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Remittance Transfer to Developing Countries: Role of Digital Banking and Information and Communication Technologies

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Abstract

This study investigates the influence of digital banking and information and communication technology (ICT) on remittance transmission in six developing nations. For empirical estimation, panel data spanning 2000-2020 are chosen. Empirical assessment employs Continuously Updated Bias-Corrected (CUPBC) and Continuously Updated Fully Modified (CUPFM) panel estimate techniques. The study discovered that digital banking and ICT adoption increased the flow of remittances to underdeveloped nations. Concerning control factors, the study indicated that economic growth and inflation rate harm remittance transfers to developing countries, although interest rate had no significant effect. In addition, granger causality reveals a bidirectional causal relationship between remittance transfer and digital banking and ICT technology. The study's findings indicate that the governments of the selected nations engage more in digitalization in the form of e-banking, mobile banking, and internet banking, which reduce transaction costs and increase remittance transfers in the specified countries.

Keywords: *Remittance Transfer; Digital Banking; ICT; Developing Countries; CUP-FM &CUP-BC.*

1. Introduction

In recent years, remittances, or the money migrants send back to their home countries, have garnered increased attention in the context of global development due to their capacity to decrease poverty and stimulate prosperity. Remittances are the resources (financial or material) that migrants who live or work outside their hometowns send back to their relatives and communities. Remittances are progressively becoming an essential source of economic transformation in developing nations (Adejo & Etowa, 2016). As a result of rising policy pressure to legalize remittances, the marketplace for remittance transfers has recently been stimulated and innovated. Technological advances such as digital banking and mobile remittance services are heavily considered when seeking new and improved remittance-sending techniques (USAID & DFID, 2005). Electronic or digital banking is the technique by which a customer can do financial services electronically without visiting a physical institution. Due to the continual development of IT and the highly competitive banking markets, e-banking has been launched and embraced widely throughout time (Ojo & Sadiq, 2022). Personal computer banking, telephone banking, home banking, internet banking, remote electronic banking, online banking, and virtual banking are all types of electronic banking. Personal computers and online

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or internet banking are the most popular types. Personal computer banking refers to all transactions performed via a customer's computer. This can be accomplished via Internet banking, which enables consumers to make transactions from any Internet-connected terminal, or online banking, in which financial transactions are directed within a closed network (Applegate, Hazell, & Raphael, 2001). Online services are currently a distinguishing characteristic of the banking business. Customers can make financial transactions using a secure interface via e-banking or internet banking. In addition, it enables users to perform all banking-related actions with a single click, including accessing transaction history, moving funds, withdrawing cash, and making deposits (Mehmood et al., 2014).

Instead of sending actual cheques or cash, electronic banking, also known as electronic funds transfer, employs an automated system to transfer payments directly from one account to another (Han, 2022). Due to its adaptability, speed, convenience, and accessibility, e-banking has achieved significant acceptance in remittances. In addition, it provides users with benefits such as easy money transfers, online shopping, speedy transactions at lower rates, and time savings (Chijioke, 2016). Likewise, mobile banking enables individuals with formal bank accounts to do swift digital transactions via mobile phones. Mobile money, which permits transactions such as deposits, transactions, and exchanges without a bank account, is another option (Emara & Zhang, 2021). Through this payment technique, mobile devices can be used to send money. It is believed that these innovations will cut the cost of remittances and make them easier for receivers and senders to access, particularly in remote areas. Mobile phones, according to USAID and DFID, "hold the most potential for Africa and the remote corners of Asia and Latin America," as they state: "Of the new technologies bringing advances to fund transfer and reductions in transaction costs, mobile phones hold the most promise for Africa and the remote corners of Asia and Latin America" (Siegel & Fransen, 2013). Due to their reliance on existing smartphone networks and mobile banking, technical innovations that facilitate remittances have great potential because they are relatively straightforward to execute. Therefore, developing new technologies based on the current financial system is encouraged (Siegel & Fransen, 2013).

The primary objective of the present study is to assess the impact of digital banking and information technology on remittance transfers in six developing nations, namely Pakistan, India, Jordan, Sudan, Egypt, and Yemen, throughout the period 2000-2020. The research adds three contributions to the existing body of knowledge. This is the first study to quantify the impact of digital banking and ICT on remittance flows in the nations mentioned above. Second, past studies have examined the significance of ICT on remittance flows; however, the role of e-banking has been rather overlooked. And third, Second, and most critically, this is the first study to employ the CUPFM and CUPBC estimation methodologies to assess the long-run effect of the abovementioned factors. These techniques are superior to other empirical estimations because they solve the problem of cross-sectional dependency (CSD) arising from global unobserved stochastic trends, endogeneity, heteroskedasticity, and autocorrelation (Ahmed & Le, 2021; Samadi & Rad, 2013). The study's findings are anticipated to aid future scholars, institutions, and politicians concerned with remittance

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flows from the perspective of emerging nations.

2. Review of literature

In the past few decades, economists (along with other social scientists) have become increasingly interested in examining the growing significance of remittance transfers worldwide. Scientists who have studied their dynamics and effects on the economy have primarily focused on the factors influencing remittance inflows and outflows and the impact of remittances on economic and social outcomes. Using the Fixed Effect Approach, Alshammari, Faras, and Alshuwaiee (2022) examined numerous political and economic factors influencing remittance transfers in Gulf Cooperation Council nations from 1996 to 2019. Higher economic growth and political instability were found to correlate negatively with remittances. At the same time, it was observed that rising oil costs increased it. Umair and Waheed (2017) examined the factors influencing the flow of remittances from Saudi Arabia to Pakistan. Using the ARDL bound testing method, the authors discovered that a fall in domestic economic growth increased remittances to Pakistan. In Pakistan, trade openness was shown to increase remittance transfers, while financial deepening was found to decrease them. Al-Abdulrazag and Foudeh (2022) examined the impact of inflation on the outflow of remittances from Saudi Arabia using the ARDL bound testing method. The authors concluded that host-country inflation decreased remittance outflows. Javid and Hasanov (2022) also investigated the critical factors of the outflows of remittances from Saudi Arabia. The co-integration and equilibrium correction model results indicated that the increase in Saudi Arabia's GDP and the number of migrants grew.

In contrast, the increase in price level and expatriate taxes decreased the outflow of remittances. Barua (2007) assessed the determinants of Bangladeshi remittance transfers from 1993 to 2005. Inflation differentials between Bangladesh and remittance-receiving countries were found to influence remittances negatively. In contrast, an increase in the exchange rate was found to have a favorable effect on remittance transfers. Al-Assaf and Al-Malki (2014) assessed the determinants of remittance transfers in Jordan. The authors concluded that exchange rate and income are cointegrated with remittance transfer. Aydas, Metin-Ozcan, and Neyapti (2005) discovered that inflation rate differentials, interest rate differentials, and the gap between host and home country income levels had a substantial impact on Turkey's remittance flows. Pfau and Giang (2009) reached a similar finding for Vietnam. Schiopu and Siegfried (2006) assessed the influence of income and interest rate differentials between home and host countries on remittances transfer for 21 European nations. The authors discovered that interest rate differentials had no meaningful effect on remittance flows. In contrast, income differentials supported remittance transfers in European nations including Singh et al. (2011) for Sub-Saharan nations, Amuedo-Dorantes and Pozo (2004) for Latin American countries. Hassan and Holmes (2019) for 57 countries all came to the same conclusion.

However, only a small number of research have investigated the impact of digital banking

or information and communication technology on remittance outflows. Similar to Emara and Zhang (2021), this study evaluates the effect of digitalization, notably fin-tech, on remittance inflows in 34 poor and developed nations from 2004 to 2018. The results of the GMM estimation revealed that digitization increased the flow of remittances between the analyzed nations. Adejo and Etowa (2016) reviewed Nigeria's interconnections between ICT, remittances, and migration. The authors concluded that ICT was an effective strategy for promoting remittances in the nation. Asongu and Odhiambo (2020) estimated the impact of ICT on industrialization-related remittances using data from 49 African countries from 1980-2014. Using a Fixed Effect model, GMM estimation, and Instrumental Quantile Regression, the authors determined that the role of ICT in supporting remittance-based industrialization was evident and substantial (AKYOL et al., 2020). Siegel and Fransen (2013) investigated the availability of innovative remittance technologies in Africa. The authors concluded that mobile banking and online banking played a significant role in facilitating the flow of remittances in African nations. The effect of baking in remittance transfer and financial inclusion was investigated by Siriwardhane (2007). The authors found that the banking sector significantly and positively influenced the growth of the remittance industry and financial inclusion (Ubillus et al., 2022).

2. Research Gap

The literature provided evidence for estimating macroeconomic factors influencing the remittance transfer. However, very few studies have examined the role of ICT and digital banking in international money transfers. In addition, none of the previous research has examined the impact of digital banking and ICT on remittance transfers in a sample of developing nations. After identifying these gaps in research, we fill them in the areas mentioned above. In addition, the study goes a step further by employing advanced panel estimate approaches, specifically CUPFM and CUPBC, which previous research overlooked.

3. Data and Methodology

This study's primary objective is to assess digital banking's influence on remittance transfers in India, Pakistan, Egypt, and Yemen from 2000 to 2020. The study's dependent variable is personal remittances as a percentage of gross domestic product. In contrast, the primary explanatory variables are digital banking as measured by automated teller machines (ATMs) and ICT assessed by mobile phone and internet penetration. To prevent the omitted variable bias, the model's control variables include interest rate, economic growth, and inflation rate.

The model of the study is specified below:

REM = f (e-BANK, MOB, INTERNET, INF, GDP, INTRATE) (1)

The model in its econometric form can be formulated as

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$$REM_{it} = \alpha_0 + \beta_1 e - BANK_{it} + \beta_2 MOB_{it} + \beta_3 INTERNET_{it} + \beta_4 INF_{it} + \beta_5 GDP_{it} + \beta_4 INTRATE_{it} + e_{it} \quad (2)$$

The following Table 1 provides the variable descriptions and data sources.

Table 1: Variable Measurements and Sources of Data

Variables	Acronym	Measurement	Source
Remittances	REM	Personal remittance (% of GDP)	WDI
Digital Banking	e-BANK	Automated Teller Machines (per 1000 people)	WDI
Mobile Phone Penetration	MOB	Mobile subscriptions (per 1000 people)	WDI
Internet Penetration	INTERNET	Fixed Broad Band subscriptions (per 1000 people)	WDI
Economic Growth	GDP	GDP per capita constant (2015 $US)	WDI
Inflation	INF	Consumer Price Index	WDI
Interest Rate	INTRATE	Real interest rate (%)	WDI

Where WDI stands for World Development Indicator.

Econometric Methodology

First, the presence of CSD in panel data is tested using three different tests: the Breusch-Pagan LM test (BP test) by Breusch and Pagan (1980), the Pesaran CD test (PCD test), and the Pesaran Scaled LM test (PS test) by Breusch and Pagan (1980). (Pesaran, 2004). Using two tests of the second generation, namely CIPS and CADF, each series' stationarity and unit root processes are examined in the second stage (Pesaran, 2007). In the third phase, we utilized the co-integration test (Westerlund & Edgerton, 2008) to examine the co-integration relationship between all variables. The fourth step comprises estimating long-term parameters using the CUPFM and CUPBC estimation approaches. The fifth and last step used the heterogeneous causality test (Dumitrescu & Hurlin, 2012) to examine the causal association between variables.

Tests for Cross-Sectional Dependence (CSD)

Increasing economic integration between nations is expected to generate enormous cross-country interdependencies, mainly when temporal dimensions or cross-sections are large (De Hoyos & Sarafidis, 2006). CSD is a crucial issue in panel data estimation, and its omission can lead to inaccurate and inconsistent findings. Therefore, the BP, PS, and PCD tests are used to determine whether or not CSD is present.

BP test is suitable when data comprises of large N and small T and computed as follows:

$$LM_1 = \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} T_{ij} \hat{\rho}_{ij}^2 \rightarrow X^2 \frac{N.(N-1)}{2} \quad (i)$$

A standardized variant of the BP test is, the PS test, is computed as follows:

$$LM_2 = \sqrt{\frac{1}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \left(T_{ij} \hat{\rho}_{ij}^2 - 1\right) \rightarrow N(0,1) \quad (ii)$$

PCD test has been developed to deal with the size distortions in the Pesaran Scaled-LM test and Bruech-Pegan-LM. This test is suitable for large N and fixed T and can be computed

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as follows:

$$CD = \sqrt{\frac{2}{N*(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} T_{ij} \hat{\rho}_{ij}^2 \rightarrow N(0,1) \quad (iii)$$

In equation **(iii),** coefficients of correlation from the residuals are represented by $\hat{\varrho}_{ij}$. As previously mentioned, the model is standard normal (asymptotically) for $N \rightarrow \infty$ and $T_{ij} \rightarrow \infty$.

Unit Root Testing

After CSD testing, it is mandatory to test order of integration of the panel series. CADF is an IPS test category which indicates the CSD problem. The test statistics of the CADF test is given as follows:

$$y_{it} = \alpha_i + b_i y_{it-1} + c_i \bar{y}_{it-1} + d_i \Delta \bar{y}_t + e_{it} \quad (iv)$$

In the CADF test, the average unit root statistics of all cross sections are used to calculate statistics for the whole panel. The null hypothesis assumes nonstationarity, whereas the alternative hypothesis assumes stationarity of the panel data (Hızarcı & Zeren, 2020).

We also applied the CIPS unit root test. It can deal with CSD, resulting in more consistent and accurate findings. The equation of the test is specified as follows:

$$\Delta W_{i,t} = \partial_i + \partial_i Z_{i,t-1} + \partial_i \bar{Z}_{t-1} + \sum_{l=0}^{p} \partial_{il} \Delta \bar{W}_{t-1} + \sum_{l=0}^{p} \partial_{il} \Delta W_{i,t-1} + \mu_{it} \quad (v)$$

Where $\bar{W}$ denotes the cross-sectional averages and given as:

$$W^{it} = \partial^1 \overline{ERT}^{i,t} + \partial^2 \overline{EINOV}^{i,t} + \partial^3 \overline{RE}^{i,t} + \partial^4 \overline{NRE}^{i,t} \quad (iv)$$

The CIPS test statistics are specified as

$$\widehat{CIPS} = N^{-1} \sum_{i=1}^{n} CADF_i \quad (vii)$$

Co-integration Testing

For testing the presence of long-run co-integration among the series, we utilized the (Westerlund & Edgerton, 2008) co-integration test, which is applicable in the presence of CSD. Using the LM bootstrap co-integration approach, this co-integration method produces samples and two statistics. The significance of this method stems from the null hypothesis, which claims that long-run co-integration is present and addresses the variability of model variables. Westerlund and Edgerton (2008) provide the following test statistics:

$$LM_{\varphi}(i) = T\hat{\varphi}_i \, (\hat{r}_i/\hat{\sigma}_i) \quad (viii)$$

$$LM_{\tau}(i) = \hat{\varphi}_i / SE(\hat{\varphi}_i) \quad (ix)$$

Here, $\hat{\boldsymbol{\varphi}}_{\boldsymbol{i}}$ is the φ_i approximation against $\hat{\sigma_i}$ standard error, and $\hat{r}^2_i$ shows the long-term estimated variance of m_{it}, $\boldsymbol{\varphi i}\ \boldsymbol{(L)} = \mathbf{1} - \sum \boldsymbol{\varphi_{ij} L^j}$ represents a scalar polynomial having unit lag length, $\hat{\sigma}_i$ is vector of loading parameters. The structural breaks are represented by both level

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and regime shifts that these statistics account for (Umer et al., 2020).

CUPFM and CUP BC Estimations

In the presence of a co-integration relationship in the model, long-run parameters are obtained using estimate techniques for long-run coefficients. The new estimators CUPBC and CUPFM (Bai, Kao, & Ng, 2009) that enable robust estimation have been utilized in this investigation. The trend of CSD in the error component, as depicted in the following panel regression equation, is assumed to be based on the factor model, i.e., where it represents stationary error.

$$y_{it} = \alpha_i + \beta X_{it} + \varepsilon_{it}, \varepsilon_{it} = \lambda' F_t + \mu_{it} \qquad (x)$$

Ft represents the common factor vectors, λi indicates parallel factor loading, and the distinctive factor of the disturbance term is represented by $\mathbf{u_{it}}$. Continuous parameters, covariance matrix and factor loadings are used to create the CUP-FM estimator until there is a convergence. We define CUPFM as:

$$\beta_{cup} = \left[\sum_{i=1}^{N}\left(\sum_{t=1}^{T}\hat{y}_{it} + \hat{\beta}_{cup})(x_{it} - \bar{X}_i)' - T\left(\lambda'_i(\hat{\beta}_{CUP})\hat{\Delta}_{F\varepsilon i}(\hat{\beta}_{CUP}) + \hat{\Delta}_{u\varepsilon i}(\hat{\beta}_{CUP})\right)\right)\right]$$

$$\times \left[\sum_{i=1}^{N}\sum_{t=1}^{T}(x_{it} - \bar{X}_i)\,(x_{it} - \bar{X}_i)'\right] \qquad (xi)$$

where, $\hat{\Delta}_{F\varepsilon i}$ ***and*** $\hat{\Delta}_{u\varepsilon i}$ *denote one-sided estimated* covariance. CUPFM and CUPBC approaches give a steady estimate in the case of exogenous variables. Furthermore, CUPFM and CUPBC estimators give robust estimations and are appropriate in situations including every integration order regressor. Based on FMOLS and following Barlett Kernel procedures (Kiefer & Vogelsang, 2002), these techniques yield reliable results even when heteroskedasticity, endogeneity and autocorrelation exist (Bai et al., 2009). Furthermore, the power and scale of these estimates are reasonable. CUPBC and CUPFM are the best techniques for analysis because they provide the best fit in case of a small sample size. But these techniques are also commonly employed for long panels (Fang & Chen, 2017; Ulucak, 2020).

Panel Causality Testing

In the third phase, we estimate the short-run bidirectional causal relationship between the variables using a technique proposed by Dumitrescu and Hurlin (2012) that permits model heterogeneity across cross-sections. The VAR model's constant coefficients make it suited for stationary data. This technique requires unique log structures and appropriately diverse measurements along the cross-sections under both hypotheses. The null hypothesis assuming the lack of a causal relationship, is tested first, followed by alternative hypotheses of causal relationships for cross-sections. Lastly, for Granger non-causality testing, the Wald statistics are obtained individually for each cross-section. According to Dumitrescu and Hurlin (2012), this test corresponds to the normal distribution in the homogeneous non-causality

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hypothesis.

4. Empirical Results and Discussion

The descriptive statistics of the study's variables are provided in Table 2. These figures reveal that, among all variables, GDP has the highest mean value, whereas INTRATE has the lowest. GDP has the most significant standard deviation, whereas INTRATE has the lowest, indicating that INTRATE is the least volatile statistic in our model. In addition, for every series, the J-B (Jarque-Bera) test fails to reject the null hypothesis (normal distribution).

Table 2: Descriptive Analysis

Variables	Mean	Min value	Max value	Std. Deviation	J-B Stats
REM	3.321	28.50	36.82	1.867	1.567
e-BANK	2.318	13.47	45.22	1.347	4.765
MOB	2.304	0.082	3.452	1.484	1.372
INTERNET	3.402	6.19	13.31	1.753	3.248
GDP	4.67	109898	1666876	2.904	2.243
INTRATE	1.887	21.98	88.87	1.098	2.009
INF	3.871	19.11	24.55	1.556	1.445

Table 3 displays the correlations between all variables. The negative relationship between REM and e-BANK, MOB, and INTERNET suggests that MOB, INTERNET, and e-BANK diminish remittances. However, REM is positively associated with GDP, INTRATE, and INF, indicating that remittances increase as these factors do. In addition, the correlation between explanatory variables is not excessively high (less than 0.8), indicating that multicollinearity is not a problem in the sample.

Table 3: Correlation Test Results

Variables	REM	e-BANK	MOB	INTERNET	GDP	INTRATE	INF
REM	1.00						
e-BANK	-0.650	1.00					
MOB	-0.240	0.174	1.00				
INTERNET	-0.367	0.187	-0.143	1.00			
GDP	0.741	0.114	- 0.394	-0.418	1.00		
INTRATE	0.571	0.143	0.445	0.665	0.775	1.00	
INF	0.543	0.746	0.367	0.775	0.321	0.576	1.00

Source: Author's estimation

In this investigation, we utilized the BP, PS, and PCD tests to determine the presence or absence of CSD in the panel series. The test results are presented in Table 4. The significant

values suggest the presence of CSD in panel data, as the null hypothesis of no CSD has been decisively refuted.

Table 4: CSD Test Results

Variables	BP test	PS test	PCD test
REM	456.208***	24.334***	11.295***
e-BANK	223.157***	38.420***	13.530***
MOB	424.049***	61.115***	80.036***
INTERNET	235.156***	64.465***	26.173***
GDP	250.671***	55.091***	23.819***
INTRATE	367.009***	44.876***	21.55***
INF	256.778***	55.432***	40.073**

Note: *** denotes a 1% level of significance

Testing for CSD is followed by testing for the order of variable integration. In the presence of CSD in the data, the stationarity of the series is examined using two CIPS and CADF tests of the second generation, as suggested by empirical research. The results of both the CADF and CIPS tests, as shown in Table 5 below, indicate that each series is the unit root at level but becomes stationary when the difference is calculated. This indicates that all panel series have the same integration order.

Table 5: CIPS and CADF Test Result

Series	CIPS		CADF	
	Level	First Difference	Level	First Difference
REM	-1.019	-3.025***	-1.138	-3.233***
e-BANK	-1.088	-2.562***	-1.380	-5.202***
MOB	-0.119	-4.572***	-1.097	-4.542***
INTERNET	-0.192	-3.247***	-0.149	-5.132***
GDP	-0.137	-4.015***	-0.279	-2.630***
INTRATE	-0.567	-5.671***	-0.341	-3.222***
INF	-0.427	-4.981***	-0.165	-2.765***

Note: *** denotes a 1% significance level

As all variables are I(1), it is necessary to test for the presence of long-run co-integration among the study's variables. The (Westerlund & Edgerton, 2008) test was used for this purpose, and the findings are shown in Table 6 below. This test's null hypothesis assumes the absence of co-integration, whereas the alternative hypothesis implies its presence. According to the substantial test results, we conclude that all variables exhibit long-run co-integration.

Table 6: Co-integration Test Results (Westerlund and Edgerton)

Model	No Shift		Mean Shift		Regime Shift	
	t-stat	Prob-value	t- stat	Prob -value	t-stat	prob-value
LM_{τ}	-4.423	0.001	-3.348	0.004	-5.752	0.002
LM_{φ}	-4.327	0.002	-4.255	0.000	-4.460	0.000

A maximum of five factors are used to regress the model

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Table 8 below reveals the estimations of CUP-FM and CUPBC. All variables except interest rate affect remittances transfer significantly, either positively or negatively.

Table 8: CUPFM and CUPBC Results

Variables	CUPFM		CUPBC	
	Coeff	t-stat	Coeff	t-stat
e-BANK	0.655***	3.133	0.556***	4.065
MOB	0.372***	2.351	-0.299***	3.148
INTERNET	0.459***	4.643	0.389***	3.148
GDP	-0.998***	-2.641	-0.850***	-3.258
INTRATE	-0.875	0.087	-0.1253	-0.148
INF	-0.773***	-4.871	-.0.345***	-.4.965

According to CUPFM and CUPBC estimates, an increase in digital banking is connected with increased remittance transfers. CUPFM and CUPBC estimate that an increase of one unit in electronic or digital banking boosts remittance transfers by 0.65 units and 0.55 units, respectively. Similarly, the increase in mobile phone and internet penetration is related to increased remittance transfers in developing nations. The results demonstrate that adopting ICT technology and digital banking reduces the cost of money transmission. In addition, because sending mobile remittances is relatively affordable, users are more likely to send little amounts, which increases the motivation to send remittances more frequently. Our findings are substantially supported by the results of Emara and Zhang (2021), Adejo and Etowa (2016) and Siegel and Fransen (2013).

According to the data, increased economic growth is connected with a reduction in remittance transfers in the nations investigated. For each unit rise in economic growth, remittances fall by 0.99 units in CUPFM and 0.85 units in CUPBC. This can be explained by the fact that growing living standards boost local investment by increasing the sources of income and discretionary funds of overseas workers. This conclusion is consistent with past research by Elbadawi and Rocha (1992), Al-Abdulrazag and Foudeh (2022), El-Sakka and McNabb (1999), Elbadawi and Rocha (1992) and Alshammari et al. (2022). Similarly, CUPBC and CUPFM estimations indicate that inflation reduces remittance transfers in underdeveloped nations. In CUPFM and CUPBC assessments, a one-unit increase in inflation reduces remittance transfers by 0.77 and 0.34 units, respectively. This data suggests that rising inflation reduces migrants' savings by raising their consumption expenditures, resulting in fewer remittances. This finding is supported by prior research (Bobeva, 2017), (Javid & Hasanov, 2022), and (Alshammari et al., 2022). Despite having a negative coefficient, the interest rate was not determined to impact remittance transfers by CUPFM and CUPBC substantially. This finding contradicts Abdel-Rahman (2006); Adenutsi and Ahortor (2008); Al Oshaibat (2016).

To analyze the causality between the variables, we employ the granger causality test given by Dumitrescu and Hurlin (2012). Table 9 demonstrates the results of the causality test. The data reveal a feedback effect or bidirectional causality between REM, e-BANK, MOB,

INTERNET, INF, INTRATE, and GP, indicating a decrease or increase in e-BANK, MOB, INTERNET, GDP, INTRATE, and INF causes a decrease or increase in REM and vice versa.

Table-9: Results of Dumitrescu & Hurlin (2012) test

Null hypothesis (H0)	Stats	Prob value
REM doesn't homogenously cause e-BANK	14.312	0.008
e-BANK does' nt homogenously cause REM	16.330	0.000
REM doesn't homogenously cause MOB	20.350	0.010
MOB does' nt homogenously cause REM	18.735	0.040
REM doesn't homogenously cause INTERNET	19.592	0.000
The INTERNET doesn't homogenously cause REM	20.730	0.025
REM does' nt homogenously cause GDP	19.880	0.054
GDP does' nt homogenously cause REM	17.439	0.000
REM doesn't homogenously cause INTRATE	13.770	0.0088
INTRATE does' nt homogenously cause REM	14.980	0.064
REM doesn't homogenously cause INF	15.876	0.043
INF does' nt homogenously cause REM	12.987	0.076

Source: Author's estimation

5. Concluding Remarks and Policy Recommendations

The digital banking business is expanding fast in developing nations, which is considered a critical instrument for providing access to financial services to the unbanked and the underprivileged. In addition, mobile and online banking growth can considerably influence remittance transfers by decreasing transaction costs. Keeping these considerations in mind, the current study intends to estimate the impact of digital banking and ICT on remittance transfer in developing nations, namely Pakistan, India, Jordan, Sudan, Egypt, and Yemen, for the period 2000-2020. To achieve the purpose of the study, advanced panel estimate techniques using CUPFM and CUPBC approaches that account for CSD among panel series are utilized. In all calculations, the study indicates that digital banking, mobile phone penetration, and internet penetration improve remittance transfer. However, economic development and inflation have been observed to decrease remittances. In the analyzed economies, the interest rate has no substantial effect on remittance transfers. In addition, panel granger causality analysis reveals a bidirectional causal link between remittances and all variables.

The study's conclusions have essential policy consequences. The study advises that each country in our sample should establish a national strategic plan to develop and expand digital infrastructure to increase remittances. This digital infrastructure would increase investments in mobile data, digital technology, and internet connectivity and boost electronic banking usage and access among individuals, businesses, and governments. Due to the rising global

use of mobile devices and the internet, notably due to COVID-19, policymakers must invest in cyber security and fraud prevention. This will assist in decreasing cyber dangers, protect overseas workers, and encourage them to send money home.

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