The Effect Of Openness On Economic Growth: Panel Data Analysis

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Abstract

In this study, the effect of openness on economic growth was searched for the most rapidly developing countries(emerging markets)(Brazil,Russia,India,China and Turkey,BRIC-T) via panel data analysis by using the annual data of the period from 1989 to 2010. As openness variable, the proportion of external trade scale to GDP was used. According to empirical evidence derived from the study made with panel data analysis it was found that the effect of openness on economic growth was positive and statistically significant in line with theoretical expectations.

Keywords:Trade Openness, Economic Growth, BRIC Countries, Turkey.

Jel Codes: E41, F43, G53

1.INTRODUCTION

In our globalized world whether there is a relationship between trade openness and economic growth and openness is useful for the economy of the countries or not is still a matter in arguement. On one hand by trying to decrease the quotas and tariffs through GATT (General Agreement on Tariffs and Trade),UNCTAD (United Nations Conference on Trade and Development) which was established to liberalize the trade between countries and WTO (World Trade Organization) which was established instead of GATT in 1995 , increasing the openness of the countries to the world trade is aimed,on the other hand countries impose restrictions in the world trade by increasing the invisible barrier both to protect the domestic industries and to get income.

With non-functioning of the national development thesis through the late and the collapse of the Eastern Block at the end of 1980's it was again started to argue that openness was necessary for the national economies. In this context some economists expressed that having a certain development level was a precondition for openness policies to support the growth while operating the growth models based on openness and export. (Han and Kaya, 2006: 245; Sun and Parikh, 2001: 187-188).There are classical economists on the basis of the view that capital movement liberalization and trade openness will increase the economic growth and welfare after 1980's.According to Classical and Neoclassical economists foreign trade makes important contributions to the development and the foreign trade is not only an effective productivity instrument but also it is the engine of the growth.Since the sources are limited in developing countries, the production on the scale of a high and sustainable growth can not be performed and new sources can be needed for production.With the openness, domestic markets will encounter with the competition, the domestic industries which can not compete with international prices will transfer their production factor to the other productive factors

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and the welfare increase will happen as a result of more effective allocation of the sources.So for this type of economies it will be useful to make production under free trade.The precondition of providing growth under free trade is to apply a foreign trade policy which the national economies may combine with the international structure and to direct the allocation of the sources for pruduction to the sectors determined by the international demand.The natural aim of this type of economy is the industrilization and the availibility of the growth and it is suggested that the required dynamism for this will be realized by a structuring coming from external demand rather than domestic demand (Çelebi, 1991: 33).

Against the liberal understanding of some classical economists , some economists defended the import substitution and drew attention to the importance of protectionism for industrialization. (Bahmani, Oskooee, Niromand, 1999, s.1).He suggested that free trade would not contribute to the growth among the countries that their development levels were different, but it would be useful among the countries that their development levels are the same.For instance,in England where the Industrial Revolution began first and in many of the other countries that were trying to reach England's development level he expressed that free trade is on behalf of England and less developed countries were negatively affected for foreign trade relatively. (Chang, 2004: 20).

Openness was modelled with the New Growth Theories suggested in 1980's and it was started to be tested ampirically.Internal growth theoriessuppose (varsayar) that trade openness will stimulate the new technologies input. (Harrison, 1996).No matter how the economy is open, technology input increases,technology usage becomes wide and a more rapid growth realizes as compared to a less open economy. (Wu, 2004, s. 1).Internal growth models mentioning the importance of technological diffusion as the source of growth in long period generally suggest the thesis that the countries that are open to the foreign trade will reach higher stiff growth rates(Grossman ve Helpman, 1990: 796).So Romer(1986) and Lucas (1998) expressed that the size of the openness in a country was proportional with the ability of adaptation to the new and imported technologies and the ability of the arrangement in production.

In the studies so far about the effect of the trade openness on economic growth it is difficult to say that there is a consensus.Besides Romer (1986) and Lucas (1988) in the context of internal growth theories, while Dollar (1992), Barro and Sala-i Martin (1995), Sachs andWarner (1995), Sinha and Sinha (1996), Edwards (1992, 1998) asserted that the effect of the trade openness on economic growth was positive,Levine and Renelt (1992), Harrison (1996), Rodrigez and Rodrik (1999) claimed the opposite of this idea.

Shortly called as BRIC firstly in the early 2000s Brazil,Russia,India and China that have common characters like wide area, big population and rapid economic growth are accepted as the fastest growing "emerging market" in world economy (O'Neill, 2001:1-16). Total area of these countries contains more than %25 of the world area and total population of them contains more than %40 of the world population. It is argued that BRIC group would take G7 group's place and get the leadership of the world economy when the economic indicators are considered(Frank and Frank, 2010:46-54).Goldman Sachs who has studies about 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 biggest economy.Based on these indicators, in our study the effect of openness on economic growth will be searched for BRIC countries and Türkiye that is the most devoloping country than after China and has a developing economy.

2.Openness

The openness rate of a country is generally calculated as the proportion of foreign trade volume to GDP besides the usage of the proportion of import to GDP (Romer (1993)) and the rate of export increase (Chow (1987), Kwan and Cotsomitis (1991))(Bahmani-Oskooee and Niroomand (1999), Ahmad and Anoruo (2000), Dar and Amirkhalkhali (2003)).Openness also indicates the dependence of the country on the foreign trade.The size of openness rates indicates the importance level of the foreign trade for economy of the country.With the trade openness of the country , an increase can be seen in foreign Exchange incomes and expenses at the export and import volume increase results. The share of foreign trade in GDP will increase with the foreign trade volume increase. In Figure 1 trade openness rates of BRIC-T countries are presented.
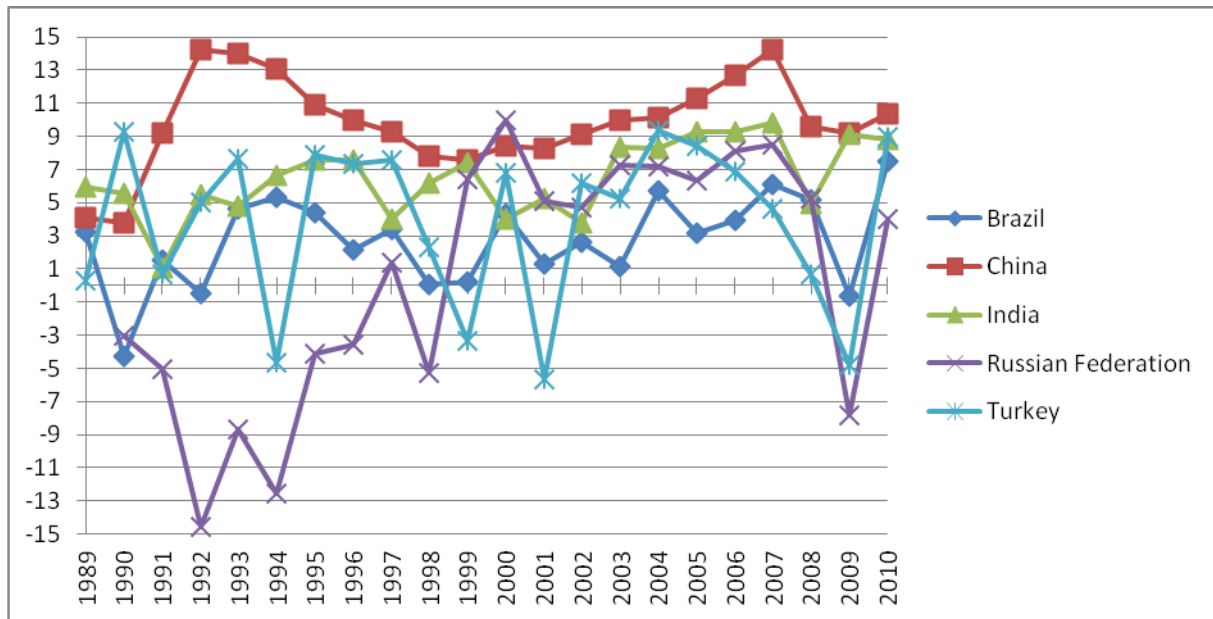
Figure 1. BRIC-T Countries Trade Openness Rates
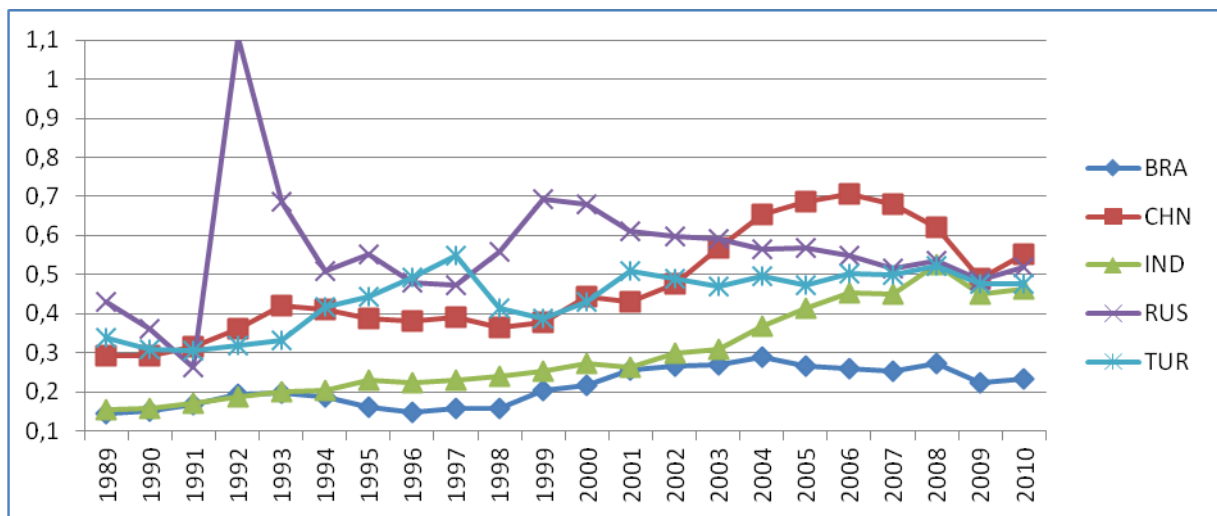
Source:It was formed by the writers using the World Bank data

As can be followed from Figure 1, in all BRIC-T countries called as emerging markets since 1990's we see a stiff openness rates and the share of foreign trade increases. It has been observed that openness rate is about 0,5 in recent years,so foreign trade volumes of the countries have reached to nearly half of their GDP.Also in Figure 2the growth rate ofBRIC-T countries are presented.

Figure2. BRIC-T Countries Growth Rates

Source:It was formed by the writers using the World Bank data

As can be followed from Figure 2, we see that the growth rates of the related countries are closs to each other and the countries were nagatively affected from the global economic crisis in 2008 and the Asia crisis in 1997.The striking point in Figure 2 is China and India's positive growth throughout the whole periods.Also we see that Russia and Turkey are the most affected countries from the global crisis in 2008.In Table 1 economic size of BRIC-T countries are presented.

Table 1. Economic Sizes of the Selected Countries(Billion $)

	BRA	CHN	IND	RUS	TUR	BRIC-T	WORLD	OECD	AB
2000	645	1.198	460	260	267	2.830	32.240	26.162	8.477
2001	554	1.325	478	307	196	2.859	32.046	25.917	8.579
2002	504	1.454	507	345	233	3.043	33.305	27.085	9.362
2003	552	1.641	599	430	303	3.526	37.466	30.422	11.409
2004	664	1.932	722	591	392	4.300	42.229	33.873	13.172
2005	882	2.257	834	764	483	5.220	45.658	35.749	13.749
2006	1.089	2.713	951	990	531	6.274	49.506	37.744	14.665
2007	1.366	3.494	1.242	1.300	647	8.049	55.849	41.346	16.957
2008	1.653	4.522	1.216	1.661	730	9.782	61.305	43.816	18.252
2009	1.594	4.991	1.377	1.222	615	9.800	58.088	41.036	16.310
2010	2.088	5.927	1.727	1.480	734	11.956	63.124	42.809	16.223

Source: It was formed by the writers using the World Bank data
As can be followed from Table 1, the GDP of the studied 5 countries in 2010 is totally 11,956 Billion$. This value corresponds to the % 71 of European Unity GDP, % 28 of OECD countries GDP and % 19 of world countries total GDP. In 2000 while BRIC-T countriestotal GDP corresponds to % 8 of world countries total GDP, the increase of this rate to % 19 in 2010 is a significant evidence to be noticed.

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3. Openness and Growth : Literature Scan

The studies searching the relationship between trade openness and economic growth, country groups, the used methods and results are presented in Table 2. As can be followed from Table 2 the view that openness affects the economic growth positively is generally supported in the studies and the importance of growth based on export is emphasized.

Table 2: Abstract of Some Theoric and Ampirical Studies Searching the Openness and Economic Growth Relationship

Writers	Sampling and Used Econometric Method	Basic Findings
Edwards (1998)	93 countries study Method of Least Squares	He found that total factor productivity increased more rapidly in the country that are more open.
Bahmani-Oskooee and Niroomand (1999)	For 59 countries 1960-92 Period Johansen cointegrationmethod	They found that there was a positive relationship between openness and growth in 19 countries that has cointegration relations.
Ahmad and Anoruo (2000)	For 5 countries1960-97 period Johansen cointegrationmethod	They indicated that openness and growth variables were cointegrated,and also they expressed that there was a two-sided causality relationship between openness and growth in error correction model.
Ahmad (2001)	Developed and developing countries, Engle-Granger and VAR model	Study results supports the export-oriented growth hypothesis.
Sun and Parikh (2001)	29 region of China(1985-1995) Panel Data Analysis	They expressed that export and foreign capital inputs have significant and positive effects on economic growth.
Vamvakidis (2002)	Regression predicted for various periods	He identified that free trade has had no positive effect on the growth since 1870,even this effect was positive in 1930'sand he expressed that this could be explained by the changing world trade regime.
Jin (2003)	North Koreathe period of 1953 and 1999 Granger causality test	He supports the hypothesis that free trade arouses the economic growth.
Wu (2004)	APEC (Asian-Pacific Economic Cooperation) countries.	He identified that openness not only provided an effective change in country's economy,but also it changed the structure of production technology.
Kaplan (2004)	General Equilibrium Model	He identified that the changes of economic policy effected the sectors in economy and production factors in different ways.
Utkulu and Kahyaoğlu (2005)	Türkey (1990-2004) Non-linear Time Series and Markow Modelling	They found that trade openness in Turkey affected the growth positively.
Yapraklı (2007)	Türkey (1990-2006) Johansen Cointegraiton Method	He identified that economic growth was affected positively from trade openness and there was a mutual causality between trade openness and economic growth in short term.
Kurt and Berber (2008)	Türkey (1989-2003) VAR analysis	They expressed that the hypothesis that trade openness claimed by endogeneous growth theories would increase the growth was applicable for Turkish economy.
Yang (2008)	30 countries (OECD and Asya) between 1958 and 2004 Panel Data Analysis	In the economies where the export growth is more rapid than the economic growth it was identifeid that froeign exchang policy helped in this situation.
Omisakin vd. (2009)	Nigeria (1970-2006) Toda-Yamamoto causality and ARDL Method	There is a positive relationship betweeen trade openness and growth and a % 10 increase in trade openness rate increases the growth nearly with the rate of % 7.

Source: Writers' studies

4. AMPIRICAL ANALYSIS

4.1. Data set and Model

In this study, the effect of openness on economic growth was searched for the most rapidly developing countries(emerging markets)(Brazil,Russia,India,China and Turkey,BRIC-T) via panel data analysis by using the annual data of the period from 1989 to 2010. From the variables used in the analysisy;represents the growth rate (GDP) andopen;represents trade openness (X+M/GSYİH). The data was obtained from the web pages of IMF and the World Bank (www.imf.org, www.worldbank.org).

For analysis Stata 11 and Eviews 5.1. econometric analysis programmes were used and for model choise and correction tests codes22 were used.

4.2. Method

Panal data analysis was used to search the data from different countries together. Panel data analysis (Baltagi, 2001; Gujarati, 1999 and Tarı, 2010):

$$Y_{it} = \propto + X_{it}'\beta + u_{it} \tag{1}$$

This model was based on decomposing the error term (u_{it}) to its components in terms of its individual and time effects. In the modeliindicates the countries, tindicates the time. When the error term was decomposed:

$$u_{it} = \mu_i + \lambda_t + \vartheta_{it} \tag{2}$$

was obtained. This final equation is called error component model. Hereμ_i indicates the individual effects, λ_t indicates the time effects.It is supposedμ_i, λ_t ve $\vartheta_{it} \sim \text{IID}(0, \sigma^2)$ (Independent Identically Distributed), in other words the avarage of error terms is zero, its variant is stable and it is distributed normally(having white noise process).In the Panel data analysis the stability of the series are searched through panel unit root tests firstly.Then the type of individual and time effects should be identified. An indogeneity 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 indogeneity. After that a model should be estimated and the problems of changing variant and autocorrelation in the model should be tested.

4.3.Panel Unit Root Analysis

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

The first problem in panel unit root test is whether the horizontal sections building the panel are independent or not. At that point panel unit root tests are classified as the first generation

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22 For codes Thanks to Prof. Haluk Erlat, Asst.Prof. Bülent Güloğlu and Asst. Prof. Şaban Nazlıoğlu .

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. On the other hand, 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) will use (IPS) testin this study. This test:

$$\Delta Y_{it} = \propto_i Y_{it-1} + \sum_{j=1}^{P_j} \beta_{ij} \Delta Y_{it-j} + X'_{it}\delta + \varepsilon_{it} \tag{3}$$

is based on the model above. Here$\propto_i$; is error correction term and when $|\propto_i|<1$ happens, we understand that the serie is trend stable ,on the other hand when$|\propto_i| \geq 1$ happens, it has unit root, thus it is not stable.IPS test enables the$\propto_i$ sto differentiate for the horizontal section units, in other words heterogeneous panel structure.Test hypotheses:

H0: $\propto_i = 1$for all the horizontal section units,so the serie is not stable.

H1: $\propto_i < 1$for at least one horizontal section unit,so the serie is stable.

When the possibility value obtained from the test results is smaller than 0.05 , H0is rejected and it is decided that the serie is stable. IPS panel unit root test results are on Table 4.

Table4:IPS Panel Unit Root Test Results

Variant	Level Value	Possibility Value	First Difference	Possibility Value
Y	-0,74	0,77	-2,64	0,00
OPEN	3,66	0,99	-3,79	0.00

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

When we study on the results on Table 4, it is observed that only Y and OPENseries are not stable in level value and series became stable in the first difference. In other words,in the studied period it is found out that macroeconomic variables are not stable and the shock effects on these variables do not disappear after a while.So we can say that the last economic crisis was destabilized the countries' economies considerably.

4.4. Breush- Pagan Lagrange Multiplier (LM) Test

In this stage of the analysis, LM test was performed in order to determine the type of time effect and individual effects(random or stable). Because the selected countries are not in a certain economic group, it was anticipated that individual effects would be random and also the time effects would be random for the countries because there is an economic crisis affecting most of the countries in the studied period. Whether the effects are really random or not can be determined by LM test (Baltagi. 2001:15).

LM test is classified as LM1 and LM2 . LM=LM1+LM2. LM1; tests the randomness of individual effects and F2 tests the randomness of time effects.

In LM1 test; H0: $\sigma_\mu^2 = 0$ (No individual effects) hypothesis is tested throughLM1 statistics. LM1 statistics is calculated by the formula below.

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

Hereμ; indicates the individual effects in the equation (4), N;indicates the horizontal section (country) number, T; indicates the time dimension, û; indicates the prediction for the error terms in the equation (3). When the possibility value obtained from the test results is smaller than 0.05 , H0is rejected and it is decided that individual effects are random.

In F2 test; H0: $\sigma_\lambda^2 = 0$ (No time effect) hypothesis is tested by LM2 statistics. LM2 statistics is calculated by the formula below.

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

Hereμ; indicates the individual effects in the equation (4), N; indicates the horizontal section (country) number , T; indicates the time dimension, û; indicates the predictions for the error terms in the equation (3). When the possibility value obtained from the test results is smaller than 0.05 , H0is rejected and it is decided that time effects are random.

In LM=LM1+LM2 test;

H0: $\sigma_\mu^2 = \sigma_\lambda^2 = 0$ (No individual and time effects)

H1: $\sigma_\mu^2 \neq 0 \text{ or } \sigma_\lambda^2 \neq 0$ or both of them$\neq 0$ (At least one or two of the effects are random).

When the possibility value obtained from the test results is smaller than 0.05 , H0is rejected and it is decided that both of the effects are random.In this case the prediction is made through the two-sided random effect model.In Table 5 there are LM tests results.

Table5: LM Tests

Test	Possibility Value	Decision
LM$_1$	0,243	Individual Effects are not Random.
LM$_2$	0,052	Time Effects are not Random.
LM	0.032	Individual Effects and Time Effects are not Random.

When we look the results in Table 5, we can see thatindividual effects and time effects are stable.According to this result the prediction was made by the two-sided stable effect model.

4.5. Hausman Endogeneity Test

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

H0: $Cov(\mu_i, x_{it}) = 0$ No endogeneity problem.

H1: $Cov(\mu_i, x_{it}) \neq 0$ An endogeneity problem.

Hereμ_i; indicates the individual effets in the equation (4),but X_{it} indicates the exlanatory variables in the equation (3). When the possibility value of χ^2 (Chi2=Kikare) obtained from the analysis is smaller than 0.05 , H0is rejected and it is decided that there is an endogeneity problem in the model.In this case stable effects model is used.(Greene, 2003).However, when H0 is accepted,random effects model is used.This prediction is effective , non-deviated and coherent. Hausman test is not an alternative forLM test.But it works as function to check the decision by LM test. Hausman test was conducted and χ2=14.62 ve χ2 possibility value =0.406 was obtained and since this value was bigger than 0.05, H0 hypothesis was accepted and it was decided that there was no endogeneity problem in the model.In this case, it is necessary to do the analysis with the random effects model and this result supports the LM test results.

4.6. Two-Sided Random Effects Model Predictions

Panel data analysis is predicted by the two-sided random effect model and the result are on theTable6.

Table6: Predicition Results

Variant	Coefficient	Standard Error	t-Statistics	Possibility Value
Trade Openness	0,271	0,078	3,442	0,000
Crisis Dummy Variable	0,030	0,047	0,648	0,518
Stable Term	0,056	0,014	3,791	0.000
Weighted R^2=0,39 DW=1,89 F$_{ist}$= 3,66 Root MSE=0.035				

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

4.7. Lagrange Multiplier (LM) Flexible Variant Test

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

H0: $\sigma_{u_1}^2 = \sigma_{u_2}^2 = ... = \sigma_{u_n}^2 = \sigma_u^2$ Variant is stable. So there is no flexible variant problem.

H1: At least one $\sigma_{u_i}^2 \neq \sigma_u^2$ Variant is not stable. So there is a flexible variant problem.

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

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

When the possibility value obtained from the test results is smaller than 0.05 , H0is rejected.In other words it is decided that there is a flexible variant problem in the model. (Greene, 2003). Lm test was conducted and the possibility value was found 0.23..In this case H0 was rejected and it was decided that there was no flexible variant problem in the model.

4.8. Autocorrelation Test

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

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

Test hypotheses:

H0: $\rho = 0$No autocorrelationproblem.

H1: $\rho \neq 0$ Am autocorrelationproblem.

The required test statistics to test these hypotheses is calculated by the following formula:

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

HereSSRR; indicates the sum of the squares of the error terms of the limited model in the equation (3) SSRUR; indicates the sum of the squares of error terms of the unlimited model, g; indicatesthe limit number anddf; indicates the independence grade. When the possibility value obtained from the test results is smaller than 0.05,H0is rejected.It is decided that there is an autocorrelation problem in the model. (Drukker, 2003).

F test was conducted and the possibility value was found0,622. In this case   H0is accepted and it was decided that there was no autocorrelation problem in the model.

Since there is no flexible variant and autocorrelation problems in the model, the prediction results are reliable and interpretable. As can be seen from the Table 6, financial development level affects the economic growth positively in line with the theoretical expectations.A % 1 increase in financial development level will increase the growth with the rate of % 1.33. The importance of the foreign direct investments especially in developing countries is often emphasized. 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 variant used in the model was observed as the most effective variant in growth and it was found out that a %1 increase in openness level increased the growth with the rate of % 4,31. So this affected Turkey mostly in terms of the decrease in export depending on the decrease in external demand as a result of 2008 global economic crisis. (Somel, 2009).

5.CONCLUSION

In this study the effect of financial development level on economic growth was searched via panel data analysis method in the sample of 5 developing countries which have an important place in the world economy(emerging markets, Brazil, Russia, India, China and Turkey-BRIC-T). The foreign direct investments and trade openness which were considered to affect

the growth as well as financial development were included in the study where the annual data between 1989 and 2010 periods were used. At the panel unit root analysis result it was found out that series were not stable 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.

At the F tests result conducted to define the applicable panel data analysis method it was found out that individual and time effects were stable, for that reason an analysis with the two-sided stable effect model was carried out.At the endogeneity test result it was found out that there was no endogeneity problem in the model. At the model conformation tests result it was foud out that there was no flexible variant and autocorrelation problems in the model. In this regard, the predicted model is reliable econometrically.

According to the analysis results, it was determined that a % 1 increase in financial development level increased the growth at the rate of % 1,33 , a % 1 increase in foreign direct investments increased the growth at the rate of % 0,79.Also it was found out that trade openness in the model was the most effective variant of the growth and the evidence that a % 1 increase in openness level increased the the growth at the rate of % 4,31.The expression that the global economic crisis in 2008 affected Turkey mostly in export dimension supports the analysis result.

As a conclusion, in the study the effect of financial development, foreign direct investments and openness were searched and it was found that openness, financial development and foreign investments in turn affected the growth mostly. If the sustainable growth is considered as one of the most significant variables of the growth 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 very important.

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