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FOREIGN DIRECT INVESTMENT, DOMESTIC INVESTMENT AND 2008 FINANCIAL CRISIS: THE RISE OF EMERGING NATIONS

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ABSTRACT

This research extends Dunning's investment development path theory to assess the long-run relationship among foreign direct investment (FDI) inflow, outflow and domestic investment (DI) for 32 emerging market economies (EMEs) based on 17 years data from 1996 to 2012. Breitung, IPS and Fisher-ADF tests have been used to identify the presence of unit root in the panel data. Further, Pedroni's panel cointegration test was used to find long-run relationships among DI, FDI inflow, and FDI outflow. The long-run association was further confirmed by Westerlund's panel cointegration test. Based on panel VECM a joint long-run causality from both FDI inflow and outflow towards domestic investment was identified. However, in the short-run domestic investment was caused by FDI inflow. Further applying fully modified OLS (FMOLS) and dynamic OLS (DOLS) it was observed that FDI inflow and FDI outflow have crowding-in effects on domestic investment. It can be concluded that for EMEs FDI outflow is also equally important in addition to FDI inflow to augment domestic investment. The impact of 2008 crisis was also examined in the light of FDI outflows and inflows from EMEs. Results based on FMOLS and DOLS indicate that 2008 crisis negatively affected the FDI inflow but the effect on outflows was not statistically significant. These results advocate for a protection mechanism from the financial crises for the EMEs as the FDI inflow declined during the period.

JEL Classifications: E22, F21, G01
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INTRODUCTION

Foreign Direct Investment (FDI) is the most preferred form of capital flows when there is an investment squeeze in the emerging markets due to drying up of domestic investment. FDI ensures long-term commitment from the investors as well as enhances transfer of technical know-how and managerial expertise. FDI inflow also augments domestic savings and helps in sustaining high growth rates for the emerging market economies (Kasekende, 2000). FDI is expected to aid in technology transfer leading to enhancement of efficiency, competitiveness, and productivity in addition to generating employment in the recipient nations (Korbin, 2005). Further, FDI complements domestic investment by supplying scarce capital and relaxing the financial constraints for the domestic firms (Stiglitz, 2001).

Domestic investment augmented by FDI is also supported by neoclassical growth theory (Romer, 1990), endogenous growth theory (Lucas, 1988; Borensztein et al., 1998), and modernization theory (Adams, 2009). The neoclassical growth theory argues that FDI inflow gives a thrust to new capital formation and is favorable for 'crowding-in' domestic investment. Further, endogenous growth theory suggests that FDI inflow enhances the availability of technology leading to increase in productivity and other intangibles for the local economy. Based on the economic principle Adam's (2009) modernization theory argues that FDI encourages economic growth driven by capital investments.

FDI outflow similar to inflow also affects domestic investment but negatively since the financial capital and production process are transferred to foreign countries. On the contrary, it can also be argued that where domestic investment and FDI are interrelated, it could lead to reduction in the cost of production, thus generating a positive effect. Lower cost of production induces shifting production of intermediate goods to

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foreign countries. This combination of production process escalates both domestic investment and output (Desai et al., 2005).

Dunning's investment development path theory (Dunning and Lundan, 2008) suggests that if a country engages with both FDI inflow and outflow, it would lead to economic development and integration with the global economy. The inflow and outflow happens in phases for countries in the development stage (EMEs) making it difficult to measure the isolated effect of inflow or outflow on the economy. Therefore, the relationship between FDI (both inflow and outflow) and domestic investment is examined for the EMEs in this study.

The global FDI flow peaked to around two trillion USD in 2007 which subsequently dropped to just above one trillion USD in 2010 due to the global crisis. This was essentially driven by multinational companies (MNCs) from the developed economies avoiding risky foreign investments due to limited availability of liquid funds leading to collapse of global FDI flows (Poulsen and Hufbauer 2011). However, the degree of impact and the consequences of 2008 crisis have not been thoroughly investigated by researchers barring a few (Filippov and Kalotay 2011). Though Hill and Jongwanich (2009) explored the effect of 2008 crisis on FDI outflow for few Asian economies, it fell short of a comprehensive empirical method. Therefore, the current study analyses the effect of 2008 crisis on both FDI inflow and outflow for 32 EMEs.

STUDIES ON FDI INFLOW, OUTFLOW, AND DOMESTIC INVESTMENT

Literature has indicated that the linkage between FDI inflow and domestic investment is varied, and inconclusive. Studies have evidenced existence of strong linkages (Jansen, 1995; Sun, 1998; Bosworth and Collins, 1999; Harrison et al., 2004; Tang et al., 2008; Ang, 2009 and Jain et al., 2014), followed by studies that have indicated little association to (Devereux and Freeman, 1995; Borensztein et al., 1998; Bonfiglioli, 2008; Alfaro et al., 2009) few studies reporting negative effects (Fry, 1993; Lipsey, 2000; Misun & Tomsik, 2002; Harrison and McMillan, 2003; Titarenko, 2006; Apergis et al., 2006). In contract Ahmed et al. (2015) reported neutral association between FDI inflow and domestic investment for Uganda.

It is argued that FDI inflow has a favorable effect on domestic investment, if the recipient economy has developed absorptive capacities. Apergis (2006) and Borensztein et al. (1998) attributed absorptive capacities to trade openness and human capital for the recipient countries. The technological gap between the recipient and source economy is a primary reason contributing to absorptive capacity (De Mello, 1999). Similarly, Morrissey and Udomkerdmongkol (2012) and Kim et al. (2013) argued the need for an acceptable level of governance and social capability as prerequisites for strong linkages.

Similar to the literature on FDI inflow and domestic investment research on outflow and domestic investment are also mixed. While studies (Feldstein, 1995; Andersen and Hainaut, 1998; Hejazi and Pauly, 2003; Braunerhjelm et al., 2005; Sauramo, 2008; Jain et al., 2014) have indicated negative relationship, Desai et al. (2005) reported that FDI outflow complements domestic investment. This was supported by Goedegebuure (2006) as the study argued that MNCs increase domestic investment in research and development along with FDI outflow. The linkage between combined FDI flows and domestic investment is almost nonexistent though there are literature on inflow and outflow independently. A study to analyze the combined linkage could throw some light on the interaction effects.

STUDIES ON CRISIS AND FDI FLOWS

Studies (Kirabaeva and Razin, 2013) have indicated that FDI inflow to EMEs increased during the Asian financial crisis due to the sharp fall in prices of domestic assets in crisis-affected economies. This created a spurt in M&A activity in crisis-affected economies due to lower prices of assets. This was popularly called as Fire-sale FDI theory and was supported by Krugman (2000), Aguiar and Gopinath (2005) and Baker et al. (2009) during the Asian crisis.

However, this Fire-sale theory could not explain the collapse of FDI flow during the recent 2008 crisis (Poulsen and Hufbauer, 2011). Further, the study indicated that 2008 crisis had a stronger negative effect on FDI flow than any prior crisis since 1970. On the flipside, Filippov and Kalotay (2011) argued that 2008 crisis had a differential impact across sectors. The automotive sector was severely affected, and the services sector suffered the least. On the similar lines, Dornean et al. (2012) proved FDI inflow was negatively affected for Central and

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East European countries during 2008 crisis. The effect on both FDI inflow and outflow has been mixed during the 2008 crisis prompting further examination of the effects in the context of EMEs.

HYPOTHESIS FOR LINKAGES BETWEEN DOMESTIC INVESTMENT AND FDI FLOWS

Literature on the long-run causal relationship between FDI flows (both outflow and inflow) and domestic capital formation is scarce with studies indicating limited effect to bidirectional causality (Jain et al., 2014). This is possibly because FDI inflow to EMEs has been around for some time whereas FDI outflow from EMEs is relatively new. FDI outflow from EMEs has grown from 368.1 billion USD in the 1990s (1990-99) to 1508.7 billion USD in 2000s (2000-09). Therefore, given the growth in outflow, it would be worthwhile to study the combined effect of FDI flows on domestic investment.

Dunning's Investment Development Path theory

Dunning proposed a theory based on stages of an economy and its relationship to FDI flows (Dunning & Lundan, 2008). According to the theory in the first stage, the nation only trades with the world with minimal or no impact on FDI inflow. In the second phase largely driven by domestic investment, the economy receives higher FDI inflow and supplies a little FDI to foreign nations. The third phase is largely driven by innovations increasing the FDI outflow significantly. But, the magnitude of outflow is still comparatively lower than that of inflow. The penultimate phase signifies that the inflow and outflow are comparable in magnitude and in the last phase the outflow is larger than inflow. Service intensity and knowledge stock play a key role in the last two phases. The EMEs chosen in this study predominantly are in the second or third phase of Dunning's theory.

Studies (Feldstein, 1995; Desai et al., 2005; Al-Sadig, 2013) have also attempted to explore the short-run relationship between combined flows and domestic investment. Feldstein (1995) suspected the possibility that endogeneity may decrease the power of regression analysis because the explanatory variables like FDI outflow and inflow may be correlated.

Though there have been studies that have explored the short-run relationships of combined FDI flows and domestic investment the long-run relationship is largely unexplored. It is possible that variables may have long-term equilibrium relationships as predicted by Dunning's IDP theory. The extent of the relationship between domestic investment and FDI could also vary according to the geographic region and also the nations considered for the study (De Mello, 1999; Agosin and Machado, 2005). The results can also vary with variables, methods, and samples (Moosa, 2002). This is further complicated by higher growth rates and different structures in macroeconomic fundamentals for EMEs.

Investment is considered as a crucial component of domestic aggregate demand. Any volatility (may be due to FDI) in investments may distort the economic activities and output of an economy necessitating the need to study the long-run relationships. Therefore to study the long-run relationship in the context of EMEs the following hypotheses were formed.

$H0_a$: There is no long-run relationship among domestic investment, FDI inflow and FDI outflow.

$H0_b$: FDI inflow and outflow jointly do not cause domestic investment in the long-run.

HYPOTHESIS FOR EFFECT OF 2008 CRISIS ON FDI INFLOW AND FDI OUTFLOW INDEPENDENTLY

FDI inflow to EMEs increased marginally above 50% of the total global FDI inflow in 2012 (Marino, 2013). The productivity, trade and output increase as a result of FDI flows in the recipient countries enhancing the linkage between the developed and EMEs making it more vulnerable to global shocks. This linkage or outflow may cut the cost of production by way of integrating local and foreign production process (Desai et al., 2005). The enhanced domestic economic activity may push the growth of the EMEs further, but the interactions may dampen the growth in case of volatility in the host economy. Given the fact that most of the EMEs went through

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the liberalization process in the last two decades increasing their interactions with developed economies, could have damped their growth due to the 2008 crisis. The second objective of this study is to analyze the effect of 2008 crisis on FDI inflow and outflow independently for the EMEs based on which the following hypotheses were formulated.

$H0_c$: The 2008 global financial crisis did not affect the FDI inflow to the EMEs.

$H0_d$: The 2008 global financial crisis had no effect on the FDI outflow from the EMEs.

DATA, VARIABLES AND EMPIRICAL MODEL

EMEs and Variables

This study is based on the classification of EMEs by the International Monetary Fund (IMF)[2] and is restricted to 32 EMEs viz. Argentina, Brazil, Bulgaria, Chile, China, Colombia, Croatia, Czech Republic, Egypt, Estonia, Hong Kong, Hungary, India, Indonesia, Israel, Jordan, Korea, Malaysia, Mexico, Pakistan, Panama, Peru, Philippines, Poland, Romania, Russia, Singapore, Slovak Republic, South Africa, Sri Lanka, Thailand and Ukraine. Though 69 EMEs are listed by IMF, constraints on obtaining data to arrive at a balanced panel data set for analysis the study was restricted to 32 EMEs.

Proxies for the variables were identified from literature. Gross fixed capital formation (GFCF) as a percentage of GDP was used as a proxy for domestic investment. Inward FDI as a percentage of GDP and outward FDI as a percentage of GDP were used as the proxy for FDI inflow (IFDI) and FDI outflow (OFDI). Data on IFDI and OFDI were obtained from United Nations Conference on Trade and Development (UNCTAD) online database.

The annual per capita GDP growth rate (PGR) and trade openness (TO: imports and exports as a percentage of GDP) were used as control variables for both the FDI inflow and FDI outflow. From literature it can be stated that (Asied, 2002) infrastructure development is one of the major determinants for FDI inflow to the recipient country. In this study, Power Consumption (EP) in the recipient country is used as a proxy for measuring infrastructure development. Power consumption is defined as the per capita consumption of electric power measured in kilo watt per hour.

Total reserves (RES) is used as an additional explanatory variable in the regression where FDI outflow is used as a dependent variable. The variable RES is measured as the ratio of total reserves (including gold) and GDP for the economy. Total reserves and corresponding GDP figures were obtained from WDI (the World Bank) and World Economic Outlook online database of IMF respectively. GFCF, PGR, TO, and EP were obtained from World Development Indicator (WDI) online database of the World Bank. The period considered for this analysis was from 1996 to 2012 as the FDI flows increased substantially after liberalization in many countries during 1990 to 1995.

Empirical Model

$$LGFCF_{it} = f(LIFDI_{it}, LOFDI_{it}, u_{it}) \quad (1)$$

$$LIFDI_{it} = f(LPGR_{it}, LTO_{it}, LEP_{it}, GC_{it}, u_{it}) \quad (2)$$

$$LOFDI_{it} = f(LPGR_{it}, LTO_{it}, LRES_{it}, GC_{it}, u_{it}) \quad (3)$$

where i and t are indexes as cross-sections (1,2….N) and time (1,2….T) and u_{it} is the i.i.d. error term. GC_{it} is the crisis dummy which takes value one for the years 2008 to 2012, otherwise zero.

[2] World Economic Outlook (WEO), IMF, October 2012, Chapter 4, p. 151. These economies are called emerging economies as per their higher growth potential to achieve the developed economic status. The growth pattern of these economies over last fifty/sixty years was similar to emerging economies rather than that of the advanced ones.

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METHODOLOGY

Data Transformation

The variables were log-linearized to normalize the probable presence of non-linearity in the data. The study followed Yeyati, et al. (2007) for the logarithmic transformation. This transformation method helps in normalizing the fractions and negative values in the data. The transformation technique is as follows.

$$New\ Y_{it} = sign\ (Y_{it}) * log(1 + |Y_{it}|) \quad (4)$$

where Y is an annual macroeconomic variable used in this study.

Panel Unit Root Test

In this study, two forms of panel unit root tests are used. The first form (Breitung 2000) assumes common unit root for the panel and the second form (Im, Pesaran and Shin 2003 (IPS), and Fisher-ADF) assumes individual unit roots for the panel.

The first-order autoregressive (AR (1)) equation for the panel data is as follows.

$$y_{it} = \pi_i\, y_{it-1} + X'_{it}\, \mu_i + u_{it} \quad (5)$$

where "i" and "t" represents the number of cross sections (1, 2 … N) and time periods (1, 2 … T) in the panel. X_{it} includes either cross-section specific means or individual trend or both. "u_{it}" is the i.i.d. error term. The series contains unit root, when the absolute value of π_i is one. Breitung unit root test allows π_i to be same for all the cross sections i.e. $\pi_i = \pi$. However, IPS and Fisher-ADF tests assume π_i to vary across cross sections.

Breitung panel unit root test (Breitung, 2000) was used as the first step in the analysis. Breitung test was preferred over LLC test (Levin etc., 2002) as Breitung (2000) reported that the panel unit root test is more powerful compared to LLC test based on Monte Carlo simulations. Further, Breitung panel unit root test provides robust results for smaller panel datasets[3].

Breitung unit root test assumes a common unit root for the panel, which is a strong assumption in macroeconomic panel data. The EMEs considered in this study have different macroeconomic fundamentals necessitating the application of IPS panel unit root test to account for country heterogeneity. This study further used Fisher's panel unit root test for the purpose of robustness. Fisher unit root test assumes different unit roots for individual cross-sections similar to that of IPS test. This unit root test follows Fisher (1932) and combines the *p*-values obtained from unit root tests across individual cross-sections.

Panel Cointegration Regression

Pedroni's panel cointegration test was used to assess the long-run relationship among the variables. Westerlund cointegration test was used as a robustness check for the cointegration test.

Pedroni Cointegration Test

Pedroni's cointegration process extends the residual based cointegration method of Engle and Granger (1987) to the panel framework. Pedroni's method accounts for the country heterogeneity and allows for the country specific intercept (fixed effects), differential slopes and trend across the cross-sections (countries). The following cointegration regression was formulated in a bivariate framework.

$$y_{it} = a_i + \beta_i x_{i\,t} + \rho_t + \omega_i t + u_{i\,t} \quad (6)$$

where i represents for N cross-sections of the EMEs, t is indexed for the time period of T years. The bivariate cointegration equation can be extended to a multivariate framework. The parameters a_i and β represent the intercept and slope coefficient, which are permitted to vary across the individual cross-section. The individual specific trend is denoted as $\omega_i t$ and ρ_t is the year specific dummy variable. The time specific ρ_t accounts for the co-movement of the macroeconomic variables over the sample period. The error term is denoted by u_{it} and is stationary in a cointegrating relationship.

[3] www.stata.com/manuals13/xtxtunitroot.pdf, xtunitroot — Panel-data unit-root tests, p. 13

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The null hypothesis of the Pedroni cointegration test is that there is no cointegration or long-run relationship among the variables in heterogeneous panels. The error term u_{it} is assumed to be non-stationary under the null. Pedroni's method computes seven test statistics, four "within dimensions" statistics and three "between statistics" based on the estimated value of error term (u_{it}) from the cointegration equation. These within and between statistics are calculated on the basis of Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) technique. The "within dimensions" statistics are also known as panel statistics, and they are panel *v*, panel rho, panel PP and panel ADF statistics. The "between statistics" also represented as group statistics are group rho, group PP, group ADF statistics. The computation of panel *v*, panel rho statistics are based on Phillips and Perron (1988) method and panel PP, panel ADF statistics are computed on the basis of Augmented Dickey-Fuller test for a single equation.

Pedroni (2004) reported that all the test statistics give powerful results for longer time periods and any change in size has a minimal impact on the test statistic. However, short panels with limited time span give more varied results. Pedroni (2004) also suggested that group-ADF and panel-ADF statistics perform better in the case of different results provided by the test statistics.

***Westerlund Panel Cointegration Tests*[4]**

Residual-based panel cointegration methods may under-reject the null hypothesis of no cointegration even if the theory suggests otherwise. This rejection of null may be due to the requirement of equality of long-run parameters for level variable and short-run parameters for differenced variable by these cointegration tests. This requirement is referred as "common-factor restriction" (Banerjee et al., 1998). This restriction causes the panel cointegration technique (residual based tests) to lose a significant amount of power. Westerlund (2007) built four panel cointegration tests to overcome the limitation of "common-factor restriction". The Westerlund panel cointegration method, under the null hypothesis (no cointegration) equates the error correction term to zero for a conditional error correction process.

The Westerlund tests are of two type i.e. group-mean tests and panel tests. The panel tests (*Pt* and *Pa*) are computed by considering information from all the cross sections whereas the group-mean tests (*Gt* and *Ga* statistics) are computed by considering individual cross-sections. These four tests have normal distributions and account for individual specific trend, slope coefficients, and short-run dynamics, and more importantly, the cross section dependence in the panel data. The panel test statistics are considered to confirm the cointegration of the whole panel.

Panel Long-run and Short-run Causality Test

The panel causality method proposed by Canning and Pedroni (2008) is used in this study. Canning and Pedroni (2008) developed the "Granger representation theorem" of Engle and Granger (1987) for the panel framework. The "Granger representation theorem" suggests that a dynamic "error correction model" (ECM) can be constructed from the non-stationary cointegrated series. The error term from the cointegrated regression (estimated using Pedroni's panel cointegration technique) is used as an explanatory variable in the construction of ECM. The error term is also known as error correction term (ECT) or disequilibrium term. ECT should be negative and significant to indicate long-run causality. The negative ECT indicates that the ECM comes back to the equilibrium position, and the magnitude of ECT indicates the speed of this correction. The short-run causality can be found with the help of standard Granger (1969) technique. Joint F-test was used on the coefficient terms of the lagged independent variables in the vector error correction model (VECM) framework to confirm the short-run causality. The null hypothesis, the coefficients are zero, should be rejected to establish short-run causality from explanatory variable to dependent variable.

Panel Long-run Coefficient Estimation

The long-run coefficients were estimated by panel fully modified ordinary least square (FMOLS) and dynamic ordinary least square method (DOLS).

Panel FMOLS

[4] Persyn, D & Westerlund J 2008, 'Error Correction Based cointegration Tests for Panel Data', *Stata Journal,vol.* 8, no. 2, pp. 232-241.

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Panel FMOLS technique is used to estimate the long-run coefficients of the heterogeneous cointegrated panel. The FMOLS method was extended to panel framework by Pedroni (2000, 2001). This method minimizes the effect of auto-correlation and also accounts for the endogeneity in the explanatory variables attributed to the presence of cointegrating association among the variables. This method also accommodates the unit-specific fixed effects and short-run dynamics. FMOLS is robust to simultaneous bias, and the estimated cointegrating vector is efficient and consistent. The cointegrating regression used in this technique is stated as follows:

$$Y_{i\,t} = a_i + \beta\, X_{i\,t} + u_{i\,t} \quad (7)$$

$$X_{i\,t} = X_{i\,t-1} + v_{i\,t} \quad (8)$$

where *i* is indexed for *N* cross sections and *t* is indexed for *T* time periods.

Panel DOLS

The DOLS method for the time series is proposed by Saikkonen (1992) and Stock and Watson (1993). Kao and Chiang (2000) extended the idea of DOLS to panel settings. Serial correlation and endogeneity are eliminated by adding individual cross-section specific leads and lags of differenced explanatory variables to the cointegrating regression in the panel format. DOLS also accounts for the short-run dynamics specific to the cross sections.

RESULTS AND DISCUSSION

Panel Unit Root Test and Cointegration Test

Macroeconomic variables should be non-stationary at level and stationary after first difference (integrated of order one) to have a cointegrating relationship. Therefore, the panel unit root test was performed prior to the panel cointegration analysis. The estimated unit root statistics at level and first difference are reported in table 1. The null hypotheses was not rejected at level implying that the variables contain unit root, or they are non-stationary at level of order one. Further, the test statistics were significant when the variables were first differenced. All the three unit root tests provided similar results. This further implied that the variables may have long-run relationships or are cointegrated. Therefore, the cointegration among variables is analyzed in the subsequent sections. Pedroni's Panel cointegration regression technique was applied to assess the cointegrating relationship among variables.

TABLE 1. PANEL UNIT ROOT TEST

Variable	Breitung t - Statistic	IPS W - Statistic	Fisher ADF Statistic		Null Hypothesis
			Chi Square	Choi Z Statistics	
LGFCF	0.281	-1.508	82.847	-0.15	Accept
LIFDI	-0.799	-0.921	62.149	-0.091	Accept
LOFDI	0.208	-0.816	70.17	-0.977	Accept
LPGR	0.905	-1.119	63.083	-0.18	Accept
LTO	-0.373	-0.473	58.819	0.199	Accept
LEP	-0.653	-0.076	72.707	0.022	Accept
LRES	0.911	-0.977	39.239	3.21	Accept
Δ LGFCF	-6.556***	-4.876***	116.493***	-3.587***	Reject
Δ LIFDI	-7.546***	-3.315***	91.741**	-2.535***	Reject
Δ LOFDI	-3.259***	-7.529***	171.270***	-7.675***	Reject
Δ LPGR	-2.396***	-4.776***	112.965***	-4.453***	Reject
Δ LTO	-2.079***	-2.18**	198.884***	-8.797***	Reject
Δ LEP	-5.181***	-6.036***	147.243***	-6.118***	Reject
Δ LRES	-4.057***	-6.495***	82.976*	-2.011**	Reject

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Notes: The test statistics have standard normal (N (0, 1)) distributions. The null hypothesis is that the panel data is non-stationary[5]*. Δ indicates that the series is first differenced. The symbols ***, ** and * represents the variable is significant at 1%, 5% and 10% respectively.*

From the results presented in table 2 it can be inferred that the variables are cointegrated. Pedroni's cointegration regression indicated a cointegrated association among variables after accounting for both unit-specific intercept and unit-specific time trend. The panel-ADF and group-ADF statistics are highly significant implying that the domestic investment, FDI inflow and FDI outflow are cointegrated indicating the existence of a long-run relationship[6] among domestic investment and both the FDI flows.

TABLE 2. PEDRONI PANEL COINTEGRATION TEST

Panel PP		Panel ADF		Group PP	Group ADF	Null Hypothesis
Statistic	Weighted Statistic	Statistic	Weighted Statistic			
-0.882	-1.396*	-2.383***	-3.552***	-1.086	-3.089***	Reject

*Notes: The variables domestic investment, FDI inflow and FDI outflow were used in the cointegration analysis. The null hypothesis - "there is no cointegration among the variables". Both individual intercept and trend were assumed in the cointegration regression. The symbols ***, ** and * represents the variable is significant at 1%, 5% and 10% respectively.*

The robustness of cointegration relationship is assessed using Westerlund Cointegration test. It is based on the error correction process and allows for the cross section dependence in the panel data. Further, bootstrapping method is used to compute the *p*-values. These *p*-values are robust to probable common factors in the variables. The bootstrap method allowed 400 replications to arrive at the *p*-values. The results of the analysis are reported in the table 3. The panel statistics *Pt* and *Pa* were found to be significant in the cointegration test indicating that the panel as whole has a cointegration relationship.

TABLE 3. WESTERLUND PANEL COINTEGRATION TEST

	Gt	Ga	Pt	Pa	Null Hypothesis
Value	-4.077	-1.728	-8.572	-1.671	
Z - value	-10.419*	9.186	4.843*	7.378**	Reject

*Notes: The variables domestic investment, FDI inflow and FDI outflow were used in the cointegration analysis. The null hypothesis - "there is no cointegration among the variables". Both individual intercept and trend were assumed in the cointegration regression. Robust p-values were calculated by bootstrapping for all the four statistics. The symbols ***, ** and * represents the variable is significant at 1%, 5% and 10% respectively.*

The results indicated rejection of null hypothesis ($H0_a$) that the variables were not cointegrated. This indicated the presence of cointegration or long-run equilibrium relationship between FDI inflow, FDI outflow and domestic investment.

Panel VECM Results

Vector error correction equation was estimated to assess the long-run causality from both FDI flows to domestic investment. The panel VECM specification is presented in the equation 9 and the estimated ECT is presented in table 4. The ECT is negative and significant at 5% significance level. This further indicated that both FDI inflow and FDI outflow have a long-run causal relationship towards domestic investment.

[5] Breitung unit root test assumes single unit root for the panel where as IPS and Fisher test assume individual unit root in the panel.

[6] The long-run relationship further confirmed by both the Kao test and Pedroni's test (with only intercept). The results are not reported here.

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$$D(LGFCF) = C(1)*(LGFCF(-1) + 1.008*LIFDIU(-1) - 0.648*LOFDI(-1) - 4.266) + C(2)*D(LGFCF(-1)) + C(3)*D(LGFCF(-2)) + C(4)*D(LIFDIU(-1)) + C(5)*D(LIFDIU(-2)) + C(6)*D(LOFDI(-1)) + C(7)*D(LOFDI(-2)) + C(8) \quad (9)$$

where *D(LGFCF)* is the differenced value of LGFCF, (-1) and (-2) indicates the first and second lagged value.

TABLE 4. PANEL VECM RESULTS

	Value
ECT	-0.012**

*Notes: ECT is Error Correction term. The symbols ** represents the variable is significant at 5%.*

The Wald test (coefficient restriction test) was used to assess the short-run causality between FDI flows to domestic investment independently. The restrictions have been applied to the coefficients of first (C (4)) and second lag (C (5)) of FDI inflow (equation 9). If the coefficients of first and second lags of FDI inflow are zero in the VECM system equation, then there is no short-run causality from FDI inflow to domestic investment. If the null hypothesis C (4) = C (5) =0 is rejected, then FDI inflow causes domestic investment in the short-run as the coefficients of the lagged FDI inflow are statistically different from zero.

TABLE 5. WALD TEST RESULTS

Test-Statistic	Value
F-Statistic	5.767***
Chi-Square	11.533***

*Notes: Restrictions were applied to coefficients of lagged FDI inflow. The null hypothesis was C (4) = C (5) =0. The symbols *** represents the variable is significant at 1%.*

Table 5 indicated that the null hypothesis, C (4) = C (5) =0, is rejected indicating that FDI inflow has short-run causality towards domestic investment.

TABLE 6. WALD TEST RESULTS

Test-Statistic	Value
F-Statistic	0.551
Chi-Square	1.103

*Notes: Restrictions were applied to coefficients of lagged FDI outflow. The null hypothesis was C (6) = C (7) =0. The symbols ***, ** and * represents the variable is significant at 1%, 5% and 10% respectively.*

From table 6 it can be inferred that the null hypothesis is not rejected, viz. C (6) = C (7) = 0. C (6) and C (7) are the first and second lag of FDI outflow in the VECM system of equation (equation 9). This further implies that FDI outflow has no short-run causal effect towards domestic investment.

FDI outflow requires a time lag to show its beneficial effects on domestic investments for the EMEs. One of the reasons that could be attributed is that MNCs from EMEs need a time gap for adoption and implementation of superior technologies in the foreign countries. The MNCs also take some time to get acquainted with the foreign product markets. Therefore, MNCs may not be able to combine the production

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process immediately after they invest abroad. However, with passage of time, they may combine domestic and foreign production process for cost reduction. The production cost of intermediate goods may decrease due to higher efficiency and productivity in foreign countries. Therefore, this cost reduction of the production process might increase domestic investment in the long-run.

These results from panel VECM system indicated that both FDI outflow and inflow jointly have a long-run causal relationship with domestic investment. Therefore, the null hypothesis ($H0_b$) was rejected. In the short-run, FDI inflow causes domestic investment, and FDI outflow does not cause domestic investment.

Estimation of Long-run Coefficients

Domestic investment, FDI inflow and FDI outflow for the EMEs are found to be cointegrated based on panel cointegration. Therefore, the long-run coefficients are estimated by using panel FMOLS and panel DOLS methods. The estimated coefficients are reported in table 7. The dependent variable in these regression equations is the domestic investment (LGFCF). The coefficient of FDI inflow was positive and significant at one percent significance level. Similarly, the coefficient of FDI outflow was positive and significant at five percent significance level. Both the FMOLS and DOLS methods showed similar results. These results indicate that both FDI inflow and outflow have a positive and significant relationship with domestic investment.

TABLE 7. FMOLS AND DOLS ESTIMATES FOR COINTEGRATED PANEL

Dependent variable is LGFCF, $LGFCF_{it} = a_i + \beta_1 LIFDI_{it} + \beta_2 LOFDI_{it} + \mu_i t + u_{it}$

Variable	FMOLS	DOLS
LIFDI	0.102***	0.113***
LOFDI	0.036**	0.053**
Adjusted R-squared	0.79	0.806

*Notes: Linear trend was assumed for both FMOLS and DOLS. The symbols ***, ** and * represents the variable is significant at 1%, 5% and 10% respectively.*

Results for Effect of 2008 Crisis on FDI Inflow and FDI Outflow

Effect of Crisis on FDI Inflow to EMEs

Panel Cointegration Results

The variables FDI inflow (IFDI), per capita growth rate (PGR), trade openness (TO) and power consumption (EP) were found to be integrated of order one. These variables may have a long-run association among themselves. Therefore, Pedroni's panel cointegration test was applied to find a probable long-run association and the results are presented in table 8. The panel-PP and panel-ADF statistics suggested the rejection of the null hypothesis of no cointegration among the variables. This confirmed the presence of long-run association among the variables. Further, the long-run coefficients were estimated by using FMOLS and DOLS.

TABLE 8. PEDRONI PANEL COINTEGRATION TEST

Panel PP		Panel ADF		Group PP	Group ADF	Null Hypothesis
Statistic	Weighted Statistic	Statistic	Weighted Statistic			
-5.644***	-14.287***	-4.82***	-11.043***	-13.047***	-8.261***	Reject

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*Notes: Logarithms of FDI inflow (IFDI), per capita growth rate (PGR), trade openness (TO) and power consumption (EP) were used in the cointegration method. The null hypothesis - "there is no cointegration among the variables". Both individual intercept and trend were assumed in the cointegration regression. The symbols ***, ** and * represents the variable is significant at 1%, 5% and 10% respectively.*

Estimation of Long-run Coefficients

Pedroni's panel cointegration test implied that the variables FDI inflow (IFDI), per capita growth rate (PGR), trade openness (TO) and power consumption (EP) were cointegrated. The next step was to estimate the long-run coefficients after including the crisis dummy in the model. The FMOLS and DOLS techniques were applied to the cointegrated variables, and the results are reported in the table 9. Only per capita growth was found to have a positive long-run effect on FDI inflow to EMEs among the explanatory variables. The global crisis dummy was found to be negative and significant in both FMOLS and DOLS. The results of FMOLS and DOLS tests reject the null hypothesis ($H0_c$) indicating a significant negative effect on FDI inflow to all 32 EMEs.

TABLE 9. FMOLS AND DOLS ESTIMATES FOR THE COINTEGRATED PANEL

Dependent variable is LIFDI, $LIFDI_{it} = \alpha_i + \beta_1 LPGR_{it} + \beta_2 LTO_{it} + \beta_2 LEP_{it} + GC_{it} + \mu_i t + u_{it}$		
Variable	FMOLS	DOLS
LPGR	0.083***	0.107***
LTO	0.117	0.329
LEP	0.859	0.745
GC_{it}	-0.183**	-0.251**
Adjusted R-squared	0.674	0.691

*Notes: Linear trend was assumed for both FMOLS and DOLS. The symbols ***, ** and * represents the variable is significant at 1%, 5% and 10% respectively.*

Effect of Crisis on FDI outflow from EMEs

Panel Cointegration Results

The panel unit root tests suggested that the variables FDI outflow (OFDI), per capita growth rate (PGR), trade openness (TO) and total reserves (RES) were found to be integrated of order one. Therefore in the subsequent phase, the panel cointegration technique developed by Pedroni was used to assess the probable cointegration association. The results are represented in table 10. The panel PP and ADF statistics implied rejection of the null hypothesis of nonexistence of cointegration among the variables. This confirmed that the variables had a long-run association.

TABLE 10: PEDRONI PANEL COINTEGRATION TEST

Panel PP		Panel ADF		Group PP	Group ADF	Null Hypothesis
Statistic	Weighted Statistic	Statistic	Weighted Statistic			
-8.85***	-12.08***	-9.036***	-11.54***	-17.313***	-10.715***	Reject

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*Notes: Logarithms of FDI outflow (OFDI), per capita growth rate (PGR), trade openness (TO) and reserves (RES) were used in the cointegration method. The null hypothesis - "there is no cointegration among the variables". Both individual intercept and trend were assumed in the cointegration regression. The symbols ***, ** and * represents the variable is significant at 1%, 5% and 10% respectively.*

Estimation of Long-run Coefficients

Further, FMOLS and DOLS were applied to the cointegrating variables. Table 11 presents the results obtained from FMOLS and DOLS regression techniques. Total reserves were found to be a significant determinant of FDI outflow from EMEs. Per capita growth was found to be significant at 10% level in FMOLS method. However, both the methods suggested that the coefficients of global crisis dummy were not statistically significant in the regression equations. This indicated that the 2008 global financial crisis did not significantly affect the FDI outflow from EMEs.

TABLE 11: FMOLS AND DOLS ESTIMATES FOR COINTEGRATED PANEL

Dependent variable is LOFDI, $LOFDI_{it} = \alpha_i + \beta_1 LPGR_{it} + \beta_2 LTO_{it} + \beta_2 LRES_{it} + GC_{it} + \mu_i t + u_{it}$		
Variable	FMOLS	DOLS
LPGR	0.032*	-0.017
LTO	-0.069	-0.049
LRES	0.127*	0.292***
GC_{it}	-0.046	0.073
Adjusted R-squared	0.732	0.269

*Notes: Linear trend was assumed for FMOLS and no trends for DOLS. The symbols ***, ** and * represents the variable is significant at 1%, 5% and 10% respectively.*

The results indicated that there was not enough evidence to reject the null hypothesis ($H0_d$), "the 2008 global financial crisis had no effect on the FDI outflow". This further indicates that 2008 crisis did not have a significant effect on FDI outflow from EMEs.

CONCLUSION

The empirical analysis indicated that domestic investment and both FDI inflow and FDI outflow has a robust cointegrated relationship for all the 32 EMEs. FDI inflow has a positive and significant effect on domestic investment in the long-run. This crowding in or complementary relationship is supported by neoclassical growth theory and is in line with the results of Apergis et al. (2006) and Borensztein et al. (1998), for developing economies. Similarly, FDI outflow also has a positive and significant effect on domestic investment. This result goes against the commonly accepted view that FDI outflow displaces the domestic investment (Feldstein, 1995; Jain et al., 2014). However, Desai et al. (2005), Goedegebuure (2006), Herzer & Schrooten (2008) advocated the positive relationship between FDI outflow and domestic investment. Domestic investment increases as FDI outflow combines the production process to decrease the cost of manufacturing (Desai et al., 2005)).

This study also found that FDI inflow was negatively affected by the 2008 crisis whereas the crisis did not significantly affect the FDI outflow from EMEs. The results are in line with Dornean et al. (2012) as they found that FDI flows to the CEE countries were negatively affected by the 2008 crisis. However, the results contradicted the findings of Kahouli and Maktouf (2015) and the possible reason could that in this study , FDI inflow is used as a dependent variable as FDI flow shows more volatility than FDI stocks whereas Kahouli and

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Maktouf (2015) used inward FDI stock. The FDI inflow to EMEs was adversely affected as the MNCs from the developed nations were unable to invest as their domestic financial markets provided fewer funds at higher cost (UNCTAD, 2009). On similar lines, Marino (2013) reported that FDI flows started to decline substantially after the first half of 2008. Green field FDI, a major constituent of FDI inflow to EMEs, declined by 15% in 2009 compared to previous year. FDI outflow from EMEs was not significantly affected by the 2008 crisis as the asset prices of firms in developed nations plummeted due to decreasing profitability and uncertainty in the domestic markets (UNCTAD, 2009). This was an opportunity for firms in EMEs to acquire business entities in the developed nations ensuring access to newer technologies and markets.

As domestic investment, FDI inflow and outflow have a long-run equilibrium relationship, more FDI flows to EMEs will augment domestic capital formation. This enhanced capital formation may lead to higher growth for EMEs as predicted by neoclassical growth theories. Therefore policy makers from the EMEs instead of focusing on standalone increase in FDI inflow should focus on both FDI inflow and outflow. Policies should be directed to attract and retain FDI inflow even during crisis rather than managing or taking corrective measures on the macroeconomic policies during the crisis period. EMEs should also incentivize the domestic firms investing abroad for technologies and synergies as FDI outflow also enhance growth related activities.

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