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Remittances and Financial Development in Transitional Markets. Does the Moderating Role of Technology Matter?

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Abstract: Objectives: This study explored the influence of remittance on financial development in transitional markets. It examined if financial development was influenced by the complementarity between remittance and technology in transitional markets. In other words, it investigates whether technology advancement channel is essential in ensuring that remittances are directed towards financial development. **Prior Work:** What triggered the study is that existing literature produced inconclusive, mixed and divergent results. **Approach**: The study employed the Hansen (2000) threshold regression model and the panel corrected standard errors approach. **Results**: The results indicate that remittances on their own negatively influence financial development but at the very most positively influence financial development in a non-significant manner. Technology had a non-significant enhancing impact on financial development. The complementarity between remittance and technology significantly improved financial development. **Implications**: Transitional markets must implement policies geared at enhancing remittance inflow and technology advancement to deepen the financial sector. Further studies on the subject matter need to focus on examining more than one threshold levels of remittances above which significant financial development occurs. **Value:** The study indicated that technology development enhances remittances' ability to improve financial development in transitional markets.

Keywords: Technology; Remittances; Panel Data; Transitional Markets; Financial Sector

JEL Classification: C23; E44; F24; N7; P2

1. Introduction

Although the remittance-economic growth nexus is no longer in contention in the field of economics and finance, there is no agreement yet on whether the former directly influence the latter consistent with Tchekoumi and Nya (2023). Some empirical studies have argued that remittance influence economic growth through channels such as financial development (Sobiech, 2019; Bandura et al., 2019; Alhassan et al., 2025; Gupta et al., 2007; Keho, 2024; Olayungbo & Quadri, 2019; Afridi et al., 2024; Batool et al., 2022; Hamma, 2016). Notably, empirical research on remittance's influence on financial

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development are available but still quite limited. These few empirical studies on the remittance-financial development nexus produced results which are mixed and does not agree to each other.

Majority of these empirical studies agreed with the view that remittance directly enhances financial development whilst few noted the existence of a negative relationship (Biyase & Naidoo, 2023). The neutrality hypothesis was supported by empirical studies such as Mustapha-Jaji and Adesina-Uthman (2023), Alhassan et al. (2025) and Odhiambo and Musakwa (2024) in the context of remittance and deposit money bank assets. The feedback view was also supported by Nadabo (2023). Another group produced results which shows a U-shape relationship between remittance and financial development (Sharaf & Shahen, 2022). Studies which further investigated the U-shape relationship by exploring the channels and threshold effect between remittance and financial development are quite scant. These contradictions in the findings shows lack of agreement yet regarding remittance-financial development nexus. This paper intends to fill the void by exploring the role of technology in enhancing remittance's influence on financial development in transitional markets. The threshold effect is also examined in the context of transitional markets.

Some of these empirical studies are also characterised by certain methodological deficiencies. They did not consider the endogeneity problem which is normally a feature of most macro-economic variables (Chiwira & Murindagomo, 2024; Biyase & Naidoo, 2023; Prempeh, 2023; Forhad & Alam, 2025; Hamma, 2016). Some of them focused on single country studies, whose main disadvantage is their inability to capture macroeconomic direction of distinct global economic groupings (Biyase & Naidoo, 2023; Chiwira & Murindagomo, 2024; Prempeh, 2023). None of them focused on transitional markets as an emerging economic bloc. The data used is now outdated (Sobiech, 2019; Prempeh, 2023; Misati et al., 2019). Threshold levels analysis was completely not accounted for. Channels through which remittance influence financial development were completely disregarded, yet it has been argued by Sharaf and Shahen (2022) that the relationship between these two variables is non-linear (Azizi, 2019; Prempeh, 2023; Chiwira & Murindagomo, 2024; Forhad & Alam, 2025; Gupta et al., 2007). This study attempted to fill in these glaring gaps.

Contribution to new knowledge: There are three ways in which this study contributes to new knowledge. Firstly, the examination of threshold level of remittance that significantly enhance financial development in transitional markets has not been yet. Secondly, the author is not aware of any existing study which examined if technology is an avenue through which remittance influences financial development in transitional markets. Thirdly, among the existing empirical studies on remittance-financial development nexus, none of them have employed both the panel corrected standard errors approach and the Hansen (2000) threshold regression estimation technique.

2. Literature Review

Five theoretical views exist, namely the popular finances view, neutral view, portfolio view and the liquidity/permanent income view. The popular finances view argue that remittances enables easy capital access by individuals and households in the economy. Capital access which would have been quite difficult to have especially considering asymmetric information challenge prevalent in rural and informal markets (Armendariz de Aghion & Murdoch, 2005).

According to the neutral view, Cornelius (1990) argued that remittances does not affect the financial sector because a greater size of its portion is channeled towards consumption and not savings and investment. The explanation is that remittances smoothens consumption patterns in the economy. The portfolio view argues that the flow of remittances into the economy triggers the increased demand of a whole lot of financial services by the recipients. Increased use of bank accounts for money safekeeping and savings, electronic transactions and investments are some of the financial products whose demand goes up in direct response to increased inflow of remittances (Orozco & Fedewa, 2005).

The liquidity view supports Romer (1986)'s explanation says that remittances spurs the inflow of liquid cash into the financial sector and the financial intermediation theory. The liquidity view explains that remittances increases savings, which can then be lend to the deficit sectors of the economy. Financial services such insurance, small loans and credit are much easier to acquire if the remittance receipts are quite regular and consistent. Due to the unpredictable nature of remittances, they are channeled towards investments to even out consumption patterns.

Several empirical studies on the remittance-led financial development view were done but their results were quite varied, mixed and failed to reach a meaningful conclusion. Employing fixed effects and instrumental variable approach with panel data spanning from 1990 to 2015, Azizi (2019) examined the subject in developing countries. The study noted that remittances enhanced liquid liabilities, bank deposits, bank credit and domestic credit to the private sector. Remittances enhanced not only financial development but also economic growth and poverty reduction in emerging markets. Biyase and Naidoo (2023) employed the non-linear autoregressive model (NARDL) with annual data time series (1980-2017) to investigate the influence of remittances on financial development in South Africa. Fully modified ordinary least squares (FMOLS) was used for robustness tests. Short run results indicate that remittances enhanced financial development whilst financial development was negatively affected by remittances in the long run in South Africa.

Sobiech (2019) examined the nexus between finance, remittances and economic growth in developing countries using the dynamic factor model with panel data ranging from 1991 to 2005. The study noted that financial development influenced remittances to enhance economic growth. Significant influence of remittances on economic growth was found to have occurred at relatively low levels of financial development. The positive impact of the complementarity variable on economic growth was also found to be weaker when financial market depth, size and efficiency were considered. Employing autoregressive distributed lag (ARDL) with annual time series data (1980-2022). Chiwira and Murindagomo (2024) explored the remittance-financial development nexus for Zimbabwe. In the short run, financial development was significantly improved by remittance inflow into Zimbabwe. No meaningful relationship between the two variables was observed in the long run.

Adekunle et al. (2020) employed the pooled mean group approach to investigate the influence of remittances on financial development in African countries. The panel data used ranges from 1986 to 2017. Remittances improved financial development in the short run in Africa. The instrument variable approach was used by Forhad and Alam (2025) to examine the relevance of the remittance-led financial development in developing countries. Primary and secondary data were used. Financial development was enhanced by remittance inflow in developing recipient countries. The study also noted that remittances flowing from less educated migrants significantly improved financial development.

Prempeh (2023) examined the nexus between financial development and remittance inflow into Ghana using time series data (1980-2019) analysis techniques such as ARDL and vector error correction model (VECM). Co-integration between the variables was confirmed and the study further noted that remittance enhanced financial development existed in the context of Ghana in the short and long run. Employing the dynamic generalized methods of moments (GMM) and panel data (2006-2016), Bandura et al. (2019) examined the intricate relationship between remittance, economic growth and financial development in SADC (Southern African Development Community) countries. The study noted a deleterious influence of remittance on financial development and a positive impact of remittance on economic growth in SADC.

An empirical study by Alhassan et al. (2025) examined the relationship between remittance, entrepreneurship and financial development in developing economies using the two-step system GMM with panel data (2006-2020) spanning over a period of 15 years. The positive influence of remittance on entrepreneurship was non-existent or negligible but the relationship became positively significant when interacted with financial development. In other words, the complementarity variable had a significant enhancing effect on entrepreneurship in developing countries. Employing the GMM methodology and panel data (1984-2012), Hamma (2016) explored the linkage between remittance and financial development in the context of MENA (Middle East and North Africa) region. Financial development enhanced remittance-led economic growth in the MENA region. Employing panel data (1980-2017) analysis in the context of ECOWAS (Economic Community of West African States), Keho (2020) examined the influence of remittance on financial development. The study observed that remittance increased money supply but reduced domestic credit to the private sector in the long run.

Gupta et al. (2007) employed descriptive statistics and panel data analysis to investigate the influence of remittance on both financial development and poverty in Sub-Saharan Africa (SSA). A significant enhancing influence of remittance on poverty reduction and financial development was observed in the context of SSA nations. Using Nigeria as a case study, relationship between remittance and financial development was investigated by Mustapha-Jaji and Adesina-Uthman (2023). ARDL approach with time series data (1981-2021) was employed in this study. The influence of international remittance on stock market development was found to be negligible whilst banking sector development was significantly enhanced by international remittance inflows into Nigeria. Employing meta-analysis approach, Anwar and Afesorgbor (2021) examined the impact of remittance on financial development. Their study revealed a general positive effect of remittance on financial development, but that influence was observed to be more pronounced in the long run.

Keho (2024) investigated the mediating role of financial development on the relationship between remittance on domestic investment in West Africa using panel pooled mean group estimation approach. The panel data used spanned from 1975 to 2019. Both financial development and remittance had a significant positive influence on domestic investment in West Africa. Results also revealed that the interaction variables between the variables in question significantly improved domestic investment in West Africa. Employing ARDL approach with quarterly time series data (2006-2016), Misati et al. (2019) examined whether remittance influence financial development in the context of Kenya. Using different proxies of financial development, remittance significantly enhanced financial development. These proxies include number of mobile transactions, number of mobile agents, credit to private sector and number of bank accounts.

Odhiambo and Musakwa (2024) investigated whether governance matter in the relationship between remittance and financial development in SSA using the GMM approach. Their study noted that remittance had a significant enhancing influence on bank deposits and liquid liabilities whilst remittance had a negligible effect on deposit money bank assets. The study also revealed that good governance enhanced remittance's positive role on financial development in SSA countries. Using panel quantile regression analysis, Keho (2016) examined the influence of remittance on banking sector development in developing countries. The study observed that remittance enhanced financial development especially at lower levels in developing countries.

Using Toda Yamamoto and ARDL approaches and time series data (1990-2021), Nadabo (2023) examined the effect of remittance on financial development in Nigeria. The study produced results which supports the remittance-led financial development hypothesis in the short run. Toda Yamamoto approach revealed that remittance and financial development affected each other in Nigeria. Olayungbo and Quadri (2019) studied the influence of remittance on financial development and economic growth in SSA. Their study employed ARDL approach and time series data (2000-2015). In the long and short run, remittance and financial development improved economic growth. Financial development negatively affected remittance's impact on economic growth in SSA. Furthermore, no causality was observed between the variables in SSA.

Employing Granger causality test, Motelle (2011) investigated the nexus between remittance and financial development in Lesotho. Remittance had a positive influence on financial development in the short run whilst the long run showed results which supports the neutrality hypothesis. Karikari et al. (2016) examined the extent of remittance's influence on financial development in Africa using panel VECM, random and fixed effects. They used panel data which spanned from 1990 to 2011. The study observed that remittance positively influenced financial development to a certain degree whilst strong financial system was also noted to have had a role in attracting remittance inflow into Africa.

Afridi et al. (2024) investigated the influence of financial development in the remittance-economic growth nexus in developing economies using the system GMM. Interaction between these two main variables was observed to have reduced economic growth.

Employing the two-stage least squares and panel data (1982-2016), Hamma (2016) investigated the influence of financial development on the remittance-economic growth nexus in the MENA group of countries. The study observed that higher levels of financial development enhanced remittances' positive impact on the economy in MENA. Batool et al. (2022) also examined the remittance-financial development-economic growth nexus in developing economies using the ARDL econometric procedure. Time series annual data (1998-2020) was used in this study. Financial development significantly enhanced the remittance's positive influence on economic growth in developing economies. These results were found to be applicable both in the short and long run.

The nexus between remittance and financial development in developing countries was investigated by Anghel et al. (2017) using literature review and descriptive statistical analysis. The study noted that remittance not only enhanced financial development but overally spearheaded smooth economic growth in developing countries. Employing ARDL approach and annual time series data (1980-2019), Sharaf and Shahen (2022) investigated the non-linear influence of remittance on financial development in Egypt. Remittances enhanced financial development in a significant manner both in short run. In the long run, a U-shaped influence of remittance on financial development was observed.

Literature review on influence of remittance on financial development showed mixed results and absence of a consensus. Four theoretical views exist whilst five empirical literature rationales are quite evident. These are the positive influence of remittance on financial development view, negative influence of remittance on financial development rationale, the feedback view, the neutrality hypothesis and the U-shaped view. This state of existing literature (mixed, varied and divergent) is evidence that the subject is still inconclusive and far from reaching consensus. Current study seeks to fill in this glaring void.

3. Research Methodology

This study focused on exploring the interlinkages between remittances, technology and financial development in transitional markets using panel data ranging from 2005 to 2021. Philippines, Argentina, Republic of Korea, Peru, Colombia, India, Peru, Thailand, South Africa, Turkey, Mexico, Malaysia, Czech Republic, Indonesia, Brazil and China are the transitional markets included in this study, consistent with International Monetary Fund (2020) categorization. The choice of the period, variables and sample of countries was mainly informed by the availability of data. World Development Indicators was the major source of secondary data extraction used.

Table 1. Variables

Variable	Symbol	Proxy	Source
Dependent variable			
Financial development	FIN	Domestic credit by financial sector (% of GDP)	World Development Indicators
Independent variable			
Remittances	REMIT	Personal remittances received (% of GDP)	World Development Indicators
Control variables			
Technology	TECH	Individuals using the internet (% of population)	World Development Indicators
Trade openness	OPEN	Exports of goods and services (% of GDP)	
Urbanization	URBAN	Urban population (% of total population)	
Human capital development	HCD	Human capital development index	
Tax revenue	TR	Tax revenue (% of GDP)	
Population growth	POP	Population growth (annual %)	
Foreign direct investment	FDI	Net foreign direct investment (% of GDP)	
Economic growth	GROWTH	GDP per capita	

Source: Author

Empirical model specification on the interaction between remittances and technology's influence on financial development in transitional economies is as follows:

$$FIN_{it} = \alpha_0 + \alpha_1 REMIT_{it} + Z_{it} + \mu_{it} \quad \text{(a)}$$

$$FIN_{it} = \beta_0 + \beta_1 TECH_{it} + Z_{it} + \mu_{it} \quad \text{(b)}$$

FIN is financial development, REMIT is personal remittances and TECH represents technology. A vector of controls (GROWTH, FDI, TR, HCD, URBAN, TECH) is represented by Z_{it}. Empirical studies which used similar control variables include Forhad and Alam (2025), Alhassan et al. (2025), Afdri et al. (2024), Nadabo (2023), Keho (2024), and Prempeh (2023).

Panel threshold regression by Hansen (2000) was employed to approximate the minimum threshold level of remittances above which significant financial development happens. Panel corrected standard errors was also employed, whose advantage is that it deals with statistical problems such as autocorrelation, heteroscedasticity and cross-sectional dependency. The econometric model first converts all the data sets into natural logarithms and then using ordinary least squares estimation approach.

Equation c captures the complementarity effect, in line with Li and Liu (2005).

$$FIN_{it} = \gamma_0 + \gamma_1 REMIT_{it} + \gamma_2 TECH_{it} + \gamma_3 (REMIT * TECH)_{it} + Z_{it} + \mu_{it} \quad \text{(c)}$$

The derivatives (equation d and e) quantifies the impact of both remittances and technology on financial development, in line with Baltagi et al (2009).

$$\frac{\delta FIN_{it}}{\delta REMIT_{it}} = \gamma_1 + \gamma_3 TECH_{it} \quad \text{(d)}$$

$$\frac{\delta FIN_{it}}{\delta TECH_{it}} = \gamma_1 + \gamma_3 REMIT_{it} \quad \text{(e)}$$

To address the issue of biased estimates, cross sectional dependency was done before main estimation (Pesaran, 2021).

Equation f is the modified threshold model by Hansen (2000). The model econometrically estimates non-linear relationship between these two variables.

$$FIN_{it} = \begin{cases} \beta_0^1 + \beta_1^1 REMIT_{it} + \beta_2^1 X_{it} + \varepsilon_i, & REMIT_{it} \leq \gamma \\ \beta_0^1 + \beta_1^2 REMIT_{it} + \beta_2^2 X_{it} + \varepsilon_i, & REMIT_{it} > \gamma \end{cases} \quad \text{(f)}$$

Unknown threshold parameter is represented by γ. Threshold variable is $REMIT_{it}$. Whether financial development is affected differently above or below a certain threshold was econometrically estimated by the Hansen (2000) model.

Table 2. A priori theoretical explanation of control variables

Variable	Theoretical bias	Impact
Technology	According to Mhlanga (2020), the use of technology in the delivery of financial services has increased in the last decade due to the proliferation of internet access, mobile telephones and broadband linked services. Liu et al. (2020) argued that technology has enhanced financial development through its ability to make financial products more accessible in a non-expensive way, dealing away with geographical limitations and opening more financial products delivery channels.	+
Remittances x technology	The literature which explains that digital technology facilitates the inflow of remittances has been proffered by Asong et al. (2018) and Bersch et al. (2021). The positive influence of digital technology on financial development is also theoretically explained by Liu et al. (2020) and Mhlanga (2020) as has been shown earlier. Since positive influence of	+

	remittances on financial development is non-deniable in the literature, it follows therefore that digital technology improved remittances' impact on the financial sector. In other words, a strong digital technology system speeds up the rate and efficiently through which remittances flows into the country through the financial sector, consistent with Jemiluyi and Jeke (2023).	
Trade openness	Trade openness allows domestic firms to internationalise their operations. This spurs financial sector growth because these local companies require more sophisticated financial risk management techniques to respond to foreign competition and external shocks (Svaleryd & Vlachos, 2002).	+
Urbanization	An increase in urbanization means that more people lives, work and transact in urban areas hence spurring the development of the financial sector.	+
Human capital development	Educated people are more likely to possess financial literacy skills which spurred the financial sector, for example savings, budgeting, wealth creation and investment.	+
Tax revenue	Increased tax revenue collection is good for economic growth and enhancing development of the financial sector.	+
Population	Higher population growth in a growing economy increases the demand for financial services, consistent with Aspromourgos (1986).	+
Foreign direct investment	Foreign direct investment has got an absorption capacity which acts as an intermediary force in the financial sector (Yeboua, 2019). Foreign direct investment brings along with it managerial experience, capital, technological advancement hence positively enhancing financial sector and economic growth (Majeed et al., 2021).	+
Economic growth	Robinson (1952) explained that the increase in wealth among the people which comes alongside economic growth allows consumers to save extra cash and invest in banks, stock and bond markets hence promoting financial development.	+

Source: Author

4. Pre-Estimation Diagnostics

Table 3. Correlation analysis results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) FIN	1.00									
(2) REMIT	-0.28***	1.00								
(3) TECH	0.36***	-0.30***	1.00							
(4) OPEN	0.46***	0.08	0.13**	1.00						
(5) URBAN	-0.18***	-0.44***	0.59***	-0.2***	1.00					
(6) HCD	0.07	-0.28***	0.60***	0.20***	0.59***	1.00				
(7) TR	0.29	-0.18***	0.10*	0.32***	0.14**	0.02	1.00			
(8) POP	-0.34***	0.33***	-0.4***	-0.2***	-0.11*	-0.43***	0.17***	1.00		
(9) FDI	-0.21***	-0.08	-0.07	-0.02	0.14**	0.09	-0.01	-0.10	1.00	
(10) GROWTH	0.26***	-0.51***	0.78***	0.20***	0.76***	0.73***	0.20***	-0.44***	0.01	1.00

Source: Author

A significant negative correlation between remittances and financial development is evident in Table 3, an indication that certain channels are necessary to enable remittances to positively influence financial

markets. A significant positive correlation was also observed between (1) technology and financial development, (2) trade openness and financial development and (3) economic growth and financial development. These correlation results are generally supported by the existing literature (refer to Table 2). The correlation results also show a significant negative relationship between (4) urbanization and financial development, (5) population growth and financial development and (6) foreign direct investment and financial development. Such correlation results are in line with theoretical literature (Table 2). The correlation between (7) human capital development and financial development and (8) tax revenue and financial development was also found to be positive but weak. Consistent with Stead (2007), multicollinearity problem was observed in the correlation between economic growth and trade openness, economic growth and urbanization and economic growth and human capital development.

According to the descriptive statistics in Table 4, the ranges for financial development and trade openness is greater than 100, results which show the existence of outliers in the data set. The mean value is another layer of statistics which supports the existence of outliers in the data set employed in this study. The mean value of financial development is 70.6% of GDP whilst its standard deviation sits on 45.87. Technology's mean value is 46.74% of the population yet its standard deviation is 25.21. Trade openness's mean value sits on 47.52% of GDP whilst its standard deviation is 31.73. The mean value of urbanization is 66.91% of total population whereas its standard deviation sits on 16.90. Such significantly high standard deviations of these variables are a further proof of the existence of outliers in the data sets.

Table 4. Descriptive statistics

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
FIN	255	70.6	45.87	10.65	203.53
REMIT	255	1.66	2.49	0.07	12.78
TECH	255	46.74	25.21	2.39	97.6
OPEN	255	47.52	31.73	10.71	140.44
URBAN	255	66.91	16.90	29.24	92.23
HCD	255	0.75	0.09	0.08	0.94
TR	255	14.02	3.49	7.97	25.89
POP	255	1.03	0.47	0.01	1.97
FDI	255	2.60	1.52	0.01	10.01
GROWTH	255	3.83	0.34	2.86	4.55

Source: Author

5. Main Results and Findings

The panel corrected standard errors approach produced results presented in Table 5. Model 1 represents the main effect whilst model 2 shows results of the moderating influence of technology on remittance's effect on financial development.

Table 5. Role of complementarity between remittances and technology on financial development

Variables	Model 1	Model 2
REMIT	-5.85	-4.89
TECH	0.89	0.93
REMIT*TECH		0.53**

OPEN	0.30*	0.29*
URBAN	-1.79	-1.82
HCD	-82.65	-83.20
TR	2.24	2.31
POP	-8.73	-9.04
FDI	-3.02	-2.80
GROWTH	31.02	32.03
Constant	73.20	68.87
Observations	255	255
Number of countries	15	15
R-squared	0.628	0.629

**** p<0.01, ** p<0.05, * p<0.1*
Standard errors in parentheses

Remittances negatively influenced financial development under both models 1 and 2, in line with Biyase and Naidoo (2023)'s findings which say that remittances had a deleterious effect on financial development in the long run in South Africa. The results agree with literature which says that remittance in some countries can act as a substitute for the financial sector especially when is does not flow through the financial system. It is possible that there is a minimum threshold level above which remittances begins to have not only a positive influence but significant effect on financial development. The non-significant positive impact of technology on financial development under both models is generally in line with Liu et al (2020) whose argument is that technology's ability to avail financial services to most people in a less costly manner has enhanced financial development. Model 2 indicates that the complementarity between remittance and technology significantly improved financial development in transitional markets. These results support Jemiluyi and Jeke (2023)'s assertion that the efficiency of remittance flow into the financial system and economy of the labour sending country is ensured by the presents of strong digital technology.

In line with existing literature (Svaleryd & Vlachos, 2002), trade openness's positive impact on financial development was significant under both models. In contrast with available literature, urbanization, human capital development, population growth and foreign direct investment non-significantly reduced financial development under both models. These results could be an indication that certain infrastructural, policies, values and environment must exist before these variables can have a positive effect on financial development. It is a gap which further research can explore in the context of transitional markets. Both models show that economic growth had an insignificant enhancing influence on financial development, in line with Robinson (1952) whose explanation was that wealth triggered by positive economic growth lead to an increase in demand for financial products as the people would be now interested in saving, investment and protecting their wealth.

Threshold regression results using Hansen (2000) approach are summarized in Table 6.

Table 6. Bootstrap replications

Number of Bootstrap replications	2000
Threshold estimate	0.48
Trimming percentage	0.09
Bootstrap p-value	0
LM-test for no threshold	71.28

Importantly, these results show the minimum level of remittances beyond which financial development

happens in transitional economies. Bootstrap replications performed were 2 000 and a 0.09 trimming ratio is evident. The threshold estimates of 0.48 is shown in Table 6. LM-test (71.28) for absence of a threshold and the probability value (0) of bootstrap indicates that there exists a threshold level.

Table 7. Threshold regression results

Variables	Without threshold	Lower regime q ≤ = 0.48	Upper regime q > 0.48
REMIT	-3.11	-6.27	3.32
TECH	0.13	0.38	0.42
OPEN	0.15*	-0.32	0.07*
URBAN	-4.99	-2.01	-0.02
HCD	-5.93	-3.03	0.17
TR	2.89	1.06	2.21
POP	-3.94	-2.18	0.04
FDI	0.28	0.21	0.56**
GROWTH	1.87	0.11	0.09*
Constant	23.85	15.94	43.81
Confidence interval	[0.35-0.58]		
Observations	255		
R-squared	0.629		
Number of countries	15		
Threshold value	0.48		

Table 7 show that remittance below or equal to a threshold value of 0.48 had a non-significant negative effect on financial development. Remittances above a threshold level of 0.48 had a non-significant enhancing effect on financial development. The results are consistent with Sharaf and Shahen (2022) whose study noted that the influence of remittance on financial development is U-shaped. It could be that there is another threshold level (outside the scope of this study) above which remittances significantly enhances financial development.

The positive non-significant influence of technology on financial development is less under the lower regime and more under the upper regime, an indication that the upper regime has a stronger positive impact on financial development. The results are in line with Mhlanga (2020) whose study revealed that the proliferation of technological gadgets acts as a conduit for easy and efficient delivery of financial products to most of the citizens. Unlike under the lower regime, trade openness improved financial development significantly under the upper regime. Such results agree with Svaleryd and Vlachos (2002) whose argument was that increased international trade activities require a strong financial sector to help mitigate against not only external shocks, but a multifaceted layer of financial risks and impediments associated with the players.

The influence of urbanization, human capital development, tax revenue and population growth on financial development improved under the upper regime, in line with theoretical literature (refer to Table 2). FDI's impact on financial development was positive but non-significant under the lower regime but became positive and significant under the upper regime. Such results show that higher levels of FDI improves financial development in line with Yeboua (2019) whose argument is that FDI has got an absorption capacity which acts as an intermediary force in the financial sector. Economic growth insignificantly improved financial development under the lower regime whilst it significantly enhanced financial development under the upper regime. Higher levels of economic growth significantly enhance financial development, in agreement with Robinson (1952) whose study noted that economic growth

improves people's wealth standards hence triggering an increased demand of financial services so that they invest and protect their finances and wealth.

6. Conclusion

This study explored the influence of remittance on financial development in transitional markets. It examined if financial development was influenced by the complementarity between remittance and technology in transitional markets. In other words, it investigates whether technology advancement channel is essential in ensuring that remittances are directed towards financial development. What triggered the study is that existing literature produced inconclusive, mixed and divergent results. The study employed the Hansen (2000) threshold regression model and the panel corrected standard errors approach. The results indicate that remittances on their own negatively influence financial development but at the very most positively influence financial development in a non-significant manner. Technology had a non-significant enhancing impact on financial development. The complementarity between remittance and technology significantly improved financial development. Transitional markets must implement policies geared at enhancing remittance inflow and technology advancement to deepen the financial sector. Further studies on the subject matter need to focus on examining more than one threshold levels of remittances above which significant financial development occurs.

References

Adekunle, I. A., Tella, S. A., Subair, K., & Adegboyega, S. B. (2020). *Remittances and financial development in Africa*. European Xtramile Centre of African Studies WP/20/081.

Afridi, M. A., Khan, I., Rahman, H. U., & Khan, M. R. (2024). Remittances as a driver of economic growth: The moderating impact of financial development in developing economies. *Journal of Economic and Administrative Sciences,* December (2024), 1-21.

Alhassan, U., Maswana, J., & Inaba, K. (2025). Leveraging remittances for entrepreneurship: The role of financial development in developing economies. *Journal of Knowledge Economy*, 2-40.

Anghel, M., Nita, G., & Badiu, A. (2017). Impact of remittances on financial development and economic growth. *Romanian Statistical Review, 1*(2017), 106-112.

Anwar, A., & Afesorgbor, S. K. (2021). *The effect of remittances on financial development: Evidence from a meta-analysis*.

Azizi, S. (2019). Impacts of remittances on financial development. *Journal of Economic Studies, 47*(3), 467-477.

Armendáriz de Aghion, B., & Murdoch, J. (2005). *The Economics of Microfinance.* Cambridge: The MIT Press.

Baltagi, B. H., Demitriades, P. O., & Law, S. H. (2009). Financial development, openness and institutions: Evidence from panel data. *Journal of Development Economics, 89*(2), 285-296.

Bandura, W. N., Zivanomoyo, J., & Tsaurai, K. (2019). Remittances, financial development and economic growth: A case of SADC countries. *Acta Universitatis Danubius OEconomica, 15*(4), 67-82.

Batool, Z., Haroon, M., Ali, S., & Ahmad, R. (2022). Remittances and economic growth: Exploring the role of financial development. *IRASD Journal of Management, 4*(1), 127-134.

Biyase, M., & Naidoo, Y. (2023). The symmetric and asymmetric effect of remittances on financial development: Evidence from South Africa. *International Journal of Financial Studies*, *11*(26), 1-17.

Chiwira, O., & Murindagomo, T. (2024). Examining the relationship between remittances and financial development in Zimbabwe. *International Journal of Research in Business and Social Science, 13*(10), 181-188.

Cornelius, W. (1990), *Labour migration to the U.S.: development, outcomes, and alternatives in Mexican sending communities*. Report of the Commission for the Study of International Migration and Cooperative Economic Development. Washington, D.C.: Government Printing Office.

Forhad, R. J., & Alam, G. M. (2025). The impact of remittance on financial management in the recipient: A comparison between highly-and low-skilled migrants. *Migration and Development, 14*(1), 62-78.

Gupta, S., Pattillo, C., & Wagh, S. (2007). *Impact of remittances on poverty and financial development in Sub-Saharan Africa*. International Monetary Fund Working Paper Series Number WP/07/38.

Hamma, I. E. (2016). Migrant remittances and economic growth: The role of financial development and institutional quality, *Economie et Statistique,* 2018(503-504), 123-142.

Hamma, I. E. (2018). How catalytic is digital technology in the nexus between migrants' remittance and financial development in Sub Saharan African countries. *Economies,* 11(74), 1-12.

Hansen, B. E. (2000). Sample splitting and threshold estimation. *Econometrica*, *68*(3), 575-603.

Jemiluyi, O. O., & Jeke, L. (2023). How catalytic is digital technology in the nexus between migrants' remittance and financial development in Sub Saharan African countries. *Economies,* 11(74), 1-12.

Karikari, N. K., Mensah, S., & Harvey, S. K. (2016). Do remittances promote financial development in Africa? *SpringerPlus, 5*(2016), 1-21.

Keho, Y. (2016). Non-linear effect of remittances on banking sector development: Panel evidence from developing countries. *Theoretical Economics Letters, 6*(5), 1096-1104.

Keho, Y. (2020). Impact of remittances on financial development: Revisiting the evidence for ECOWAS countries. *Theoretical Economic Letters, 10*(1), 169-179.

Keho, Y. (2024). Impact of remittances on domestic investment in Western African countries: The mediating role of financial development. *SN Business and Economics, 4*(20), 1-27.

Liu, J., Li, X., & Wang, S. (2020). What have we learnt from 10 years of fintech research? A scientometric analysis. *Forecasting Technological and Social Change,* 155(June), 1-11.

Li, X., & Liu, X. (2005). Foreign direct investment and economic growth: An increasingly endogenous relationship. *World Development, 33*(3), 393-407.

Mustapha-Jaji, O. K., & Adesina-Uthman, G. A. (2023). The impact of international remittances on financial development in Nigeria: 1981-2021. *Economic Development, Technological Change and Growth, 19*(1), 130-146.

Majeed, A., Jiang, P., Ahmad, M., Khan, M. A., & Olah, J. (2021). The impact of foreign direct investment on financial development: New evidence from panel co-integration and causality analysis. *Journal of Competitiveness, 13*(1), 95-112.

Mhlanga, D. (2020). Industry 4.0 in finance: The impact of artificial intelligence (AI) on digital financial inclusion. *International Journal of Financial Studies,* 8(45), 1-14.

Misati, R. N., Kamau, A., & Nassir, H. (2019). Do migrant remittances matter for financial development in Kenya? *Financial Innovation, 5*(31), 1-25.

Motelle, S. I. (2011). The role of remittances in financial development in Lesotho: Evidence from alternative measures of financial development. *Journal of Development and Agricultural Economics, 3*(6), 241-251.

Nadabo, Y. S. (2023). Revisiting the nexus between remittances and financial sector development in Nigeria. *Economic Journal of Emerging Markets, 15*(2), 115-128.

Odhiambo, N. M., & Musakwa, M. T. (2024). Remittance inflows and financial development in Sub-Saharan African countries: Does governance matter? *Heliyon, 10*(2024), 1-8.

Olayungbo, D. O., & Quadri, A. (2019). Remittances, financial development and economic growth in Sub-Saharan African countries: Evidence from a PMG-ARDL approach. *Financial Innovation, 5*(9), 1-25.

Orozco, M., & Fedewa, R. (2005). *Leveraging Efforts on Remittances and Financial Intermediation*. Washington D.C.: Inter-American Development Bank.

Pesaran, M. H. (2021). General diagnostic tests for cross-sectional dependency in panels. *Empirical Economics, 60*(2021), 13-50.

Prempeh, K. B. (2023). The link between remittance inflows and financial development in Ghana: Substitutes or complements? *Cogent Economics and Finance, 11*(2), 1-17.

Romer, P. (1986). Increasing returns and long run economic growth. *Journal of Political Economy*, *94*(5), 1002-1037.

Robinson, J. (1952). *The Generalisation of the General Theory. In the rate of interest and other Essays*. London: MacMillan.

Sharaf, M. F., & Shahen, A. M. (2022). *The threshold impact of remittances on financial development: New evidence from Egypt*. ERF Working Paper Series Number 1545.

Sobiech, I. (2019). Remittances, finance and growth: Does financial development foster the impact of remittances on economic growth, *World Development, 113*(January), 44-59.

Svaleryd, H., & Vlachos, J. (2002). Markets for risk and openness to trade: How are they related? *Journal of International Economics, 57*(2), 369-395.

Tchekoumi, L. B., & Nya, P. D. (2023). Remittances and economic growth: What lessons for CEMAC zone? *Cogent Economics and Finance, 11*(1), 1-14.

APPENDIX

Diagnostic Test

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of financial development

chi2(1) = 19.91

Prob > chi2 = 0.0000

Ramsey RESET test using powers of the fitted values of financial development

Ho: Model has no omitted variables

F(3, 242) = 9.74

Prob>F = 0.0000

Table 8. Variance inflation factor

	VIF	1/VIF
GROWTH	7.321	0.137
URBAN	4.534	0.221
TECH	2.751	0.363
HCD	2.519	0.397
POP	1.895	0.528
OPEN	1.835	0.545
REMIT	1.643	0.609
TR	1.389	0.72
FDI	1.132	0.884

MEAN VIF	2.78	-

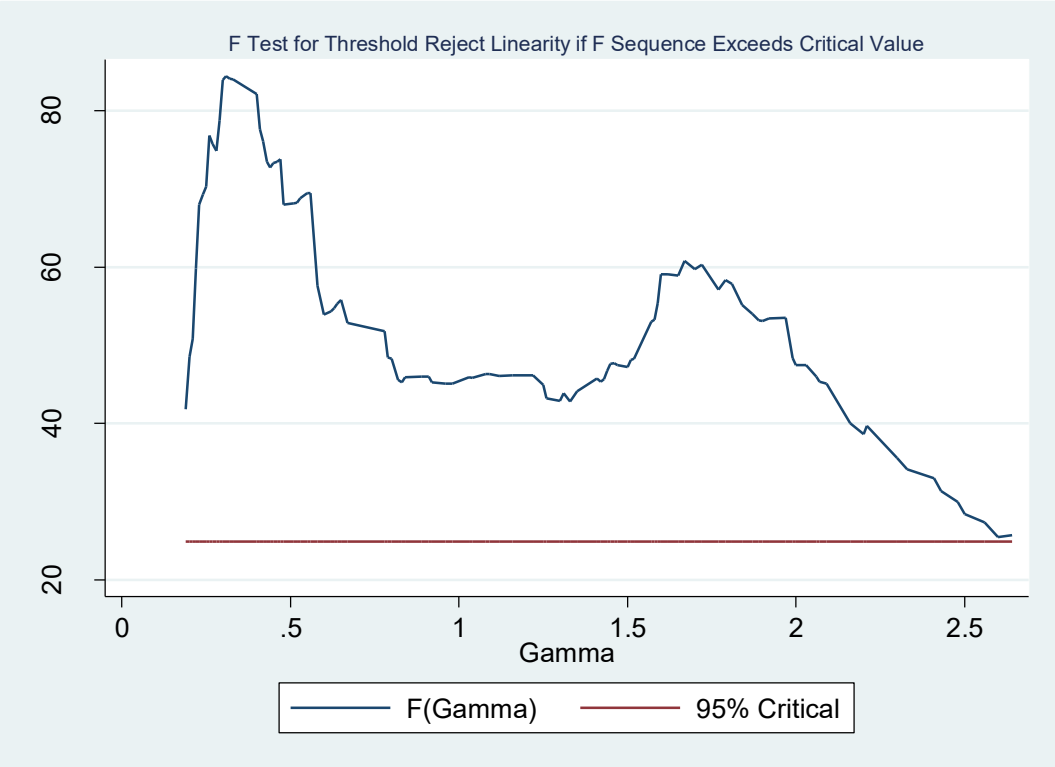
Table 9. Skewness/Kurtosis tests for normality (joint)

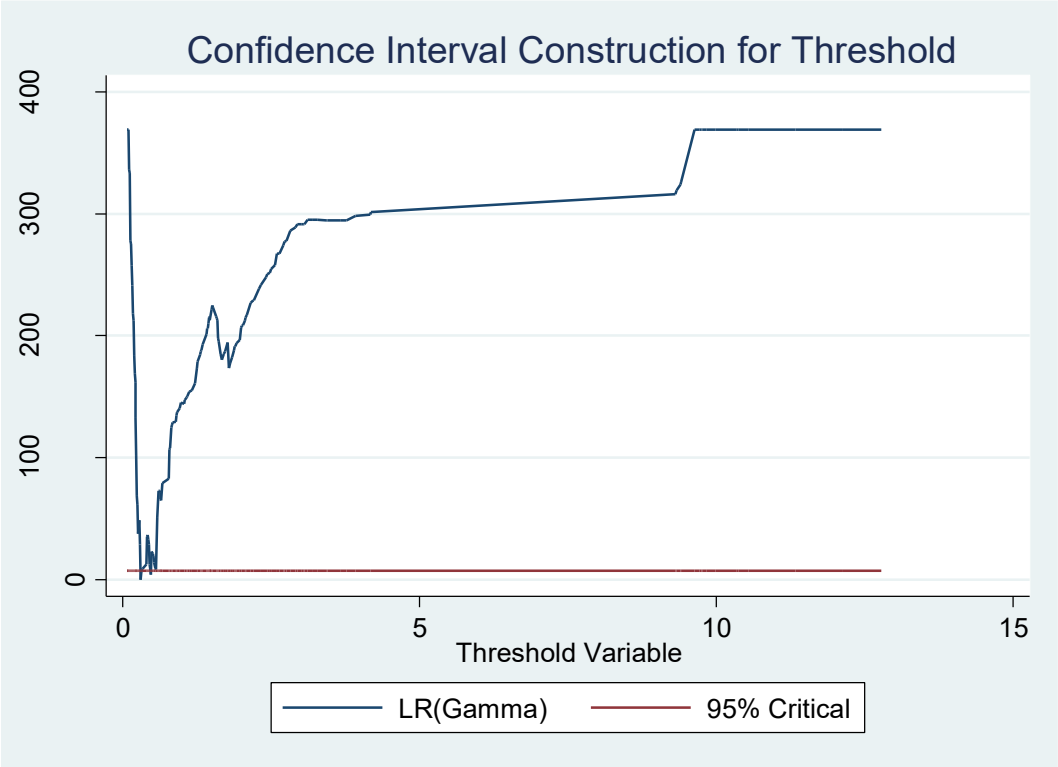
Variable	Observations	Pr(skewness)	Pr(kurtosis)	Adj chi2(2)	Prob>chi2
Residual	255	0.465	0.223	2.030	0.362

Test of endogeneity (orthogonality conditions)

Ho: Variables are exogenous

GMM C statistic chi2(1) = 0.83784 (p=0.3600)




Confidence Interval Construction for Threshold
400
300
200
100
0
0
5
10
15
Threshold Variable
LR(Gamma)
95% Critical