_t = \delta_0 + f_t$ and $d_t = \delta_0 + \delta_1 t + f_t$, and $f_t = \alpha_k \sin\left(\frac{2\pi kt}{T}\right) + \beta_k \cos\left(\frac{2\pi kt}{T}\right)$ represents the Fourier function. Here k, t and T represent number of frequency, trend, and sample size, respectively. From here, the following equation is obtained:

$$y_t = \delta_0 + \alpha_k \sin\left(\frac{2\pi kt}{T}\right) + \beta_k \cos\left(\frac{2\pi kt}{T}\right) + x_t^{'}\beta + \upsilon_{1t}. \tag{8}$$

The following test statistic is used to test the null hypothesis:

$$CI_f^m = \frac{1}{T^2}\hat{\omega}_1^{-2}\sum_{t=1}^{T} S_t^2. \tag{9}$$

Here $\hat{\omega}_1^2$ represents a consistent estimator of long-run variance of v_{1t} in Formula (7) and S_t represents the partial sum of the least squares residues obtained from Formula (8).

2.3 Fourier Toda-Yamamoto causality test

After the determination of the cointegration relationship between the variables, a causality test based on the Vector Autoregressive (VAR) model introduced by Toda and Yamamoto (1995) has been proposed. The VAR structure proposed by Sims (1980) has been proposed as an alternative to large-scale structural models. VAR removes the constraints arising from economic theory in structural models and provides convenience for multivariate analysis. Thanks to this advantage, the VAR model is thought to be more useful than univariate models. The VAR model is defined as a system of equations in which the lagged values of each internal variable and other variables are take place on the right side of the equation and shown as follows:

$$y_t = \alpha + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \ldots + \beta_{p+d} y_{t-(p+d)} + \varepsilon_t. \tag{10}$$

In the causality test of Toda and Yamamoto (1995), after obtaining the highest order of stationarity and optimal lag length, which are indicated by d_{max} and p, respectively, a VAR model is obtained at the level of $(d_{max} + p)$. Toda and Yamamoto (1995) performed the causality test with the help of Wald test statistics. If the obtained test statistics value is greater than the critical value, the null hypothesis stating that there is no causality is rejected.

Nazlioglu et al. (2016), on the other hand, proposed a new test by incorporating Fourier terms into the model, taking into account the structural breaks. They included structural changes in the familiar VAR model and extended the constant term assumption. In other words, instead of the constant term in the VAR model, Fourier terms are added to capture the changes that may occur in the dependent variable. Instead of the constant term in Formula (10), Fourier terms are added as in Formula (8) and it is represented as follows:

$$y_t = \alpha_0 + \gamma_{1k} \sin\left(\frac{2\pi kt}{T}\right) + \gamma_{2k} \cos\left(\frac{2\pi kt}{T}\right) + \beta_1 y_{t-1} + \beta_2 Y_{t-2} + \ldots + \beta_{p+d} Y_{t-(p+d)} + \varepsilon_t. \quad (11)$$

Here k represents the frequency number. Thanks to these added terms, possible structural breaks are captured with sinus and cosinus waves, without knowing the breaking time, the number of breaks, and the way of breaking. Nazlioglu et al. (2016) suggested that the F test statistic should be used instead of the Wald test, since the χ^2 distribution is weak in causality tests in terms of small sample features. After determining the optimal lag and frequency of the Fourier terms, the test is performed and the null hypothesis that there is no causality is tested.

3 EMPRICAL FINDINGS

In this study investigating the effects of financial development and trade openness on economic growth for Turkey, Becker et al. (2006) Fourier KPSS stationarity test results and Tsong et al. (2016) Fourier Shin Cointegration test results are presented in the tables below. In the continuation, KPSS stationarity test results and Shin (1994) cointegration test results, which form the basis of these tests, respectively, are also reported. Lastly, to these, the results obtained as a result of the Fourier Toda-Yamamoto causality analysis proposed by Nazlioglu et al. (2016) and taking into account the structural changes are also presented.

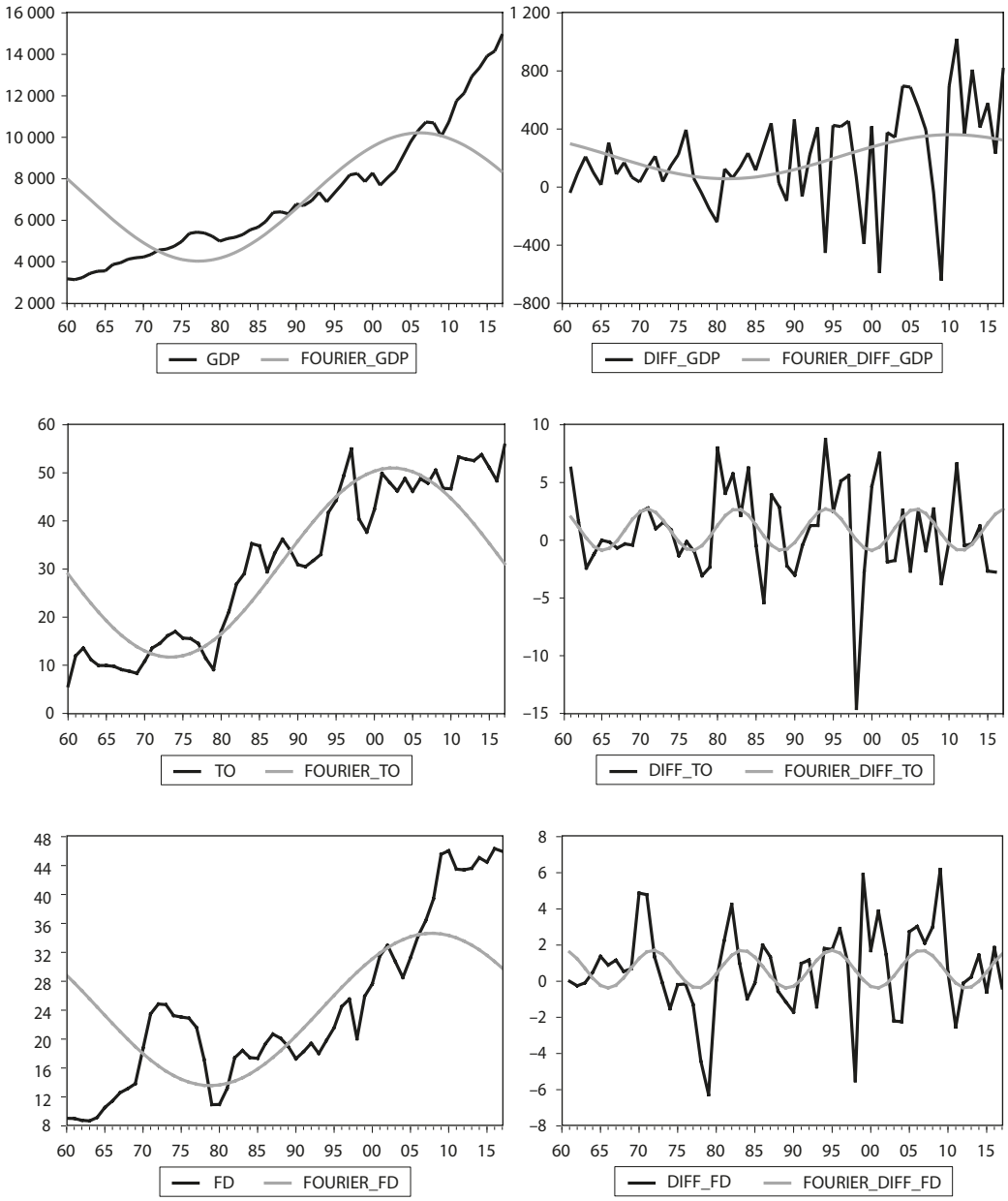
Table 4 KPSS and Fourier KPSS unit root test results

	KPSS test stat.	Frequency	Min. SSR	Fourier KPSS test stat.	Critical values			F test stat.
					%1	%5	%10	
ΔGDP	0.895	1	275 000	0.457	0.269	0.172	0.131	27.783***
GDP	0.625*	1	5 383 768	0.184*	0.269	0.172	0.131	3.309
ΔTO	0.900	1	4 336.839	0.433	0.269	0.172	0.131	71.151***
TO	0.103***	5	782.237	0.264***	0.738	0.462	0.351	3.128
ΔFD	0.778	1	4 266.452	0.405	0.269	0.172	0.131	20.752***
FD	0.112***	5	293.963	0.139***	0.738	0.462	0.351	2.802

Note: *, ** and *** shows respectively %10, %5 and %1 significance level. KPSS test and the critical values required for the F test, which is used to test the significance of trigonometric terms in levels %1, %5 and %10 respectively 0.739, 0.463, 0.347 and 6.730, 4.929, 4.133.
Source: Own construction

According to the Fourier KPSS stationarity test results, it is seen that the GDP, TO and FD variables are not stationary at the level, but become stationary after taking their first difference. Therefore, it is concluded that all three series are I(1). Since the significance test of trigonometric terms was used only when the null hypothesis was not rejected, the F test was performed again for three variables whose difference was taken, and it was found that trigonometric terms were not significant in these three variables. For this purpose, KPSS test was applied for difference series and it was concluded that both series were I(1) according to both Fourier KPSS and traditional KPSS test results. In addition, the time path graph of the Fourier estimates of the variables is presented in Figure 1.

Figure 1 Time paths of series with fourier approximations



Source: Own construction

According to the time path graphs of the Fourier predictions obtained from Figure 1, it is seen that the appropriate Fourier predictions are realized and long-term oscillations can be captured.

The findings of the tests carried out to test the long-term cointegration relationship are reported in Table 5.

Table 5 Shin and Fourier Shin cointegration test results

	F test atat.	Frequency	Min. SSR	Test statistic	Critical values		
					%1	%5	%10
FSHIN cointegration test	11.572***	2	41 959	0.108***	0.132	0.182	0.328
Shin cointegration test	–	–	–	0.115***	0.163	0.221	0.380

Note: *** shows significance at %1 level. The critical values required for the F test, which is used to test the significance of trigonometric terms in levels %1, %5 and %10 respectively 5.774, 4.066, and 3.352.
Source: Own construction

As a result of both FSHIN and Shin cointegration tests, it is found that there is a long-term cointegration relationship between economic growth, trade openness and financial development. This result shows that trade openness and financial development move together with economic growth in the long run. It is also seen that the F statistic is significant for the trigonometry terms for the FSHIN test. The coefficient estimates of the long-term relationship determined between the variables were investigated with the Dynamic Least Squares (DOLS) method. It is stated that this technique proposed by Stock and Watson (1993) produces strong and consistent predictions even in the presence of endogenity and autocorrelation problems in explanatory variables. In order to overcome the internality problem, in addition to the level values of the explanatory variables, the lag of the first differences (lag) and the antecedents (lead) should be included in the model. In addition, to overcome autocorrelation problem Generalized OLS method should be used. The findings of the DOLS method are presented i n Table 6.

Table 6 DOLS Long-Run coefficient estimator results

	Coefficient	Standard error	Statistic value
TO	71.327	13.536	5.269 (0.000)***
FD	167.547	20.946	7.998 (0.000)***
SIN	–156.702	198.083	2.671 (0.432)
COS	358.672	182.992	1.960 (0.055)*
C	847.167	317.054	–0.791 (0.010)**

Note: *, ** and *** respectively shows significance at the level %10, %5 and %1.
Source: Own construction

It is seen that both trade openness and financial development series are statistically significant and have a positive effect on growth. In addition, it was found that the cosinus term among the Fourier functions included in the model was statistically significant, and the sinus term was not statistically significant.

According to the Fourier Toda-Yamamoto causality analysis results, it is seen that there is a one-way causality relationship from financial development to economic growth and from financial development to trade openness. For the other variables, no causality is determined according to the test result.

Table 7 Fourier Toda-Yamamoto causality test results

H_0 null hypothesis	Optimal lags	Optimal frequency	Wald stat.	Asymptotic p-value	Bootstrap-value
FD does not cause *GDP*	1	3	4.311	0.038**	0.041**
GDP does not cause *FD*	1	3	0.175	0.675	0.684
TO does not cause *GDP*	1	1	1.918	0.166	0.172
GDP does not cause *TO*	1	1	2.286	0.131	0.131
FD does not cause *TO*	1	1	2.929	0.087*	0.094*
TO does not cause *FD*	1	1	0.114	0.736	0.740

Note: ** and * indicate 5% and 1% significance level, respectively. Analyzes were performed with 1 000 bootstrap simulations.
Source: Own construction

CONCLUSION

In the economic literature, financial development and trade liberalization are identified as key factors supporting economic growth in general. In theory, the financial system mediates the allocation of financial resources, and financial development increases both the size and efficiency of the allocation of resources. Especially for developing countries, economic growth occurs when a country has an efficient financial system. An advanced financial system encourages investments, funds business opportunities, mobilizes savings, and manages risks. All these functions stimulate the economy and thus support its growth.

In this study, the effects of financial development and trade openness on economic growth were tested with annual data covering the period 1960–2017 for Turkey. For this purpose to measure the degree of integration of the variables; KPSS stationarity test, which is one of the traditional tests, and Becker et al. (2006), the Fourier KPSS stationarity test, which is an extended version of the KPSS test with Fourier functions, are applied. As a result of these two stationarity analysis, it is concluded that three variables became stationary after taking their first difference, that is, I(1). In order to measure the long-term cointegration relationship between the variables considered, Shin and Fourier Shin cointegration tests, which are accepted as the continuation of these stationarity tests in the literature, were carried out. According to the cointegration test results, it is seen that there is a long-term relationship between the variables. In addition, as a result of the long-term coefficient estimation, it is concluded that the coefficients of the trade openness and financial development series, which are taken as independent variables, are significant and positive. In addition, it is seen that the cosinus term, which is one of the Fourier functions included in the model, is also significiant. Finally, according to the results of the Fourier-based causality analysis, a one-way causal relationship from financial development to economic growth and from financial development to trade openness.

According to the results of the analysis, financial development and trade openness had a positive effect on growth. The empirical results of the study are consistent with the studies of Shahbaz (2012) and Alsamara et al. (2019). The positive functioning of the financial markets in Turkey and the increase in the level of trade openness have great importance in obtaining these results. It is important to continue the positive economic transformation, especially with the progress in the post-1980 liberalization process. At this point, some transformations should be implemented at both national and international level.

Structural reforms should be accelerated in order to keep the competition dynamism alive in the country and to be ready for competing with foreign countries. International integration should be achieved with broader participation and multilateral trade agreements.

With the acceleration of the globalization phenomenon, multinational companies (MNCs) have started to take part actively in international retail chains. While this process makes easier accessing to products at more affordable prices for individuals, it has made companies more open to competition. At this point, it has become essential for countries to allocate more resources to R&D and innovation. However, in this way, the domestic market becomes ready for foreign competition. Considering these aspects in terms of trade policy, policymakers in Turkey should focus more on export policies.

In developing countries such as Turkey the existence of a strong financial structure that can quickly adapt to international financial conditions is essential in order to avoid the risk of increased capital flows arising from trade openness. Considering the challenging structure in global competitive conditions, priority should be given to policies regarding the efficiency of the financial system. Because, for the continuity of the positive effect of financial development on growth, it is important to provide financial deepening. At this point, it is necessary to reduce financial fragility and diversify financial instruments. Similarly, priority should be given to long-term policies for the effective and efficient allocation of resources.

In recent years, when the policies of foreign expansion became obvious and capital movements accelerated around the World, financially successful openness policies should be maintained in developing countries such as Turkey. In particular, the speculative effects of capital movements should be minimized and the amount of foreign borrowing should be reduced.

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