Relationship between Remittance, Export, Foreign Direct Investment and Growth in South Asia: A Panel Cointegration and Causality Analysis

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The relationship among remittances, Foreign Direct Investments (FDI), exports and economic growth is known to have important role in economic literature for countries suffering from technological distress and unemployment problems. This paper explores the long and short run relationship between remittances, exports, foreign direct investment and economic growth using data of South Asian countries. The study covers the period from 1988 to 2011. Stationarity of the variables have been examined through both first and second generation panel unit root tests to cater for cross-section dependence. After confirmation of panel cointegration, long term coefficients have been estimated by Fully Modified OLS (FMOLS) and Dynamic Ordinary Least Square (DOLS) models. Pooled Mean Group (PMG) methodology is applied to examine the cause and effect relation among the associated variables. Results suggest presence of cointegration among the tested variables. FMOLS and DOLS estimation analysis reveal positive impact of capital, remittances, exports, and FDI on economic growth whereas a negative impact of labor on growth is observed. The causality analysis confirms the presence of long term equilibrium relation among economic growth, labor, capital, remittances, exports, and FDI. In short run, exports Granger cause growth and FDI Granger cause exports. Feedback causality is also confirmed between remittances and capital in the South Asian countries.

1. Introduction

Every economy strives to achieve the higher level of economic growth. There are many macroeconomic factors that contribute towards the economic growth of a country and they have also received much attention in the literature. Workers' remittances, exports expansion, and FDI are few among others. Workers' remittances and net FDI inflows emerged as important components for the purpose of external financing for developing countries (World Bank, 2009). FDI as a net inflow of investment presents a way to acquire management interest in an enterprise of any economy. This management interest is usually of lasting nature (voting stocks of 10 percent or more). FDI stimulates economic growth primarily through work force and knowledge/technological transfer effect as growing number of literature proves the positive impact of FDI on the economic growth of the host countries. For instance, see Rao and Hassan (2011), Cooray (2012), Azam et al., (2013), Imai et al., (2014), Hassan et al., (2014), Shakar and Aslam (2015).

The second largest source of foreign funding is remittance. Remittances of foreign employed workers or migrants are the current transfers as these migrants have intentions to remain

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employed for more than one year and are considered residents of the that economy (WDI, 2014). The remittances-growth literature is divided into two schools of thought. One school of thought supports the positive impact of remittances on the economic growth i.e. Catrinescu et al., (2009), Marwan et al., (2013), Azam et al., (2013), Kumar and Stauvermann (2014), etc. However the other school of thought argues that remittances either have a negative influence on the economic growth of a host country or there is no relationship. Rao and Hassan (2011) selected a sample of 40 countries having remittances to GDP ratio of one percent or more and found that remittances did not have any significant direct impact on growth of these countries. Moreover, Rao and Takirua (2010) found the negative impact of remittances on growth for Kiribati. The negative effects are attributed to the Dutch Disease effect and decrease in the quality of governance being carried out in the host country.

This study focuses on exploring the impact of workers' remittances and FDI along with exports and the two basic conditioning variables, capital (K) and labor (L), on the economic growth of South Asian countries. Export is one of the major determinants of the economic growth. Literature provides mixed/ambiguous result on its impact on economic growth. Some studies support that exports lead to higher economic growth; for example, Rao and Takirua (2010), Marwan et al. (2013), Ullah et al. (2009), Aditya and Acharyya (2012). Others do not support the export-led growth hypothesis (see, for example, Mah (2005) and Pazim (2009)). Bilquees and Mukhtar (2012) argue that exports instability has a potential impact on economic growth in case of Pakistan. The present study empirically analyze the relationship between economic growth, FDI, workers' remittances and exports using Solow model (1956) and its extended version for South Asian countries. It is relatively unexplored area for the South Asian countries including Bangladesh, India, Pakistan, Sri Lanka and Nepal. This paper uses the extension of Solow model used by Mankiw *et al.* (1992) in which the Cobb–Douglas production function as a basic neoclassical model is amplified with the help of the shift variables. Summaries of the previous empirical work conducted on international and country specific level is provided in Table 1.

Table 1: Summaries of main International, Country Specific and Asian Studies

Year	Country/ Sample	Period	Methodology	Cointegration/ Causality Results
		International (Panel)		
Driffield and Jones (2013)	Entire sample of developing countries available at WDI	1984-2007	Dynamic GMM	FDI and RE have +ve impact on EG.
Tekin (2012)	18 least developed countries	1970-2009	Panel data SUR (seemingly unrelated regression) systems proposed by Konya (2006)	EX impact GDP (few countries) GDP impacts EX (few countries) FDI impacts GDP FDI has no impact on real EX (few countries)
Rao and Hassan (2011)	40 Countries. (Having remittances	1960-2007	System GMM	FDI has +ve impact on EG.

	to GDP ratio of 1% and above.)			
Azman-Saini *et al.* (2010)	85 countries	1976-2004	GMM	FDI itself has no impact on output growth but through economic Freedom.
Catrinescu (2009)	162 countries. (Remittances' model) 102 countries (Institution model)	1970-2003 1991-2003	AH, GMM	RE have +ve impact on GDP in presence of sound institutional environment.
Adams (2009)	Sub-Sahara African countries	1990-2003	OLS, FEM	FDI has +ve impact on EG. (only in OLS)
Le (2009)	67 countries	1970-2000	OLS, GMM	TO positively impacts EG through institutions. RE not a stable source of capital and thus may hamper EG
Fayissa & Nsiah (2008)	37 African countries	1980-2004	FEM, REM	RE boosts EG in countries where financial systems are less developed.
Herzer *et al.* (2008)	28 Developing countries	1970-2003	Engle-Granger, ECM, Johanson approach, Gregory-hansen approach	No LR and SR between FDI and EG.
Hansen & Rand (2006)	31 developing countries	1970-2000	GC (VAR framework) MGE (Mean group estimator)	FDI has +ve impact on EG.
Borensztein *et al.* (1998)	69 developing countries	1970-1990	System equations	FDI have a positive impact on growth
		Country Specific Studies		
Kumar & Stauvermann (2014)	Lithuania	1980-2012	ARDL, TY-GC	RE have +ve LR and SR with GDP RE → GDP Capital per worker ↔ output per worker.
Marwan *et al.* (2013)	Sudan	1977-2010	Johansen Cointegration technique, TY-GC	RE, EX, TO have +ve LR with GDP RE, EX, TO − − GDPPC
Rao and Takirua (2010)	Kiribati	1970-2005	Hendry's general to	EX has +ve SR with GDPPC

			specific approach (GETS), Johansen's maximum-likelihood VECM	RE has –ve LR with GDPPC
Asian Studies				
Imai *et al*. (2014)	24 Asian countries	1980-2009	GMM	FDI and RE have +ve impact on EG.
Azam *et al*. (2013)	5 South and South East Asian countries	1985-2011	FEM, REM	FDI and RE have +ve impact on EG. Corruption has negative impact on EG.
Cooray (2012)	6 South Asian Countries	1970-2008	GMM	RE, FDI and EX have +ve impact on EG.
Siddique *et al.* (2012)	Bangladesh, India, Sri-Lanka	1977-2006	GC (VAR framework)	RE impact EG (Bangladesh) RE has no impact on EG (India) RE ↔ EG (Sri-Lanka)
Hsiao & Hsiao (2006)	Newly developed Asian countries	1986-2004	Johansen Cointegration, FEM, REM, TY-GC	FDI impacts EG indirectly through EX.

Notes: → , ↔ and — — indicate unidirectional, bidirectional and no causality, respectively.
Abbreviations are defined as follows: AH= Anderson–Hsiao estimator; ARDL=autoregressive distributed lagged; RE= Remittances; ECM=error correction model; EX=export; EG=Economic growth; FEM=Fixed effect model; FDI= Foreign Direct Investment; GDP=Real gross domestic product; GDPPC=GDP per capita; GMM=generalized method of moments; GC=granger causality; LR= long run relation; OLS= ordinary least square method; REM=random effect model; SR= short run relation. TY= Toda-Yamamoto; TO=trade openness; VAR= vector autoregressive model; VECM=vector error correction model.

There are three types of empirical limitations that are worth considering in the light of the past studies. First, there are few studies focusing on the causal relationship among export, remittances, FDI and economic growth in the South Asian countries. Second, the literature indicates the presence of cross section dependence in a panel setting due to unobserved common factors, macro-economic and regional linkages, externalities and unaccounted residual interdependence. Besides its importance, no study has discussed the implications of cross sectional dependence. Similarly, the issues of heterogeneous co-integrated panels are un-dealt. To deal with the problems associated with co-integration tests in small sample sizes and lower power of unit root tests, methods introducing new panel data techniques within panel settings are preferred over the traditional and usual time series techniques. Along with using the time dimension, addition of cross sectional dimensions play an important role in increasing the power of these tests regarding the non-stationary time series. According to Baltagi and Kao (2000), the purpose of the application of non-stationary panel data aims to combine the both worlds, one being the dealing with non-stationary time series and the other being the power and increased data from cross section. To sum up, there is very limited literature on the relationship between remittances, exports, FDI, and economic growth in South Asia; however, the available empirical work either provides mixed results or there is no consensus on the direction of causality between the selected variables.

2. The Model

Mankiw et al., (1992) extension of basic Solow growth model (1956) where the neoclassical Cobb-Douglas production function has been augmented with shift variables is used in this empirical study. Thus, the basic production function with constant returns and Hicks- neutral technical progress, following Rao and Takirua (2006) is:

$$y_t = A_t K_t^{\alpha} L_t^{1-\alpha} \quad [1]$$

where, A_t present technology, K denotes capital, L is labor, and t is time. The Solow growth model assumes the technological evolution as:

$$A_t = A_0 e^{g^T} \quad [2]$$

where, the initial knowledge stock is denoted by A_0. It is further assumed that:

$$A_t = f(R_t, X_t, F_t) \quad [3]$$

where, R is remittance, X is exports, and F is foreign direct investment. The Rearrangement of equation (1) and (3) results:

$$y_t = (R_t, X_t, F_t) K_t^{\alpha} L_t^{1-\alpha} \quad [4]$$

3. Data, Methodology and Discussion

3.1. Data

We have taken five South East Asian countries including Bangladesh, Pakistan, India, Nepal and Srilanka. Panel data of annual frequency is used where, Growth (G) is measured by GDP per capita (constant US$) and real Gross fixed capital formation (K) is a proxy for capital. Following Kumar (2011), labor (L) is proxied by using average employment rate as a percentage of annual population ages >15, workers' remittance (R) inflows percentage of GDP (%), Exports (X) of goods and services as a percentage of GDP, and inflows of FDI also as a percentage of GDP is used from 1988-2011. Data source is the World Development Indicators of World Bank. We have made selection of the countries and time period according to the availability of secondary data.

Table 2: Variables and Symbols

S. No.	Variables Used	Variable Symbol
1.	GDP per capita (constant US$)	*G*
2.	Gross fixed capital formation (% of GDP)	*K*
3.	Employment to population ratio, ages 15-24, total (%) (modeled ILO estimate)	*L*
4.	Workers' remittances (% of GDP)	*R*

5.	Exports of goods and services (% of GDP)	*X*
6.	Foreign direct investment (FDI), net inflows (% of GDP)	*F*

Table 3 presents descriptive statistics for the sample covering period 1988 to 2011. Exports as a percentage of GDP (18.12%) are higher than both remittances (5.68%) and foreign direct investment (0.83&). However, exports also show higher variability (8.13%) when compared with remittances (4.90%) and FDI (0.764). On the other hand, Remittances to South Asian countries are five times higher than the FDI.

Table 3: Descriptive Statistics of Variables (1988–2013)

	G	K	L	R	X	F
Mean	618.157	21.799	48.479	5.679	18.129	0.832
Std. Dev.	347.340	4.424	16.389	4.906	8.135	0.764
Maximum	1724.826	32.918	79.500	23.220	39.015	3.668
Minimum	228.575	12.514	24.100	0.730	5.747	-0.098

The relationship between economic growth, capital, labor, remittances, exports, and foreign direct investment is analyzed in a three stage process in this paper. Initially, an assessment on the order of integration is made for the variables. Then, two panel cointegration tests are applied to analyze the presence of a long-run relationship among the variables. Then, the long-run coefficients are estimated using FMOLS and DOLS models. Finally, Pooled Mean Group (PMG) approach developed by Pesaran et al. (1999) is used to establish the long-run and short-run relationship between the variables. Same is used to ascertain the direction of causality among economic growth, capital, labor, remittances, exports, and foreign direct investment in South Asian countries.

3.2. Panel Unit Root Tests

The selection of appropriate cointegration technique depends on the order of integration of all variables. Considering the relative advantage i.e. less restrictive and more powerful over previous tests developed by Breitung (2000), Levin and Lin (1993), and Levin et al. (2002), Im et al. (2003, hereinafter IPS) panel unit root test is used. These former tests do not deal with heterogeneity of the autoregressive coefficient. IPS test first applies the Augmented Dickey Fuller (ADF) test to each series thus it allows individual series to have its own short-run dynamics. Then the arithmetical mean of all individual countries' ADF statistics is used as the overall t-test statistics. This dynamic panel framework may resolve the serial correlation problems of Levin and Lin's. The panel unit root equation for IPS is as under:

$$\Delta y_{it} = \alpha_i + \rho_i y_{i,t-1} + \sum_{j=1}^{p} \emptyset_{ij} \Delta y_{i,t-j} + \varepsilon_{i,t}\,; \qquad i = 1,2, \ldots, N; t = 1,2, \ldots T, \qquad [5]$$

where, y_{it} represents the variables under analysis in our Augmented Solow Model (ASM), α_i denotes individual fixed effect, and to make residual uncorrelated overtime, ρ is added in above equation. The null hypothesis is that $\rho_i = 0$ for all i while the alternative hypothesis is that $\rho_i < 0$ for some $i = 1, \ldots, N_1$, and $\rho_i = 0$ for $i = N_1 + 1, \ldots, N$. After the ADF regression, the model also includes various augmented lags for individual country with infinite samples. The terms E(t_i) and var(t_i) are then replaced with the corresponding group averages of the tabulated values of E(t_i, P_i) and var(t_i, P_i), respectively. The IPS statistic which is an average of individual Augmented Dickey–Fuller (ADF) statistic can be written as under:

$$\bar{t} = \frac{1}{N}\sum_{i=1}^{N} t_{iT}\ (P_i), \qquad [6]$$

where, t_{iT} presents the country specific ADF t-statistic obtained from the country "i" ADF regression. The t-statistic is normally distributed under H_0 and Im et al. (2003) have provided the critical values for specified values of N and T. The results of IPS (2003) shows the panel unit root tests with and without trend in table 4. All of the included variables are non-stationary at level and therefore made stationary at first difference with 1 percent significance level.

Table 4: Results of IPS-2003 panel unit root test.

Variables	Level		1st difference	
	Constant	Constant with trend	Constant	Constant with trend
G	4.433	1.039	-2.890***	-2.182**
K	-0.853	-0.683	-6.462***	-5.032***
L	2.050	0.874	-7.347***	-6.063***
R	2.071	-0.229	-6.589***	-5.480***
X	1.419	-0.707	-7.134***	-5.706***
F	-1.657	-2.091	-8.764***	-6.337****

Note: ***' ** indicates the rejection of null hypothesis of non-stationary at the 1% and 5% level of significance, respectively.

The panel unit root tests can be divided into two groups based on their nature to cater for cross sectional dependence. First generation unit root test e.g. IPS-2003, assumes that the cross sections in the panel data are independent. On the other hand, second generation panel data unit root tests allows to cater more general forms of cross sectional dependency which are not limited to common time effects (Pesaran 2007). To test the cross sectional dependence, we have calculated the cross sectional dependence (CD) statistics through the application of simple test of Pesaran (2004). First, the individual OLS residuals are obtained through standard ADF regressions. Then average values of the pair-wise correlation coefficients are calculated. The null hypothesis of cross-sectional independence is finally tested where the two-tailed normal distribution is assumed to be asymptotically distributed. The literature indicates that there are some unobserved externalities, unaccounted residual interdependence, common factors and macroeconomic linkages that give rise to cross section dependence within a panel. The Rejection of the null hypothesis irrespective of the lags (up to five) in ADF auxiliary regression at 5 percent significance level indicates the presence of cross sectional dependence in our panel. The high cross sectional correlation exits among the selected countries of South Asia and thereby we can conclude that this may have resulted due to similar regulation present in fields like economy, trade, tourism, administration, finance, customs and legislation along with the increasing level of financial integration.

Table 5: results of cross-sectional dependence test.

Test	Statistics
Pesaran's test of cross sectional independence	2.188**

Note: ** indicates rejection of null hypothesis of cross sectional independence at the 5% level of significance.

Recently the question of correlation and dependence has been addressed by some new panel unit root statistics given the presence of macro-economic dynamics and linkages within the variables. These tests are commonly known as second generation panel unit root tests and the most common of which is the CIPS (Cross Sectionally Augmented Test IPS test). Pesaran (2007) developed a panel unit root test that assumes dependence between the cross sections. The test estimates the OLS method for the ith cross-section in the panel by considering the following Cross-Sectional ADF (CADF) regression. The resulting mathematical equation is presented below.

$$\Delta y_{it} = \alpha_i + \rho_i y_{i,t-1} + c_i \bar{y}_{i,t-1} + \sum_{j=0}^{k} d_{t-j} \Delta \bar{y}_{t-j} + \varepsilon_{i,t} + \sum_{j=1}^{k} \delta_{ij} \Delta y_{i,t-j} + \varepsilon_{i,t}, \qquad [7]$$

In the above expression, $\bar{y}_{i,t-1} = (1/N)\sum_{i=1}^{N} y_{i,t-1}$ and $t_i(N,T)$ represents t-statistic of ρ_i that is used for the computation of individual Augmented Dickey Fuller statistic. Following CIPS statistic was proposed by Pesaran based on individual CADF average statistic.

$$CIPS = \left(\frac{1}{N}\right) \sum_{i=1}^{N} t_i\,(N,T), \qquad [8]$$

Pesaran (2007) has tabulated the critical values for CIPS for various deterministic terms. The expression given below presents the panel unit root test with and without the presence of trend. For all of the included variables, null hypothesis cannot be rejected at level and therefore implying the non-stationarity of all these variables at one and five percent significance level. We can conclude that all of the included series are stationary at first difference and non-stationary at level even if the cross sectional dependence is present or not.

Table 6: Results of Pesaran-2007 CIPS panel unit root test.

Variables	Level		1st difference	
	Constant	Constant with trend	Constant	Constant with trend
G	-1.734	-1.588	-2.402**	-3.047**
K	-1.594	-1.659	-3.046***	-3.023**
L	-1.046	-1.493	-2.304**	-2.622**
R	-1.416	-2.821	-3.302***	-3.360***
X	-0.112	-2.236	-2.832***	-2.743**
F	-2.277	-2.405	-3.622***	-3.543***

Note: ***’ ** Rejection of null hypothesis of non-stationary at the 1% and 5% level of significance, respectively.

3.3. Co-integration Tests on Panel Data

We have applied Pedroni’s (1994) co-integration test after the identification of lag orders. This heterogeneous panel co-integration test like IPS test allows the cross sectional interdependence along with the individual effects of different nature. Following equation represents the Pedroni’s co-integration test:

$$G_{it} = \eta_i + \delta_i t + \beta_{1i} \mathrm{K}_{i,t-1} + \beta_{2i} \mathrm{L}_{i,t-1} + \beta_{3i} \mathrm{R}_{i,t-1} + \beta_{4i} \mathrm{X}_{i,t-1} + \beta_{5i} \mathrm{F}_{i,t-1} + \varepsilon_{it}, \qquad [9]$$

where, $t = 1, \dots\dots, T$ shows the time period and $i = 1, \dots\dots, N$ shows the number of countries. η_i and δ_i are the effects of country and time fixed effects. ε_{it} represents the residual that are estimated showing deviations from long term relation. The estimated residuals are represented in the following equation.

$$\varepsilon_{it} = \rho_i \varepsilon_{it-1} + \mu_{it}, \quad [10]$$

To test co-integration on panel data, seven different statistics were proposed by Pedroni out of which four have pooling basis commonly referred to as "within" dimension whereas the last three are based on "between" dimensions.

Panel v-statistics:

$$X_v \equiv T^2 N^{3/2} (\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{k}^{-2}{}_{11,i}\, \hat{\mu}^2{}_{it-1})^{-1}$$

Panel ρ-statistics:

$$X_p \equiv T\sqrt{N} (\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{k}^{-2}{}_{11,i}\, \hat{\mu}^2{}_{it-1})^{-1} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{k}^{-2}{}_{11,i}\, (\hat{\mu}_{it-1} \Delta\hat{\mu}_{it} - \hat{\lambda}_{it})$$

Panel t-statistics (non-parametric):

$$X_t \equiv (\hat{\sigma}^2 \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{k}^{-2}{}_{11,i}\, \hat{\mu}^2{}_{it-1})^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{k}^{-2}{}_{11,i}\, (\hat{\mu}_{it-1} \Delta\hat{\mu}_{it} - \hat{\lambda}_{it})$$

Panel t-statistics (parametric):

$$X^*{}_t \equiv (\widehat{S_{N,T}}^{*2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{k}^{-2}{}_{11,i}\, \hat{\mu}^2{}_{it-1})^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{k}^{-2}{}_{11,i}\, (\hat{\mu}_{it-1} \widehat{\Delta\mu^*}_{it})$$

Group ρ -statistics:

$$\tilde{X}_p \equiv T N^{-1/2} \sum_{i=1}^{N} (\sum_{t=1}^{T} \hat{\mu}^2{}_{it-1})^{-1} \sum_{t=1}^{T} (\hat{\mu}_{it-1} \Delta\hat{\mu}_{it} - \hat{\lambda}_{it})$$

Group t-statistics (non-parametric):

$$\tilde{X}_t \equiv N^{-1/2} \sum_{i=1}^{N} (\hat{\sigma}_i^2 \sum_{t=1}^{T} \hat{\mu}^2{}_{it-1})^{-1/2} \sum_{t=1}^{T} (\hat{\mu}_{it-1} \Delta\hat{\mu}_{it} - \hat{\lambda}_{it})$$

Group t-statistics (parametric):

$$\tilde{X}^*{}_t \equiv N^{-1/2} \sum_{i=1}^{N} (\tilde{S}^{*^2} \hat{\mu}^{2*}{}_{it-1})^{-1/2} \sum_{i=1}^{N} (\hat{\mu}^*{}_{it-1} \Delta\hat{\mu}^*{}_{it})$$

where $\hat{\lambda}_i = 1/2(\hat{\sigma}_i^2 - \hat{S}_i^2)$ and $\tilde{S}^{*^2}{}_{N,T} = 1/2(1/N \sum_{i=1}^{N} \hat{S}^{*^2})$.

Null hypothesis of no co-integration is focused by both of the tests. However, the alternative hypothesis specification makes distinction between them. For tests based on "within", alternative hypothesis is given by $\rho_i = \rho < 1$ for all values of i. As far as the last three hypothesis are concerned that are based on "between" dimension, $\rho_i < 1$, represents the alternative hypothesis for each value of i. For each of the seven statistics, finite sample distribution was tabulated by Pedroni through Monte Carlo simulations. The value calculated through the statistical tests must be smaller than the critical value so that null hypothesis for the absence of co-integration can be rejected. As all the included variables are integrated at order 1, we will check the presence of long run relations among these variables. Table given below shows us the result of Pedroni (1999) among all the included variables. In most of the cases, the null hypothesis of no co-integration can be rejected based on within dimensions and between dimensions tests. Therefore, growth, capital, labor, remittances, exports and FDI are cointegrated in our selected sample of South Asian countries for the period 1988-2013.

Table 7: Results of Pedroni-1999 panel cointegration tests.

	Statistics of panel tests				Statistics of group tests		
	V statistics	Rho statistics	pp statistics	Adf statistics	Rho statistics	pp statistics	Adf statistics
Statistics	1.259	1.507	-2.441*	-4.419*	1.738	-2.558*	-1.606***
p-value	0.103	0.934	0.007	0.000	0.959	0.005	0.054

The common factor restriction assumption and failure to take into account the possible cross-country dependence are considered the limitation of Pedroni (1999) co-integration test. The common factor hypothesis assumes that the short-run parameters of the variables in first difference and the long-run parameters of the variables in levels are equal. Thus a failure in satisfying this restriction may cause a significant power loss in a residual-based cointegration tests. Hence, the panel cointegration test proposed by Westerlund (2007), in addition to the Pedroni (1999) tests, is used to examine the long-run relationship between economic growth, capital, labor, remittances, exports, and foreign direct investment in South Asian countries. The test proposed by Westerlund (2007) tests not only avoids the common factor restriction problem but it also tests the presence of cointegration under the null hypothesis with the inference that in a conditional error-correction model, the error-correction term is equal to zero. Therefore, when the null hypothesis of no error-correction is rejected, it is inferred that long run relationship exists between the variables under consideration. Following error-correction model is assumed in this case:

$$\Delta Y_{it} = \delta_i' d_t + \alpha_i (Y_{it-1} - \beta_i' X_{it-1}) + \sum_{j=1}^{p_i} \alpha_{ij}\, \Delta Y_{it-j}) + \sum_{j=0}^{p_i} \alpha_{ij}\, \Delta X_{it-j} + \varepsilon_{it}, \qquad [11]$$

where, Y_{it} shows the remittances inflows, d_t represents the deterministic components, and X_{it} gives a set of exogenous variables. We can rewrite equation (7) in the given below form:

$$\Delta Y_{it} = \delta_i' d_t + \alpha_i Y_{it-1} - \lambda_i' X_{it-1} + \sum_{j=1}^{p_i} \alpha_{ij}\, \Delta Y_{it-j}) + \sum_{j=0}^{p_i} \alpha_{ij}\, \Delta X_{it-j} + \varepsilon_{it}, \qquad [12]$$

where, $\lambda_i' = -\alpha_i \beta_i'$ .The speed is determined by the parameter α_i at which the system $Y_{it-1} - \beta_i' X_{it-1}$ reverts back to the equilibrium after experiencing the sudden shock. The value of $\alpha_i < 0$ suggests that the model is error-correcting, which implies that Y_{it} and X_{it} have cointegrating relationship. Value of $\alpha_i = 0$, suggests the absence of error correction and thereby lack of co-integration. H₀ for all the included sample countries in the panel dataset is $H_0\colon \alpha_i = 0$, for all $i = 1, \ldots, N$ whereas $H_1\colon \alpha_i \neq 0$ for $i = 1, \ldots, N_1$ and $\alpha_i = 0$ for $i = N_1 + 1, \ldots, N$. H₀ allows α_i having differentiation across the units in cross-sectional settings. To test the panel co-integration based on least square parameters of α_i and the associated t ratio, Westerlund (2007) presented four type of statistics. Two out of four are panel tests presenting alternative hypothesis of cointegration presence among the whole panel, the remaining two presents mean group tests against the above mentioned alternative hypothesis thereby proving the presence of co-integration for at least one cross-section unit. Two out of four tests are panel in nature with alternative hypothesis suggesting integration among the whole panel ($H_1: \alpha_i = \alpha < 0$) . Remaining two tests are group mean tests against the alternative hypothesis that the co-integration for at least one unit in cross-section setting ($H_1: \alpha_i < 0$ for at least one i). The null hypothesis of cointegration absence is tested by the panel statistic P_t and P_a against the simultaneous alternative of panel co-integration. The null hypothesis of no cointegration against the alternative hypothesis of atleast one element of panel cointegration, is tested by the group mean statistic statistics G_t and G_a. One property of Westerlund (2007) is that it provides p-values quite robust against cross sectional dependencies through boot strapping thereby allowing for various forms of heterogeneity.

The results are presented in table 7 given below. Null hypothesis of no cointegration is rejected under 1% level of significance except for the Ga test statistics. Null hypothesis stating no-cointegration is rejected in three out of four cases with the significance level of 1 percent when using bootstrapped calculated p-values (making allowance for cross-sectional dependence). Boot strapped p-values indicate the presence of strong cointegrating relation among economic growth, capital, labor, remittances, exports, and foreign direct investment.

Table 8: Results of Westerlund-2007 panel cointegration test.

Statistic	Value	*p*-value	Robust *p*-value
G_t	-6.291	0.000	0.000
G_a	-0.215	1.000	0.300
P_t	-17.479	0.000	0.000
P_a	-0.828	0.979	0.000

Notes: The width for Bartlett-kernel window is 2. Akaike Information Criterion (AIC) with a maximum lag/lead length of 2 is used for optimal lag/lead length selection. Bootstrapped p-values robust against cross-sectional dependencies are obtained by setting the bootstrap value to 200.

3.4. Long/short Run Parametric Estimation through Panel Error Correction Model

Coefficient estimation either for short or the long term parameter of the panel error correction model is not provided by Westerlund (2007) and Pedroni (1999) although they allow us to check the presence of cointegration among the economic variables. Fully Modified OLS (FMOLS), simple OLS, Pooled Mean Group (PMG) and Dynamic OLS (DOLS) can be used if the cointegration is present in a panel framework. The properties of OLS estimator are analyzed by Chen et al (1999) with the suggestion of using DOLS and FMOLS estimators in cointegrated panel regression. This paper addresses the estimation of three parameters of PVAR describing linkage among the included economic variables i.e. economic growth, labor, exports, capital, remittances ad foreign direct investment: PMG for both the long and short run parameters whereas DOLS and FMOLS in case of long run parameters.

3.4.1. Fully Modified OLS (FMOLS) Estimation

As the OLS estimator is an inconsistent and biased estimator during its application on the cointegrated panels, we have utilized the group mean panel fully modified OLS estimator (FMOLS) by Pedroni (1999, 2001) is made. This estimator helps in the generation of consistent estimates of parameters β along with the control on correlation and regressors endogeneity. The expression given below presents the FMOLS equation.

$$\beta_i^* = (X_i' X_i)^{-1}\left(X_i' y_i^* - T\delta\right), \quad [13]$$

In the above presented equation, endogenous variable in transformed form is presented by y* whereas δ represents the parameter for adjustment of autocorrelation. T shows the number of time periods taken. Tables 8 display the results of FMOLS at individual as well as panel level. The capital coefficient is positive and significant in India, Sri Lanka and Bangladesh whereas negative and significant in Pakistan and Nepal. The +/- coefficient of capital suggests that increase (decrease) in capital leads to increase (decrease) in economic growth in South Asian countries. Labor coefficient is positive and significant in Pakistan, Sri Lanka and Bangladesh whereas negative and significant in India and Nepal. Remittance is negative and significance in Pakistan however, insignificant in India. In Bangladesh, Sri Lanka and Nepal, remittance has a positive impact on growth. Exports are positive and significant in India, Bangladesh and Nepal. FDI has a positive impact on growth in Pakistan, Sri Lanka and Nepal and otherwise in India and Bangladesh. The results of FMOLS at group level show that all coefficients are statistically significant and positive except labor. Results of FMOLS indicate that 1% increase in remittances, exports and FDI as a percentage of GDP increases GDP per capita by about 6%, 14% and 23%, respectively in the South Asian countries.

Table 9: Results of Long term Co-efficient Estimates by FMOLS

	K	L	R	X	F	Adj. R-sq.
Pakistan	-18.771***	31.666***	-10.986*	-4.110	22.785**	0.892
	(-5.443)	(6.513)	(-1.839)	(-0.956)	(2.430)	
India	8.829***	-36.107***	-9.339	17.033***	-40.358***	0.992
	(2.870)	(-14.564)	(-0.941)	(5.806)	(-3.611)	
Srilanka	12.724***	12.772***	191.018***	-26.638***	41.051**	0.975
	(3.108)	(2.867)	(16.120)	(-11.958)	(2.184)	
Bangladish	11.436**	9.317**	23.822***	7.393**	-27.151*	0.970
	(2.245)	(2.495)	(8.479)	(2.608)	(-1.979)	
Nepal	-4.529***	-0.587**	6.757***	4.302***	32.451**	0.933
	(-2.044)	(-2.806)	(13.947)	(6.332)	(2.620)	
Panel	23.138***	-6.079***	6.673***	14.282***	23.06***	0.624
	(32.804)	(-31.316)	(9.368)	(28.876)	(22.043)	

Note: ***’ **’ * indicates 1%, 5% and 10% level of significance, respectively.

Both OLS and FMOLS estimators’ exhibit a small sample bias, however, the estimators by DOLS seems to outperform the preceding models (Kao and Chiang, 2000). Kao and Chiang (2000) have discussed the advantages of DOLS estimators. To avoid such biasness in our analysis, we have further applied the DOLS estimator to gauge the long-run relation.

3.4.2. Dynamic OLS (DOLS) Estimation

To achieve an unbiased and endogeneity corrected estimates of the long-run parameters, parametric adjustment are made to the errors. This adjustment is done by including both past and future values of first differenced *I*(1) regressors. Following equation is used to obtain the Dynamic OLS estimators:

$$Y_{it} = \alpha_i + X_{it}^{'}\beta + \sum_{j=-q_1}^{j=q_2} C_{ij}\,\Delta X_{it+j} + v_{it}, \qquad [14]$$

where, X = [K, L, R, X, F], C_{ij} represents the lead or lag coefficient of explanatory variables at first difference. The equation given below presents the estimated coefficient of DOLS:

$$\hat{\beta}_{DOLS} = \sum_{i=1}^{N}(\sum_{t=1}^{T} z_{it}z_{it}^{'})^{-1}\left(\sum_{t=1}^{T} z_{ij}\,\hat{y}_{it}^{+}\right), \quad [15]$$

where, z_{it}= $[X_{it}$- $\bar{X}_i$, $\Delta X_{i,t-q}, \dots \dots \Delta X_{i,t+q}]$ is vector of regressors, and $\hat{y}_{it}^{+}$ ($\hat{y}_{it}^{+}$= $y_{it} - \bar{y}_i$) is the GDPPC variable. Table 10 shows the results of DOLS at individual as well as panel level. The capital coefficient is positive and significant in India, Sri Lanka and Bangladesh whereas negative and significant in Pakistan. Labor coefficient is positive and significant in Pakistan and Sri Lanka whereas negative and significant in India and Nepal. In Bangladesh, Sri Lanka and Nepal, remittance has a positive impact on growth. Exports are positive and significant in India, Bangladesh and Nepal. FDI has a positive impact on growth in Pakistan and Nepal whereas negative in India. The results of FMOLS for panel show that FDI has a high positive impact on GDP per capital at 1% significance in the South Asian countries.

Table 10: Results of Long term Co-efficient Estimate by DOLS

	K	L	R	X	F	Adj. R-sq.
Pakistan	-18.898***	29.512***	-10.544	-6.583	21.828*	0.903
	(-4.293)	(5.183)	(-1.500)	(-1.234)	(1.819)	
India	9.306**	-35.598***	-7.614	16.011***	-38.775**	0.991
	(2.306)	(-10.911)	(-0.601)	(4.150)	(-2.668)	
Srilanka	11.970**	13.626***	190.290***	-26.113***	33.862	0.977125
	(2.679)	(2.843)	(14.758)	(-10.780)	(1.663)	
Bangladish	8.959	8.702	21.780***	8.697*	-20.929	0.972
	(1.098)	(1.544)	(4.931)	(1.874)	(-0.928)	
Nepal	-3.389768	-0.556*	6.463***	3.698***	27.875*	0.940572
	(-1.285)	(-2.007)	(11.911)	(4.845)	(1.823)	
Panel	13.767***	-7.575***	-4.030376	-0.279303	33.69***	0.921194
	(5.721)	(-4.330)	(-0.653)	(-0.066)	(3.666)	

Note: ***’ **’ * indicates 1%, 5% and 10% level of significance, respectively.

3.4.3. The Pooled Mean Group (PMG) Estimator and the Test for Causality

Final step in the implementation of an alternative methodology consists of the PMG approach proposed by Pesaran et al. (1999) to estimate the long and short run parameters of PECM (Panel Error Correction Model) along with the test to check causality among all the included macro-economic variables. The role of PMG is like an intermediate estimator as it involves both averaging and pooling. PMG test has a preference over the DOLS model as it allows the specification of short term dynamics so that it can differ among the countries whereas the coefficients in long term have constraints to remain same, an assumption that will be tested in this investigation. The strong assumption of the underlying PMG test consists of having restriction on long run coefficients to have similar values in different countries needs to be discussed in detail as the empirical data does not support it. One reason for the difference of our result from the previous studies is due to the incorporation of above methodology as they have not included it and therefore they all behave in a similar manner in the long run. If this is the case, then we shall not have an idea of the amount of weight that needs to be assigned on the new results of panel estimation, as these will merely be estimation and modeling artifact used here and therefore not be able to provide beneficial information. As our variables have cointegration among them, the granger causality test is performed through the estimation of PMG estimator. Equation (9) is used to as a long run model to obtain residuals. The following model is estimated in define the lag residuals as the error correction term.

$$\Delta G_{it} = \beta_{1j} + \sum_{k=1}^{p} \beta_{11ik}\,\Delta G_{it-k} + \sum_{k=1}^{p} \beta_{12ik}\,\Delta K_{it-k} + \sum_{k=1}^{p} \beta_{13ik}\,\Delta L_{it-k} + \sum_{k=1}^{p} \beta_{14ik}\,\Delta R_{it-k} + \sum_{k=1}^{p} \beta_{15ik}\,\Delta X_{it-k} + \sum_{k=1}^{p} \beta_{16ik}\,\Delta F_{it-k} + \lambda_{1i}\varepsilon_{it-1} + v_{1it} \qquad [16a]$$

$$\Delta K_{it} = \beta_{1j} + \sum_{k=1}^{p} \beta_{11ik}\,\Delta G_{it-k} + \sum_{k=1}^{p} \beta_{12ik}\,\Delta K_{it-k} + \sum_{k=1}^{p} \beta_{13ik}\,\Delta L_{it-k} + \sum_{k=1}^{p} \beta_{14ik}\,\Delta R_{it-k} + \sum_{k=1}^{p} \beta_{15ik}\,\Delta X_{it-k} + \sum_{k=1}^{p} \beta_{16ik}\,\Delta F_{it-k} + \lambda_{1i}\varepsilon_{it-1} + v_{1it} \qquad [16b]$$

$$\Delta L_{it} = \beta_{1j} + \sum_{k=1}^{p} \beta_{11ik}\,\Delta G_{it-k} + \sum_{k=1}^{p} \beta_{12ik}\,\Delta K_{it-k} + \sum_{k=1}^{p} \beta_{13ik}\,\Delta L_{it-k} + \sum_{k=1}^{p} \beta_{14ik}\,\Delta R_{it-k} + \sum_{k=1}^{p} \beta_{15ik}\,\Delta X_{it-k} + \sum_{k=1}^{p} \beta_{16ik}\,\Delta F_{it-k} + \lambda_{1i}\varepsilon_{it-1} + v_{1it} \qquad [16c]$$

$$\Delta R_{it} = \beta_{1j} + \sum_{k=1}^{p} \beta_{11ik}\,\Delta G_{it-k} + \sum_{k=1}^{p} \beta_{12ik}\,\Delta K_{it-k} + \sum_{k=1}^{p} \beta_{13ik}\,\Delta L_{it-k} + \sum_{k=1}^{p} \beta_{14ik}\,\Delta R_{it-k} + \sum_{k=1}^{p} \beta_{15ik}\,\Delta X_{it-k} + \sum_{k=1}^{p} \beta_{16ik}\,\Delta F_{it-k} + \lambda_{1i}\varepsilon_{it-1} + v_{1it} \qquad [16d]$$

$$\Delta X_{it} = \beta_{1j} + \sum_{k=1}^{p} \beta_{11ik}\,\Delta G_{it-k} + \sum_{k=1}^{p} \beta_{12ik}\,\Delta K_{it-k} + \sum_{k=1}^{p} \beta_{13ik}\,\Delta L_{it-k} + \sum_{k=1}^{p} \beta_{14ik}\,\Delta R_{it-k} + \sum_{k=1}^{p} \beta_{15ik}\,\Delta X_{it-k} + \sum_{k=1}^{p} \beta_{16ik}\,\Delta F_{it-k} + \lambda_{1i}\varepsilon_{it-1} + v_{1it} \qquad [16e]$$

$$\Delta F_{it} = \beta_{1j} + \sum_{k=1}^{p} \beta_{11ik}\,\Delta G_{it-k} + \sum_{k=1}^{p} \beta_{12ik}\,\Delta K_{it-k} + \sum_{k=1}^{p} \beta_{13ik}\,\Delta L_{it-k} + \sum_{k=1}^{p} \beta_{14ik}\,\Delta R_{it-k} + \sum_{k=1}^{p} \beta_{15ik}\,\Delta X_{it-k} + \sum_{k=1}^{p} \beta_{16ik}\,\Delta F_{it-k} + \lambda_{1i}\varepsilon_{it-1} + v_{1it} \qquad [16f]$$

The Δ represents operator at first difference whereas p represents the lag length at optimal level as per Schwarz Bayesian Criterion. We have selected six lags for this purpose and considered these as the optimal lag length as per Schwarz Bayesian Criterion in the VAR system. The problem of endogeneity can be minimized by selecting the value of explanatory variable lags from k=1 rather than k=0. We can check the long and short run causality through the specification presented in equation (16). For instance, in the per capita gross domestic product in equation 16(a), causality in short term is tested among capital, labor, remittance, exports and FDI to GDP per capita based on $H_0;\ \beta_{12ik} = 0\ \forall ik$, $H_0;\ \beta_{13ik} = 0\ \ \forall ik$, $H_0;\ \beta_{14ik} = 0\ \ \forall ik$, $H_0;\ \beta_{16ik} = 0\ \forall ik$, and $H_0;\ \beta_{12ik} = 0\ \forall ik$. In general, referring to Eqs. (16a)–(12f), statistical significance value of the partial F-statistic having association with the variables on the right hand side determines the short run causality. We can check for the long term causality by having an examination of the t value on coefficient λ of ECT ε_{it-1} to confirm the significance level.

Table 11 reports the results of short-run and long-run Granger causality tests. With respect to Eq.(16a), the coefficient of lagged error-correction term is negative and significant at 5% level but with a relatively low speed of adjustment to long-run equilibrium. Negative error correction term confirms the existence of the long run Granger causality running from capital, labor, remittances, exports, and FDI to economic growth. With respect to short-run causality tests, there is evidence of Granger causality running from exports to economic growth. From Eq.(16b), error correction term is negative and significant at 1% which suggests that capital responds to long-run equilibrium and confirms the long-run causality running growth, labor, remittances, exports and FDI. Over a short period of time, there is evidence of Granger causality running from remittances to capital. The significant and negative error correction term in Eq. (16c) confirms the presence of long-run causality running from energy growth, capital, remittances, exports and FDI to labor. In Eq.(16d), the long-run equilibrium relation is insignificant however in and short-run indicates that Granger causality runs from capital to remittances. The existence of long run equilibrium relation at relatively higher speed is evident in Eq. (16e, 16f) between all the variables. However, Eq. (16e) shows that causality runs from FDI to exports. Results indicate unidirectional causality from exports to growth and from FDI to exports. Results also provide evidence of feedback relationship between remittances and capital. These results suggest that remittances, exports and FDI play a vital role in the economic growth and capital in South Asia. Effective utilization of inflows through remittances and FDI, enhancing the exports are necessary to reap optimal fruits of economic growth.

Table 11: Results of PMG Panel Causality Test

Dependent Variables	Independent Variables (Sources of Causality)						
	ΔG_{it} Short run	ΔK_{it}	ΔL_{it}	ΔR_{it}	ΔX_{it}	ΔF_{it}	ECT_{t-1} Long run
Eq. (16a) ΔG_{it}	-	1.529	-.914	.684	1.634*	-2.715	-.0443**
		(0.87)	(-0.49)	(0.30)	(1.76)	(-0.48)	[-1.93]
Eq. (16b) ΔK_{it}	.011		.101	-.887**	-.010	.020	-.467***
	(1.14)	-	(0.51)	(-1.94)	(-0.13)	(0.03)	[-2.82]
Eq. (16c) ΔL_{it}	.067	-.268		-.588	.043	-1.070	-.535**
	(0.97)	(-1.61)	-	(-0.72)	(0.99)	(-1.45)	[-2.48]
Eq. (16d) ΔR_{it}	-.033	-.191***	.017		-.024	-.639	-.189
	(-1.06)	(-3.47)	(0.20)	-	(-0.55)	(-0.76)	[-1.14]
Eq. (16e) ΔX_{it}	.019	-.008	-.081	.292	-	.550**	-.547***
	(0.82)	(-0.07)	(-0.62)	(0.64)		(1.89)	[-2.57]
Eq. (16f) ΔF_{it}	.001	.044	-.033	.050	.010	-	-.879***
	(0.21)	(1.31)	(-0.90)	(0.47)	(0.39)		[-3.91]

Notes: ***’ ** indicates significance at the 1% and 5%, respectively. () and [] represent sum of the lagged coefficients for the respective short-run changes and t-statistics.

4. Conclusion and Policy Implications

This paper explores the relationship between economic growth, capital, labor, remittances, exports, and foreign direct investment using data of 5 South Asian countries over the period 1988–2013. In doing so, we have applied panel unit root tests to examine the integrating properties of the variables. To examine cointegration between variables, we have applied Pedroni cointegration and Westerlund panel cointegration approaches. The PMG Granger causality proposed by Pesaran et. al is applied to examine the direction of causality between variables in the South Asian countries.

Empirical results indicate that all variables are integrated at I(1) confirmed by panel unit root tests and the same inference is drawn about cointegration between economic growth, capital, labor, remittances, exports, and foreign direct investment. The FMOLS and DOLS estimation analysis reveals a positive impact of capital, remittances, exports and FDI on economic growth whereas an inverse relationship between labor and growth is observed. The causality analysis confirms the existence of long run equilibrium relationship between economic growth, capital, labor, remittances, exports, and foreign direct investment. In short run, exports Granger cause growth and FDI Granger cause exports. Feedback causality is also confirmed between remittances and capital in the South Asian countries.

The empirical findings of this paper have important implications for the policymakers of South Asia. The region should undertake the educational and financial reforms as this will help to create an environment which is more favorable for the spillover effects as this spillover will improve the social returns for both domestic and foreign investments. This paper presents very important results for developing countries to have an understanding that the formulation of capital, increase in exports and the attraction of remittances and FDI is important to promote economic growth. Future research can utilize the sector level data on these variables to dig deep the implications for economic growth. The availability of data is the biggest hurdle in doing so at present.

References

Adams, S. (2009). Foreign Direct investment, domestic investment, and economic growth in Sub-Saharan Africa. *Journal of Policy Modeling, 31*(6), 939-949.

Aditya, A., & Acharyya, R. (2013). Export diversification, composition, and economic growth: Evidence from cross-country analysis. *The Journal of International Trade & Economic Development, 22*(7), 959-992.

Azam, M., & Hassan, S. Khairuzzaman, (2013). Corruption, Workers Remittances, Fdi and Economic Growth in Five South and South East Asian Countries: A Panel Data Approach, *Middle-East Journal of Scientific Research,15*(2), 184-190.

Azman-Saini, W. N. W., Baharumshah, A. Z., & Law, S. H. (2010). Foreign direct investment, economic freedom and economic growth: International evidence. *Economic Modelling, 27*(5), 1079-1089.

Baltagi, B. H., & Kao, C. (2001). *Nonstationary panels, cointegration in panels and dynamic panels: A survey* (Vol. 15, pp. 7-51). Emerald Group Publishing Limited.

Bilquees, F., & Mukhtar, T. (2012). Export Instability, Income Terms of Trade Instability and Growth: Evidence from Pakistan. *Journal of Economic Cooperation and Development*, *33*(1), 59-78.

Borensztein, E., De Gregorio, J., & Lee, J. W. (1998). How does foreign direct investment affect economic growth?. *Journal of international Economics, 45*(1), 115-135.

Breitung, J., (2000). The local power of some unit root tests for panel data. *Advances in Econometrics, 15*, 161–177.

Catrinescu, N., Leon-Ledesma, M., Piracha, M., & Quillin, B. (2009). Remittances, institutions, and economic growth. *World Development, 37*(1), 81-92.

Chen, B., McCoskey, S., Kao, C., (1999). Estimation and inference of a cointegrated regression in panel data: a Monte Carlo study. *American Journal of Mathematical and Management Sciences, 19*, 75–114.

Cooray, A. (2012). The impact of migrant remittances on economic growth: evidence from South Asia. *Review of International Economics, 20*(5), 985-998.

Driffield, N., & Jones, C. (2013). Impact of FDI, ODA and migrant remittances on economic growth in developing countries: A systems approach. *European Journal of Development Research, 25*(2), 173-196.

Fayissa, B., & Nsiah, C. (2010). The impact of remittances on economic growth and development in Africa. *American Economist, 55*(2), 92.

Hansen, H., & Rand, J. (2006). On the causal links between FDI and growth in developing countries. *The World Economy, 29*(1), 21-41.

Hassan, S., Bakar, N. A., & Abdullah, H. (2014). Analysis of FDI Inflows into China from ASEAN-5 Countries: A Panel Cointegration Approach. *Journal of Economic Cooperation & Development*, *35*(3), 1-28.

Herzer, D., Klasen, S., & Nowak-Lehmann D, F. (2008). In search of FDI-led growth in developing countries: The way forward. *Economic Modelling, 25*(5), 793-810.

Hsiao, F. S., & Hsiao, M. C. W. (2006). FDI, exports, and GDP in East and Southeast Asia—Panel data versus time-series causality analyses. *Journal of Asian Economics, 17*(6), 1082-1106.

Im, K.S., Lee, J., Tieslau, M., (2005). Panel LM unit-root tests with level shifts. *Oxford Bulletin of Economics and Statistics, 67*(3), 393–419.

Imai, K. S., Gaiha, R., Ali, A., & Kaicker, N. (2014). Remittances, growth and poverty: New evidence from Asian countries. *Journal of Policy Modeling, 36*(3), 524-538.

Kao, C., Chiang, M.H., (2000). On the estimation and inference of a cointegrated regression in panel data. In: Baltagi, B. (Ed.), Nonstationary Panels, Panel Cointegration, and Dynamic Panels. *Advances in Econometrics, 15*. , JAI Press, Amsterdam, 161–178.

Kumar, R. (2011). Role of Trade, Aid, Remittances and Financial Development in Pakistan. MPRA Paper No. 38871. Online at http://mpra.ub.uni-muenchen.de/38871/

Kumar, R. R., & Stauvermann, P. J. (2014). Exploring the Effects of Remittances on Lithuanian Economic Growth. *Engineering Economics, 25*(3), 250-260.

Le, T. (2009). Trade, remittances, institutions, and economic growth. *International Economic Journal, 23*(3), 391-408.

Levin, A., Lin, C.F., (1993). *Unit Root Tests in Panel Data: New Results*. Discussion paper. Department of Economics, UC-San Diego.

Levin, A., Lin, C.F., Chu, C., (2002). Unit root tests in panel data: asymptotic and finite sample properties. *Journal of Econometrics, 108*, 1–24.

Mah, J. S. (2005). Export expansion, economic growth and causality in China. *Applied Economics Letters, 12*(2), 105-107.

Mankiw, N. G., Romer, D., & Weil, D. N. (1992). *A contribution to the empirics of economic growth* (No. w3541). National Bureau of Economic Research.

Marwan, N. F., Kadir, N. A. A., Hussin, A., Zaini, A. A., Ab Rashid, M. E., & Helmi, Z. A. G. (2013). Export, Aid, Remittance and Growth: Evidence from Sudan. *Procedia Economics and Finance, 7*, 3-10.

Pazim, K. H. (2009). *Panel data analysis of "Export-led" Growth Hypothesis in BIMP-EAGA Countries*. University Library of Munich, Germany.

Pedroni, P., (2004). Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis: new results. *Econometric Theory, 20*, 597–627.

Pedroni, P. (2001). Fully modified OLS for heterogeneous cointegrated panels. *Advances in econometrics, 15*, 93-130.

Pedroni, P., (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and Statistics, 61*, 653–670.

Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association, 94*(446), 621-634.

Pesaran, M. H., (2004). *General Diagnostic Tests for Cross Section Dependence in Panels.* Cambridge Working Papers in Economics no. 435. University of Cambridge.

Pesaran, M. H., (2007). A simple panel unit root test in presence of cross section dependence. *Journal of Applied Econometrics, 22*, 265–312.

Rao, B. B., & Hassan, G. M. (2011). A panel data analysis of the growth effects of remittances. *Economic modelling, 28*(1), 701-709.

Rao, B. B., & Takirua, T. (2006). *The effects of exports, aid and remittances on output: The case of Kiribati*. University Library of Munich. (MPRA paper no 1548).

Sakar, S. A., & Aslam, M., (2013). Foreign Direct Investment, Human Capital and Economic Growth in Malaysia. *Journal of Economic Cooperation & Development*, *36*(1), 103-132.

Shirazi, N. S., & KHAN, A. U. (2009). Role of Pakistan Poverty Alleviation fund's Micro Credit In Poverty Alleviation: A Case of Pakistan. *Pakistan Economic and Social Review*, 215-228.

Siddique, A., Selvanathan, E. A., & Selvanathan, S. (2012). Remittances and economic growth: empirical evidence from Bangladesh, India and Sri Lanka. *Journal of Development Studies, 48*(8), 1045-1062.

Solow, R. M. (1956). A contribution to the theory of economic growth. *The quarterly journal of economics*, 65-94.

Tekin, R. B. (2012). Economic growth, exports and foreign direct investment in Least Developed Countries: A panel Granger causality analysis. *Economic Modelling, 29*(3), 868-878.

Westerlund, J., (2007). Testing for error correction in panel data. *Oxford Bulletin of Economics and Statistics, 69*(6), 709–748.