

The Effect of Financial Development on Economic Growth in BRIC-T Countries: Panel Data Analysis

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ABSTRACT

In this study, the effect of financial development on economic growth was researched for the most rapidly developing countries (emerging markets) (Brazil, Russia, India, China and Turkey, BRIC-T) via panel data analysis using the annual data for the period from 1989 to 2010. Foreign direct investments and trade openness, which was thought to have effects on the growth, were included in the analysis. According to empirical evidence derived from the study made with panel data analysis it was found that the effect of financial development on economic growth was positive and statistically significant in line with theoretical expectations. Evidence that even foreign direct investments and openness contributed to the growth positively was also found.

KEYWORDS

Financial Development, Economic Growth, BRIC-T, Foreign Direct Investment, Trade Openness.

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Introduction

An increase in financial instruments and the foundation of these instruments more commonly available in a country is defined as financial development. In other words, financial growth means the development of financial markets (Erim and Türk, 2005). Financial growth is the change of the financial system in terms of size and structure. However, financial deepening expresses the share of the money supply in national income and it becomes a measure for financial growth and financial instrument variety (Saltoğlu, 1998). Financial growth can be expressed as a channel that transforms the savings to the investment in the financial changing process.

In its literature, great contributions of the financial markets and institutions to the economic growth process of the countries in many ways are emphasised and this constitutes the subjects of many empirical studies. In the studies it is generally stated that a financial system which performs its financial functions would contribute to the economic growth in the long term (King and Levine, 1993a, 1993b; Arestis and Demetriades, 1997; Thiel, 2001; Levine, 2004; Eschenbach, 2004; Lawrence, 2006; Shan and Jianhong, 2006). Smoothly running financial markets in the economy support the capital accumulation, help the small funds direct to the big investments, encourage the disseminations of new technologies and therefore provide the most effective usage of the sources; they support the economic productivity and growth (Aslan and Küçükaksoy, 2006).

Economic growth of that country will be high if financial institutions provide the credit demands of the real sector. In early studies about financial and economic growth (Gurley and Shaw, 1955, 1967), we observe that the effect of financial intermediation function on economic growth process is stated, although the theoretical thoughts cannot be expressed as a whole.

Although Gurley and Shaw have made an important contribution to the literature by expressing the relationship between the financial sector and economic growth for the first time, they do not make any comment about whether or not there is a causality relationship between financial development and economic growth or if there is, what the direction of this relationship is. Patrick (1966) for the first time dealt with the relationship between the financial sector and economic growth by conceptualising. He expressed the idea that the causality between the financial sector and economic growth could be in two different forms and explained this relationship by using the demand-following and supply-leading concepts. On the demand-following case he expresses the financial sector growth to supply the demand occurring as

a result of the developments in real sector and in supply-leading he explains that the growth of the financial sector would institutionally stimulate economic growth.

It is very difficult to say if there is an agreement in many studies performed in order to determine the direction of the causality between the financial sector and economic growth. In the empirical analysis between financial development and economic growth we can see that there are studies expressing that the causality relationship is both one-sided and two-sided (Arestis and Demetriades, 1997; Thiel, 2001; Eschenbach, 2004; Lawrence, 2006; Shan and Jianhong, 2006). In some studies it is also stated that the relationship between financial development and economic growth variables is weak, even though financial growth may play a decreasing role in the economic growth process (Singh, 1997; Deidda, 2006).

First named BRIC in the early 2000s, countries such as Brazil, Russia, India and China that have common characters such as a wide area, large population and rapid economic growth are accepted as the fastest growing “emerging markets” in the economic world (O’Neill, 2001:1-16). The total area of these countries covers more than 25% of the world’s area and more than 40% of the world’s population. It is argued that the BRIC group would take the G7 group’s place and obtain leadership of the world’s economy when the economic indicators are considered (Frank and Frank, 2010:46-54). Goldman Sachs, who studied the BRIC countries, estimates that in 2050 China will be the greatest economy in the world, India will be the third, Brazil will be the fourth and Russia will be the sixth largest economy.

Based on these indicators, with the help of panel data analysis using the annual data of 1989 and 2010, in our study the effect of financial development on economic growth is researched for BRIC countries and Turkey, which is a developing country after China and has a developing economy. In the second section of the study, the literature review of empirical studies is presented as a table. In the following section the data set and method used in the analysis are introduced and evidence is presented. In the final section a general evaluation is conducted.

Literature Review

The first studies researching the relationship between financial development and economic growth were conducted by Schumpeter (1912). In his study, Schumpeter

(1912) indicated that a smooth running economy would support the investors economically by providing the finance of technological innovations that was necessary for producing the new products most effectively and productively. Meanwhile, he expressed the opinion that the growth of the financial sector, especially the growth of the banking sector, was necessary for economic growth. In literature following Schumpeter (1912), many theoretical and empirical studies were performed. The studies researching the relationship between the financial development and economic growth, country group and the used methods and results are indicated in Table 1. As we can observe from Table 1, the view that financial development positively effects economic growth is supported, although there was no agreement between financial development and economic growth in terms of causality in the studies generally.

Table 1. The Abstract of Some Theoretic and Empirical Studies Researching the Relationship between Financial Development and Economic Growth

Writers	Sampling and Econometric Method	Basic Evidence
King and Levine (1993)	An International study–80 countries over the period of 1960-1980	They found that all indicators of financial development were highly related with economic growth rates, physical capital accumulation and economic productivity increase.
Demirgüç-Kunt and Maksimoviç (1998)	An international analysis for 30 developed and developing countries.	An active stock market and a well-developed legal system facilitate the growth of the firms.
Kang and Sawada (2000)	Time series data for 20 country's Endogenous Growth Model	Financial development and trade liberalisation accelerate economic growth by increasing the marginal benefits of human capital investments.
Shan et al. (2001)	9 OECD Countries and China Causality and VAR Analysis	He found two sided causality in 5 countries and supply leading to causality in 3 countries, although in 2 countries he found no relationship.
Shan and Morris (2002)	19 OECD Countries and China Causality Test	They reached the results that financial development causes economic growth either directly or indirectly.
Müslümov and Aras (2002)	OECD Sample (22 countries) Granger Causality and Panel Data	A one sided relationship was obtained from the development of the capital market to economic growth.
Calderon and Liu (2003)	109 Developed and Developing Countries	They reached the result that financial development affects economic growth via capital accumulation and productivity.
Fink et al. (2003)	13 Developed Countries Co-integration and Correction Model Analysis	They found evidence supporting the “demand-following” and “supply-leading” approaches in Italy, Japan and Finland; “supply-leading” in USA, Germany, Austria, England, Switzerland and weak “supply-demand” in Holland and Spain.
Beck and Levine (2004)	40 countries Panel Data Analysis	They emphasised the importance of financial development in the economic growth process.

Thangavelu et al. (2004)	Australia Sample VAR Methodology	They found causality from economic growth to the development of financial intermediaries, although they could not find evidence that the development of financial markets would cause economic growth.
Christopoulos and Tsionas (2004)	10 Developing Countries Panel Co-integration Analysis	They found evidence that economic growth was the cause of financial development.
Caporale et al. (2005)	5 South-eastern Asian Countries Co-integration Granger Causality	It was found that the capital market increased economic growth by increasing investment activity.
Ndikumana (2005)	99 Countries Panel Data Analysis	He presented evidence that the development of financial intermediation increased investments.
McCaig and Stengos (2005)	71 Countries	They identified that the development of financial intermediation affected the growth strongly and positively.
Rousseau and Vuthipadadorn (2005)	10 Asian Countries Co-integration Granger Causality	They found that financial development stimulated the investments and there was a one-sided relationship (supply-leading) from financial development to investments in many countries.
Shan and Jianhong (2006)	China Sample VAR Methodology	They found that there was a two sided causality relationship between financial development and economic growth.
Artan (2007)	79 Countries Sample Panel Data Analysis	In underdeveloped countries financial development negatively affects growth.
Ağır et al. (2009)	Turkey Sample Literature Review	He expressed the idea that the relationship between financial development and economic growth could be simultaneous.
Kar et al. (2011)	MENA Countries(1980-2007) Panel Granger Causality Test	They inferred that it was impossible to make a certain statement about the causality between financial development and economic growth.
Hassan, Sanchez Yu (2011)	168 Countries Classified According to Income Level Panel Data Analysis	It was stated that there was a positive relationship between financial development and economic growth in developing countries. For many country samples a two sided causality was obtained for the short term.
İnce (2011)	Turkey Sample (1980-2010) Co-integration Analysis Granger Causality Analysis	They found that although there was a strong relationship between economic growth and financial development in the short term, there was no relationship in the long term.

Source: Study of the writers and Kularatne, 2001: 10-11.

There are also studies researching the relationship between financial development and economic growth in the Turkish sample. In empirical studies on Turkey it can be said that there is no consensus about the causality relationship between financial development and economic growth.

Financial Development Indicators

In financial development literature, the proportion of the financial sector to GDP is defined as financial depth (Feldman and Gang, 1990; Outreville, 1999). The indicators based on the size of the loan and money are the variables that are used as a measure of financial development. In the literature the proportion of narrow and broad money supply to GDP (M1/GDP, M2/GDP, M2Y/GDP), private sector loans/GDP, private sector credits of the banks/GDP, market value of the firms in Stock Exchange Market/GDP and effective money/GDP are used as the indicator of financial development and financial depth (Outreville, 1999, Darrat, 1999, King and Levine, 1993; Demetriades and Hussein, 1996, Halicioğlu, 2007). The “loans for the private sector” variable that has been used recently as an alternative indicator for financial intermediation is not preferred, because the indicators based on the monetary size (M1, M2, M2Y) in some studies do not represent financial development (Khan and Senhadji, 2000).

The most fundamental of these indicators are the indicators giving the proportion of narrow and broadly defined money supply/GDP. It is indicated that the M1/GDP proportion is not in strong relation to the growth, although the M2/GDP proportion indicates the measure of the size of the whole sector in financial intermediation and it is in strong relation to the change in per capita real GDP (King and Levine, 1993).

Empirical Analysis

Data Set and Model

In this study the effect of financial development on economic growth was researched using the data for the 1989-2010 periods in the sample of 5 developing countries that have an important place in the economic world (Brazil, Russia, India, China and Turkey-BRIC-T). In the analysis, besides the financial development, foreign direct investments and trade openness, which was thought to affect the growth, was included in the model. From the variables used in the analysis y_t represents the growth rate (GDP), fd_t represents Financial Development (M2/GDP), fdi_t repre-

sents Foreign Direct Investments (FDI/GDP) and *open*; represents trade openness (Export+Import/GDP). The data was obtained from the web pages of the IMF and the World Bank (www.imf.org, www.worldbank.org).

For analysis Stata 11.0 and Eviews 7.0 econometric analysis programmes were used and for model choice and correction test codes were used.

Method

Panel data analysis was used to research the data from different countries together. Panel data analysis was based on decomposing the error term (u_{it}) to its components in terms of its individual and time effects (Baltagi, 2001; Gujarati, 1999 and Tari, 2010):

$$Y_{it} = \alpha + X'_{it}\beta + u_{it} \quad (1)$$

In the model, i indicate the countries, t indicates the time. When the error term (u_{it}) was decomposed the:

$$u_{it} = \mu_i + \lambda_t + \vartheta_{it} \quad (2)$$

equation (2) was obtained. This final equation is called error component model. Here u_i indicates the individual effects, λ_t indicates the time effects. It is supposed u_i, λ_t and $\vartheta_{it} \sim IID(0, \sigma^2)$ (Independent Identically Distributed), in other words the average of error terms is zero, its variant is fixed and it is distributed normally (with a white noise process).

In the panel data analysis the stationarity of the series was first researched through panel unit root tests. The type of individual and time effects should then be identified. An endogeneity test should be conducted among the variables when there is a variable which is considered to have a close relation with the given variable, therefore it is suspected for its endogeneity. After that a model should be estimated and the problems of heteroscedasticity and autocorrelation in the model should be tested.

Panel Unit Root Analysis

It is accepted that the panel unit root tests, which regard the information about both time and cross section dimensions of the data, are statistically stronger than the time series unit root tests, which only regard the information about the time dimension (Im, Pesaran and Shin, 1997; Maddala and Wu, 1999; Taylor and Sarno, 1998; Levin, Lin and Chu, 2002; Hadri, 2000; Pesaran, 2006; Beyaert and Camacho, 2008), because the variability in the data increases when the cross section dimension is included to the analysis.

The first problem with the panel unit root test is whether or not the cross sections forming the panel are independent. At that point panel unit root tests are classified as the first generation and the second generation. The first generation tests are also classified as homogeneous and heterogeneous. While Levin, Lin and Chu (2002), Breitung (2000) and Hadri (2000) are based on homogeneous model hypothesis, Im, Pesaran and Shin (2003), Maddala and Wu (1999), Choi (2001) are based on heterogeneous model hypothesis. Conversely, the main second generation unit root tests are MADF (Taylor and Sarno, 1998), SURADF (Breuer, McKnown and Wallace, 2002), Bai and Ng (2004) and CADF (Pesaran, 2006).

Since the countries included in the analysis are not homogeneous, Im, Pesaran and Shin (2003) we used (IPS) testing this study. This test:

$$\Delta Y_{it} = \alpha_i Y_{it-1} + \sum_{j=1}^{P_j} \beta_{ij} \Delta Y_{it-j} + X'_{it} \delta + \varepsilon_{it} \quad (3)$$

is based on the model in equation (3). Here; α_i is error correction term and when $|\alpha_i| < 1$ happens; we understand that the series is trend stationary, conversely when $|\alpha_i| \geq 1$ happens, it has unit root, therefore it is not stationary. The IPS test enables the α_i to differentiate for the cross section units, in other words the heterogeneous panel structure. Test hypotheses:

H_0 : $\alpha_i = 1$ for all the cross section units, so the series is not stationary.

H_1 : $\alpha_i < 1$ for at least one cross section unit, so the series is stationary.

When the probability value obtained from the test results is smaller than 0.05, H_0 is rejected and it is decided that the series is stationary. The IPS panel unit root test results are presented in Table 4.

Table 4. IPS Panel Unit Root Test Results

Variable	Level	Prob-Value	First Difference	Prob-Value
<i>y</i>	-0.74	0.77	-2.64	0.00
<i>fd</i>	-0.21	0.41	-4.60	0.00
<i>fdi</i>	-1.04	0.14	-3.29	0.00
<i>open</i>	3.66	0.99	-3.79	0.00

Note: In Panel unit root test Schwarz criterions used and lag length is regarded as 1.

When we examine the results on Table 4, it is observed that all series are not stationary in level value, although the series becomes stationary when the first differences of the series are taken. In other words, in the studied period it is found that macroeconomic variables are not stationary and the shock effects on these variables do not disappear after a while.

Breush-Pagan Lagrange Multiplier (LM) Test

In this stage of the analysis the LM test was performed in order to determine the type of time effect and individual effects (random or fixed). Because the selected countries aren't in a certain economic group, it was anticipated that individual effects would be random and also the time effects of financial development on the growth would be random for the countries in the studied period. Whether or not the effects are really random can be determined with the LM test (Baltagi, 2001:15).

The LM test is classified as LM_1 and LM_2 . $LM=LM_1+LM_2$. LM_1 ; tests the individual effects are random and LM_2 tests the time effects are random. In LM_1 test; $H_0: \sigma_{\mu}^2 = 0$ (no random individual effects) hypothesis is tested through LM_1 statistics. LM_1 statistics are calculated with the formula below.

$$LM_1 = \frac{N.T}{2.(T-1)} \left[\frac{\sum_{i=1}^N (\sum_{t=1}^T \hat{u}_{it})^2}{\sum_{i=1}^N \sum_{t=1}^T \hat{u}_{it}^2} - 1 \right]^2 \tag{4}$$

Here, μ_i indicates the individual effects in the equation (2), N ; indicates the cross section (country) number, T ; indicates the time dimension, \hat{u}_i ; indicates the prediction for the error terms in the equation (1). When the probability value obtained from the test results is smaller than 0.05, H_0 is rejected and it is decided that individual effects are random.

In LM_2 test; $H_0: \sigma_\lambda^2 = 0$ (No random time effect) hypothesis is tested by LM_2 statistics. LM_2 statistics are calculated with the formula below.

$$LM_2 = \frac{N.T}{2.(N-1)} \left[\frac{\sum_{t=1}^T (\sum_{i=1}^N \hat{u}_{it})^2}{\sum_{i=1}^N \sum_{t=1}^T \hat{u}_{it}^2} - 1 \right]^2 \tag{5}$$

Here, μ_i indicates the individual effects in the equation (2), N ; indicates the cross section (country) number, T ; indicates the time dimension, \hat{u}_i ; indicates the predictions for the error terms in the equation (1). When the probability value obtained from the test results is smaller than 0.05, H_0 is rejected and it is decided that the time effects are random.

In $LM=LM_1+LM_2$ test;

$H_0: \text{Cov}(\mu_i, x_{it}) = 0$ (no random individual and time effects)

$H_1: \text{Cov}(\mu_i, x_{it}) \neq 0$ At least one and at least one (random effects both).

When the probability value obtained from the test results is smaller than 0.05, H_0 is rejected and it is decided that both of the effects are random. In this case a prediction is made through the two-way random effect model. The LM tests results are presented in Table 5.

Table 5. LM Tests

Test	Prob-Value	Decision
LM_1	0.004	Individual Effects are random.
LM_2	0.001	Time Effects are random.
LM	0.001	Individual Effects and Time Effects are random.

When we look the results in Table 5, we can see that individual and time effects are random. According to this result the prediction was made using the two-way random effect model.

Hausman Endogeneity Test

In this stage of the study, whether or not there was a relationship between the individual effects and the explanatory variables was tested with the Hausman method. Test hypotheses:

H_0 : Cov(No endogeneity problem.

H_1 : Cov(An endogeneity problem.

Here, μ_i indicates the individual effects in the equation (2), although X_i indicates the explanatory variables in the equation (1). When the probability value of χ^2 obtained from the analysis is smaller than 0.05, H_0 is rejected and it is decided that there is an endogeneity problem in the model. In this case the fixed effects model is used (Greene, 2003). However, when H_0 is accepted, the random effects model is used. This prediction is effective, non-deviated and coherent. The Hausman test is not an alternative for the LM test. However, it works as a function to check the decision from the LM test. The Hausman test was conducted and $\chi^2=14.62$ ve χ^2 probability value=0.404 was obtained and since this value was bigger than 0.05, H_0 hypothesis was accepted and it was decided that there is no endogeneity problem in the model. In this case, it is necessary to carry out the analysis with the random effects model and this result supports the LM test results.

Two-way Random Effects Model Estimations

Panel data analysis is estimated with the two-way random effect model and the results are presented in Table 6.

Table 6. Estimation Results

Variable	Coefficient	Standard Error	t-Statistics*
<i>fd</i>	1.332	0.949	1.403
<i>fdi</i>	0.792	0.439	1.802
<i>open</i>	4.315	2.596	1.662
Constant Term	2.310	1.101	2.097
Weighted	R ² =0.46 F _{ist} = 4.28		

*: %10 level of significance was used.

In the random effect models weighted statistics values are used (Baltagi 2001: 21). When we look at the weighted test statistics in Table 6, we can see that the model is reliable statistically. Whether there are heteroscedasticity and autocorrelation problems in the model are tested below.

Lagrange Multiplier (LM) Heteroscedasticity Test

The most common test in order to test whether the error terms variance of the model changes from cross section to cross section is the LM test (Greene, 2003). Test hypotheses:

H_0 : $\sigma_{u_1}^2 = \sigma_{u_2}^2 = \dots = \sigma_{u_n}^2 = \sigma_u^2$ Variant is fix. So there is no heteroscedasticity problem.

H_1 : At least one $\sigma_{u_i}^2 \neq \sigma_u^2$ Variant is not fix. So there is a heteroscedasticity problem.

The required statistics to test these hypotheses are calculated through the following formula:

$$LM = \frac{T}{2} \sum_{i=1}^N \left[\frac{\sigma_{u_i}^2}{\sigma_u^2} - 1 \right]^2 \quad (6)$$

When the probability value obtained from the test results is smaller than 0.05, H_0 is rejected. In other words it is decided that there is a heteroscedasticity problem in the model (Greene, 2003). LM test was conducted and the probability value was found 0.05. In this case H_0 was rejected and it was decided that there was no heteroscedasticity problem in the model.

Autocorrelation Test

This is a test to examine the relationship of the error terms of the model with its lagged values. The equation to measure this relationship is the AR (1) process (Wooldridge, 2002):

$$u_{it} = \rho u_{i,t-1} + \varepsilon_{it} \quad (7)$$

Test hypotheses:

$H_0: \rho = 0$ No autocorrelation problem.

$H_1: \rho \neq 0$ An autocorrelation problem.

The required statistics to test these hypotheses are calculated with the following formula:

$$F = \frac{(SSR_R - SSR_{UR})/g}{SSR_{UR}/df} \quad (8)$$

Here, SSR_R ; indicates the sum of the squares of the error terms of the restricted model in the equation (3) SSR_{UR} ; indicates the sum of the squares of error terms of the unrestricted model, g ; indicates the constraint number and df ; indicates the degree of freedom. When the probability value obtained from the test results is smaller than 0.05, H_0 is rejected. It is decided that there is an autocorrelation problem in the model (Drukker, 2003). The F test was conducted and the probability value was found 0.052. In this case H_0 is accepted and it was decided that there was no autocorrelation problem in the model.

Since there are no heteroscedasticity or autocorrelation problems in the model, the prediction results are reliable and interpretable. As can be seen from Table 6, the financial development level positively affects economic growth in line with the theoretical expectations. A 1% increase in the financial development level will increase the growth with the rate of 1.33%. The importance of foreign direct investments especially in developing countries is often emphasised. As a result of the analysis the effect of a 1% increase in the foreign direct investments on the growth will be 0.79%. Also trade openness variable used in the model was observed as the most effective variable in growth and it was found out that a 1% increase in openness level increased the growth with the rate of 4.31%. Therefore, this affected Turkey mostly in terms of the decrease in export depending on the decrease in external demand as a result of the 2008 global economic crisis (Somel, 2009).

Conclusion

In this study the effect of financial development on economic growth was researched via a panel data analysis method in the sample of 5 developing countries that have an

important place in the world's economy (emerging markets, Brazil, Russia, India, China and Turkey-BRIC-T). The foreign direct investments and trade openness, which was considered to affect the growth, as well as financial development, were included in the study where the annual data of 1989-2010 periods was used. At the panel unit root analysis result it was found that series were not stationary and the effects of shocks on the series did not disappear after a while and therefore it was determined that macroeconomic shocks affected the economy of the countries significantly.

Regarding the LM tests result conducted to define the applicable panel data analysis method it was found that individual and time effects were random, for that reason an analysis with the two-way random effect model was carried out. Regarding the endogeneity test result it was found that there was no endogeneity problem in the model. In the diagnosis tests result it was found that there were no heteroscedasticity and autocorrelation problems in the model. In this regard, the estimated model is reliable econometrically.

As a result of analysis it has been found that financial development increased the economic growth. Financial systems function for markets by meeting the funding needs of real sector. Therefore, they provide a source by contributing to the effective distribution of savings and eventually they support the economic growth.

The fact that trade openness affects the economic growth most is a finding that has to be focused on in the analysis. Switching of the analyzed countries especially Turkey to the export-led growth model instead of import-substitution industrialization after 1980's and in parallel with these reaching very high figures in foreign trade volume and economic growth supports the model results.

For sustainable growth countries need external sources in case of insufficient national savings. In this context, foreign direct investments are a significant source of growth. When the foreign direct investments to BRIC-T countries drawing attention with their high growth rate in 2011 are analyzed, China is the second in the world with \$ 220.1 billion, Brazil is the fifth in the world with \$ 71.5 billion, Russian Federation is the eighth with \$ 52.8 billion, India is the thirteenth with \$ 32.1 billion and Turkey is the twenty first with \$ 16 billion. Being also the most foreign direct investment attracting countries BRIC-T countries considered as emerging markets in the world is compatible with the analysis results.

To summarise, in the study the effect of financial development, foreign direct investments and openness on economic growth were researched and it was found that

openness, financial development and foreign investments in turn had the most significant affected on the growth. When we considered that sustainable growth is one of the most important macroeconomic variables for the countries, the increase in foreign trade especially in export, the stimulations for the foreign direct investments and the increase in financial development level are extremely important.

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