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SAVINGS, FOREIGN DIRECT INVESTMENT INFLOWS AND ECONOMIC GROWTH IN EMERGING ASIAN ECONOMIES

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ABSTRACT

Saving rate is one of the important elements of all the theories of economic growth and foreign direct investment inflows also became an important determinant of economic growth together with the globalization process as of 1990s. Therefore many studies have been conducted on the relationship between economic growth and savings, foreign direct investment inflows. This study examines the effects of domestic savings and foreign direct investment inflows on the economic growth in emerging Asian economies during the period 1982-2012 by using Pedroni, Kao and Johansen-Fisher panel co-integration tests and vector error correction model. We found that gross domestic savings, gross domestic investment and foreign direct investment inflows had positive effect on economic growth in the long run.

Keywords: Economic growth, Gross domestic savings, Gross domestic investments, Foreign direct investment inflows.

Jel Codes: E21, E22, F21.

Contribution/ Originality

Savings is constantly one of the crucial components behind the economic growth and therefore saving rate takes an important place in the theories of economic growth. On the other hand foreign direct investment inflows gained importance together with the globalization in the world and foreign direct investment inflows have increased substantially since 1990s. There have been extensive studies which examine the relationship among the savings, foreign direct investment inflows and economic growth separately. But there has been few studies which investigate the effects of both domestic savings and foreign direct investment inflows on the economic growth in the same study. Besides that emerging economies, especially Asian emerging economies, reached high successive economic growth rates in past three decades. This study contributes to the literature by examining the effects of domestic savings, domestic investments and foreign direct investment inflows on economic growth in highly expanding Asian economies during the period 1982-2012.

1. INTRODUCTION

One of the main objectives of macroeconomic policies is to achieve sustainable economic growth. So the interactions between economic growth and other macroeconomic variables are very important to determine the policies which lead economic growth. The theoretical studies on the relationship between economic growth and savings dated back to the Harrod (1939) and Domar (1946) growth model which stated that economic growth depends on saving rate and higher saving rate will lead higher rates of economic growth. On the other hand saving rate also has impact on economic growth in the neoclassical growth model (see Solow (1956) and Swan (1956)) and changes in saving rates affect economic growth until the steady state output only in the short-run in this model. Moreover saving rate is accepted as one of the key determinants of economic growth in the endogenous growth theory whose pioneer studies are Romer (1986), Lucas (1988), Rebelo (1991). It is predicted that an increase in the saving rate will lead to a permanently higher growth rate in according to the endogenous growth theory.

Empirical studies on the relationship between economic growth and saving rate have reached mixed findings, while theories of economic growth suggest that savings are one of the key determinants of economic growth. Carroll and Weill (1994) found that economic growth causes savings, not savings to economic growth. Many studies such as Sinha and Sinha (1998), Agrawal (2000), Anoruo and Ahmad (2001) reached the same findings with Carroll and Weill (1994). Moreover foreign direct investment (FDI) inflows to the emerging economies have increased significantly since 1990s and most of the empirical studies such as Blomstrom *et al.* (1994), Xu and Wang (2007) and Gursoy *et al.* (2013) found that FDI inflows had positive impact on economic growth.

Emerging Asian economies experienced significant rates of economic growth especially during the past three decades. The objective of this study is to investigate the relationship between economic growth and domestic savings, domestic investment, foreign direct investment inflows in high-growth emerging Asian economies during the period 1982-2012 by Pedroni, Kao and Johansen-Fisher panel co-integration tests and vector error correction model (VECM). In this context the rest of the study is organized as follows. Section 2 reviews the previous literature. Section 3 presents the data and method; Section 4 presents econometric application and introduces the main findings. Section 5 concludes the study.

2. LITERATURE REVIEW

There have extensive studies about the effects of the savings, investment and FDI inflows on the economic growth in the literature. But the studies generally have focused on the relationship between economic growth and savings or between economic growth and FDI inflows. However gross domestic investment generally has been included as a control variable in both empirical studies. Therefore we will review the literature in two subsections. Firstly we will review the empirical studies on the relationship between economic growth and savings and then review the empirical studies on the relationship between economic growth and FDI inflows. The literature on

the relationship between economic growth and domestic investment will be covered in both subsections.

2.1. Literature on the Economic Growth and Savings

The studies on the relationship between economic growth and savings have reached mixed findings depending on country/country group, study period and methods. Carroll and Weill (1994), Sinha and Sinha (1998), Anoruo and Ahmad (2001), Agrawal (2001), Baharumshahl *et al.* (2003), Verma (2007), Ekinci and Gul (2007), Odhiambo (2009), Agrawal *et al.* (2010) and Andrei and Huidumac-Petrescu (2013) found that there was unidirectional causality from economic growth to savings, while Aghion and Howitt (2005), Greenidge and Miller (2010), Jangili (2011), Budha (2012), Tang and Ch'ng (2012), Tang and Lean (2013) and Tang and Tan (2014) found that there was unidirectional causality from savings to economic growth. On the other hand relatively few studies such as Tang and Chua (2012) and Gulmez and Yardımcıoglu (2013) found that there was bidirectional causality between economic growth and savings.

Table-1. Literature Review about the Studies on the Relationship between Economic Growth and Savings

Study	Country/Country Group (Period)	Findings
Carroll and Weill (1994)	Two samples (64 countries and 22 OECD countries) (1960-1987)	There was unidirectional causality from economic growth to savings.
Sinha and Sinha (1998)	Mexico (1960-1996)	There was unidirectional causality from economic growth to private and public savings.
Agrawal (2000)	Bangladesh, India, Nepal, Pakistan, Sri Lanka (1960-1998)	There was unidirectional causality from savings to economic growth in Bangladesh and Pakistan and unidirectional causality from economic growth to savings in India and Sri Lanka.
Anoruo and Ahmad (2001)	7 Africa countries (1960-1997)	There was unidirectional causality from economic growth to domestic savings.
Agrawal (2001)	7 Asian countries	There was unidirectional causality from economic growth to savings.
Baharumshahl *et al.* (2003)	5 Asian countries (1960-1997)	They found that economic growth had positive impact on savings.
Aghion and Howitt (2005)	91 countries (1960-2000)	Savings had a positive impact on economic growth.
Mohan (2006)	20 countries (1960-2001)	There was unidirectional causality from economic growth to savings in 8 high income countries, 3 lower-middle income countries and 2 low income countries, while there was bidirectional causality in 4 upper-middle income countries.
Verma (2007)	India (1950-2004)	Economic growth caused savings and also savings drove investment in short and long run, but no evidence that investment drove economic growth.
Ekinci and Gul (2007)	Turkey (1960-2004)	There was unidirectional causality from economic growth to domestic investments.

Continue

Study	Country/Country Group (Period)	Findings
Odhiambo (2009)	South Africa (1950–2005)	There was unidirectional causality from economic growth to savings in the long run.
Agrawal *et al.* (2010)	India (1960-2008)	There was unidirectional causality from economic growth to savings.
Greenidge and Miller (2010)	Latin American and Caribbean economies (1960-2007)	There was unidirectional causality from saving to investment
Jangili (2011)	India (1950-2008)	There was unidirectional causality from gross domestic saving and gross domestic investment to economic growth.
Budha (2012)	Nepal (1974-2010)	Gross domestic savings and gross fixed capital formation had positive impact on economic growth in the long run.
Tang and Chua (2012)	Malaysia (1971-2008)	There was bidirectional causality between economic growth and savings.
Tang and Ch'ng (2012)	Association of Southeast Asian Nations (1970-2010)	There was unidirectional causality from savings to economic growth.
Andrei and Huidumac-Petrescu (2013)	17 Eurozone countries (1960-2011)	There was unidirectional causality from economic growth to gross national saving.
Tang and Lean (2013)	Malaysia (1961-2000)	Domestic saving was the dominant factor on economic growth and impact of foreign savings was relatively insignificant.
Gulmez and Yardımcıoglu (2013)	BRICS countries and Turkey (1994-2011)	Domestic and foreign savings had positive impact on economic growth.
Tang and Tan (2014)	Pakistan (1971-2001)	Savings had positive impact on economic growth in the short and long run and there was unidirectional causality from savings to economic growth.

2.2. Literature on the Economic Growth and Foreign Direct Investment Inflows

FDI flows have increased significantly in the world during the globalization process especially since 1980s. Therefore studies on the effects of FDI inflows on economic growth also emerged in parallel with increasing FDI flows. However studies on the relationship between economic growth and FDI inflows have reached mixed findings. Some studies such as Blomstrom *et al.* (1994), Borensztein *et al.* (1995), Ahmad and Hamdani (2003), Xu and Wang (2007), Almasaied *et al.* (2008), Hetes *et al.* (2009), Kotrajaras (2010), Tiwari and Mutascu (2011), Asghar *et al.* (2011), El-Wassal (2012), Soumia and Abderrezzak (2013) and Gursoy *et al.* (2013) found that FDI inflows had positive impact on economic growth, while Mencinger (2003) and Saqib *et al.* (2013) found that FDI had negative impact on economic growth. On the other hand relatively few studies such as Katerina *et al.* (2004), Yalta (2011), Mohamed *et al.* (2013) and Chowdhary and Kushwaha (2013) found that FDI inflows had no impact on economic growth, while some studies such as Türkcan *et al.* (2008), Mucuk and Demirsel (2009), Agayev (2010), Ahmadi and Ghanbarzadeh (2011), Gursoy *et al.* (2013) and Sooreea-Bheemul and Sooreea (2013) found that there was bidirectional causality between economic growth and FDI inflows.

On the other hand there have been relatively few studies on the relationship between domestic investment and economic growth in the literature. These studies also have found mixed findings. Ahmad and Hamdani (2003) found that domestic investment had positive impact on economic growth, while Adams (2009), Sooreea-Bheemul and Sooreea (2013) found that economic growth had positive impact on domestic investment. On the other hand Mohamed *et al.* (2013) and Chowdhary and Kushwaha (2013) found that there was bidirectional causality between economic growth and domestic investment.

Table-2. Literature Review about the Studies on the Relationship between Economic Growth and FDI Inflows

Study	Country/Country Group (Period)	Findings
Blomstrom *et al.* (1994)	69 developing countries (1960-1985)	FDI inflows had positive impact on economic growth.
Borensztein *et al.* (1995)	69 developing countries (1970-1989)	FDI had positive effect on economic growth.
Ahmad and Hamdani (2003)	32 developing countries (1965-1992)	Domestic investment and FDI inflows had positive impact on economic growth.
Lyroudi *et al.* (2004)	17 transition economies (1995-1998)	FDI inflows did not have any significant impact on economic growth.
Xu and Wang (2007)	China (1980-1999)	FDI inflows had a positive impact on economic growth and domestic investment
Türkcan *et al.* (2008)	23 OECD countries (1975-2004)	There was bidirectional causality between economic growth and FDI inflows.
Almasaied *et al.* (2008)	ASEAN countries (1968-2002)	FDI inflows and domestic investment had positive impact on economic growth.
Hetes *et al.* (2009)	Central and Eastern European countries (1994-2006)	FDI inflows had positive impact on economic growth.
Mucuk and Demirsel (2009)	Turkey (1992-2007)	There was bidirectional causality between economic growth and FDI inflows.
Agayev (2010)	25 transition economies (1994-2008)	There was bidirectional causality between economic growth and FDI inflows.
Kotrajaras (2010)	15 East Asian countries (1990-2009)	FDI had positive impact on economic growth only in high and middle income countries.
Tiwari and Mutascu (2011)	23 Asian countries (1986-2008)	FDI inflows had positive impact on economic growth.
Asghar *et al.* (2011)	14 Asian countries (1983-2008)	FDI inflows had positive impact on economic growth.
Ahmadi and Ghanbarzadeh (2011)	Middle East and North Africa counties (1970-2008)	There was bidirectional causality between economic growth and FDI inflows.
Yalta (2011)	China (1982-2008)	There was no statistically significant relationship between economic growth and GDP inflows.
El-Wassal (2012)	16 Arab countries (1970-2008)	FDI inflows had positive impact on economic growth.
Mohamed *et al.* (2013)	Malaysia (1970-2008)	There was bidirectional causality between economic growth and domestic investment, while there was no causality between economic growth and FDI inflows.

Continue

Study	Country/Country Group (Period)	Findings
Gursoy *et al*. (2013)	Azerbaijan, Kyrgyz Republic, Kazakhstan, Tajikistan, Turkmenistan, and Uzbekistan (1997-2010)	There was unidirectional causality from FDI inflows to economic growth in Azerbaijan, while there was bidirectional causality between economic growth and FDI inflows in Turkmenistan.
Soumia and Abderrezzak (2013)	Arab Maghreb Union countries (1980-2010)	FDI inflows had a positive impact on economic growth.
Sooreea-Bheemul and Sooreea (2013)	28 developing and emerging countries (1980-1998)	There was unidirectional causality from economic growth to domestic investment, while there was bidirectional causality between economic growth and FDI inflows.
Chowdhary and Kushwaha (2013)	India (1992-2012)	There was bidirectional causality between economic growth and domestic investment, where FDI inflows had no impact on economic growth and domestic investment.

3. DATA AND METHOD

We used annual data of economic growth, gross domestic saving, gross domestic investment and FDI inflows during the period 1982-2012 to investigate the relationship between economic growth and gross domestic savings, gross domestic investments and FDI inflows. All the data were taken from World Development Indicators of World Bank and variables and their symbols were presented in Table 3.

Table-3. Variables used in the econometric analysis

Variable Symbols	Variables
GDP	GDP growth rate based on constant 2005 U.S. dollars (%)
GDS	Gross domestic savings (% of GDP)
GDI	Gross domestic investments (% of GDP)
FDI	Foreign direct investment inflows (% of GDP)

We analyzed the long run relationship between economic growth and domestic savings, domestic investment, foreign direct investment inflows in highly growing emerging Asian economies during the period 1982-2012 by Pedroni, Kao and Johansen-Fisher panel co-integration tests and VECM. Eviews 7.1, Stata 11.0 and Rats 8.1 statistical software packages were used in the analyses.

We used Pedroni, Kao and Johansen Fisher co-integration tests to determine whether there is a long run relationship between economic growth and saving rate, domestic investment and FDI inflows. Pedroni suggested some tests which allowed heterogeneity in the co-integration analyses. This test allows heterogeneity in co-integration vector (Asteriou and Hall, 2007). This test does not allow only dynamic and fixed effects to be different among the cross sections of panel, but also allows co-integrated vector to be different among the cross sections under alternative hypothesis (Guvenek and Alptekin, 2010). Pedroni's approach becomes different from McCoskey and Kao approaches in terms of assumption of cross sectional trend and null hypotheses which have

nonexistence of co-integration. Allowing multiple regressors, varying of co-integration vectors in different parts of panel and allowing heterogeneity of errors through cross sectional units constitute good sides of Pedroni's tests. Seven co-integration tests were presented to cover "within" and "between" effects in the panel and these tests were separated as two different categories (Asteriou and Hall, 2007). The first category includes 4 tests which are pooled at "within" dimension, The second category includes the remaining 3 tests at "between" dimension. The first three of four tests in the first category are non-parametric tests. The first test is a statistic that is a kind of variance ratio. The second one is similar to Phillips-Peron (PP) (rho) statistic and the third one is similar to PP (t) statistic. The fourth statistic is a parametric statistic which is similar to Augmented Dickey and Fuller (1979) (t) statistic. The first one of three tests in the second category is similar to PP (rho) statistic, the other two tests are similar to PP (t) and ADF (t) statistics (Guvenek and Alptekin, 2010). We used also Kao panel co-integration test, which was developed by Kao (1999) by DF and ADF tests, and Johansen-Fisher panel co-integration test.

4. ECONOMETRIC APPLICATION AND FINDINGS

4.1. Panel Unit Root Test

Panel data methodology conducts both time and cross sectional analyses, so it is required that the variables should be stationary to avoid possible spurious relationships among the variables. Therefore we investigate common unit root processes with panel unit root tests by Levin *et al.* (2002) and the individual unit root process by Im *et al.* (2003). We test the stationarity of individual invariant time series by Dickey and Fuller (1979) test. The results of the stationarity tests were presented Table 4. The results demonstrated that GDP, GDS, GDI and FDI were I(1).

Table-4. Results of Panel Unit Root Test

Variables	Levin, Lin & Chu Test		Im, Pesaran & Shin Test		ADF-Fisher Chi-square	
	Level	First Difference	Level	First Difference	Level	First Difference
	Trend and Constant	Constant	Trend and Constant	Constant	Trend and Constant	Constant
GDP	0.1132	0.0001*	0.1299	0.0043*	0.1176	0.0001*
GDS	0.0977	0.0002*	0.0841	0.0001*	0.0962	0.0000*
GDI	0.1365	0.0011*	0.1073	0.0031*	0.0954	0.0000*
FDI	1.2048	0.0255*	1.1066	0.0197*	1.1887	0.0252*

Time series were deseasonalized by tramo/seats and periods of crisis and policy changes were considered in regard to their statistical significance and they were included in the model if their trend and constant components were statistically significant.
* Significant at the 0.05 and 0.01 level, lags for ADF test were selected automatically based on Schwarz information criterion (SC), bandwiths for Phillips-Perron test were selected automatically based on Newey-West bandwith.
Cusum path lies within the confidence interval bounds at %5, it was not observed structural breakpoint.

The unit root tests in Table 4 are called as first generation panel unit root tests. First generation panel unit root tests are assumed that cross-sectional units are independent and affected equally from the shock which any panel unit is exposed to. But it is more realistic that the other panel units are affected in different measures from the shock which any panel unit is exposed to. The second

generation panel unit root tests were developed to eliminate this shortcoming and they test the stationarity by considering the dependency among the cross-sectional units (Gocer, 2013).

It is required to test the cross-sectional dependency in panel data set for determining the existence of unit root. If the cross-sectional dependency in panel data set is rejected, first generation panel unit root tests can be used. However if there is cross-sectional dependency in the panel data, use of second generation panel unit root tests yield a more consistent, efficient and powerful estimation (Guloglu and İspir, 2011). We can determine the existence of cross-sectional dependency by Breusch and Pagan (1980) CD_{LM1} test in case of time dimension (T)> cross-sectional dimension (N), Pesaran (2004) CD_{LM2} test in case of T=N, by Pesaran (2004) CD_{LM} test in case of T<N (Gocer, 2013). We used Breusch and Pagan (1980) CD_{LM1} to test the cross-sectional dependency because there are 7 countries (N=7) and 30 years (T=30). The hypotheses of the test are as follows:

H_0: There is no cross-sectional dependency

H_1: There is cross-sectional dependency

If the p value is smaller than 0.05, H_0 hypothesis is rejected at 5% significance level and it is decided that there is cross-sectional dependency among the panel units (Pesaran, 2004). The results of the CD_{LM1} test were presented in Table 5. The results demonstrated that there was cross-sectional dependency in the series. It means that the other countries were affected from the shock which any country was exposed to. In this case we would test the stationarity of the series with cross-section augmented Dickey and Fuller (1979) (CADF) which is a second generation panel unit root tests.

Table-5. CD_{LM1} Test Results

Test	GDP		GDS		GDI		FDI	
	t stat.	p value	t stat.	p value	t stat.	p value	t stat.	p value
CD_{LM1}	7.892	0.003	8.661	0.034	6.995	0.000	5.067	0.010

CADF test assumes that error term is composed of two parts which one part is common to all the series and one part is specific to each series. It is assumed that cross-sectional dependency is arisen from the unobservable common part. The hypotheses of the test are as follows:

H_0: There is unit root.

H_1: There is no unit root.

We will firstly calculate CADF statistics for each country. The calculated values are compared with the table values obtained from the Monte Carlo simulation by Pesaran (2006). If the calculated CADF statistics are smaller than critical values from the table, H_0 is rejected. In other words there are no unit roots in data of this country and the shocks are temporary.

CIPS (Cross-sectionally augmented IPS (Im *et al.* (2003)) statistics is calculated by taking the arithmetic average of all the calculated CADF statistics for each country to determine whether there is unit root in the overall panel. CIPS statistics is compared with the table values in Pesaran (2006). If CIPS value is smaller than critical value in the table, H_0 is rejected and it means that there is not

unit root in relevant data and the shocks are temporary (Gocer, 2013). CADF and CIPS statistics were calculated for our study and presented in Table 6. H_0 was accepted because CIPS statistics was higher than the critical value in the table and thus there was unit root in the time series. So the series were not stationary at the level and this demonstrated that the effect of the shock from the independent variables on the relevant countries was not lost immediately. Therefore we would conduct co-integration test with the first-differenced series because the series were not stationary at the level.

Table- 6. CADF and CIPS Test Results

Variables	GDP		GDS		GDI		FDI	
Countries	**CADF stat.**	**lag**	**CADF stat.**	**lag**	**CADF stat.**	**lag**	**CADF stat.**	**lag**
China	-6.23	1	-5.21	1	-5.69	1	-5.11	1
Indonesia	-4.89	2	-4.52	2	-4.84	1	-4.82	1
India	-4.32	1	-4.76	2	-5.28	2	-5.83	1
Korea, Rep.	-5.97	3	-4.87	1	-5.32	2	-5.27	3
Malaysia	-5.54	1	-5.02	1	-4.99	1	-5.60	2
Philippines	-6.06	2	-5.83	3	-4.92	1	-5.16	2
Thailand	-5.38	1	-5.26	2	-5.11	1	-4.92	1
CIPS Statistics	-5.48		-5.06		-5.16		-5.24	

Critical value at 1% significance level is -4.013 for CADF Pesaran (2007)

Critical value at 1% significance level is -2.994 for CIPS Pesaran (2007)

4.2. Panel Co-integration Analysis

We used Pedroni, Kao and Johansen-Fisher co-integration tests to determine whether there is long run relationship among the variables. We determined 2 of lag length as a common result of Akaike Information Criterion (AIC), SC and Hannan-Quinn Information criterion (HQ). The results of co-integration tests were presented in Table 7. We found that there was long run relationship among the variables as a consequence of all the tests except group rho and group ADF test. We applied full modified ordinary least square (FMOLS) and dynamic ordinary least square (DOLS) methods.

Table-7. Results of Co-integration Tests

Pedroni Panel Co-integration test				
(Within-Dimension)				
	t-Statistic	**Prob.**	**Weighted t-Statistic**	**Prob.**
Panel v-Statistic	5.7561	0.011*	5.0445	0.000*
Panel rho-Statistic	-5.3422	0.002*	-2.8702	0.002*
Panel PP-Statistic	-4.8875	0.016*	-2.2241	0.021*
Panel ADF-Statistic	-3.9032	0.000*	-2.9428	0.001*
(Between-Dimension)				
	t Statistic		Prob.	
Group rho-Statistic	-1.6654		0.1276	
Group PP-Statistic	-3.6522		0.0023*	
Group ADF-Statistic	-1.4299		0.0964	

Continue

Kao Panel Co-integration Test				
	t- Statistic		Prob.	
ADF	-3.6429		0.0033*	
Residual variance	32874.19			
HAC variance	41832.37			
Johansen-Fisher Panel Co-integration Test				
Hypothesized No. Of CE(s)	Fisher Stat. (from trace test)	Prob.	Fisher Stat. (from max-eigen test)	Prob.
None	243.56	0.001	163.48	0.000*
At most 1	102.71	0.000	79.43	0.012*

*Statistically significant at 0.01 and 0.05

4.3. Co-Integration Coefficients of FMOLS and DOLS

FMOLS method developed by Pedroni (2000) and DOLS method developed by Kao and Chiang (2000) and VECM developed by Breitung (2002) are used for the model estimation in the panel co-integration. DOLS method is a parametric approach which adjusts the autocorrelation by incorporating the lagged first differences into the model. FMOLS method is a nonparametric approach in adjusting the autocorrelation and yields quite biased results in small estimators (Breitung, 2005). We used FMOLS and DOLS methods in estimation of final unbiased coefficients of the co-integration relationship.

The results of FMOLS and DOLS estimation methods were presented in Table 8. The results demonstrated that GDS, GDI and FDI variables had positive impact on GDP (economic growth). One unit increase in gross domestic savings, gross domestic investment and FDI inflows respectively increased economic growth by 21%, 18% and 13% according to the FMOLS, while one unit increase in gross domestic savings, gross domestic investment and FDI inflows respectively increased economic growth by 19%, 16% and 14% according to the DOLS. All the independent variables except FDI for China had positive impact on economic growth.

Table-8. Estimation Results of FMOLS and DOLS

Countries		**FMOLS**		**DOLS**	
		t-statistics	**Coefficient**	**t-statistics**	**Coefficient**
Panel	GDS	4.767	0.215*	5.007	0.193*
	GDI	3.998	0.186*	4.752	0.165*
	FDI	6.231	0.131*	4.629	0.146*
China	GDS	3.887	0.198*	4.822	0.201*
	GDI	4.202	0.197*	4.702	0.152*
	FDI	*0.773*	*0.153*	*0.983*	*0.126*
Indonesia	GDS	4.323	0.230*	4.652	0.173*
	GDI	4.894	0.209*	4.371	0.164*
	FDI	5.803	0.122*	5.288	0.163*
India	GDS	4.869	0.207*	5.113	0.195*
	GDI	5.112	0.158*	4.899	0.138*
	FDI	4.682	0.147*	4.690	0.151*
Korea, Rep.	GDS	4.365	0.193*	5.066	0.212*
	GDI	3.780	0.175*	4.532	0.181*

Continue

Countries		FMOLS		DOLS	
		t-statistics	Coefficient	t-statistics	Coefficient
	FDI	4.991	0.129*	4.103	0.120*
Malaysia	GDS	5.008	0.225*	4.831	0.187*
	GDI	3.442	0.192*	5.006	0.149*
	FDI	6.781	0.116*	4.365	0.155*
Philippines	GDS	4.303	0.219*	5.187	0.163*
	GDI	3.118	0.172*	4.280	0.149*
	FDI	6.909	0.135*	4.651	0.131*
Thailand	GDS	4.776	0.202*	3.802	0.216*
	GDI	5.371	0.191*	4.166	0.157*
	FDI	6.533	0.140*	4.013	0.118*

*Statistically significant at 0.05

4.4. Short and Long Run Panel Causality Analysis

We found that there was a long run relationship among the variables. This means that there is at least one unidirectional causality among the variables. Therefore we will test the causality among the variables. We can determine the direction of the relationship by VECM, if there is a co-integration relationship among the variables. k represents optimal lag lengths in the following equations. The panel shows the residual terms in the first equation of FMOLS. This enables us to analyze short and long run causality relationships. We tested the short run relationship among the variables by Wald test and long run relationship by searching the significance of test statistics of error correction coefficient.

$$\Delta Y_{it} = \alpha_{1i} + \sum_{p=1}^{k} \alpha_{11ip} \Delta Y_{it-p} + \sum_{p=1}^{k} \alpha_{12ip} \Delta X_{it-p} + \emptyset_{1i} \varepsilon_{it-1} + \omega_{1it}$$

$$\Delta X_{it} = \alpha_{2i} + \sum_{p=1}^{k} \alpha_{21ip} \Delta X_{it-p} + \sum_{p=1}^{k} \alpha_{22ip} \Delta Y_{it-p} + \emptyset_{2i} \varepsilon_{it-1} + \omega_{2it}$$

We determined the lag lengths in according to the SC. The results of short run panel causality analysis were presented in Table 9. The results of short run causality analysis demonstrated that:

- There was bidirectional causality between economic growth (DGDP) and gross domestic savings (DGDS), gross domestic investment (DGDI) and FDI inflows (DFDI).
- There was unidirectional causality from gross domestic saving (DGDS) to gross domestic investment (DGDI).
- There was unidirectional causality from FDI inflows to gross domestic investment (DGDI). In other words FDI inflows crowd in domestic investments.

Table-9. Results of Short Run Panel Causality Analysis

		DGDP	DGDS	DGDI	DFDI
DGDP	Chi-sq		23.34	36.71	42.99
	Prob.		0.000*	0.000*	0.012*
DGDS	Chi-sq	37.39		62.78	2.785
	Prob.	0.003*		0.003*	0.114
DGDI	Chi-sq	15.68	1.631041		6.9155
	Prob.	0.000*	0.2016		0.092
DFDI	Chi-sq	26.82	1.4382	43.56	
	Prob.	0.016*	0.1566	0.000*	

*Statistically significant at 0.05 significance level

The results of long run panel causality analysis were presented in Table 9. The results of long run causality analysis demonstrated that:

- There was bidirectional causality between economic growth (GDP) and gross domestic savings (GDS), gross domestic investment (GDI).
- There was bidirectional causality between gross domestic savings and gross domestic investment (GDI).
- There was unidirectional causality from FDI inflows (FDI) to economic growth (GDP), gross domestic investment (GDI), gross domestic savings (GDS).

Our findings on the relationship between economic growth and gross domestic savings are consistent with Tang and Chua (2012) and Gulmez and Yardımcıoglu (2013), while most of the studies found that there was unidirectional causality from savings to economic growth. On the other hand our findings on the relationship between economic growth and FDI inflows are consistent with the most of the studies such as Blomstrom *et al.* (1994), Borensztein *et al.* (1995), Ahmad and Hamdani (2003), Xu and Wang (2007), Almasaied *et al.* (2008), Hetes *et al.* (2009), Kotrajaras (2010), Tiwari and Mutascu (2011), Asghar *et al.* (2011), El-Wassal (2012), Soumia and Abderrezzak (2013) and Gursoy *et al.* (2013).

Table-10. Results of Long Run Panel Causality Analysis

DGDP		f(DGDS,DGDI,DFDI)
	ECT	-1.117125
	t-statistics	16.92502*
DGDS		f(DGDP,DGDI,DFDI)
	ECT	-0.0254
	t-statistics	-0.0261*
DGDI		f(DGDS,DGDP,DFDI)
	ECT	-0.131877
	t-statistics	-0.0116*
DFDI		f(DGDS,DGDI,DGDP)
	ECT	-0.18755
	t-statistics	-0.39674

*Statistically significant at 0.05 significance level

5. CONCLUSION

Emerging Asian economies experienced both significant rates of economic growth and increasing saving rate and FDI inflows especially during the past three decades. This study investigated the relationship between economic growth and gross domestic savings, gross domestic investments and FDI inflows in these high-growth emerging Asian economies during the period 1982-2012 by using Pedroni, Kao and Johansen-Fisher panel co-integration tests and vector error correction model. The results of co-integration tests demonstrated there was a long run relationship among the variables and then the results of FMOLS and DOLS methods demonstrated that gross domestic savings, gross domestic investments and FDI inflows had positive impact on economic growth in the long run. However gross domestic investments relatively had more effect on economic growth than gross domestic investments and FDI inflows with regard to both FMOLS and DOLS.

The results of the causality test demonstrated that there was bidirectional causality between economic growth and gross domestic saving, gross domestic investment and FDI inflows in the short run, while there was bidirectional causality between economic growth and gross domestic savings, gross domestic investment and unidirectional causality from FDI inflows to economic growth in the long run. So economic growth and gross domestic savings and gross domestic investments depends each other in the short and long run. But FDI inflows had a positive effect on economic growth in the long run, while economic growth and FDI inflows depends each other in the short run. On the other hand there was unidirectional causality from FDI inflows to gross domestic investment in the short run and long run. So there is a complementary relationship between FDI inflows and domestic investment. In other words FDI inflows crowds in domestic investment in the short and long run.

Consequently economic growth and gross domestic savings and gross domestic investments drove each other. Therefore on the one hand gross domestic savings and gross domestic investments are very important to achieve a sustainable long run economic growth, but on the other hand economic growth feeds back both gross domestic savings and gross domestic investments. So gross domestic savings should be directed towards productive investments to achieve economic growth and in turn increase the gross domestic savings. Moreover empirical findings demonstrated that FDI inflows had a positive effect on economic growth and also crowded in the gross domestic investments. In this context governments should follow policies to attract more FDI inflows for the economic growth and gross domestic investments.

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