E u r o E c o n o m i c a

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Remittances and Human Capital Development in BRICS

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Abstract: The study investigated the impact of personal remittances on the development of human capital in BRICS (Brazil, Russia, India, China, South Africa) using panel data (1990-2020) analysis methods such as the fully modified ordinary least squares (FMOLS), dynamic ordinary least squares (DOLS) and the fixed effects. Using the same data set and econometric estimation methods, the study also explored if financial development is a channel through which the positive influence of remittances on human capital development is enhanced. In line with Ali et. al. (2023), the study focused on BRICS because of its global dominance in terms of share of gross domestic product in the world economy and its fastest pace in terms of economic growth and development. The influence of remittances on human capital development was found to be positive but insignificant under both the fixed effects and FMOLS, results which generally agrees with literature (positive rationale hypothesis). The dynamic OLS shows that remittances reduced human capital development in a significant manner, consistent with the negative rationale hypothesis. The complementarity between remittances and financial development had a non-significant positive impact on human capital development. The study produced results which show that internet usage (DOLS), government consumption expenditure (FMOLS), trade openness (fixed effects, FMOLS) and economic growth (DOLS, FMOLS) had a significant positive effect on human capital development in BRICS. Policies aimed at increasing internet usage, government consumption on education, trade openness and economic growth must therefore be implemented by the responsible authorities in BRICS to enhance human capital development.

Keywords: Remittances; Human Capital Development; BRICS; Panel Data

JEL Classification: F24; J24; P2

1. Introduction

Background: According to Dilanchiev et. al. (2024), remittance has become a major source of external finance bringing in a total of US$548 billion in 2019 in comparison to US$152 billion brought in by official development assistance. Personal remittances enhance economic growth in the labour sending country through providing liquidity that lubricates the economy and entrepreneurship projects. In line

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with Dilanchiev et. al. (2024), remittance spurs economic growth through its ability to mediate the relationship between renewable energy, FDI, and quality of the environment. Empirical research which supported the argument that remittances improves economic growth include but are not limited to Oshota and Badejo (2015), Shafqat et. al. (2014), Salahuddin and Gow (2015), Belmimoun et. al. (2014), Asad et. al. (2016), Abdellatif et. al. (2013) and Rahman (2014). It is clear in the literature that the positive influence of remittance on economic growth is no longer queried or debatable. It is also not contestable that remittance enhances economic growth through the availability of certain macroeconomic factors (human capital and financial development) in the labour sending country, consistent with Azam and Raza (2016), Becker (1993), Ustubici and Irdam (2012) and Mesnard (2004). The revelation makes empirical studies on the direct effect of remittances on human capital development quite a necessity and intriguing.

The impact of remittances on human capital development is described in three ways from a theoretical view point. A positive remittance-led human capital development, a negative remittance-led human capital development and a non-linear hypothesis sums up how the theoretical relationship between remittances and human capital development is described (Acharya & Leon-Gonzalez, 2014). Empirical literature which attempted to estimate the impact of remittances on human capital development produced mixed, conflicting and disagreeing results. Some noted that remittances promote human capital development, others observed that remittances negatively affect the development of human capital whilst the feedback effect was also supported by another group. The fourth and last group produced results which show that the relationship between remittances and human capital development is non-linear, meaning the existence of certain variables in the labour sending country is a necessity before remittance can have a meaningful influence on human capital development. The absence of a consensus among both theoretical and empirical researchers on this subject matter triggered the author to carry out a further empirical test.

Moreover, the existing empirical researchers on the effect of remittance on human capital development is fraught with methodological deficiencies. Firstly, they ignored the fact that remittances and human capital development are related in a non-linear fashion. Secondly, none of them used the most recent data. Thirdly, none of them to the author's best knowledge used BRICS group of countries as a unit of analysis. In other words, the story of BRICS in as far as the remittance-human capital development nexus is concerned has not yet been told. Fourthly, none of the similar empirical researchers on the subject matter investigated the influence of a complementarity variable (remittances x financial development) on human capital development. This study filled in these gaps.

Contribution of the study: The contribution towards literature was made in three ways. Unlike previous similar empirical research, this study used the most recent data set (1990-2020). Other similar empirical studies on the subject matter shied away from BRICS economic grouping. This is the first study to the author's best awareness to investigate the remittances-human capital development nexus for BRICS. Majority of empirical studies on the remittance-led human capital development hypothesis wrongly assumed that the two variables are related in a linear fashion. This study addresses that anomaly by investigating whether financial development is a necessary condition that must be available in the labour sending nation before human capital development is significantly enhanced by personal remittances. This study also assesses the influence of the complementary variable (financial

development x remittances) on human capital development, an aspect which has never been earlier investigated to the best knowledge of the author.

Organization of the remaining sections: Section 2 describes the theoretical foundation of the study, Section 3 reveals the related empirical literature discussion whilst Section 4 explains how the control variables affects the dependent variable (human capital development). Section 5 presents and describes the trends of personal remittances and human capital development in BRICS during the period from 1990 to 2020. Research methodology presentation is outlined in Section 6 whereas the final data analysis, results presentation and interpretation is done in Section 7. The summary of the study is done in Section 8 whilst Section 9 is the bibliography.

2. Theoretical Literature Review

The positivity, negativity and non-linear rationales are the three hypotheses that describes the influence of remittances on the development of human capital. Personal remittances inflow enables many households to have financial resources directed towards education, training and development of the children (Acharya & Leon-Gonzalez, 2014). The same study noted that remittances enables children to spend more time within the education system thus reducing the chances of children being used as child labour. Remittance avails the cash flows much needed by households to embark on little projects that reduce poverty levels (Dilanchiev et. al., 2024). The negativity rationale argues that because of parents' absence, the amount and quality of time allocated towards studying becomes problematic. Acharya and Leon-Gonzalez (2014) has a negative influence on the children's educational performance. Mansuri (2006) argued that the guardians normally underfund the children's educational programs despite remittance inflow because they tend to allocate financial resources more towards their own preferences which does not have anything to do with the children's education.

Other authors (Azam & Raza, 2016; Ustubici & Irdam, 2012; Becker, 1993) who support the non-linear rationale opines that certain variables must be available in the labour sending country before human capital development can be effectively influenced by remittances. Becker (1993) argued that remittances trigger human capital development enhancement only in a scenario in which the migrants parents are not only adequately educated but have handsomely paying jobs. The only scenario personal remittances can significantly trigger human capital development is when the migration of labour is part of a wider government plan to export the labour (Ustubici & Irdam, 2012). Macroeconomic stability in the labour sending country must be present if personal remittances are to meaningfully contribute towards enhanced human capital development, argued Azam and Raza (2016). Alshaib et. al. (2023) also revealed that a decline in remittance was catastrophe not only to the fiscal space and economic sustainability in Egypt but also led to a ballooned external debt. Fiscal sustainability can only be achieved if the governments can receive adequate finance from different external sources such as remittance, official development assistance and foreign direct investment (Alshaib et. al, 2023, p. 3).

3. Empirical Literature Review

Table 1. Related Empirical Research

Author	Unit of analysis	Approach	Findings
Ustubici and Irdam (2012)	Medium income countries	Ordinary least squares (OLS)	Remittances in countries characterized by medium income was found to have significantly positively impacted human capital development.
Mozumdar and Islam (2013)	Developing countries	Generalized least square	Education positively and significantly responded to remittances inflow in developing countries.
Azam and Raza (2016)	Middle income countries	Fixed effects	Remittances-led human capital development hypothesis was confirmed in this study.
Gao et al (2021)	Kyrgyz Republic	Fixed effects	Remittances was observed to have a deleterious effect on human capital development in Kyrgyz Republic.
Lopez et. al. (2013)	Latin America	Multiregression analysis and descriptive statistics	Health and education were positively affected by remittances in Latin America.
Tsaurai and Ngcobo (2018)	Emerging economies	Pooled OLS, fixed and random effects	Migrant remittances' impact on human capital development was found to be positive and significant in emerging economies. Liquidity was found to be a channel through which remittances negatively affected human capital development in emerging economies.
Sahoo and Sethi (2020)	Sub-Saharan African countries	Dynamic ordinary least squares (DOLS) and the fully modified ordinary least squares (FMOLS)	Remittances' influence on human capital development was observed to be positive.
Azizi (2018)	Developing countries	Panel data analysis	Remittances had a significant positive impact on school enrolment, health status and child mortality rate in developing countries.
Banzak and Chezum (2009)	Developing countries	Panel data analysis	Human capital development was enhanced by remittances.
Aregbeshola (2022)	Sub-Saharan African countries	Panel data analysis	Remittances enhanced human capital development.
Dash (2020)	South Asian countries	Panel data analysis	Human capital development was enhanced by remittances in South Asian countries
Hassan et. al. (2013)	Pakistan	Autoregressive distributive lag (ARDL)	A significant positive relationship running from workers' remittances towards human capital development in Pakistan.
Udah (2011)	Nigeria	ARDL	Education, health and technological diffusion were all found to have been positively influenced by remittances inflow in Nigeria.

Wahab et. al. (2013)	South Asia	Descriptive statistics	A feedback effect between foreign remittances and human capital development was observed.
Amamoo-Otoo and Chi (2020)	Ghana	Time series data analysis	Remittances had a deleterious impact on economic growth in Ghana. Remittances had a negative influence on human capital development in Ghana as it promoted laziness among the remittances recipients.
Yiheyis and Woldemariam (2020)	Africa	Panel data analysis	Among other results, remittances enhanced human capital development in Africa.
Ifeyinwa (2010)	Nigeria	Multi-regression analysis	Both poverty and human capital development were positively enhanced by remittances inflow into Nigeria.
Khraiche and Boudreau (2020)	Africa	Panel data analysis	Mobile banking (an approach to lower down remittance pricing) enhanced human capital development in Africa.
Muchemwa (2015)	Sub-Saharan Africa	Generalized methods of moments (GMM)	Remittances had a significant positive influence in the economy through the human capital development channel in Africa.
Gubert (2017)	Developing countries	Descriptive statistics	Remittances positively affected human capital development.
Mim and Ali (2012)	MENA regional countries	GMM, random effects and ordinary least squares (OLS)	Remittances positively influenced economic growth through the human capital accumulation in MENA group of countries.
Khan (2018)	Nepal	Instrumental variable two-stage least squares	Private schooling, educational expenditure and private tuition were also enhanced by remittance inflow into Nepal.
Olimova (2010)	Tajikistan	Descriptive statistics	Human capital development was found to have been enhanced by migration in Tajikistan.
Kamalu et. al. (2022)	Organization of Islamic Cooperation Member Countries	Cross-Sectional Autoregressive Distributive Lag (CS-ARDL)	A uni-directional relationship running from remittances towards human capital development was observed.
Kroeger and Anderson (2013)	Kyrgyzstan	Panel data analysis	Remittances were found not to have any influence on the education of children left behind by their parents. The study found out that overall school enrolment increased in response to improved remittance inflow into Kyrgyzstan.

Source: Author compilation

Table 1 shows that the empirical literature on the influence of personal remittances on human capital development produced results which can be categorised into four sections. Firstly, personal remittances enhance human capital development. Secondly, human capital development is negatively affected by personally remittances. Thirdly, there is a non-linear relationship between personal remittances and human capital development. Certain factors must be available in the labour sending country to facilitate personal remittances' significant enhancing influence on human capital development. Fourthly, a feedback relationship describes a relationship between these two variables. In summary, such divergent,

conflicting and mixed results are an indication that the subject matter has not yet reached a consensus stage hence there is still a lot of room for more empirical tests. This study was motivated by the desire to fill in such a gap.

4. Control Variables

Table 2. Control Variables of the Human Capital Development Function

Variable (s)	Measure used	Explanation	Expected influence
Foreign direct investment (FDI)	Net foreign direct investment inflows (% of GDP)	According to Romer (1986), technology, technical know-how, human capital development and skills flows along foreign direct investment into the receiving country. Kumar and Pradhan (2002) also argued that foreign direct investment is a package that encompasses knowledge, managerial skills, technical know-how, organizational skills and human capital development advancement.	+
Internet usage (INTERNET)	Individuals using internet (% of population)	The availability of internet helps the people to acquire skills, technical know-how, learning facilitation, human capital development and education (De Grip & Sauermann, 2013).	+
Domestic credit (FIN)	Domestic credit to private sector (% of GDP)	Developed financial sector avails cheaper and affordable loans earmarked at education provision, development of skills, management skills and human capital development in general (Kargbo et. al, 2016). The same study also argued that human capital development is generally enhanced by the effective and efficient provision of financial services.	+
Population growth (POP)	Population growth (% annual)	Increased national population growth improves market size that attracts foreign direct investment, which flows with human capital development, skills, education and management know-how (Jorgenson, 1963). According to Rosenzweig (1990), increased population growth rate forces the government to channel more resources towards more pressing issues such as procurement of food, thus diverting financial resources away from human capital development (education, skills, health) programs.	+/-
Government consumption (GOV)	Government final consumption expenditure (% of GDP)	According to Oluwatobi and Ogunrinola (2011), education and health quality, enrolment and skills development is enhanced if the government directs more resources towards improving human capital development programs.	+
Trade openness (OPEN)	Total of exports and imports (% of GDP)	According to Binder and Georgiadis (2011), high levels of trade openness facilitates quick, easy and effective skills exchange programs between and among countries and continents. The findings produced by Binder and	+

		Georgiadis (2011) observed that human capital development is enhanced by higher levels of trade openness.	
Economic growth (ECON)	Gross domestic product per capita	According to Shuaibu and Oladayo (2016), higher levels of economic growth enhances the general level of wealth, savings and income levels among the people which can be directed more towards enhancing education, health and skills development programs.	+

Source: Author

Human capital development (HUMAN) was proxied by the human capital development index whilst remittances was measured by personal remittances received (% of GDP), in line with Kroeger and Anderson (2013), Kamalu et. al. (2022), Olimova (2010), Khan (2018), Mim and Ali (2012), Gubert (2017), Khraiche and Boudreau (2020), Ifeyinwa (2010), Yiheyis and Woldemariam (2020), Amamoo-Otoo and Chi (2020) and Muchemwa (2015). To a larger extent, these empirical same empirical studies and the availability of the data influenced the choice of proxies which were used for the control variables in this study.

5. Human Capital Development and Remittances Trends in BRICS

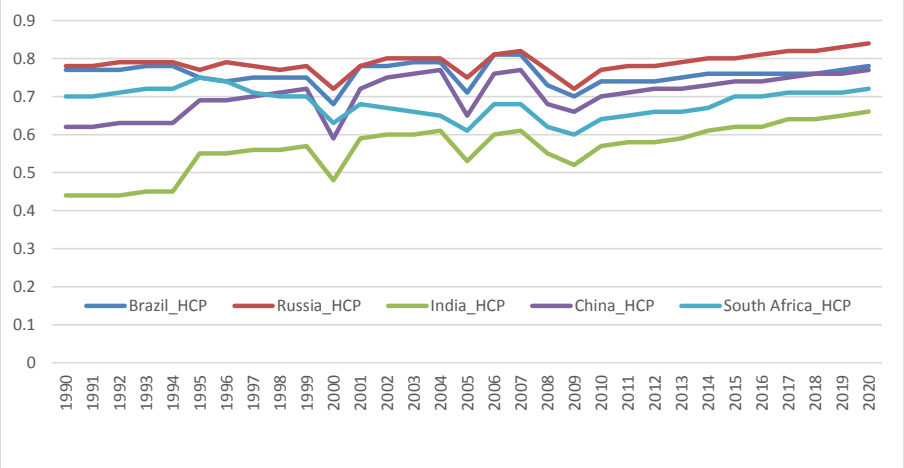

Figure 1. Human Capital Development Index Trends for BRICS (1990-2020)
Source: Author

Brazil's human capital development index went down from 0.77 in 1990 to 0.75 in 1995 before further going down by 9.33% during the subsequent five-year period (from 0.75% in 1995 to 0.68% in 2000). Brazil's human capital development index incrementally went up during the period from 2000 to 2020. It went up by (1) 4.41%, from 0.68 in 2000 to 0.71 in 2005, (2) 4.23%, from 0.71 in 2005 to 0.74 in 2010, (3) 2.70%, from 0.74 in 2010 to 0.76 in 2015 and (4) 2.63%, from 0.76 in 2015 to 0.78 in 2020.

Russia's human capital development index also declined by 1.28%, from 0.78 in 1990 to 0.77 in 1995 before further plummeting by 6.49% during the subsequent five-year timeframe to end the year 2000 at 0.72. The five-year period ranging from 2000 to 2005 saw Russia's human capital development index going up by 4.17%, increased by 2.67% during the subsequent five-year time horizon (2005-2010) before further going up by 3.90% during the five-year period ranging from 2010 to 2015. A 5% increase (0.80 in 2015 to 0.84 in 2020) in Russia's human capital development index during the subsequent five-year period ranging from 2015 to 2020 was also observed.

India's human capital development index massively went up by 25%, from 0.44 in 1990 to 0.55 in 1995, decreased by 12.73% during the subsequent five-year period (1995 to 2000) before experiencing a 10.42% increase during the subsequent five-year period to end the year 2005 at 0.53. A 7.55% increase in India's human capital development index during the five year-period ranging from 2005 to 2010 was observed. India's human capital development index went up by 8.77%, from 0.57 in 2010 to 0.62 in 2015 before it further increased by 6.45% during the subsequent five-year period to end the year 2020 at 0.66.

A 11.29% growth in China's human capital development index was observed during the five-year period ranging from 1990 to 1995 before China experienced a 14.49% decline in human capital development index during the subsequent five-year period to end the year 2000 at 0.59. Successive increase in China's human capital development index during the subsequent five-year periods were observed, namely (1) 10.17%, from 0.59 in 2000 to 0.65 in 2005, (2) 7.69%, from 0.65 in 2005 to 0.70 in 2010, (3) 5.71%, from 0.70 in 2010 to 0.74 in 2015 and (4) 4.05% during the subsequent five-year period to close the year 2020 at 0.77.

South Africa's human capital development index (1) increased from 0.70 in 1990 to 0.75 in 1995, (2) massively decreased by 16% during the five-year subsequent period, (3) marginally went down by 3.17%, from 0.63 in 2000 to 0.61 in 2005, before (4) increasing by 4.92% during the subsequent five-year period ranging from 2005 to 2010. The five-year period ranging from 2010 to 2015 saw South Africa's human capital development index going up by 9.37%, from 0.64 in 2010 to 0.70 in 2015 before experiencing another increase, from 0.70 in 2015 to 0.72 in 2020.

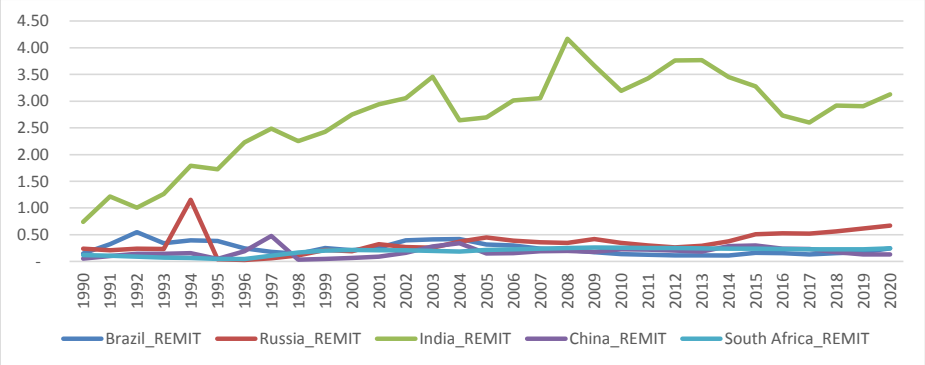

Figure 2. Personal Remittances Inflows (% of GDP) Trends for BRICS for the Period from 1990 to 2020
Source: Author

Brazil's personal remittances (% of GDP) went up by 0.24 percentage points, from 0.15% in 1990 to 0.38% in 1995, declined by 0.18 percentage points during the subsequent five-year period before going up by 0.11 percentage points, from 0.21% in 2000 to 0.31% in 2005. A 0.18 percentage points decline in personal remittances during the period ranging from 2005 to 2010 was observed. Brazil's personal remittances then marginally increased by 0.02 percentage points during the five-year period ranging from 2010 to 2015 before further going up by 0.09 during the subsequent five-year timeframe, from 0.16% in 2015 to 0.25% in 2020.

A 0.20 percentage points decline in personal remittances was observed in Russia during the five-year period ranging from 1990 to 1995. Russia's personal remittances then increased from 0.04% in 1995 to 0.19% in 2000 before further increasing by 0.26 percentage points during the five-year subsequent period to end the year 2005 at 0.45%. Russia also experienced a 0.11 percentage points decline in personal remittances during the five-year period ranging from 2005 to 2010. Russia's personal remittances then increased from 0.34% in 2010 to 0.51% in 2015 before experiencing another increase (0.16 percentage points) during the subsequent five-year period, from 0.51% in 2015 to 0.67% in 2020.

India's personal remittances increased by (1) 0.98 percentage points between 1990 and 1995 and (2) 1.02 percentage points, from 1.73% in 1995 to 2.75% in 2000. A 0.05 percentage points decline in India's personal remittances inflow was observed during the period between 2000 and 2005. India's personal remittances increased from 2.70% in 2005 to 3.19% in 2010 before further going up by 0.08 percentage points during the five-year subsequent period, from 3.19% in 2010 to 3.28% in 2015. India then experienced a 0.15 percentage points decline during the subsequent five-year period to close the year 2020 at 3.13%.

The personal remittance inflow for China marginally decreased by 0.01 percentage points during the period ranging from 1990 to 1995 before increasing by the same magnitude during the subsequent five-year period to end the year 2000 at 0.06%. The 3 subsequent five-year periods (2000 to 2005, 2005 to 2010, 2010 to 2015) experienced an increase in personal remittance inflow of 0.08 percentage points each before a 0.17 percentage points decline was observed during the five-year period ranging from 0.30% in 2015 to 0.13% in 2020.

South Africa's personal remittance inflow went down from 0.12% in 1990 to 0.05% in 1995, marginally increased by 0.166 percentage points during the five-year subsequent period before experiencing a 0.002 percentage points plunge, from 0.214% in 2000 to 0.212% in 2005. South Africa's personal remittance inflow then increased by 0.044 percentage points during the five-year period beginning from 2005 to 2010 before plummeting by 0.018 percentage points, from 0.26% in 2010 to 0.24% in 2015. The subsequent five-year period (2015 to 2020) saw South Africa's personal remittance inflow marginally surging by 0.004 percentage points to end the year 2020 at 0.24%.

6. Research Methodological Presentation

Data: Secondary data ranging from 1990 to 2020 was used in this study. The data was extracted from reputable, trustworthy and verifiable international source, namely the World Development Indicators.

Model descriptions: Equation 1 shows a general model specification of the human capital development function.

HUMAN=f (REMIT, FIN, INTERNET, FDI, GOV, OPEN, ECON) ..... [1]

Ustubici and Irdam (2012), Mozumdar and Islam (2013), Azam and Raza (2016), Gao et. al. (2021), Lopez et. al. (2013), Tsaurai and Ngcobo (2018), Sahoo and Sethi (2020), Azizi (2018), Banzak and Chezum (2009), Aregbeshola (2022), Dash (2020), Hassan et. al. (2013), Wahab et. al. (2013), Amamoo-Otoo and Chi (2020), Yiheyis and Woldemariam (2020), Khraiche and Boudreau (2020) and Ifeyinwa (2010) are some of the recent empirical literature which informed the choice of the control variables of the human capital development function.

In line with Ali et. al. (2023) whose studies focused on BRICS and used panel methods of data analysis, the econometric model representation of the human capital development function is in the form of equation 2.

$$HUMAN_{it} = \beta_0 + \beta_1 REMIT_{it} + \beta_2 FIN_{it} + \beta_3 (REMIT_{it}.FIN_{it}) + \beta_4 INTERNET_{it} + \beta_5 FDI_{it} + \beta_6 GOV_{it} + \beta_7 OPEN_{it} + \beta_8 ECON_{it} + \mu + \varepsilon \quad [2]$$

Table 3. Equation 2 Decomposition

β_0	Intercept term
t	Time
i	Country
FDI_{it}	Foreign direct investment in country i at time t
$REMIT_{it}$	Personal remittances in country i at time t
$INTERNET_{it}$	Internet usage in country i at time t
$HUMAN_{it}$	Human capital development in country i at time t
FIN_{it}	Financial development in country i at time t
GOV_{it}	Government expenditure in country i at time t
$OPEN_{it}$	Trade openness in country i at time t
ε	Error term
$ECON_{it}$	Economic growth in country i at time t
β_1 to β_8	Explanatory variables' co-efficients
μ	Time invariant and unobserved country specific effect

Source: Author

Personal remittances inflows into the country is mainly collected through the financial markets before the recipients use it to fund education, health, skills upgrading and for self-help projects, consistent with Khan (2018), Olimova (2010), Kamalu et. al. (2022) and Udah (2011). What these researchers argued for is that personal remittances which enhances education, skills and health in the receiving country would have been send through the banking or financial system. This study investigates whether the financial sector is a channel through which remittances enhances human capital development in the context of BRICS. Panel data analysis (fixed effects, random effects, pooled OLS) methods are used to econometrically estimate equation 2.

7. Main Data Analysis

Table 4. Correlation analysis

	HUMAN	REMIT	FIN	INTERNET	FDI	GOV	OPEN	ECON
HUMAN	1.00							
REMIT	-9.30***	1.00						
FIN	0.16	-3.62***	1.00					
INTERNET	5.51***	-2.64***	3.76***	1.00				
FDI	2.32**	-2.34**	-0.25	1.85*	1.00			
GOV	13.89***	-14.83***	2.51**	5.55***	0.57	1.00		
OPEN	2.43**	-0.48	1.41	1.37	0.19	-0.01	1.00	
ECON	7.84***	-5.68***	3.68***	17.80***	2.14**	9.29***	0.61	1.00

***/**/* represents 1%, 5% and 10% significant level respectively

Source: E-Views

Pre-estimation diagnostics: A significant positive correlation was observed between (1) internet usage and human capital development, (2) foreign direct investment and human capital development, (3) government consumption expenditure and human capital development, (4) trade openness and human capital development and (5) economic growth and human capital development (see Table 4). A significant negative relationship was also observed between personal remittances and human capital development, in line with the negative rationale view (Mansuri, 2006). Financial and human capital development were found to be positively but non-significantly related, consistent with the available literature. The maximum correlation according to Table 4 was observed to be between trade openness and economic growth, hence multicollinearity problem does not exist in line with Stead (2007).

Table 5. Descriptive Statistics

	HUMAN	REMIT	FIN	INTERNET	FDI	GOV	OPEN	ECON
Mean	0.70	0.73	62.60	21.55	2.02	16.26	40.76	4 658
Median	0.72	0.24	52.39	8.07	1.73	16.97	42.00	3 480
Maximum	0.84	4.17	266.61	84.99	6.19	21.07	110.58	15 975
Minimum	0.44	0.03	11.32	0.01	0.01	9.80	15.16	301.16
Standard. deviation	0.09	1.07	38.49	25.68	1.48	3.20	14.88	3 806
Skewness	-0.94	1.80	1.36	0.95	0.63	-0.61	0.53	0.85
Kurtosis	3.45	4.70	6.65	2.47	2.58	2.16	4.65	2.91
Jarque-Bera	24.11	102.56	133.81	25.04	11.31	14.26	24.99	18.89
Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Observations	155	155	155	155	155	155	155	155

Source: E-Views

Table 5 shows that all the probabilities of the Jarque-Bera criteria is zero, indicating that the data set for all the variables used is abnormally distributed. Except for human capital development and government consumption expenditure, the remaining variables are skewed to the right. This is another indication that the data set is not normally distributed. The range for financial development and economic growth exceed 100, an indication of the existence of extreme values. Additionally, the standard deviation for economic growth is 3 806 (greater than 1000), another evidence of the existence of outliers. Consistent with Aye and Edoja (2017), all the data set was transformed into natural logarithms to address the issues of abnormal data, outliers and multi-collinearity.

Panel stationarity tests: Some of the variables at level were found to be not stationary whilst all variables at first difference were observed to be stationary. The results show that the variables were integrated of order 1, thus paving way for panel co-integration tests to happen.

Table 6. Panel root tests –Individual intercept

Level				
	Levin, Lin and Chu (2002) tests	Im, Pesaran and Shin (2003) tests	ADF Fisher Chi Square tests	PP Fisher Chi Square tests
HUMAN	-3.00***	-2.56***	23.90***	31.24***
REMIT	-2.14**	-2.36***	21.45**	30.16***
FIN	-0.12	0.88	10.98	9.22
INTERNET	-2.91***	-3.82***	35.76***	29.45***
FDI	-4.73***	-3.51***	31.66***	29.96***
GOV	-0.78	-2.22**	24.46***	18.04*
OPEN	-2.25**	-2.75***	29.59***	23.72***
ECON	-1.48*	0.42	6.38	3.51
First difference				
HUMAN	-10.86***	-10.42***	99.05***	136.30***
REMIT	-4.51***	-7.65***	70.25***	119.86***
FIN	-4.79***	-4.33***	41.68***	50.73***
INTERNET	-5.32***	-2.13**	19.42**	24.23***
FDI	-5.71***	-7.22***	66.47***	97.84***
GOV	-5.60***	-6.86***	63.87***	95.31***
OPEN	-12.79***	-9.94***	54.31***	102.21***
ECON	-2.31**	-3.60***	30.78***	47.58***

Source: E-Views

Panel co-integration tests: Using Johansen panel co-integration test approach, seven co-integrating relationships were observed in this study. Such results mean that the existence of a long run relationship among the variables under study was confirmed, in line with Tsaurai and Ngcobo (2018).

Table 7. Johansen Fisher Panel Co-integration test

Hypothesised No. of CE(s)	Fisher Statistic (from max-eigen test)	Probability	Fisher Statistic (from trace test)	Probability
None	567.4	0.0000	173.8	0.0000
At most 1	277.1	0.0000	149.4	0.0000
At most 2	204.9	0.0000	95.95	0.0000
At most 3	127.9	0.0000	52.92	0.0000
At most 4	84.88	0.0000	37.75	0.0000
At most 5	54.77	0.0000	40.72	0.0000
At most 6	25.60	0.0043	21.41	0.0184
At most 7	20.02	0.0291	20.02	0.0291

Source: Author's compilation from E-Views

7.1. Final Data Analysis

Remittances had a non-significant positive influence on human capital development under the FMOLS and fixed effects, in line with the positive rationale philosophy put forward by Acharya and Leon-Gonzalez (2014) whose study noted personal remittances inflow enables many households to have financial resources directed towards education, training and development of the children. On the other hand, a significant negative relationship running from remittances towards human capital development

was observed under the DOLS approach, consistent with the negative rationale hypothesis which argued that argued that children's guardians normally underfund the children's educational programs despite remittance inflow from their parents (Mansuri, 2006).

Table 8. Results of the Human Capital Development

	Fixed effects		FMOLS		DOLS	
	Co-efficicent	t-statistic	Co-efficicent	t-statistic	Co-efficicent	t-statistic
REMIT	0.03	0.5880	0.05	0.9700	-0.78*	-1.9744
FIN	0.02	0.8086	0.03	1.1275	0.12	0.9208
REMIT.FIN	0.005	0.4291	0.01	0.7718	0.14	1.6734
INTERNET	-0.002	-0.5291	-0.001	-0.2364	0.08*	2.2577
FDI	0.01	0.9127	-0.01***	-4.0763	-0.15*	-1.9349
GOV	0.12	1.4054	0.23*	1.9087	-0.46	-1.0286
OPEN	0.11***	3.5502	0.15***	3.4514	-0.05	-0.4179
ECON	0.02*	1.6689	0.01	0.5714	-0.12	-1.1700
R-squared 0.8028 Adjusted R-squared 0.7862 F-statistic 48.18 Prob (F-statistic) 0.0000			R-squared 0.7836 Adjusted R-squared 0.7646		Adjusted R-squared 0.7483	

***/**/* indicate 1%, 5% and 10% significance levels respectively

Source: E-Views

Across all the three approaches, financial development had an insignificant positive impact on human capital development, in line with Kargbo et. al. (2016) whose study observed that developed financial sector avails cheaper and affordable loans earmarked at education provision, development of skills and management skills improvement. The combination between remittances and financial development was observed to have a non-significant influence on human capital development under the fixed effects, FMOLS and DOLS. These results mean that non-significantly, financial development enhanced the positive influence of remittances on human capital development, in line with Khan (2018) whose study argued that personal remittances inflows into the country is mainly collected through the financial markets before the recipients use it to fund education, health, skills upgrading and for self-help projects.

The DOLS approach shows that internet usage significantly enhanced human capital development, results which agrees with De Grip and Sauermann (2013) whose study noted that internet usage assist the people to acquire skills, education and better health. Fixed effects and FMOLS noted that internet usage had a non-significant negative influence on human capital development, in contradiction with the available literature which support the argument that internet usage enhance the development of human capital.

Fixed effects show that foreign direct investment non-significantly enhanced human capital development, in line with Romer (1986) whose study argued that technology, technical know-how, human capital development and skills flows along foreign direct investment into the receiving country. On the other hand, DOLS and FMOLS produced results which show a significant negative relationship running from foreign direct investment towards human capital development. The results mean that foreign direct investment reduced human capital development, in contradiction to available literature (Kumar & Pradhan, 2002; Romer, 1986) on the subject matter.

Under the fixed effects, government consumption had a non-significant positive impact on human capital development whilst FMOLS shows that human capital development was significantly enhanced

by government consumption, in support of an argument by Oluwatobi and Ogunrinola (2011). DOLS methodology indicates that human capital development was negatively affected in a non-significant manner by government consumption, in agreement with literature which argued that government consumption expenditure is inflationary and has a deleterious effect on any kind of investment (human capital development included) in the economy (Oluwatobi & Ogunrinola, 2011).

The significant positive impact of trade openness on human capital development was observed under the FMOLS and fixed effects, in line with Binder and Georgiadis (2011) whose study noted that high levels of trade openness facilitates quick, easy and effective skills exchange programs between and among countries and continents. In contradiction with the available literature, a non-significant negative influence of trade openness on human capital development was observed under the DOLS approach.

Fixed effects show that economic growth's influence on human capital development was positive and significant whereas FMOLS approach produced results which indicates that human capital development was enhanced by economic growth in a non-significant manner. These results generally agree with Shuaibu and Oladayo (2016) whose study opined that increased economic growth enhances the general level of wealth, savings and income levels among the people which can be directed more towards enhancing education, health and skills development programs. On the other hand, a non-significant negative correlation running from economic growth towards human capital development was observed under the DOLS methodology, results which disagrees with the available literature.

8. Conclusion

The study investigated the impact of personal remittances on the development of human capital in BRICS using panel data (1990-2020) analysis methods such as the fully modified ordinary least squares (FMOLS), dynamic ordinary least squares (DOLS) and the fixed effects. Using the same data set and econometric estimation methods, the study also explored if financial development is a channel through which the positive influence of remittances on human capital development is enhanced. The influence of remittances on human capital development was found to be positive but insignificant under both the fixed effects and FMOLS, results which generally agrees with literature (positive rationale hypothesis). The dynamic OLS shows that remittances reduced human capital development in a significant manner, consistent with the negative rationale hypothesis. The complementarity between remittances and financial development had a non-significant positive impact on human capital development. The study produced results which show that internet usage (DOLS), government consumption expenditure (FMOLS), trade openness (fixed effects, FMOLS) and economic growth (DOLS, FMOLS) had a significant positive effect on human capital development in BRICS. BRICS nations should develop and implement policies aimed at attracting more remittances into the economy to enhance the development of their human capital levels. Policies that enhance the development of financial sector should be spearheaded by BRICS nations if they aim to enhance human capital development in the medium to long term. Policies aimed at increasing internet usage, government consumption on education, trade openness and economic growth must therefore be implemented by the responsible authorities in BRICS to enhance human capital development.

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