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Remittances and domestic investment in BRICS: Does financial development matter?

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ABSTRACT

The study investigated the impact of remittances on domestic investment within the BRICS region. It also explored the complementarity effect (remittance and financial development) on domestic investment using the same data set. The existing literature shows a lack of consensus; hence, their findings are mixed, inconsistent, and divergent, and they show an absence of consensus. The study employed fixed effects, fully modified ordinary least squares (FMOS), and pooled ordinary squares (OS). Panel data used ranged from 1989 to 2020. Using personal remittance inflow per capita as a proxy, remittance's influence on domestic investment was positive and significant across all three panel methods. When personal remittances received were employed as a proxy, remittance's impact on domestic investment was significantly deleterious under the pooled OS. Financial development significantly improved domestic investment, as observed by Pooled OS (all three models) and FMOS (model 3). Pooled OS (model 1) and FMOS (model 2) produced results that show that financial development improved remittances' ability to significantly improve domestic investment. The study shows that remittances are a critical element in enhancing domestic investment in BRICS. BRICS nations are urged to develop policies that enhance financial development and remittance inflow to improve domestic investment.

Contribution/ Originality: This study is the first to investigate whether remittances influence domestic investment through the financial sector. This is the first study on the remittance–domestic investment nexus to focus on BRICS. This study also addressed the issue of omitted variable bias by incorporating a financial development variable.

1. INTRODUCTION

Consistent with the World Bank (2014) remittances from outside the country to developing countries grew significantly during the last two decades, both in terms of their share of the gross domestic product (GDP) and in absolute terms. Their importance in terms of being the source of household income, funding education, health, and investment for the receiving families is well documented (Aggarwal, Demirgüç-Kunt, & Pería, 2011). According to Bhattacharya, Inekwe, and Paramati (2018) remittances are the second or first largest external financing source, alternating with foreign direct investment (FDI) in most developing nations. In line with Keho (2024) World Bank statistics show that the inflow of remittances into Sub-Saharan Africa went up from 0.8 percent of gross domestic product (GDP) in 1990 to 1.3 percent of GDP in 2000, attaining 2.8 percent of GDP in 2019 before going down to

2.5 percent of GDP in 2020 in response to the coronavirus disease pandemic. This trend has so far incited many researchers to empirically explore the influence of remittance on economic development and growth.

The literature generally agrees that remittances play a crucial role in steering economic growth in construction. What these empirical studies generally agree on is that remittance inflow enhances economic growth through the financial sector's ability to mobilize savings and investment (Keho, 2024). This paper explores the impact of remittance on domestic investment in BRICS (Brazil, Russia, India, China, and South Africa). Several empirical studies attempted to research a similar area, but their methodological deficiencies are as follows: Firstly, none of these studies concentrated on BRICS, a significant player in the global economy whose remittance-investment narrative remains untold. Secondly, the use of outdated data characterizes most of these empirical research works. Thirdly, the endogeneity problem, a common issue in domestic investment data, received no attention. Fourthly, the study largely ignored the influence of financial development on remittance and domestic investment.

Few empirical studies investigated the financial sector's role in the remittance-domestic investment nexus. Their differences with the current empirical study are listed next. Keho (2024) carried out a similar study, but the difference with the current study hinges on the following. Keho (2024) focused on West African countries, used panel data up to 2019, avoided sensitivity analysis using remittance data, and employed the panel pooled mean group estimation method.

Issifu (2018) focused on Sub-Saharan Africa, did not perform sensitivity analysis, employed panel data (1984-2014), and used a fixed effects model. Nyeadi, Adams, and Musah (2022) whose study focused on Africa, also avoided sensitivity analysis and used system generalized methods of moments (GMM) with panel data from 2004 to 2018. Adeniyi, Afolabi, Adekunle, Babatunde, and Omiwale (2022) used Sub-Saharan Africa as a focal point, did not perform sensitivity analysis, and employed panel ARDL with data ranging from 1990 to 2017. Githaiga (2020) also used Sub-Saharan Africa as a unit of analysis, used data ranging from 1986, ignored sensitivity analysis, and employed multiple regression analysis. The study was narrowly focused because it excluded other financial sector proxies. The current study fills these gaps.

2. REMITTANCES' IMPACT ON DOMESTIC INVESTMENT–LITERATURE REVIEW

According to Bettin and Zazzaro (2012) the influence of remittance inflow in the economy relies on whether it is used to fund work-related projects or leisure activities or whether it is channeled towards investment or consumption expenditures. In line with Ratha (2003) the positive view says that remittances help economic growth and development by investing in physical capital, savings, and human capital, and by encouraging the growth of the financial market and smoothing out consumption. The pessimistic view is that remittance negatively influences savings, domestic investment, and economic growth because it promotes consumption expenditure at the expense of domestic investment (Cattaneo, 2005). The overdependence on remittances without motivating the recipients to work also curtails economic growth initiatives, according to the pessimistic theoretical rationale (Anyanwu & Erhijakpor, 2010). None of these theoretical views on the relationship between remittances and domestic investment explained the channels or absorption capacities involved.

Ratha (2003) outlined three channels by which remittances enhance domestic investment, economic development, and growth. Remittance inflow provides the necessary funding to initiate small-scale projects that stimulate not only domestic investment and employment creation but also overall community development. Remittance inflow increases household consumption, which also leads to improved demand for goods and services manufactured, hence overall enhancing domestic investment, employment creation, and economic development and growth. The economy experiences a multiplier effect as the majority of the remittance inflow fuels the consumption of domestically produced goods. The theoretical arguments by Ratha (2003) assume that the link between remittances and domestic investment is direct, yet recent studies have shown that there is an indirect relationship between the two variables.

The remittances-domestic investment hypothesis was the subject of several empirical studies. We will discuss the five categories in which their findings fall. The positive view, which says that remittance enhances domestic investment, was supported by Dash (2020); Bjuggren, Dzansi, and Shukur (2008); Magwedere and Marozva (2023); Issifu (2018); Javad (2017); Chetachukwu, Izuka, and Ezenekwe (2019); Hossain and Sunmoni (2021); Ogbonna, Nwonumara, Eze, and Kenneth (2024); Privara and Trnovsky (2021); Nwokolo, Ogbuagu, and Isola (2021); Incaltarau and Maha (2012); Chetachukwu, Emmanuel, and Kingsley (2021) and Didiya (2019).

The negative view, which argues that remittances' impact on domestic investment is deleterious, was supported by Tung (2018); Dhakal (2020); Nyeadi et al. (2022); Amutabi (2023); Adeniyi et al. (2022) and Chaudhary (2022). The feedback view, which says the remittance and domestic investment influence one another, was supported by Keho (2024).

The channel view, which argues that remittance influences domestic investment indirectly through some channels, was supported by empirical studies such as Keho (2024); Bjuggren et al. (2008); Issifu (2018); Nyeadi et al. (2022); Adeniyi et al. (2022); Githaiga (2020) and Barth (2017). The neutrality view, which says there is a negligible, non-significant, or no relationship at all between remittances and domestic investment, was supported by Amutabi (2023); Nonyelum, Nwannediuto, and Valerie (2023); Haque, Kibria, and Selim (2021) and Ali (2013).

Table 1 summarizes the empirical literature on the relationship between remittances and domestic investment.

Table 1. Remittance led domestic investment nexus - Empirical literature point of view.

Author	Country/Countries of study	Period	Methodology	Results
Keho (2024)	Sub-Saharan Africa	1975-2019	Panel pooled mean group estimation method	The interaction between remittances and financial development enhanced domestic investment in Sub-Saharan Africa. Financial development and remittances complemented each other in promoting domestic investment.
Dash (2020)	South Asian countries	1991-2017	Panel data analysis	Remittances in South Asia enhanced domestic investment, according to short- and long-run results. The study noted that remittances not only promoted consumption expenditures but also facilitated investment in both physical and human capital.
Bjuggren et al. (2008)	Developing countries	1995-2005	Panel data analysis	Remittances, alongside a developed credit market and institutional framework, improved domestic investment.
Tung (2018)	Asia-Pacific region	1980-2015	Fixed effects model	Remittances have a negative impact on domestic investment, according to research.
Magwedere and Marozva (2023)	African countries	2000-2021	Dumitrescu-Hurlin causality and panel auto regressive distributed lag	Remittance was found to be a key driver of domestic investment.
Dhakal (2020)	Nepal	Survey data	Multiple regression model	A negative relationship running from remittances towards domestic investment was found.
Issifu (2018)	Sub-Saharan Africa	1984-2014	Fixed effects model	Remittances significantly improved domestic investment in Sub-Saharan Africa. Political institutions enhanced remittances' positive effect on domestic investment. The interaction term (Financial development x remittance) showed a modest influence on domestic investment in Sub-Saharan Africa.
Nyeadi et al. (2022)	Africa	2004-2018	System generalized methods of moments (GMM)	Remittances negatively affected domestic investment in Africa. Interaction between the development of the banking sector and remittances improved domestic investment. Good governance enhances the domestic investment influence of remittances.
Javad (2017)	Pakistan	Survey data	Multiple regression analysis	Causality of a uni-directional nature from remittances towards domestic investment was observed.
Amutabi (2023)	Kenya	1980-2020	Autoregressive distributive lag (ARDL)	In the short run, remittances reduced domestic investment, while in the long run, a positive influence of remittance on domestic investment was not only insignificant but negligible.
Adeniyi et al. (2022)	Sub-Saharan Africa	1990-2017	ARDL	In the long run, remittances decreased the savings-investment gap. The combination between the financial sector and remittances also further reduced the gap.
Chetachukwu et al. (2021)	Nigeria	2000 survey data	Vector error correction model (VECM) and ordinary least squares (OS)	The rate of private investment was enhanced by remittances. Domestic private investment was observed to have been enhanced by its own earlier values.

Author	Country/Countries of study	Period	Methodology	Results
Hossain and Sunmoni (2021)	Sub-Saharan Africa	Survey data	Bivariate probit model	Recipients of remittance were found to be more likely to invest in social and human capital.
Githaiga (2020)	Sub-Saharan Africa	1986-2017	Multiple regression model	The combination between remittances and banking sector development enhanced domestic investment in a significant way.
Ogbonna et al. (2024)	Nigeria	1986-2021	ARDL	Remittances significantly increased private domestic investment in Nigeria.
Privara and Trnovsky (2021)	Baltics	2010-2017	OS and fixed effects	In the long run, remittances were found to be key drivers of savings and investment.
Nwokolo et al. (2021)	Africa	1995-2017	Panel auto regression distributive lag	Remittances led domestic investment hypothesis was empirically supported.
Chetachukwu et al. (2021)	Nigeria	1981-2020	Toda and Yamamoto causality approach	Remittances improved domestic investment in Nigeria.
Didiya (2019)	Nepal	1974-2017	Multiple regression model	Remittances significantly increased domestic investment in Nepal.
Nonyelum et al. (2023)	Nigeria	1981-2020	ARDL	Remittances insignificantly improved domestic investment, both in the long and short run, was noted.
Haque et al. (2021)	South Asia	1985-2018	Fixed effects (2SLS)	Remittance insignificantly enhanced domestic investment in South Asia.
Incaltarau and Maha (2012)	Romania	1970-2009	Ordinary least squares	Remittance significantly enhanced investment more than consumption in Romania
Barth (2017)	Developing countries	2004-2015	System GMM	Both the financial sector and remittances complemented one another in promoting domestic investment.
Chaudhary (2022)	Nepal	2000-2019	ARDL	Remittances had a deleterious effect on gross capital formation (GCF) in Nepal.
Ali (2013)	Developing countries	1980-2006	Panel VECM	No relationship was observed between remittances and domestic investment in developing nations.

A summary of their methodological deficiencies is as follows: Firstly, all these empirical studies ignored the endogeneity problem prevalent in the domestic investment data set. Secondly, the majority of them did not capture the indirect way remittances affect domestic investment. Thirdly, none of them specifically addressed BRICS, thereby leaving an unexplored narrative about the relationship between remittances and domestic investment within this economic bloc. Fourthly, the majority's data set is now outdated, rendering it unsuitable for current policy-making purposes. Fifthly, these empirical studies used only one proxy of remittances, a weakness on its own, as such a study cannot lead to a comprehensive understanding of how remittances affect domestic investment. The current study used three proxies of remittances.

According to empirical literature, findings are mixed and divergent. Remittances do not have a single, agreeable effect on domestic investment. It is for these reasons that the author carried out this study to further contribute to the literature on the remittance-domestic investment nexus, using BRICS as a focal point.

3. INFLUENCE OF FINANCIAL DEVELOPMENT ON DOMESTIC INVESTMENT

According to Keynes (1936) a financial sector that is developed, stable, and versatile helps to mitigate investment risks, thereby instilling investor confidence and promoting investment activities in general. Shaw (1973) argued that capping interest rates, credit allocation, credit expansion, and reserve requirements elevation all stifle domestic investment and economic growth in general. A stable and efficient financial system not only spurs economic growth but also enhances effective distribution of funds, production, and domestic investment growth. Three channels through which domestic investment is enhanced by financial development were laid bare by Dutta and Roy (2009). A developed financial sector is more efficient in the allocation of capital among different investment projects. Developed financial markets provide less costly information in the market, thereby contributing to the lowering of costs incurred in undertaking domestic investment projects. A well-developed financial system makes it easier for people to save money and bring in capital from both inside and outside the country. This capital is then used to fund technologies that make more capital and general domestic investment.

4. OTHER FACTORS THAT INFLUENCE DOMESTIC INVESTMENT

This section describes how other variables apart from remittances influence domestic investment. These include savings, economic growth, trade openness, infrastructure development, human capital development, and foreign direct investment.

Table 2. Apriori theoretical influence of independent variables on domestic investment.

Variables	Theory intuition	Expected sign.	Proxy used
Savings (SAV)	According to Feldstein and Horioka (1980) domestic savings by the public are deposited to accounts of financial institutions, and these are then converted into investment packages by these financial institutions to secure enough return for the depositors and themselves in the form of better interest rates.	Positive	Gross domestic savings (% of GDP)
Infrastructure development (INFR)	Ansar, Flyvbjerg, Budzier, and Lunn (2016) argued that costs of doing business are significantly reduced by a developed infrastructure, hence quickening and enhancing the rate and level of domestic investment. The same research noted that domestic investment in the financial sector, human capital, and small business sector thrives better in a macroeconomic environment characterized by a developed infrastructure.	Positive	Fixed telephone subscriptions per one thousand people
Interaction term (REMIT.FIN)	Through increasing savings inflow, remittances improve the ability of the financial system to avail private sector credit, thereby boosting investment in the economy (Keho,	Positive/ Negative	Domestic credit to private sector as a ratio of GDP

Variables	Theory intuition	Expected sign.	Proxy used
	2024). Fayissa and Nsiah (2010) argued that remittance can compensate for less efficient and developed financial credit markets by acting as an alternative financial source of investment.		X personal remittances received as a ratio of GDP
Economic growth (GROWTH)	Khatib, Altaleb, and Alokor (2012) argued that both local and foreign firms make better profits and are more likely to re-invest domestically if the economy is experiencing growth.	Positive	GDP per capita
Human capital development (HCD)	According to Khatib et al. (2012), human capital development enhances domestic investment through enabling and equipping the people with knowledge on nurturing small businesses, project evaluation, structuring efficient investment allocation decisions, and general investment management.	Positive	Human capital development index
Trade openness (OPEN)	A high trade openness economy allows outflow of capital, thereby contributing to a slowdown in the rate of domestic investment (Bibi, Khan, & Bibi, 2012). The same study also noted that trade openness allows simple and quick inflow into the country of raw materials, technology, and human capital resources, all of which spur domestic investment.	Positive/ Negative	Total trade (% of GDP)
Foreign direct investment (FDI)	Romer (1986) argued that foreign direct investment brings in resources (Technology, technical know-how, labour training, managerial sophistication, physical capital) that are very important in promoting domestic investment.	Positive	Net foreign direct investment (% of GDP)

5. BRICS' REMITTANCES AND DOMESTIC INVESTMENT TRENDS

Figure 1 shows that Brazil's gross capital formation (GCF) massively declined from 26.90% of GDP in 1989 to 17.29% of GDP in 1995. It went up by 1.61 percentage points (1995–2000) before plummeting from 18.90% of GDP to 17.20% between 2000 and 2005. Between 2005 and 2010, GCF for Brazil increased by 4.60 percentage points. It then declined from 21.80% of GDP in 2010 to 17.41% of GDP in 2015. It further decreased by 1.48 percentage points during the subsequent five-year period ranging from 2015 to 2020.

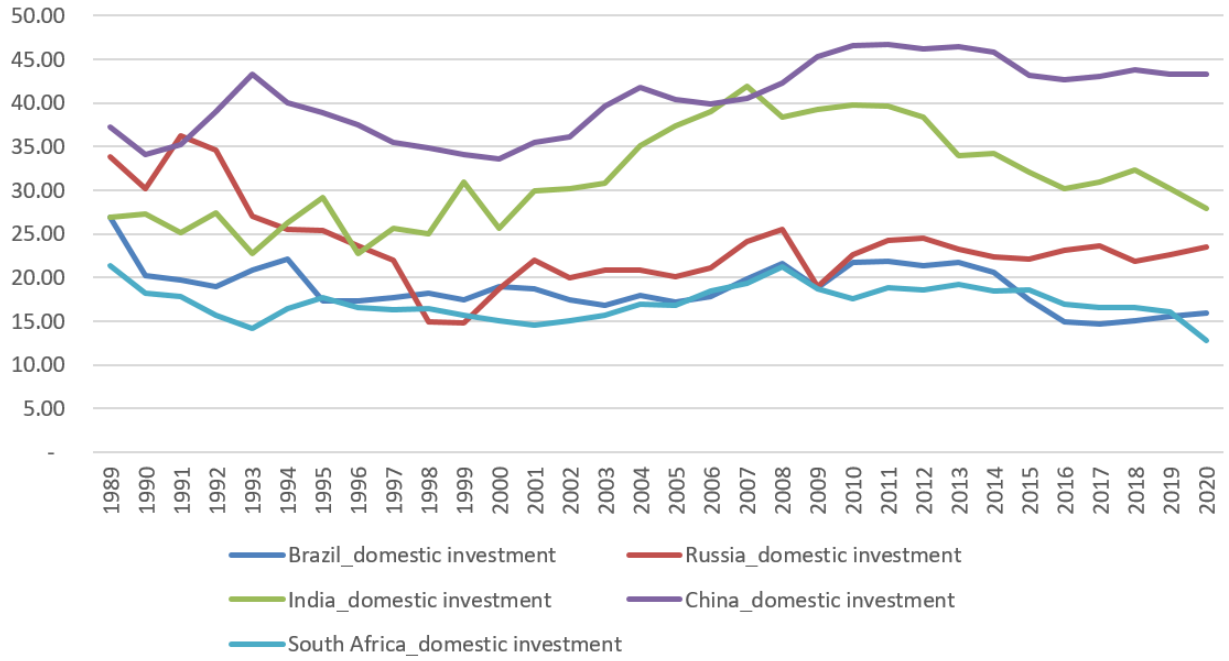

Figure 1. Trend for gross capital formation as a ratio of GDP for BRICS nations.

As for Russia, its GCF massively plummeted from 33.84% of GDP in 1989 to 25.44% of GDP in 1995, declined by 6.75 percentage points (between 1995 and 2000), gained 1.38 percentage points between 2000 and 2005, before going up from 20.08% of GDP in 2005 to 22.62% of GDP in 2010.

Russia's GCF marginally declined from 22.62% of GDP in 2010 to 22.15% of GDP in 2015 before increasing by 1.34 percentage points, from 22.15% of GDP in 2015 to 23.48% of GDP in 2020. India's GCF went up from 26.86% of GDP in 1989 to 29.15% of GDP in 1995, decreased by 3.48 percentage points between 1995 and 2000, massively increased by 11.75 percentage points (2000 – 2005) before experiencing a growth of 2.36 percentage points between 2005 and 2010. The GCF of India went down massively by 7.67 percentage points (2010 – 2015) before declining from 32.12% of GDP to 27.90% of GDP between 2015 and 2020.

China's GCF increased from 37.21% of GDP in 1989 to 38.84% of GDP in 1995, declined by 5.26 percentage points between 1995 and 2000, grew by 6.77 percentage points between 2000 and 2005, before further experiencing an increase from 40.35% of GDP in 2005 to 46.56% of GDP in 2010. GCF for China plummeted by 3.32 percentage points between 2010 and 2015 before marginally increasing from 43.23% of GDP in 2015 to 43.37% of GDP in 2020. South Africa's gross capital formation decreased from 21.31% of GDP in 1989 to 17.70% of GDP in 1995, declined by 2.64 percentage points between 1995 and 2000, went up by 1.77 percentage points between 2000 and 2005, before marginally growing from 16.83% of GDP in 2005 to 17.60% of GDP in 2010. The period from 2010 to 2015 saw South Africa's GCF increasing by 1.04 percentage points and then massively falling from 18.63% of GDP to 12.75% of GDP between 2015 and 2020.

In Figure 2, Brazil's personal remittances received grew from 0.03% of GDP in 1989 to 0.38% of GDP in 1995, went down by 0.18 percentage points (1995–2000), and went up by 0.11 percentage points between 2000 and 2005 before marginally falling from 0.31% of GDP in 2005 to 0.14% of GDP in 2010. Personal remittances received for Brazil grew by 0.02 percentage points (from 2010 to 2015), increasing from 0.16% of GDP in 2015 to 0.25% of GDP in 2020.

Russia's personal remittances received went down from 0.16% of GDP in 1989 to 0.04% of GDP in 1995, increased by 0.15 percentage points (1995 to 2000), grew from 0.19% of GDP to 0.45% of GDP between 2000 and 2005, and plummeted by 0.11 percentage points (from 2005 to 2010). Russia's personal remittances received went up from 0.34% of GDP in 2010 to 0.51% of GDP in 2015 and then grew by 0.16 percentage points between the periods from 2015 to 2020.

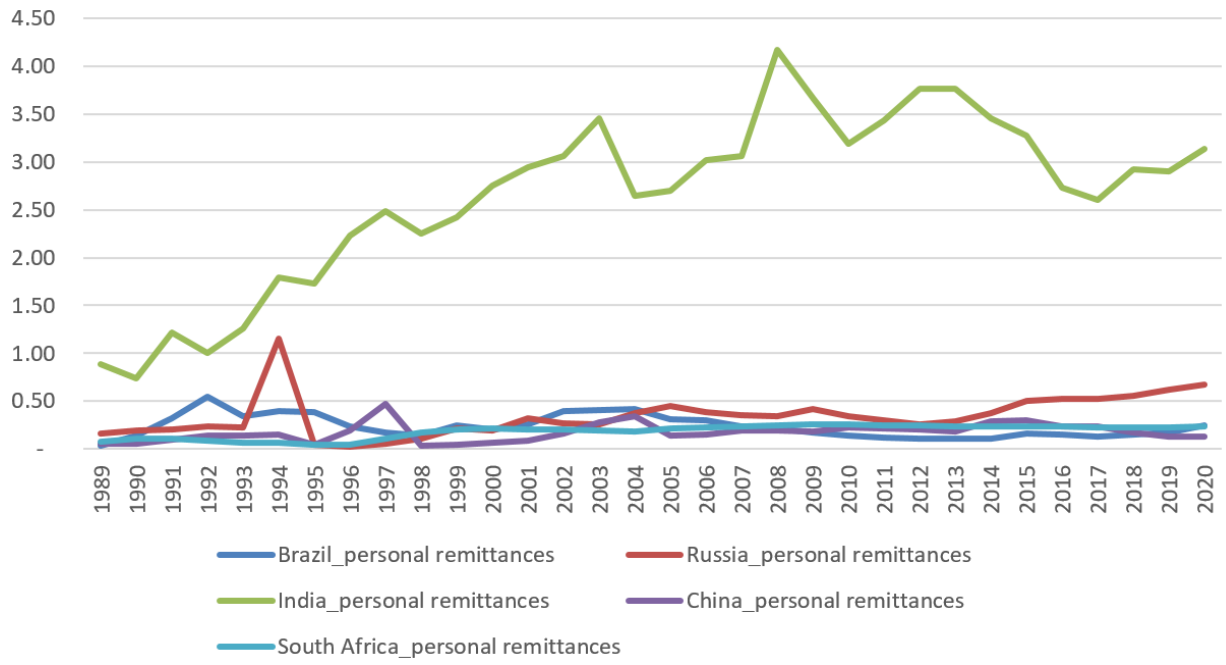

Figure 2. Trends for personal remittances received as a ratio of GDP for BRICS nations.

India's personal remittances received grew from 0.88% of GDP to 1.73% of GDP (between 1989 and 1995), increased by 1.02 percentage points (1995 to 2000), and declined by 0.05 percentage points between 2000 and 2005 before increasing from 2.70% of GDP to 3.19% of GDP (2005–2010). Between 2010 and 2015, India's personal remittances received went up by 0.08 percentage points before decreasing from 3.28% of GDP to 3.13% of GDP (2015-2020).

China's personal remittances plummeted by 0.01 percentage points from 1989 to 1995; they increased from 0.05% of GDP in 1995 to 0.06% of GDP in 2000 before experiencing successive growth of 0.08 percentage points between (1) 2000 and 2005, (2) 2005 and 2010, and (3) 2010 and 2015. Five years between 2015 and 2020 saw China's personal remittances received marginally plummeting from 0.30% of GDP to 0.13% of GDP between 2015 and 2020.

For South Africa, its personal remittances declined from 0.08% of GDP in 1989 to 0.05% of GDP in 1995, increased by 0.17 percentage points (1995–2000), remained unchanged between 2000 and 2005, and marginally went up by 0.04 percentage points during the period between 2005 and 2010. Personal remittances received for South Africa declined from 0.26% of GDP in 2010 to 0.24% of GDP in 2015 and remained the same between 2015 and 2020.

6. RESEARCH METHODOLOGY

The secondary panel data for BRICS, which was used in this study, ranged from 1989 to 2020 and was extracted from World Development Indicators, Africa Development Bank, and International Financial Statistics. These are reputable and verifiable international sources whose data is publicly downloadable. This data is for the variables, such as domestic investment and explanatory variables. In line with the main theme, the domestic investment function is expressed by the following model, Equation 1.

$$DINVEST = f(REMIT, FIN, SAV, INFR, GROWTH, HCD, OPEN, FDI) \quad [1]$$

DINVEST stands for domestic investment as measured by gross capital formation as a ratio to GDP, while REMIT represents remittances received. The study looked at three different ways to measure remittances: personal remittances received as a percentage of GDP (model 1), personal remittances inflow per capita (model 2), and total remittances inflow as a percentage of GDP (model 3). Domestic credit to the private sector measures FIN, or financial development, as a ratio of GDP. SAV represents savings, and INFR is infrastructure development. Economic growth, trade openness, human capital development, and foreign direct investment are abbreviated by GROWTH, HCD, OPEN, and FDI, respectively. Table 2 displays the proxies for these independent variables of the domestic investment function.

This group of empirical researchers on how remittances affect domestic investment helped choose both the independent variables of the domestic investment function and the variables that stood in for them. These are Ogbonna et al. (2024); Chaudhary (2022); Nonyelum et al. (2023); Githaiga (2020); Issifu (2018); Nyeadi et al. (2022); Keho (2024); Chetachukwu et al. (2021); Javad (2017) and Tung (2018) among others.

$$DINVEST_{it} = \beta_0 + \beta_1 REMIT_{it} + \beta_2 FIN_{it} + \beta_3 (REMIT_{it}.FIN_{it}) + \beta_4 SAV_{it} + \beta_5 INFR_{it} + \beta_6 GROWTH_t + \beta_7 HCD_{it} + \beta_8 OPEN_{it} + \beta_7 FDI_{it} + \mu + \varepsilon \quad [2]$$

Equation 2 is the econometric version of model 1 presented earlier. Consistent with Keho (2024) whose study noted that financial development enhanced remittances' positive influence on domestic investment in West African countries, the interaction term (REMIT.FIN) was included in Equation 2 as one of the independent variables influencing domestic investment. A significant positive value of the interaction values co-efficient implies that domestic investment is enhanced by the interaction between remittances and financial sector development. A significant but negative co-efficient value of the interaction term implies that domestic investment is deleteriously affected by the complementarity term.

Rationale of the Methodology Used: FMOS, pooled OS, and fixed effects were used in this study. These econometric estimation methods are ideal because they are suitable for analyzing panel data. They can better account for effects that are unique to each country and separate the effects of variables that change over time.

7. MAIN DATA ANALYSIS, RESULTS PRESENTATION, AND INTERPRETATION

Table 3 is the presentation of descriptive statistics, which show the character of the data employed.

Table 3. Descriptive statistics.

Variables	DINVEST	REMIT	FIN	SAV	INFR	GROWTH	HCD	OPEN	FDI
Mean	26.30	0.72	74.51	28.09	12.80	4577.21	0.70	40.16	1.96
Median	22.74	0.24	64.81	26.69	10.81	3474.07	0.72	41.96	1.67
Maximum	46.66	4.17	211.89	51.09	31.79	15974.64	0.83	110.58	6.19
Minimum	12.75	0.03	18.42	15.09	0.49	301.16	0.43	14.39	0.01
Standard deviation	9.55	1.05	44.98	9.98	8.85	3782.75	0.09	15.12	1.49
Skewness	0.62	1.84	1.43	0.60	0.33	0.89	-0.99	0.52	0.65
Kurtosis	2.06	4.87	4.46	2.32	1.99	2.98	3.56	4.45	2.60
Jarque-Bera	16.09	113.79	68.31	12.80	9.61	20.95	28.15	21.23	12.43
Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

It is clear from Table 3 that financial development and economic growth have got range values of more than 100, whilst the standard deviation of economic growth also exceeds 100. This is evidence that there are extreme values in these two variables. The fact that only human capital development is skewed to the left is an indication that the data employed does not follow a normal distribution curve. The probability values of the Jarque-Bera criterion also demonstrate the data's failure to follow a normal distribution pattern.

Table 4's correlation results are inconclusive because they don't indicate the direction of causality.

Table 4. Correlation results.

Variables	DINVEST	REMIT	FIN	SAV	INFR	GROWTH	HCD	OPEN	FDI
DINVEST	1.00								
REMIT	0.30***	1.00							
FIN	0.68***	-0.09	1.00						
SAV	0.69***	0.06	0.63***	1.00					
INFR	-0.14*	-0.50***	0.08	0.17**	1.00				
GROWTH	-0.26***	-0.40***	0.12	-0.15*	0.61***	1.00			
HCD	-0.23***	-0.58***	0.03	0.05	0.62***	0.54***	1.00		
OPEN	0.10	-0.02	0.02	0.34***	0.32***	0.11	0.22***	1.00	
FDI	0.24***	-0.16**	0.40***	0.27***	0.38***	0.19**	0.19**	0.04	1.00

Note: *, ** and *** respectively denote 10%, 5% and 1% significance levels.

Significant positive correlation was observed between (1) domestic investment and remittances, (2) domestic investment and financial development, (3) domestic investment and savings, and (4) domestic investment and foreign direct investment. These results generally resonate with existing theoretical and empirical literature. A negatively significant correlation between domestic investment and economic growth, infrastructure, and human capital development was also noted. Such results contradict literature available. The correlation between trade openness and domestic investment was non-significantly positive. Tsaurai (2018)'s criteria revealed no multicollinearity problem in this study.

It was possible to fix the issue of strange numbers and data that didn't follow a normal distribution pattern by putting the data in natural logarithm form, which is what Tsaurai (2018) says should be done. Table 5 shows that the data was stationary at the first difference, allowing the study to pursue Johansen-Fisher panel co-integration tests.

Table 5. Panel unit root tests (Individual intercept).

Level				
Variables	**Levin, Lin, and Chu (2002)**	**IPS Im, Pesaran, and Shin (2003)**	**Augmented Dick Fuller (ADF) fisher chi square**	**PP Phillip Peron (PP)**
DINVEST	-0.26	-0.87	11.90	16.72*
REMIT	-3.13***	-3.21***	29.40***	30.41***
FIN	-0.53	1.10	6.76	15.73
SAV	-1.32*	-1.65*	17.71*	25.35***
INFR	-3.98***	-1.61*	20.52**	16.14*
GROWTH	-1.00	1.10	4.59	3.42
HCD	-3.19***	-2.70***	25.10***	32.93***
OPEN	-2.29**	-1.90**	20.09**	22.62**
FDI	-3.28***	-2.63***	23.10**	18.70**
First difference				
DINVEST	-5.54***	-6.70***	60.74***	100.73
REMIT	-4.01***	-7.94***	73.49***	123.74***
FIN	-4.01***	-6.49***	60.29***	72.50***
SAV	-3.61***	-5.67***	51.95***	103.03***
INFR	-7.13***	-5.76***	85.18***	104.25***
GROWTH	-3.43***	-4.01***	34.38***	45.06***
HCD	-11.29***	-10.74***	103.50***	133.39***
OPEN	-5.11***	-5.93***	54.50***	110.67***
FDI	-6.66***	-7.73***	71.62***	115.04***

Note: *, ** and *** respectively denote 10%, 5% and 1% significance levels.

Table 6. Johansen Fisher's approach.

Hypothesised number of co-integrating equations	Fisher's trace test	Probability	Fisher's max-eigen test	Probability
None	99.74	0.0000	479.2	0.0000
At most 1	475.9	0.0000	173.0	0.0000
At most 2	236.6	0.0000	144.1	0.0000
At most 3	150.0	0.0000	73.36	0.0000
At most 4	88.76	0.0000	36.24	0.0001
At most 5	58.91	0.0000	29.62	0.0010
At most 6	36.18	0.0000	26.45	0.0032
At most 7	19.33	0.0363	19.36	0.0359
At most 8	10.74	0.3779	10.74	0.3779

At most seven co-integration relationships were observed (see Table 6), hence triggering the researcher to go ahead with the main data analysis, consistent with Sghaier and Abida (2013). These three models differ in the type of remittance proxy they use. Model 1 used personal remittance as a ratio of GDP; Model 2 employed personal remittance inflow per capita, while Model 3 used total remittance inflow as a ratio of GDP.

Table 7 presents Fixed effects results.

Table 7. Fixed effects.

Variables	Model 1	Model 2	Model 3
REMIT	-0.11	0.12**	0.05
FIN	0.04	0.14	0.0004
REMIT.FIN	0.03	0.02	0.004
SAV	0.52***	0.49***	0.47***
INFR	0.0003	0.004	0.01
GROWTH	0.10**	0.08*	0.10**
HCD	0.10	0.13	0.18
OPEN	0.04	0.06	0.06
FDI	0.02	0.02	0.02
Adjusted R-squared	0.69	0.61	0.67
F-statistic	43.61	45.74	44.70
Prob (F-statistic)	0.00	0.00	0.00

Note: *, ** and *** respectively denote 10%, 5% and 1% significance levels.

Model 1 (fixed effects), model 3 (pooled OS), and model 1 for FMOS show that remittance insignificantly reduced domestic investment, whilst model 1 (pooled OS) indicates that domestic investment was significantly decreased by remittance. These results agree with Cattaneo (2005), whose study supported the pessimistic view which says that remittance negatively influences savings, domestic investment, and economic growth because it promotes consumption expenditure at the expense of domestic investment. They also agree with existing empirical research done by Tung (2018); Nyeadi et al. (2022); Dhakal (2020); Adeniyi et al. (2022); Amutabi (2023) and Chaudhary (2022).

Model 3 (fixed effects, FMOS) indicates an insignificant positive correlation running from remittances towards domestic investment, whereas model 2 across all three estimation techniques shows that domestic investment was significantly improved by remittances. These results support Ratha (2003) argument that remittances enhance economic development and growth directly through savings and investment in human capital and physical capital and indirectly by promoting financial market deepening and smoothening consumption. These findings resemble the results produced by empirical studies done by Nwokolo et al. (2021); Chetachukwu et al. (2021); Incaltarau and Maha (2012) and Didiya (2019).

All three models with fixed effects and models 1 and 2 with FMOS showed that financial development did not have a big effect on increasing domestic investment. However, models 1, 2, and 3 (pooled OS) and model 3 (FMOS) showed that the financial sector did have a big effect on increasing domestic investment. These results generally support that financial development enhances domestic investment, in line with Keynes (1936) whose study argued that a financial sector that is developed, stable, and versatile helps to mitigate investment risks, thereby instilling investor confidence and promoting investment activities in general.

It was found that the interaction term had a small but positive effect on domestic investment in all three models: FMOS (models 1 and 3), pooled OS (models 2 and 3), and fixed effects (all three models). Model 1 (pooled OS) and model 2 (FMOS) indicate a significant positive relationship from the interaction term towards domestic investment. These results support the theoretical literature view that remittances improve the financial system's ability to avail private sector credit, thereby boosting investment in the economy (Keho, 2024). They also support Keho (2024) theoretical rationale that financial development enhanced remittances' positive influence on domestic investment. The results also resonate with earlier empirical research work done by Keho (2024); Issifu (2018); Bjuggren et al. (2008); Adeniyi et al. (2022); Nyeadi et al. (2022)l Barth (2017) and Githaiga (2020).

Table 8 presents Pooled OS results.

Table 8. Pooled OLS.

Variables	Model 1	Model 2	Model 3
REMIT	-0.25***	0.07**	-0.07
FIN	0.21***	0.17***	0.15***
REMIT.FIN	0.07***	0.01	0.03
SAV	0.87***	0.86***	0.89***
INFR	0.02	0.03*	0.03*
GROWTH	0.004	0.01	0.02*
HCD	-0.30***	0.29**	0.32***
OPEN	-0.16***	0.13***	0.15***
FDI	0.004	0.002	0.001
Adjusted R-squared	0.67	0.71	0.64

Note: *, ** and *** respectively denote 10%, 5% and 1% significance levels.

All three models (fixed effects, pooled OS, and model 2) agreed that savings had a big effect on increasing domestic investment. Models 1 and 3 (FMOS), on the other hand, showed that savings only slightly increased domestic investment. Such results indicate that savings enhance domestic investment, in line with Feldstein and

Horioka (1980) argument that savings (domestic) by the public are deposited into accounts of financial institutions, and these are then converted into investment packages to get a good return for the depositors.

All three models (fixed effect, FMOS, and model 1 of the pooled OS) showed that improving infrastructure didn't make a big difference in domestic investment. But models 2 and 3 of the pooled OS showed that improving infrastructure did make a big difference in domestic investment. This agrees with Ansar et al. (2016) who argued that climate conducive to enhancing domestic investment in housing, the small business sector, and financial and human capital growth is created by a developed infrastructure.

Insignificant enhancing influence of economic growth on domestic investment was shown in pooled OS (models 1 and 2), whilst all three models (FMOS, fixed effects) and model 3 (pooled OS) indicate a significant improving influence of economic growth on domestic investment. The results generally support Khatib et al. (2012) argument that both local and foreign firms make better profits and are more likely to re-invest domestically if the economy is experiencing growth.

Table 9 presents FMOS results.

Table 9. FMOLS.

Variables	Model 1	Model 2	Model 3
REMIT	-0.16	0.22***	0.07
FIN	0.08	0.15	0.16**
REMIT.FIN	0.04	0.05***	0.01
SAV	0.80	0.76***	0.77
INFR	0.01	0.02	0.02
GROWTH	0.10***	0.10***	0.10***
HCD	-0.23	0.16	0.16
OPEN	-0.05	0.001	-0.02
FDI	-0.001	0.01	-0.0004
Adjusted R-squared	0.73	0.65	0.70

Note: ** And *** respectively denote 10% and 5% significance levels.

In fixed effects (all models) and FMOS (models 2 and 3), the development of human capital did not have a significant effect on increasing domestic investment. However, in pooled OS (models 2 and 3), the development of human capital did increase domestic investment. These findings resemble results by Khatib et al. (2012) whose research argued that human capital development enhances domestic investment through enabling and equipping the people with knowledge on nurturing small businesses, project evaluation, structuring efficiently, and investment allocation decisions. Model 1 (FMOS) indicates an insignificant deleterious impact of the development of human capital on domestic investment, whilst a significant negative effect of human capital development on domestic investment was observed in the first model (pooled OS), in contrast with available empirical and theoretical literature.

All three models (fixed effects) and model 2 (FMOS) show that trade openness did not have a big effect on domestic investment. However, models 2 and 3 (pooled OS) show that trade openness did have a big effect on domestic investment. Such findings agree with Bibi et al. (2012) theoretical view. FMOS (models 1 and 3) shows a non-significant negative influence of trade openness on domestic investment, whilst model 1 (pooled OS) produced findings that show trade openness's significant deleterious effect on domestic investment. Results agree with Bibi et al. (2012) that an economy too open to trade allows an outflow of capital, thereby contributing to a slowdown in the rate of domestic investment.

An insignificant enhancing effect of FDI on domestic investment was noted in model 2 (FMOS) and all three models (fixed effects, pooled OS) in support of Romer (1986) argument that foreign direct investment brings in resources that are very important in promoting domestic investment. Models 1 and 3 (FMOS) show that FDI deleteriously affected domestic investment in a non-significant manner, in line with researchers who argue that FDI and domestic investment are inversely related.

8. CONCLUSION

The study used panel methods of data analysis and estimation to examine the role remittances played on domestic investment in BRICS. Panel data used ranged from 1989 to 2020. The paper also investigated the impact of the complementarity variable (remittance x financial development) on domestic investment, utilizing the same data set for BRICS. What motivated the researcher to undertake this study is that there seems to be a lack of consensus regarding the findings from empirical researchers on a similar subject matter. The findings are mixed and far from agreeing. Using personal remittance inflow per capita as a proxy, remittances' influence on domestic investment was positive and significant across all three panel methods employed. When personal remittances received were employed as a proxy, remittance's impact on domestic investment was significantly deleterious under the pooled OS. Financial development significantly improved domestic investment, as observed by Pooled OS and FMOS (model 3). Pooled OS (model 1) and FMOS (model 2) produced results that show that financial development improved remittances' ability to enhance domestic investment. The BRICS nations need to develop and implement policies aimed at improving domestic investment through remittance inflow and financial sector growth. Future research should examine financial development threshold analysis to improve the quality of empirical studies related to the remittance-domestic investment nexus.

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