

Impact of Remittances on Domestic Investment: A Panel Study of Six South Asian Countries

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Abstract

Remittances inflow to South Asian countries increased significantly and is now one of the major sources of external finance overtaking traditional capital inflows such as foreign direct investment (FDI), foreign portfolio investment (FPI) and aid. However, the role of remittances in economic development has not been examined extensively, particularly for South Asian countries. This article examines the impact of remittances on domestic investment for South Asia over 1991–2017. Advanced panel estimation methods (unit root, cointegration and causality) are employed to account for potential country-specific heterogeneity and the endogeneity problem. Results of this study suggest that remittances increase domestic investment in the short term as well as in the long run for South Asia. This indicates that remittances are used not only for consumption purposes but also for investment activities such as human and physical capital development. The panel causality results suggest the presence of uni-directional causality running from remittances to domestic investment. Therefore, the result of this study supports the theoretical argument and previous empirical studies for other developing countries

JEL: C3, O1, F3, F22

Keywords

Remittances, domestic investment, panel data, South Asia

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Introduction

Remittance inflows to developing and low-income economies are now one of the largest sources of stable external financial flows overshadowing the traditional sources like official aid and private capital flows—foreign direct investment (FDI) and foreign portfolio investment (FPI). The World Bank (2018) estimates indicate that global remittances were reported to be approximately US\$ 625 billion in 2017 and the developing countries received over US\$ 468 billion, accounting for 75 per cent, or nearly three times the amount of official development assistance in the same period. Similarly, among the lower-income countries (LICs), remittance inflows in 2017 were 6.06 per cent of gross domestic product (GDP), while FDI stood at 3.2 per cent of GDP in the same period. For lower middle-income countries, remittance inflows were 4.09 per cent of GDP, while FDI stood at 1.9 per cent of GDP in the same period. This indicates that the importance of remittances is increasing, and they are becoming one of the main important sources of foreign financial flows for many developing countries.¹

South Asia is no exception to this trend. Remittance inflows to South Asia increased from US\$ 82 billion in 2010 to US\$ 117 billion in 2017, registering a 6 per cent annual growth over 2010–2017. Similarly, remittances as a ratio of GDP stood at 3.54 per cent, while FDI stood at 1.4 per cent of GDP in 2017. This highlights the importance of remittances as an important source of foreign capital for covering the current account deficit, exchange reserves and additional source of income for households in South Asia.

Despite the significant increase in remittances into South Asia over time, the role of remittances in economic development has not been empirically investigated more intensely. Depending on their use, remittances are expected to increase expenditure on consumption, education, housing and health and foster financial development, stimulate small businesses, alleviate poverty and promote economic growth in receiving countries (Aggarwal, Kunt, & Peria, 2011; Barajas, Chami, Fullenkamp, Gapen, & Montiel, 2009; Chowdhury, 2016; Rao & Hassan, 2012). While significant literature has focused on the growth impact of remittance inflows on origin country (Barajas et al., 2009; Chowdhury, 2016; Fayissa & Nsiah, 2008, among others), only limited number of studies examines the investment impact of remittances. Some studies (Aggarwal et al., 2011; Barajas et al., 2009; Dzansi, 2013; Lartey, 2011) have found that remittance inflows may have a positive effect on investment in the migrant countries through their impact on macroeconomic stability, consumption smoothing, increased savings and others. Mallick (2012) and Tung (2018) found that remittances may not augment domestic investment since remittances are mostly used for self-consumption rather than productive investment. So, there is no conclusive answer about impact of remittances on domestic investment.

In the context of limited literature and mixed findings, this study aims to examine the impact of remittances on domestic investment for six South Asian countries over the period 1991–2017 based on panel data analysis. The contribution of this study to the existing literature can be explained as follows: first, limited and the mixed results suggest that there is the need for further research on the issue, and,

therefore, this study contributes to the literature by examining the relationship between remittance and domestic investment. Second, while there is abundant literature on FDI/FPI and domestic investment, literature on remittances' impact on domestic investment are limited. Third, the study explains the direction of causality between remittances and domestic investment, which is a vital policy analysis.

Rest of the article is structured as follows: the second section deals with previous empirical literature, including theoretical background; the third section discusses trends and significance of remittance for South Asian countries; the fourth section provides data sources, methodology and model specifications; and the fifth section provides a discussion on estimation results. Finally, sixth section concludes the article with some suggestions for the policymakers.

Review of Literature

Theoretical Background

There are two main theoretical arguments being used to evaluate the impact of remittances: the 'family approach' stating that altruistic reasons determine how the immigrants send money in order to support the family left behind in their country (Barajas et al., 2009; Chami et al., 2008) and 'the portfolio approach', which considers remittances as investments made by the immigrant in their own country (Giuliano & Ruiz-Arranz, 2009; Rao & Hassan, 2012). In both cases, remittances might trigger economic effects, either by increasing consumption (demand side) or by production (supply side), hence, boosting domestic investment and economic growth in receiving countries (OECD, 2006). The theoretical approach suggests that remittances might increase the level of investment in human and physical capital in recipient countries. There are five channels through which remittances have significant indirect and direct investment effects. First, remittances are found to reduce volatility in output by smoothing household consumption. By smoothing household consumption, particularly during adverse economic situation, remittance inflows may increase domestic investment through its multiplier effect (Lartey, 2011; Ratha, 2013).

Second, there is evidence that remittance inflows improve financial sector in the recipient's country. Developing countries are characterized by underdeveloped financial institutions, credit constraints and high interest rate. Remittance inflows improve financial sector development in the migrant's country, which helps domestic firms to mobilize necessary credit for investment (Mundaca, 2009; Giuliano & Ruiz-Arranz, 2009; Aggarwal et al., 2011). Gheeraert et al. (2010) using transaction cost approach developed a theoretical model that explains the potential impact of remittances on financial sector and domestic investment. The theoretical prediction of this study indicates that remittances increase bank deposits, which increase the availability of loanable funds and reduce the interest rate. This, in turn, increases credit to private sector and stimulates investment. Empirical evidence supports this hypothesis. For example, a study by Aggarwal et al. (2011)

indicates that 1 per cent growth in remittances increase bank deposits by 0.36 per cent and 0.29 per cent increase in credit to private sector. A similar conclusion has been reached by Giuliano and Ruiz-Arranz (2009). This study finds that remittances improve credit availability for the poor, improve the allocation of capital, substitute for the lack of financial development and thus accelerate domestic investment and economic growth in the long run.²

Third, remittances increase human development in the migrant's country by increasing household investment in education and health. McKenzie and Rapport (2011) developed a model that shows various channels through which workers' remittances influence investment in human capital. The model shows that remittances diminish poverty and encourage families to send their children to school. Therefore, remittance supports economic growth and domestic investment and reduction in poverty in the long run through the human capital channel (Gyimah-Brempong & Asiedu, 2015; Salas, 2014).

Fourth, remittance inflows increase domestic investment by increasing domestic savings in the migrant's country (Connell & Conway, 2000; Gani, 2016). Remittances are now found to be an important source of household income for many developing economies (Edwards & Ureta, 2003) and have direct poverty-mitigating effect (Gupta, Pattillo, & Wagh, 2009). Therefore, higher income levels of households are usually associated with rising saving rates in developing countries (Sahoo & Dash, 2013). Finally, remittance provides critical foreign exchange that is used for import of crucial capital and intermediate goods vital for domestic investment in developing countries (Chami et al., 2008). However, there are some studies that predict remittances may reduce domestic investment if it is used extensively for consumption instead of funding investment such as physical capital and human capital development (Ahamada & Coulibaly, 2013). Other studies such as Mallick (2012) and Tung (2018) have predicted that remittances may result in a moral hazard or dependency syndrome situation, and this may lower private investment in developing countries.

Previous Empirical Findings

Despite the significant increase in remittance flows to developing countries, the role of remittances for economic development has not been empirically investigated in detail. However, the set of literature that examines the developmental role of remittance is expanding rapidly with the availability of longer set data.

The empirical literature suggests that remittances have both welfare and growth effects and could contribute to economic growth, mainly through their positive impact on consumption, savings or investment (Ratha, 2013). Previous studies indicate that remittances reduce poverty level (Hatemi-J & Uddin, 2013), promote access to finance (Inoue & Hamori, 2016), increase households' consumption (Petrou & Connell, 2014) and reduce inequalities in income distribution (Adams & Page, 2003). However, adequate attention has not been given to the role of remittance in promoting domestic investment in recipient's country. However, some recent studies done by Chowdhury (2016) and Aggarwal et al.

(2011) found that remittances may help promote the domestic investment by contributing towards the expansion of the financial sector in developing countries. Evidence from a micro-level study (based on household survey) indicates that remittances have significant impact on household investment activity, while macro-studies provide mixed evidence (Adams & Cuecuecha, 2013).

Using survey data on communities, a study finds that the remittances from the USA accounted for 21 per cent of start-up capital of the new business formation in Mexico. Adam (1998) examines the impact of remittances on household asset accumulation using household survey data in three provinces in rural Pakistan. The results of this study suggest that remittances have a positive effect on the accumulation of two types of rural assets: landholdings and livestock holdings. Using similar micro-data (household data for Guatemala), Adams and Cuecuecha (2013) investigate how international remittances affect the marginal spending behavior of households. The findings of this study suggest that remittances-receiving households spend higher than the margin on education, housing and small business than they would have spent without remittances. These findings indicate that remittance inflows increased the level of investment in human and physical capital in Guatemala.

Fayissa and Nsiah (2010) examined the impact of remittance inflows on economic growth for 18 Latin American countries by using the panel data over the period from 1980 to 2005. Using generalized method of moment (GMM) model, the study finds that remittance inflows have positive and significant impact on economic growth. A 10 per cent increase in remittances leads to a 0.15 per cent increase in the GDP per capita income. The study finds that remittance inflows increase household investment in physical and human capital, and this can enhance their productivity and spur their economic growth in the long run. Yasmeen et al. (2011) investigated the impact of workers' remittances on total consumption and private investment of Pakistan by using the data from 1984 to 2009. Using ordinary least square model, the study found positive impact of remittances on private investment and total consumption in Pakistan. Therefore, the study concludes that workers' remittances influence economic growth in developing countries like Pakistan by its positive impact on private investment and consumption. Massey and Parrado (1998) examined the role of remittance in economic development in Mexico. Balde (2011) investigated the impact of remittances and foreign aid on savings and investment using 37 and 34 sub-Saharan African (SSA) countries over the period 1980–2004. Using both ordinary least squares (OLS) and instrumental variables (2SLS) methods, the study found that both remittance inflows and foreign aid promote domestic savings and investment in these countries. More importantly, the study also documented that remittances are more effective than foreign aid, as a 10 per cent increase in remittances increases savings by 7 per cent and investment by 6.5 per cent, while the same 10 per cent increase in foreign aid increases savings and investment by, respectively, 1.6 per cent and 1 per cent.

There are few studies that document the role of remittances in promoting human capital in home country. For example, Salas (2014) investigated the effect of international remittances on human capital investment of children left behind in home country (Peru) using data for the period 2007–2010. Results revealed a

positive and significant impact, implying that due to international remittances, there is a probability of acquiring higher education by migrant's children. Gyimah-Brempong and Asiedu (2015) investigated the effects of remittances on education in Ghana. Using cross-section and pseudo-panel data, the study finds that remittances significantly increase the probability that families enrol their children in primary and secondary schools, suggesting that remittances encourage education and contribute to human capital formation. They concluded that remittance inflow supports economic growth and reduces poverty level in the long run by improving human capital in the case of Ghana. Issifu (2018) examined the impact of migrants' remittances on domestic investment for five SSA countries, namely Ghana, Kenya, Nigeria, Senegal and Togo from 1984 to 2014. Using panel fixed effect model and controlling the level of economic development, the study finds remittances exert a significant positive effect on domestic investment. In addition, the interaction effect of remittances and institutions shows that political institution serves as a mechanism through which remittances affect domestic investment. These findings indicate that the effects of remittances on investment are larger in the presence of better financial and political institutions.

Some studies argue that the remittance impact on domestic investment is conditional on the level of financial and institutional development in the recipient's country. For example, Aggarwal et al. (2011) examined the impact of remittances on financial development for 99 developing countries over the period 1975–2003. Using GMM model, they found that improved institutional framework has resulted in an increase in deposits and bank credits in the domestic banking system. Similarly, Dzansi (2013) supports this argument and finds a complementarity between remittance inflows and financial sector development in facilitating investment growth. Using panel data for a sample of 79 developing countries over 1995–2005, the study finds that the remittances' impact on investment is conditional to institutional environment and the level of financial development. On the other hand, Chowdhury (2016) notes that in remittance-receiving countries, where financial systems are poorly developed, the usage of funds received from remittances for productive investment negatively impacts growth due to liquidity constraints. Using a dynamic panel estimation method of 33 top remittance-recipient developing countries over 1979–2011, the study found that financial development worked neither as a substitute nor a complement for the remittance–growth nexus.

Compared to the studies that evidenced positive relationship between remittances and investment, other studies (Mallick, 2012; Tung, 2018) document negative or insignificant relation between the two. Mallick (2012) examined the relationship between remittance inflows and private investment for India from 1966 to 2005. Using autoregressive distributed lag (ARDL) cointegration method, the study finds that remittances have negative impact on private investment. Based on the findings, the study assumes that a significant proportion of remittances maybe used for private consumption without production impact. Tung (2018) examine the impact of remittances on domestic investment for 19 Asia-Pacific countries over the period 1980–2015. Results based on panel fixed effect and 2SLS regression method suggest that remittances have a negative impact on domestic investment. Based on the results, they conclude that the increase of

remittances may not increase investment due to the phenomenon of moral hazard or dependency syndrome. It is clear from the earlier discussion that the findings are mixed and far from unanimous. Inconclusive results on remittance investment dynamics warrant for further examination.

Trends and Significance of Remittances for South Asian Countries

Remittances are the cross-border earnings that migrants send to their countries either by official or unofficial channels (Ratha, 2013).³ Global remittance inflows increased from mere US\$ 37 billion in 1980 to US\$ 121 billion in 2000 and further to US\$ 580 billion in 2017. The developing countries received over US\$ 457 billion, accounting for 75 per cent of total remittances. However, there was an uneven pattern between regions and between subregions. The trends of remittances are presented in Table 1, and it is clear that South Asia has emerged as the largest recipient of remittances in recent years surpassing East Asia and the Pacific region. Remittance inflows to South Asia have steadily grown from US\$ 5.2 billion in 1980 to US\$ 82 billion in 2010 and further to US\$ 117 in 2017 (Table 1). Overall, remittances to Africa grew at an average rate of 21 per cent per annum during the period 1980–2017.

Share of South Asia in Total Remittance Inflows

The share of remittances for different regions is presented in Figure 1. The share of remittances for South Asian countries in total remittances has been on an increasing trend. It was 14 per cent in the 1980s and then decreased to 11 per cent in the 1990s. However, with trade liberalization and globalization, the share of South Asia has gone up to around 18 per cent post 2000s. Coincidentally, this is the period when the growth of remittances to South Asia was highest at 34 per cent.

India is the top remittance-receiving country not only in South Asia but also in the world. Beside India, Pakistan and Bangladesh are also other top remittance-receiving countries in the world (see Table 1). Remittances have become the largest foreign capital source (FDI is second largest) for the South Asia region. In fact, in 2017, the remittance inflows to this region increased up to US\$ 117 billion in comparison with the FDI (US\$ 52 billion) and official development assistance (US\$ 14.7 billion).

Remittance inflows as ratio of GDP indicate that remittances are more important for small countries like Nepal, Sri Lanka and Bangladesh. It is clear from Figure 2 that on an average, Nepal is the highest recipient of remittances as a percentage of GDP at 30 per cent of GDP followed by Sri Lanka with a value of 9 per cent and Bangladesh 8 per cent of GDP in recent time. Pakistan is also receiving significant remittances (around 7%) during the same period.

Table I . Remittance Inflows into Selected Regions (1980–2017) (billions of US\$)

Region	1980	1990	2000	2005	2010	2012	2013	2014	2015	2016	2017
World	37	68	121	254	468	495.5	525.2	559.4	582.5	573	613
Developing countries	NA	NA	85	188	33	400	413	427	432	422	457
South Asia	5.2	5.5	17.1	34	82	108.0	110.8	115.8	117.6	110.4	116.7
Sub-Saharan Africa	1.4	2.4	4.8	20.2	31	37.5	37.6	39.4	42.6	38.4	42.7
East Asia and Pacific	2.6	8.6	18.7	37.6	69	81.9	88.3	106.0	122.8	114.0	112.6
Latin America and Caribbean	1.9	5.7	20	49	57	61.0	62.2	65.2	69.2	74.3	82.2
North America	0.08	1.2	5	5.7	8.4	8.7	9.2	9.2	9.3	9.2	9.1
Middle East and North Africa	6.5	10.5	11.5	23.5	38.2	49.1	50.6	56.5	53.1	53.4	57.6
High Income	19.3	39	47.5	82.08	117	128.6	137.7	142.9	133.2	133.9	138.4
Middle Income	16	27	71	194	284	341.9	360.7	388.3	402.6	387.7	412.7
Low Income	1.4	2.5	3	7	17.4	25.0	26.8	28.2	28.7	28.1	29.4
India	2.7	2.3	12.9	22.1	53.5	69	70	70	69	63	69
Pakistan	2	2	1	4.2	9.6	14	14.6	17.2	19.3	19.8	19.6
Bangladesh	0.3	0.77	1.9	4.6	10.2	14.12	13.86	4.98	15.3	13.5	13.5
Sri Lanka	0.15	0.40	1.1	1.9	4.1	6	6.4	7	7	7.2	7.2
Nepal		0.05	0.11	1.2	3.4	4.8	5.5	5.8	6.7	6.6	6.9
Maldives	0.003	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.004	0.004	0.004

Source: World Bank Development Indicators.

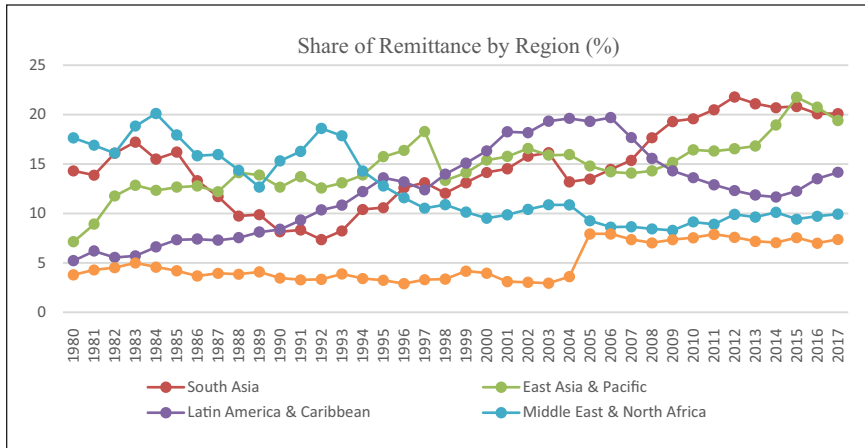


Figure 1. Share of South Asia in Total Remittance Inflows (%)

Source: World Bank Development Indicators.

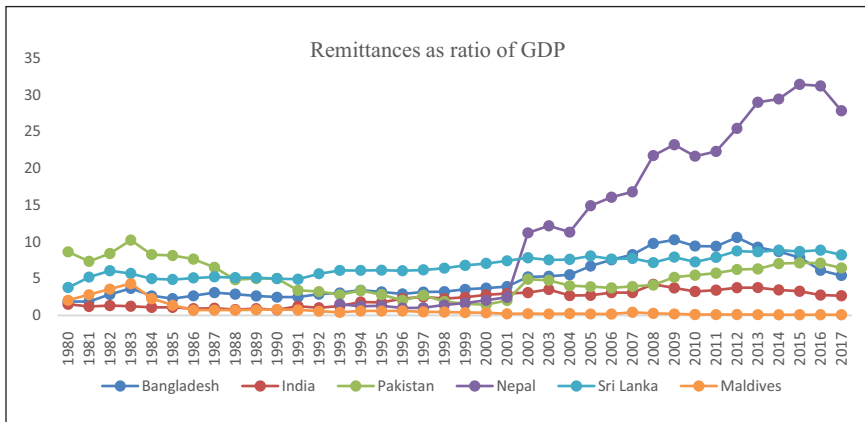


Figure 2. Remittance Inflows as Ratio of GDP

Source: World Bank Development Indicators.

Furthermore, we look at the share of remittance inflows in gross capital formation to examine the relative importance of remittance in terms of productive capacities of different economies in South Asia. Figure 3 presents remittance inflows as ratio of gross fixed capital formation for six South Asian countries.

Figure 3 suggests that the relative importance of remittances as a source of capital investment is much higher for South Asian countries, particularly for countries like Nepal, Bangladesh and Sri Lanka. The proportion of remittances in gross capital formation in South Asia has steadily increased, especially since the early 2000s due to stable rise in remittances.

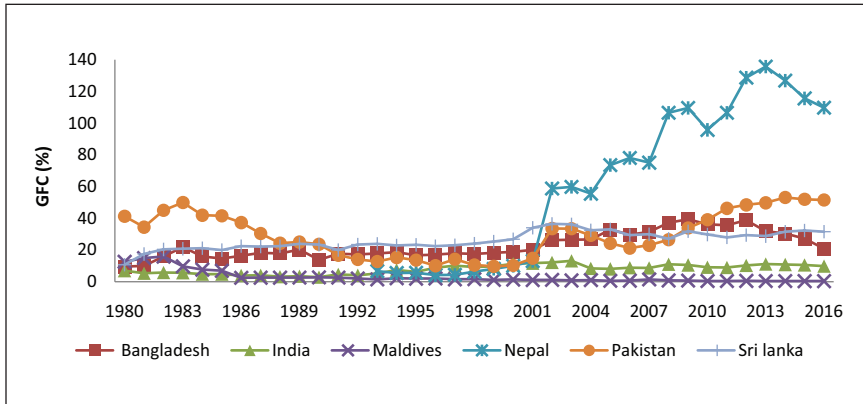


Figure 3. Remittances as Ratio of Gross Fixed Capital (GFC)

Source: World Bank Development Indicators.

Table 2. Remittance Outflows (US\$ million) from South Asian Countries

Country	1980	1990	2000	2010	2014	2015	2016	2017
India	29	106	486	3,823	4,119	4,605	5,151	5,203
Pakistan	1	1	2	9	16	30	64	121
Bangladesh	0	0	4	9	33	32	41	46
Sri Lanka	0	0	20	526	887	896	895	944
Nepal	0	0	17	32	9	9	20	33
Maldives	0	8	46	189	301	348	376	418

Source: World Bank Development Indicators.

Remittance Outflows from South Asia

Notwithstanding higher amounts of remittance inflow to South Asia, South Asian countries are also experiencing significant outflow of remittances, particularly post 2010. Remittance outflow, which was only US\$ 500 million in 2000, increased to above US\$ 6.7 billion in 2017. India accounts for bulk of the outflows from South Asia (Table 2).

Data Sources, Methodology and Model Specifications

The majority of the data are collected from the World Bank Development Indicators. Annual data for six South Asian countries (India, Pakistan, Bangladesh, Nepal, Sri Lanka and Maldives) on gross fixed capital as ratio of GDP, trade as ratio of GDP, GDP growth rate, real lending rate, inflation level (Consumer Price Index, base 2010) and average domestic exchange rate in terms of US\$ are collected from the World Development Indicators, 2019. Data on remittance as ratio of

GDP are also obtained from World Development Indicators. Data on bank credit as percentage of GDP and M2 by GDP ratio are collected from World Development Indicators. Data on infrastructure variable (Telephone line, both fixed and mobiles) per 100 population are also collected from World Development Indicators. Data on terms of trade (TOT) are collected from United Nations Conference on Trade and Development (UNCTAD) database. The analysis is limited to the period 1991–2017.

Model Specifications

In order to assess the impact of remittance inflows on domestic investment, this uses the flexible accelerator theory developed by Lucas (1967) and further by Fry (1993). According to the flexible accelerator model, the desired capital stock K^* is proportional to real output Q :

$$K^* = \alpha Q. \quad (1)$$

This can be expressed in terms of a desired ratio of investment to output $(I/Q)^*$:

$$(I/Q)^* = \alpha G \quad (2)$$

where I/Q denotes gross domestic fixed investment in current prices, Q denotes GDP in current prices and G is the rate of growth of real GDP, Q . The adjustment mechanism allows the actual investment rate to adjust partially in any one period to the difference between the desired investment rate and the investment rate in the previous period:

$$\Delta(I/Q) = \varphi[(I/Q)^* - (I/Q)_{t-1}] \quad (3)$$

Rearranging Equation 3 we can rewrite as:

$$I/Q = \varphi (I/Q)^* + (1 - \varphi) (I/Q)_{t-1} \quad (4)$$

where φ is the coefficient of adjustment. The flexible accelerator model allows economic conditions to influence the adjustment coefficient φ . Accordingly, φ can be expressed as:

$$\varphi = \beta_0 + \left[\frac{(\beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots)}{(I/Q)^* - (I/Q)_{t-1}} \right] \quad (5)$$

where X_i are the variables (including an intercept term for a constant depreciation rate) that affect investment and β_i are their respective coefficients. Investment is considered to be a partial adjustment process (adjusted between the existing and the desired capital stock) in the context of liquidity constraints and time adjustment constraints. As the investment rate is a structural component of the economy, the lagged coefficient is expected to show a high persistence, corresponding to an

autoregressive behavior. The explanatory variables used for this study are lagged GDP growth rate (G_{t-1}), trade as ratio of GDP, financial development (M2 and bank credit as ratio of GDP), remittance inflows as share of GDP (REM), real exchange rate (RER) and the real lending (RL) rate of banking sector. Based on these explanatory variables, the investment function is written as:

$$\begin{aligned} \text{GFC}_{it} = & \alpha_0 + \alpha_1 \text{GFC}_{it-1} + \alpha_2 \text{Gr}_{it-1} + \alpha_3 \text{REM}_{it} + \alpha_4 (\text{M2/BC})_{it} + \alpha_5 \text{RER}_{it} \\ & + \alpha_6 \text{RL}_{it} + \alpha_7 \text{Trade}_{it} + \alpha_8 \text{INFL}_{it} + \alpha_9 \text{INFRA}_{it} + \alpha_{10} \text{TOT}_{it} + \varepsilon_{it} \end{aligned} \quad (6)$$

The expected sign of ($\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_7$ and α_9) > 0 , whereas the coefficient of α_6 and α_8 is negative and α_5 is ambiguous.

where GFC is gross fixed capital formation as a share of GDP, LR is the real lending rate, Gr_{t-1} is real GDP growth rate over previous year, REM is the remittance as ratio of GDP, Trade is the total trade (export + import) as a share of GDP, M2 is the broad money as ratio of GDP, BC bank credit to domestic sector as ratio of GDP, RER is the real exchange rate, INF is the inflation rate (CPI), Infra is the infrastructure development as proxied by telecom density, (per 100 population), TOT refers to term of trade and ε_{it} is the error term, uncorrelated over time and across countries. The above model is (Equation 6) estimated for a panel of six South Asian countries using panel methodology (unit root, cointegration and causality).

Among the main determinants of investment, we include economic growth and the cost of capital. Thus, the inclusion of the lagged real GDP growth, as a proxy for the accelerator effect, is justified by expectations, adjustment and hysteresis phenomena in economic variables. Additionally, we include the real lending rate as a proxy for the cost of capital. We further consider other control variables, including trade as increase in trade increases domestic investment by increasing physical and human capital through higher savings and enhanced technological transfer (Nowak-Lehmann, 2003). Similarly, financial development increases domestic investment by providing necessary credit for financing investment activities and the coefficient is expected to be positive (Bontempi, Golinelli, & Parigi, 2010).

The effect of real exchange rate on investment is ambiguous, since an increase in RER (depreciation) would increase the price of imported capital and intermediate goods and reduce investment (Athukorala & Sen, 1995). On the other hand, an appreciating RER may stimulate investment through higher inflows of capital (Agrawal, 2000). Inflation rate is used as a proxy for uncertainty for the economy, which directly affects investment (Pindyck & Solimano, 1993).

Finally, the coefficient of remittance is expected to be positive since remittance promotes domestic investment by improving financial market and providing critical external funds for domestic investment in sectors such as housing, health, education and business/enterprise development (Aggarwal et al., 2011; Barajas et al., 2009; Dzansi, 2013; Lartey, 2011). When assessing the impact of REM on domestic investment, our focus is on the α_3 coefficient associated with Equation (6). The α_3 coefficient only provides short-run impact of remittance on domestic investment, and the long-run coefficients are estimated using following equation:

$$\alpha_L = (\alpha_3 / 1 - \alpha_1) \quad (7)$$

To capture the role of financial sector in the remittances and investment relationship, this study included two interaction terms (remittances*BC and remittance*M2). The sign of the interacted term provides information regarding the nature of relationship between remittances and channels. A positive interaction term indicates that a well-functioning financial system and better human development enhance the positive investment impact of remittances or complementary relationship. On the other hand, a negative sign indicates that remittances and conditional factors (financial development) are used as substitutes to promote domestic investment.

Result Analysis

Panel Unit Root

The first step in our analysis is to ascertain the stationary properties or unit root test of the relevant variables. We investigate the possible non-stationarity property of the data by applying second-generation panel cross-sectionally augmented panel unit root test (CIPS) unit root test recently proposed by Pesaran (2007), which allows for cross-sectional dependence. The CIPS unit root test is done for both 'constant' and 'constant and trend' specifications. Optimal lag length is selected based on the Akaike Information Criterion (AIC) criteria. The results of panel unit tests are presented in Table 3.

Table 3. Panel Unit Root Test Using Pesaran (2007)

Variables	At Level		First Difference	Conclusion
	Constant	Constant and Trend	Constant	
TRADE	-1.19	-1.66	-2.67*	I(1)
GFC	-1.32	-1.36	-3.51*	I(1)
Gr	-2.86*			I(0)
RER	-1.39	-3.06*		I(0)
M2	-1.65	-1.67	-2.96*	I(1)
REM	-1.54	-1.65	-3.55*	I(1)
INFRA	-4.29*			I(0)
BC	-1.49	-1.68	-3.55*	I(1)
INF	-2.15	-2.42	-4.04*	I(0)
RL	-2.97*			I(0)
TOT	-1.55	-1.98	-4.02*	I(1)

Source: The author.

Notes: The null hypothesis is that the panel has a unit root. Critical values are tabulated by Pesaran (2007). * indicates significance of the test at 1 per cent level.

It is clear that CIPS panel test does not reject the null of unit roots for the panel at level (with constant and constant and trend) for all variables except growth rate, lending rate and infrastructure. On the contrary, the differenced series are stationary, leading us to conclude that a panel unit root is present in the level series. Hence, the CIPS test indicates that we have a mixture of $I(0)$ and $I(1)$ variables.

Cointegration

After establishing the non-stationarity of the series, we then proceed to test for the existence of a long-run relationship between gross fixed capital (GFC) and its determinant variables using error correction (EC) panel cointegration test developed by Westerlund (2007), which takes into account the cross-section dependency among countries.⁴ The lead and lag orders (a single lag and lead) are selected based on the minimum AIC. The cointegration tests are conducted with both a constant and a constant and a trend.

The results of Westerlund (2007) four-panel cointegration test with the asymptotic p -values based on 500 replications are presented in Table 4. When using the asymptotic p -values, the no cointegration null is rejected by G_t in favour of existence of cointegration at 5 per cent level, indicating we have cointegration for at least one cross-section. Similarly, with the asymptotic p -values, the no cointegration null is rejected by P_t at the 5 per cent level (i.e., when ρ_i is restricted to be homogenous), suggesting that the whole panel is cointegrated. The economic implication of the existence of cointegration is that there is a stable equilibrium long-run relationship among the variables.

The Contribution of Remittance to Domestic Investment

One of the major problems with assessing the impact of remittance on domestic investment is the problem of endogeneity. To deal with the potential endogeneity, this study applies a dynamic panel data analysis, a system-GMM approach of Blundell and Bond (1998).⁵ As literature shows, system GMM estimator derived

Table 4. Panel Cointegration Tests (Dependent Variable GFC)

Panel Statistics	Test Statistics
	Value
G_t	-3.38*
G_o	-9.87
P_t	-8.72*
P_o	-11.75*

Source: The author.

Notes: The Westerlund (2007) tests assume no cointegration as the null. The test regression is fitted with constant, and one lag and lead. * denotes rejection of null of no cointegration at 5 per cent level.

from the estimation of a system of two simultaneous equations, one in level (with lagged first differences as instruments) and the other in first difference (with lagged levels as instruments). As many as four different specifications of Equation (6) are estimated and presented in Table 4.

The GMM system results pass all diagnosis test related to Sargan Test of over-identifying restrictions and the Arellano–Bond test of first-order and second autocorrelation.⁶ Overall, the main determinants of domestic investment are broadly significant and have the expected sign as described in the literature. The coefficient of lagged gross fixed capital (GFC_{t-1}) is close to 1 and statistically significant, indicating that investment has inertia effect and pro-cyclical. This indicates that investment is highly path dependent, with a consistent structural component. Therefore, the domestic investment is an increasing function of the stock of last investment. This finding is consistent with empirical studies such as that of Bosworth and Collins (1999) and Mody and Murshid (2005) for the sample of developing countries.

Focusing on the role of remittance, we note a positive overall contribution to capital formation, as expected. The coefficient of remittance is 0.10 (varies between 0.10 and 0.14 for different specifications), indicating that 10 cents of each dollar of remittance are used to finance capital formation. The values obtained are significantly smaller than 1, indicating that investment increases less than the increase in remittance inflows in the short run. Based on the coefficients presented in Table 5 (column 1), interpreted as the short-term effects, we can compute long-term elasticities, based on Equation 7. These elasticities are presented in the lower panel of Table 5. The long-term elasticities are greater than 1, indicating a long-run crowding in effect of remittances for sample countries. The results suggest that remittances affect domestic investment through various channels. Directly, remittances increase the total supply of savings to finance investment and indirectly, via consumption smoothing, financial development and increasing household investment in education and health. This result is consistent with the previous findings for other developing countries as reported by Massey and Parrado (1998), Balde (2011), Adams & Klobodu (2016) and Issifu (2018). Thus, the results of this study support the findings of micro-level studies that find that significant share of remittances are used for funding investment activities.

Recent survey by the Reserve Bank of India (RBI, 2018) provides support for this hypothesis in the case of India. Reserve Bank of India—RBI (2018) remittance survey indicates that more than half of remittances received by Indian households were used for consumption, followed by deposits in banks (20%) and rest of the amount (9%) for investment purposes. Similar pattern of remittance utilization is also found in the case of Bangladesh and Pakistan (Abbas, Sabir, Shehzadi, & Abbas, 2014; Ahmed, Sugiyarto, & Jha, 2010). The findings of this article prove the evidence that remittances play a vital role in supporting the development of South Asia by increasing domestic investment.

The indirect impact (financial development channels) was tested by including two interaction terms ($BC \times REM$ and $M2 \times REM$). Also, in accordance with the results previously found, the interaction between remittances and financial development is positive and significant in all specifications. This indicates that remittance inflows are important in relaxing the financial constraints,

Table 5. The Contribution of Remittance to Domestic Investment (1991–2017)

Variables	1	2	2	3
Constant	3.98** (3.45)	1.24* (2.14)	1.14* (2.58)	1.56* (2.48)
GFC _{t-1}	0.90** (20.11)	0.87** (22.11)	0.89** (22.11)	0.86** (13.56)
Trade	0.04* (2.11)	0.03* (2.07)	0.02* (2.17)	0.04* (2.09)
REM	0.11** (3.24)	0.10* (2.72)	0.14* (2.72)	0.12** (3.36)
LR	-0.03 (-1.39)	-0.04 (-1.04)	-0.04 (-1.22)	-0.02 (-0.98)
BC	0.08* (2.35)	0.08* (2.65)	-	-
BC × REM	-	0.005* (2.06)	-	-
M2	-	-	0.05* (2.65)	0.07** (2.69)
M2 × REM	-	-	-	0.01* (2.15)
Gr _{t-1}	0.21** (3.57)	0.17* (2.77)	0.15* (2.57)	0.16** (2.97)
RER	-0.03* (-2.37)	-0.02 (-0.66)	-0.02 (-1.26)	-0.02* (-2.06)
INFRA	0.04* (2.24)	-	0.05* (2.54)	
Long-run coefficient of REM	1.1	1.18	1.18	1.07
AR(1)	-2.9 (0.00)	-3.8 (0.00)	-3.6 (0.00)	-2.9 (0.00)
AR(1)	-1.4 (0.11)	-1.06 (0.18)	-1.32 (0.11)	-1.17 (0.13)
Sargan test:	104.56 (0.16)	75 (0.22)	64 (0.29)	56 (0.43)
Number of Obs.	156	156	156	156

Source: The author.

Notes: ** and * denotes Significance at 1 per cent and 5 per cent level, respectively. Figures in the parentheses are *t*-ratio. AR(1) = Arellano–Bond test for AR(1) in first differences, AR(2) = Arellano–Bond test for AR(2) in first differences.

particularly under the conditions of underdeveloped institutions and inadequate financial intermediation in developing countries. Therefore, financial development has a complementary effect on the use of remittances for investment for the sample countries. Our findings are in contrast with the conclusion of Giuliano and Ruiz-Arranz (2009), and Fayissa and Nsiah (2008), who found that remittances and financial development are substitutes where the financial system is less developed.

Among other determinants of domestic investment, it is found that economic growth appears to be a significant factor driving investment as predicted by accelerator model. Therefore, the real GDP growth rate (Gr) over the previous year is an important determinant of investment since higher growth would imply higher capital requirement, and hence, higher investment rate. Similarly, the coefficients of financial development indicators (bank credit and M2) are found to be positive and statistically significant in all models. This indicates that the development of financial sector is vital for the availability of formal sector credit for investment and, therefore, another important determinant of the investment rate in developing countries (Agrawal, 2000). The coefficient of trade and infrastructure also significantly contributes towards domestic investment in South Asia as their respective coefficients are positive and statistically significant. The coefficient of lending rate is although negative but found insignificant in all estimated models. Most existing studies considering the interest rate (Mody & Murshid, 2005; Wang, 2010) found either negative or inconclusive results as to the role of interest rate as a determinant of investment in developing countries. The coefficient of RER is found negative and significant. This implies that the appreciation of RER may stimulate investment through higher inflows of capital for South Asian countries (Agrawal, 2000). The coefficients of inflation and terms of trade were found to be insignificant in all specification and hence dropped from final estimation.

Panel Causality Between Remittance and Domestic Investment

Although there is some literature (Adams & Klobodu, 2016; Balde, 2011; Issifu, 2018; Massey & Parrado, 1998, among others) that documents positive relationship between remittances and investment, the direction of causality is completely ignored. Even if one accepts, the positive association there is still the question of causality, which is vital for designing policy for effective utilization of remittances. Theoretically, the causal relation between remittances and domestic investment can run in either direction. On the one hand, according to the 'remittance-led growth hypothesis', remittance inflows stimulate investment in the recipient countries by increasing domestic savings, improving human capital and broadening financial sector (Gheeraert et al., 2010; Mundaca, 2009; Rao & Hassan, 2012). On the other hand, the 'Growth-led remittances' hypothesis predicts that higher GDP growth attracts more investment in human capital and skill development that facilitates more migration and higher remittances to origin country. Finally, yet importantly, it is also possible that a causal relationship between remittance and investment does not exist, supporting the so-called 'neutrality hypothesis' (Mallick, 2012; Tung, 2018). Given the ambiguity in the direction of causality, we conduct a causality test between remittances and domestic investment in the panel framework using Dumitrescu and Hurlin (2012) method.

Dumitrescu and Hurlin (2012) proposed a non-causality test for heterogeneous panels that takes into account individual unit fixed effects. The test is based on the estimation of the following regression:

$$DGFC_{it} = \alpha_i + \sum_{k=1}^k \gamma_i^{(k)} DGFC_{it-k} + \sum_{k=1}^k \beta_i^{(k)} DREM_{it-k} + \varepsilon_{it},$$

$$i = 1, \dots, N, t = 1, \dots, T, \tag{8}$$

$$DREM_{it} = \alpha_i + \sum_{k=1}^k \gamma_i^{(k)} DREM_{it-k} + \sum_{k=1}^k \beta_i^{(k)} DGFC_{it-k} + \varepsilon_{it},$$

$$i = 1, \dots, N, t = 1, \dots, T, \tag{9}$$

Individual effects α_i are assumed to be fixed and D represents first difference. The autoregressive parameters $\gamma_i^{(k)}$ and regression coefficient slopes $\beta_i^{(k)}$ in Equation (8) and autoregressive parameters $\beta_i^{(k)}$, and regression coefficients slopes $\gamma_i^{(k)}$ in Equation (9) differ across series. To examine the granger causality from remittances to GFC by testing the null hypothesis,

$$H_0: \beta_i = 0 \text{ for all } i = 1, \dots, N$$

is tested against the alternative:

$$H_a: \beta_i \neq 0 \text{ for some } i \in \{1, \dots, N\}$$

where $\beta \equiv [\beta_i^{(1)}, \dots, \beta_i^{(k)}]'$. This is called the ‘homogeneous non-causality’ hypothesis because the alternative hypothesis allows for the causality from remittances to investment for some but not all individuals. Similarly, to examine the Granger causality from domestic investment to remittances by testing the null hypothesis,

$$H_0: \gamma_i = 0 \text{ for all } i = 1, \dots, N$$

is tested against the alternative:

$$H_a: \gamma_i \neq 0 \text{ for some } i \in \{1, \dots, N\}$$

Table 6 presents the results from the Dumitrescu and Hurlin (2012) test for Granger causality in heterogeneous parameter models between remittances and domestic investment. Optimal lag length is selected based on the AIC. The results

Table 6. Panel Granger Non-causality Test Between Remittances and GFC

Direction of Causality	Statistics	Test Value
REM→GFC	W-bar	11.26**
	Z-bar	5.33*
GFC→REM	W-bar	1.43
	Z-bar	0.27

Source: The author.

Notes: ** Denotes rejection of null hypothesis of no causality at 1% level. Appropriate lag length is selected based on AIC Criteria.

indicate that there exists uni-directional Granger causality between running from remittances to domestic investment for the sample countries. On the other hand, the null hypothesis of no causality from domestic investment to remittances is not rejected by the F -statistics, indicating there is no causality running from domestic investment to remittances. Therefore, panel causality test supports uni-directional causality from remittances to investment. This indicates that higher remittance inflows will increase domestic investment and not vice-versa for South Asia.

Conclusions and Policy Implications

Theoretical studies suggest that remittance inflows may affect domestic investment by increasing savings and consumption, promoting financial development, removing credit constraints and improving human and physical capital in migrant's country. However, empirical literature on these issues are limited, particularly for South Asian countries. Given the limited evidence, this study investigates the role of remittances in augmenting domestic investment for a panel of six South Asian countries over the period 1991–2017. This research question is very important, as developing countries like South Asia have been receiving a significant amount of foreign capital in the form of remittances in recent times. Panel data analysis (unit root, cointegration and causality) and GMM system method are applied to examine this impact.

Our empirical analysis suggests that remittances increase domestic investment in the short term as well as in the long run. The impact of remittance on domestic investment remains consistent and robust with different specifications. The result indicates remittances are not extensively utilized for consumption purpose only, some part of remittances is used for productive purposes like human and physical capital development. The panel causality results suggest the presence of uni-directional causality between remittances and domestic investment for South Asian countries over the study period. Therefore, results of this study support the theoretical argument and previous empirical studies for other developing countries. The implications of this study are:

- From the policy perspective, it can be concluded that remittances have been supportive of the domestic economy, and governments in South Asia should put in place measures to ensure efficient flows of remittances.
- It is also recommended that policies should be put in place to attract more remittances through formal channels as this increases financial development, particularly banking sector and complements domestic investment.
- Policy priority should also be given to improve the quality of infrastructure, financial sector and business climate to improve the efficiency of remittance.
- Policy should be prioritized to encourage productive use of remittance for education, health and business activities.

Appendix A

Westerlund (2007) ECM Cointegration Test

Westerlund's (2007) cointegration test is a structural-based test and considered as second-generation test. The four tests proposed by Westerlund (2007) assess cointegration properties in panel data by determining whether there exists an EC for individual panel members or for the panel as a whole. The tests take no cointegration as the null hypothesis and are based on structural dynamics so that they do not impose any common factor restrictions. Consider the following EC model, where all variables in levels are assumed to be $I(1)$:

$$\Delta y_{it} = \delta'_i d_t + \alpha_i (y_{i,t-1} - \beta'_i x_{i,t-1}) \sum_{j=1}^{p_i} \gamma_{ij} \Delta y_{i,t-j} + \sum_{j=0}^{p_i} \lambda_{ij} \Delta x_{i,t-j} + e_{it} \quad (A1)$$

The parameter α_i measure the speed of adjustment, that is, the speed at which the system returns to his equilibrium after a sudden shock in one of the model variables. The panel statistics are given by:

$$P_a = T \hat{\alpha} \text{ and } P_T = \frac{\hat{\alpha}}{SE(\hat{\alpha})}, \quad (A2)$$

The null and alternative hypotheses for the panel tests are $H_0: \alpha_i = 0$, $H_1: \alpha_i = \alpha < 0$ for all i . The rejection of null should therefore be taken as the rejection of no cointegration for the panel as a whole. G_a and G_T are group statistics, which do exploit the information regarding the EC. The between group mean tests can be calculated by: $G_T = \frac{1}{N} \sum_{i=1}^N \frac{\hat{\alpha}_i}{SE(\hat{\alpha}_i)}$ and

$$G_a = \frac{1}{N} \sum_{i=1}^N \frac{T \hat{\alpha}_i}{\hat{\alpha}_i}$$

The null and alternative hypotheses for the group tests are $H_0: \alpha_i = 0$, $H_1: \alpha_i < 0$ for at least some i . It means that the rejection of null indicates the presence of cointegration for at least one cross-sectional unit in the panel. As Westerlund (2007) demonstrates, the four tests could be adjusted to individual-specific short-run dynamics, including serially correlated error terms and non-strictly exogenous regressors, individual-specific intercept and trend terms. In sum, Westerlund's (2007) test has the advantage of greater power over the popular residual-based tests provided weak exogeneity condition is satisfied. In addition, the test allows for heterogeneity across the individual units of the panel.

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Notes

1. Foreign direct investment (FDI) and Foreign portfolio investment (FPI) are private capital flows and complement domestic investment by increasing productive capacity through various channels; remittances, on the other hand, are private transfer to households in home country, and its investment impact depends on the amount used for the purpose of education, health, human capital formation, entrepreneurial activity and savings. Therefore, the strength of the relationship between inflow of remittances and domestic investment is expected to be weak as compared to FDI/FPI inflows.
2. Remittances may ease credit constraints because a stable stream of remittance income may make households more creditworthy in the eyes of formal sector financial institutions. In addition, remittances provide an alternative way to finance investments and help overcome liquidity constraints (World Bank, 2006).
3. Reliable estimates of remittances through unofficial channel are not available.
4. See Appendix A for details on Westerlund (2007) panel cointegration test.
5. There are a number of advantages in using GMM estimations. The GMM system methodology not only removes any bias that may occur from neglecting dynamic endogeneity but also gives good instruments that address simultaneity, while removing any unobservable heterogeneity (Lartey, 2011).
6. To test the stability, we use O test developed by Hall and Sen (1999). Results of this test indicate that the over-identifying restrictions are stable over the entire sample.

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