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DIGITALIZATION'S EFFECT ON INTERNATIONAL REMITTANCES: THE HINDRANCE OF INSTITUTIONAL QUALITY IN ADVANCED ECONOMIES

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Abstract

Digital technology is crucial in reshaping economies by diminishing transactional barriers and fostering economic expansion. Concurrently, international remittance inflow is a potent tool for poverty alleviation and employment enhancement. The paper's objective is to explore the impact of digitalization on international remittances within advanced economies and to analyze how the level of institutional development influences this relationship. The research utilizes Internet user rates and fixed broadband subscription statistics as indicators of digitalization and the difference GMM estimators for a panel dataset of 34 developed countries from 2002 to 2021. The results present a counter-intuitive that digitalization and governance promote international remittances, but their interaction terms reduce these remittances. Furthermore, trade openness enhances remittances, while economic growth impedes them. From these findings, some policy lessons are suggested to look for insights into the role of institutional quality in the digitalization–international remittances nexus.

Keywords: *digitalization, international remittances, institutional development, advanced economies*

JEL code: *C23, G21, O47*

1. Introduction

In several countries, international remittances play a pivotal role in driving economic development and fostering growth, thereby leaving a positive imprint on the overall economy (Adams Jr and Page 2005). These financial inflows serve as a lifeline for countless households, enabling them to improve their quality of life and alleviate poverty in regions striving to advance. This transformative impact is attributed to the ability of remittances to cover essential daily expenses, facilitate access to education, and support crucial healthcare expenditures (Adams Jr and Page 2005).

Moreover, the significance of international remittances extends beyond their immediate effects. They possess an expenditure multiplier effect that contributes significantly to economic expansion. As households receiving remittances inject these funds into the local retail market, the demand for goods and services rises, leading to a domino effect of job creation and economic stimulation (Ratha 2003). This virtuous cycle of increased consumer spending amplifies the overall economic growth trajectory. The exemplary

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influence of remittance inflows on economic growth can be seen in the experiences of countries like India, Bangladesh, Nepal, and Sri Lanka, as highlighted by Jawaid and Raza (2016). These countries have harnessed the potential of remittances as a powerful driver of their economic progress.

However, it is crucial to acknowledge that several countries face several challenges in effectively harnessing remittances for development. These challenges include underdeveloped financial markets, limited access to credit, and insufficient foreign currency reserves. Nonetheless, remittance inflow distinguishes itself as an exogenous factor, impervious to the domestic economic situation. Unlike other forms of capital, governments do not incur interest payments on remittances, rendering them a stable source of capital that can significantly bolster the balance of payments, particularly in countries grappling with current account deficits (Buch and Kuckulenz 2010). Consequently, international remittances emerge as a potent force for promoting economic development and financial stability in developing nations.

Despite playing a supportive role in the economy, remittances can exert adverse effects. They can cause an appreciation of real exchange rates in economies, resulting in reduced trade competitiveness - a phenomenon often referred to as the "Dutch disease" (Polat and Rodríguez Andrés 2019). To attract more remittance inflows, certain governments have implemented enticing policies. These policies include offering tax exemptions to remittance recipients, removing limits on remittance amounts, eliminating the requirement to channel remittances through the commercial banking system, and permitting recipients to allocate freely remittances for spending or investment purposes. These measures can lead to the dollarization of the economy, which was initially the driving force behind this phenomenon (Luca and Petrova 2008). Dollarization frequently becomes associated with illicit activities within the foreign exchange market. As the illegal foreign exchange market expands within a country, informal remittance inflows tend to increase, as this market facilitates unlawful business practices (Luca and Petrova 2008). Moreover, remittances can foster a psychological dependence among recipients on migrants residing in recipient countries. In some instances, recipients may not utilize the remittances efficiently, thus rendering remittances suboptimal as a source of capital for stimulating economic development (Chami, Fullenkamp, and Jahjah 2005). Enhancements in institutions, as observed by Li and Filer (2007), can reduce transaction expenses, leading to higher levels of international remittances. Digital technology likely offers a fast, convenient, and cost-effective way to transfer money, making it affordable for both senders and recipients. Moreover, it is increasingly becoming more widespread and accessible to a broader range of users. Notably, the findings of Kim (2021) indicate that in nations with robust institutions, remittances are channeled more effectively and efficiently towards fostering financial development compared to countries with less effective institutions.

Meanwhile, the global shift towards digital technology represents an irreversible transformation. Digitalization plays a crucial role in empowering developing economies to reduce income disparities with more developed counterparts. Policymakers have duly acknowledged the critical role of digitalization in ameliorating poverty and income inequality, as underscored in the development agenda. One of the most effective means to afford the underprivileged access to knowledge and the opportunity to enhance their skills for improved income is through the advancement of digital infrastructure. In some countries, the pursuit of digital technology stands as a paramount development objective, especially within the context of e-government. The advent of digital technology has starkly illuminated a digital divide within our society, exposing the fact that those with greater financial means enjoy more extensive access to digital resources compared to their less fortunate counterparts. The fundamental cause of this divide can be traced to the prerequisites of knowledge and financial resources necessary for acquiring digital skills – a significant impediment for individuals with limited income. This challenge is particularly acute in developing countries, where impoverished individuals often contend with meager incomes and must allocate their resources towards necessities such as sustenance and shelter.

Despite the critical importance of the subject, there is a notable scarcity of research dedicated to understanding the impact of digitalization on international remittances. This study aims to address this void in the literature and make a unique contribution by unveiling fresh insights into the contrasting role played by institutional structures. Indeed, research on the impact of digitalization on international remittances is notably limited, particularly in advanced economies. Furthermore, no studies have yet explored the role of institutional quality in the relationship between digitalization and remittances within these countries. To this end, the research investigates the impacts of digitalization, institutional quality, and their interaction on international remittances for advanced countries. The findings in this paper are crucial for deriving valuable policy insights that could guide economic development strategies in developed countries.

We propose the research question and hypotheses as follows:

Research Question: Does institutional quality contribute to the nexus between digitalization and international remittances in advanced countries?

Hypotheses:

H1: Digitalization positively impacts international remittances.

H2: Institutional quality positively influences international remittances.

H3: The interaction between digitalization and institutional quality negatively affects international remittances.

The structure of the paper is as follows: Section 1 introduces the topic, while Section 2 explores global international remittances and the role of digital technology in developing economies. Section 3 presents the theoretical framework and literature review, followed by an explanation of the empirical model and research data in Section 4. The results are presented in Section 5, and Section 6 concludes the paper by summarizing key findings, drawing conclusions, and offering policy recommendations.

2. Some facts on global international remittances and digital technology

2.1. Global international remittances

According to the World Bank (2022), in 2021, remittances in middle-income and low-income economies are expected to reach USD 589 billion, marking a 7.3% increase. In 2020, these economies experienced a 1.7% decline in remittances due to the global economic downturn caused by the COVID-19 pandemic. Remarkably, this is the second consecutive year in which remittance inflows in these economies (excluding China) are projected to surpass the combined total of Foreign Direct Investment (FDI) and Official Development Aid (ODA).

These findings underscore the critical role played by remittance inflows in supporting families' expenditures on essential needs such as healthcare, nutrition, and education in recipient countries. The support provided by migrants to their families in times of need is a significant factor contributing to the growth in remittances. The economic recovery observed in the United States and Europe, driven by employment support programs and fiscal stimulus measures, has further boosted this essential lifeline of support. About 75 percent of remittances are utilized for essentials such as food, medical costs, education fees, and housing expenses (International Fund for Agricultural Development, 2024). According to the United Nations Development Programme (2023), a significant portion of remittances, around 80 to 90 percent, effectively incur indirect taxation through expenditure on goods and services.

The distribution of remittance flows across global regions exhibits significant variations. In the Pacific and East Asia region, remittances are projected to decline by 4% to reach 131 billion USD in 2021. Excluding China, this region saw a modest increase of 1.4% in remittance inflows during 2021, with expectations of a further 3.3% rise in 2022. Notably, the top recipient countries in this region include Tonga (accounting for 43.9% of GDP), Samoa (constituting 21% of GDP), and the Marshall Islands (representing 12.8% of GDP).

Conversely, South Asia experienced an 8% surge in remittances, totaling 159 billion USD in 2021. This growth can be attributed to elevated energy prices, stimulus initiatives, and the economic recovery in the United States. In particular, India and Pakistan witnessed significant increases in remittance inflows, with India experiencing a 4.6% rise to reach USD 87 billion and Pakistan observing a substantial 26% increase, amounting to USD 33 billion.

Remittances in Central Asia and Europe grew by 5.3% in 2021, reaching USD 67 billion. This positive trend is primarily attributed to elevated energy costs and the economic resurgence within the European Union (World Bank, 2022). This noteworthy rebound follows an 8.6% decrease in 2020. In the coming year, remittance inflows to this region are anticipated to continue their upward trajectory, with a projected increase of 3.8% in 2022. Notably, these remittances have equaled or surpassed the combined figures of portfolio investments, Official Development Assistance (ODA), and Foreign Direct Investment (FDI) in 2020 and 2021. Tajikistan and the Kyrgyz Republic emerge as the leading recipients in this region, each receiving remittances exceeding 25% of their respective GDPs.

Moving to the Caribbean and Latin America, remittances are expected to experience a substantial 21.6% surge in 2021, reaching $126 billion. The standout countries in this region in terms of remittance receipts include El Salvador (accounting for 26.2% of GDP), Honduras (comprising 26.6% of GDP), Jamaica (equivalent to 23.6% of GDP), and Guatemala (representing 18% of GDP). Several factors contribute to the robust growth in this region, including the impact of hurricanes Grace and Ida, the ongoing COVID-19 pandemic, and the implementation of social and fiscal assistance programs. Additionally, the recovery

in employment within the hosting economies plays a pivotal role in bolstering these remittance figures. Projections for 2022 indicate a continued positive trajectory, with remittances expected to increase by 4.4%.

Remittances in North Africa and the Middle East are poised to surge by 9.7% in 2021, reaching $62 billion. This remarkable growth can be attributed to the steep rise in oil prices and the economic recovery observed within the European Union, with notable contributions from countries like Spain and France. Within this context, Egypt's remittances are projected to reach 33 billion USD, marking a significant 12.6% increase, while Morocco is expected to receive 9.3 billion USD, reflecting an impressive 25% rise. However, some economies within the region, such as Jordan (at 6.9% of GDP), Djibouti (at 14.8%), and Lebanon (at 0.3%), are expected to witness a decline in remittance flows during 2021. It's worth noting that remittances have become the largest external source of financing, surpassing debt flows, portfolio equity, Foreign Direct Investment (FDI), and Official Development Assistance (ODA). Projections for 2022 indicate a potential decline of 3.6% due to the ongoing impact of the Covid-19 pandemic.

Meanwhile, in Sub-Saharan Africa, remittances experienced a notable 6.2% increase in 2021, reaching $45 billion. The standout countries in this region in terms of remittance receipts include the Gambia (constituting 33.8% of GDP), Lesotho (comprising 23.5% of GDP), Cabo Verde (representing 15.6% of GDP), and Comoros (accounting for 12.3% of GDP). Looking ahead to 2022, remittances in this region are expected to continue their positive trajectory, with a projected increase of 5.5%, driven by the recovery in Europe and the United States.Top of Form

2.2. Global digital technology

Digital technology provides a swift, convenient, and affordable method for money transfers, benefiting both senders and recipients. Furthermore, it is rapidly becoming more widespread and accessible to a broader range of users. Therefore, this subsection will mention global digital technology.

According to ITU (2022), mobile phone ownership surpasses internet usage in nearly all regions, albeit with a narrowing gap. This shift is evident in the swift rise of mobile broadband subscriptions, which are rapidly catching up to mobile cellular subscriptions, previously at a plateau. The statistics reveal that the younger generation is the driving force behind this connectivity surge, with 75% of individuals aged 15-24 now online, compared to 65% of the rest of the population. Although the gender gap in internet usage is slowly shrinking, there is a growing imbalance in the distribution of non-users, with women disproportionately underrepresented.

Compared to the prior year, the affordability of basic fixed and mobile broadband services improved in 2022. Nevertheless, a substantial global disparity in affordability persists. According to ITU's 2022 report, individuals residing in low-income economies must allocate more than 9% of their income to the most budget-friendly mobile broadband option, which is more than six times the global average cost.

The release of the Fifth United Nations Conference on the Least Developed Countries (LDC) report highlights a compilation of crucial indicators about information and communications technology (ICT). This data spans from 2011 and serves to illustrate the advancements achieved by LDCs through the Istanbul Program of Action, as agreed upon during LDC-IV in 2022 (ITU, 2022). Furthermore, the report provides an update on the progress of SDG Target 9c, which aims to enhance ICT access and advocate for universal and affordable internet access in LDCs by 2020.

Based on the analysis, it seems highly unlikely that Least Developed Countries (LDCs) will achieve universal and meaningful connectivity, which entails providing everyone with access to a secure, enriching, productive, satisfying, and reasonably priced online experience. As of 2022, only 36% of the population in LDCs had internet access, a figure significantly lower than the global average of 66%. Furthermore, 17% of LDC residents lacked access to fixed or mobile broadband networks, resulting in a significant access gap.

The usage gap, constituting 47% of the population offline, faces additional barriers to internet access, particularly the high cost of ICT services. In LDCs, the cost of internet access is higher than in any other region. An example highlighting the lack of affordability of mobile broadband in many LDCs is that a standard mobile broadband package, including a 2 GB monthly data allowance, can consume nearly 6% of the average income in these countries. This percentage is roughly four times higher than the global standard price of 1.5%. According to the UN Broadband Commission's affordability target of 2%, only two LDCs meet this criteria.

3. Theoretical background

3.1. Theoretical framework

According to Emara and Zhang (2021), the action of foreign workers sending money back to their home countries is commonly referred to as "remittance

inflow." These monetary inflows play a pivotal role as a source of financial support for developing nations, often rivaling the scale of international aid programs. For countries heavily reliant on exporting their labor force, these remittances can constitute a substantial share of their international capital flow. As countries have increasingly adopted financial openness and economic liberalization, governments have relaxed restrictions on remittances, resulting in the rise of new and alternative channels for migrants to transfer foreign currency. Consequently, the number of individuals sending remittances has increased, supplementing traditional global remittance methods, as highlighted by Emara and Zhang (2021).

Recently, digital technology has gained prominence as a favorable option due to its inherent advantages. Tabit and Moussir (2016) point out that digitization can enhance the accessibility of financial services, thereby positively impacting remittances. These remittances are acknowledged as a substantial fund for developing countries, often surpassing official aid and foreign direct investment. Rodima-Taylor and Grimes (2019) emphasize that the evolution of digital financial services provides an opportunity to reduce costs and promote financial inclusion by facilitating easier access to financial services. The high cost of remitting funds in South-South transactions is primarily attributed to limited competition in the remittance market within the countries of origin and destination. Transactional costs play a pivotal role in shaping international remittances, and any reduction in these costs could boost workers' willingness to send remittances, as indicated by Ratha and Shaw (2007). Engbersen and Dekker (2014) and Withaeckx, Schrooten, and Geldof (2015) propose that digitization in telecommunication services can lower communication expenses, enhance flexibility, and improve accessibility. These advantages could, in turn, strengthen the connection between migrants and their families. In the meantime, institutional quality can positively influence international remittances as suggested by Lartey and Mengova (2016) and Ajide and Raheem (2016). Specifically, Lartey and Mengova (2016) offer empirical evidence showing that improvements in the quality of institutions tasked with monetary policy implementation lead to increased remittances, with the impact growing stronger as the institutions' quality enhances. Therefore, the relationship between digitalization and remittances can be shaped by institutional quality. On one hand, improvements in institutions can lower transaction costs as noted by (Li and Filter, 2007), resulting in increased international remittances. However, it can foster robust development and healthy competition among digital technology platforms, potentially leading to dominance and monopolization of digital technology in advanced countries. Digital-based enterprises play a pivotal role in determining the costs associated with remittance transfers and receipts, potentially driving up transaction expenses. Furthermore, unlike developing economies, developed countries often have an institutional environment characterized by high taxation on remittance flows. Consequently, the interaction between institutional quality and digitalization can diminish international remittances.

3.2. Literature review

Recent studies by Emara and Zhang (2021) and Gascón, Larramona, and Salvador (2023) on the impact of digitalization on remittances highlight the transformative potential of digital advancements in money transfers. These studies emphasize the effectiveness and cost-efficiency of digital channels for remittance transactions, pointing to digitalization as a promising avenue for facilitating remittances. The findings strongly advocate for the adoption of digital technology by governments and financial institutions, suggesting that embracing these innovations can enhance the attractiveness of remittance flows. This not only benefits senders and recipients but also contributes to the broader economic well-being of the country.

Emara and Zhang (2021) employed the two-step system GMM estimator to analyze data from 2004 to 2018, encompassing 34 countries across various stages of development. Their research unveiled a distinctive inverted U-shaped relationship between digital advancement and remittance flows, demonstrating statistical significance precisely at a particular threshold. Furthermore, the study highlighted that both economic growth and trade openness exerted a positive influence on the volume of remittances. Meanwhile, Lyons, Kass-Hanna, and Fava (2022) examined the 2017 World Bank Global Findex database within the context of the 16 largest emerging economies. Their findings revealed that countries with robust digital payment systems, exemplified by China and South Africa, exhibit a greater inclination to initiate and receive remittances using mobile devices or financial institutions. In addition, their research unearthed a positive correlation between the utilization of digital financial services and the likelihood of remittance transactions occurring through mobile phones and financial institutions. Recently, Gascón, Larramona, and Salvador (2023) employed the 2016 Multi-purpose Household Survey (EHPM16) and a two-step selection model to evaluate how digitalization has influenced

remittances in El Salvador. The findings indicate a significant increase in the probability of households receiving remittances due to digitalization. Nevertheless, it is worth noting that digitalization does not impact the actual amount of remittances received by these households.

Research into the factors that influence remittances examines a broad range of elements. Notably, remittance inflows assume a substantial significance, especially in the early stages of economic development, as they offer an extra source of income or investment opportunities for individuals residing in middle-income countries (Yoshino, Taghizadeh-Hesary, and Otsuka 2020). Aydas, Metin-Ozcan, and Neyapti (2005) utilized OLS regression to analyze a time series dataset from 1965 to 1993 in Turkey. Their findings indicate that remittances are negatively influenced by factors such as inflation, market premiums, and military regimes, while they are positively impacted by economic growth and exchange rate fluctuations. In a parallel fashion, Castillo-Ponce, Hugo Torres-Preciado, and Luis Manzanares-Rivera (2011) employ the Vahid and Engle methodology to analyze a time series dataset spanning from 1991 to 2008 in El Salvador. Their findings reveal that remittances are positively influenced by factors such as employment in California, money supply, and interest rate differentials. However, they observe that economic growth exerts a negative impact on remittances. In the interim, in their study spanning from 1980 to 2015 using a time series dataset in Egypt, Akçay and Karasoy (2019) applied the autoregressive distributed lag (ARDL) bounds test. Their findings highlight that inflation, economic growth, oil prices, and financial development contribute to an uptick in remittance inflows, while the exchange rate exerts a diminishing effect on these inflows. Yoshino, Taghizadeh-Hesary, and Otsuka (2020) employ a two-step difference Generalized Method of Moments (GMM) estimation approach to analyze data from 22 middle-income Asia-Pacific economies from 2002 to 2015. Their findings reveal that differences in income levels between sending and receiving countries, higher levels of education, and greater trade openness positively influence remittance flows. However, FDI and high unemployment rates tend to hinder the flow of remittances. Recently, Jijin, Mishra, and Nithin (2022) utilized the ARDL bounds testing approach to analyze a quarterly time series dataset spanning from the second quarter of 1996 to the fourth quarter of 2019 in India. Their findings indicate that economic growth and oil prices improve remittances, while the exchange rate has a negative effect, leading to a reduction in remittances.

From the literature perspective, particularly highlighted by Emara and Zhang (2021) and Gascón, Larramona, and Salvador (2023), there exists a notable absence of studies integrating institutional quality into the examination of the digitalization-international remittances relationship. Moreover, no existing research addresses this topic specifically within advanced country contexts. Therefore, this study aims to fill these gaps in the literature by investigating the role of institutional quality in shaping the digitalization-international remittances nexus, focusing particularly on advanced economies.

4. Methodology

4.1. Empirical model

Based on the work of Emara and Zhang (2021), the empirical equation has been revised as follows:

$$REM_{ij} = \lambda_0 + \lambda_1 REM_{ij\text{-}1} + \lambda_2 DIG_{ij} + \lambda_3 GO_{ij} + \lambda_4 (REM \times GO)_{ij} + Y_{ij}\lambda' + \tau_i + \psi_{ij} \quad (1)$$

where subscript *i* and *j* are the indexes of country and time, respectively. REM_{ij} is personal remittances (% GDP), $REM_{ij\text{-}1}$ is the initial value of remittances, DIG_{ij} is Individuals using the Internet (INN) or Fixed broadband subscriptions (BRO), proxies for digitalisation, GO_{ij} is governance indicator, and $(REM*GO)_{ij}$ is the interaction between remittances and governance indicators. Y_{ij} contains trade openness, economic growth, and inflation as control variables; τ_i efers to a country-specific effect that is time-invariant and not directly observable, and ψ_{ij} is a term of error that is specific to the observation; λ_0, λ_1, λ_2, λ_2, λ_3, λ_4, and λ' are estimated coefficients. In this study, an extensive review of relevant literature was conducted to pinpoint the control variables suitable for inclusion in the empirical model. The scholarly sources considered in this review encompass the works of Aydas, Metin-Ozcan, and Neyapti (2005), Castillo-Ponce, Hugo Torres-Preciado, and Luis Manzanares-Rivera (2011), Lartey and Mengova (2016), Akçay and Karasoy (2019), Emara and Zhang (2021), and Jijin, Mishra, and Nithin (2022) in the context of economic growth. Additionally, for the assessment of trade openness, references were drawn from Lartey and Mengova (2016), Yoshino, Taghizadeh-Hesary, and Otsuka (2020), and Emara and Zhang (2021). Lastly, in relation to inflation, insights were gathered from Aydas, Metin-Ozcan, and Neyapti (2005), Lartey and Mengova (2016), and Akçay and Karasoy (2019).

We have employed difference GMM estimators to compute the estimates for Equation (1), as these estimators effectively address four significant issues. To begin with, certain concrete factors like economic growth, digitalization, and inflation might act as endogenous regressors because they may have a bi-directional relationship with international remittances. Secondly, there may be unobservable characteristics in τ_i (fixed effects) that are correlated with the independent variables. Thirdly, the presence of GIN_{ij-1} can lead to high serial correlation in the data. Lastly, our dataset encompasses a relatively large number of countries (34) with a limited observation period (20). It drops out the utilization of random effects models, fixed effects models, OLS regression, and IV-2SLS estimators unsuitable, as they could introduce biased and inconsistent coefficient estimates.

Holtz-Eakin, Newey, and Rosen (1988) initially advocated for the adoption of the Generalized Method of Moments (GMM) Arellano and Bond (1991) estimator, which employs all variables in the form of the first difference in Equation (1) to eliminate fixed effects (τ_i). This estimator is commonly known as the Difference GMM estimator (DGMM). However, there is a challenge when applying the one-step DGMM (1DGMM) and the two-step DGMM (2DGMM) in small samples, as the number of instrumental variables increases quadratically with the growth of the time dimension, surpassing the number of panel units, as noted by Roodman (2009). Roodman (2009) proposes a practical guideline to address this issue. For the validity of instruments, Hansen and Sargan tests are utilized to detect endogenous phenomena, while Arellano-Bond tests AR(2) are employed to assess the serial correlation of errors in the first difference. Specifically, 1DGMM relies on Sargan and AR(2) tests, while 2DGMM employs Hansen and AR(2) tests.

4.2. Research data

In this research, we employ a dataset including personal remittances, internet usage rates, fixed broadband subscriptions per 100 individuals, real GDP per capita, trade openness, inflation, and governance indicators sourced from the World Bank. Our study focuses on a sample of 34 advanced economies[1] observed from 2002 to 2021.

Table A presents dataset information, while Table B and Table C illustrate descriptive statistics. The data in Table C indicate that advanced economies exhibit strong governance. Furthermore, Table D and Table E depict correlation matrices. In Table D, the findings indicate a positive connection between trade openness and international remittances, while economic growth shows a negative relationship with international remittances. Additionally, Table E underscores that correlation coefficients between various governance dimensions exceed 0.8, suggesting collinearity concerns. Consequently, it is advisable to utilize these variables independently in empirical equations to mitigate issues related to multicollinearity.

5. Results

5.1. 2DGMM estimates

Tables 1A and 1B display the 2DGMM estimates for the baseline regression (excluding the interaction term), whereas Tables 2A and 2B present the 2SGMM estimates for the full model (including the interaction term). Specifically, Tables 1A and 2A showcase the outcomes related to Internet users, while Tables 1B and 2B provide insights into fixed broadband. Each column within these tables corresponds to a distinct governance indicator. The results in all tables for all six governance indicators show consistent outcomes. It is worth noting that the paper acknowledges the endogeneity of digitalization (Internet users/fixed broadband) in all estimation procedures. So, it adopts the gmm style, employing digitalization as an instrumented regressor. Meanwhile, it utilizes remittances, governance, economic growth, trade openness, and inflation as instrumental regressors in the iv style.

Without the interaction term (Table 1A and Table 1B), the various models' findings indicate that digitalization and governance play a role in fostering international remittances. However, when we introduce the interaction term (Table 2A and Table 2B), these findings remain unchanged. In other words, digitalization and governance still positively affect international remittances, but the interaction term introduces a contrasting effect. These results validate the proposed hypotheses, confirming that institutional quality significantly influences the digitalization-international remittances nexus to the research question. It suggests that while digitalization improves international remittances, its positive impact is weakened by governance-related factors.

The advantages of digitalization for international remittances are significant. Digital technology offers a fast, convenient, and cost-effective way to transfer money, making it accessible to both senders and receivers at a relatively low cost. Moreover, digital technology is becoming increasingly universal and available to anyone who wants to use it. So, affordable and easy access to digital technology motivates overseas workers to send more remittances to their families in

Table 1A. Digitalisation, governance, and international remittances: baseline

Digitalisation = Individuals using the Internet (% of population)

Dependent variable: International remittances (% GDP)

Variables	GO1	GO2	GO3	GO4	GO5	GO6
Remittances (-1)	0.078	0.016	0.196***	-0.050	-0.068	0.117***
	(0.046)	(0.049)	(0.042)	(0.056)	(0.048)	(0.033)
Internet users	0.008***	0.005***	0.004**	0.007***	0.007***	0.005***
	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Governance	0.171***	0.135***	0.035*	0.079***	0.166***	0.085***
	(0.035)	(0.046)	(0.020)	(0.029)	(0.059)	(0.033)
Economic growth	-0.009***	-0.007***	-0.006***	-0.010***	-0.009***	-0.006***
	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)
Trade openness	0.001**	0.001***	0.001***	0.001**	0.001*	0.001***
	(0.0005)	(0.0004)	(0.0004)	(0.0005)	(0.0005)	(0.0003)
Inflation	0.011**	0.000	0.000	0.008	0.008	-0.002
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)
Instrument	23	24	25	24	23	25
Country/Observation	34/510	34/510	34/510	34/510	34/510	34/510
AR(2) test	0.963	0.980	0.968	0.928	0.924	0.966
Sargan test	0.350	0.572	0.620	0.328	0.379	0.678
Hansen test	0.552	0.740	0.699	0.380	0.396	0.779

Note: *** denotes a 1% significance level, ** 5% significance level, and * 10% significance level.

Source: the author

Table 1B. Digitalisation, governance, and international remittances: baseline

Digitalisation = Fixed broadband subscriptions (per 100 people)

Dependent variable: International remittances (% GDP)

Variables	GO1	GO2	GO3	GO4	GO5	GO6
Remittances (-1)	-0.095***	-0.083**	0.132***	-0.299***	-0.159***	0.081
	(0.034)	(0.041)	(0.034)	(0.081)	(0.036)	(0.053)
Fixed broadband	0.002***	0.002***	0.001***	0.002**	0.002***	0.002***
	(0.0006)	(0.0006)	(0.0003)	(0.0008)	(0.0006)	(0.0004)
Governance	0.081**	0.149***	0.118**	0.500***	0.239***	0.199***
	(0.035)	(0.044)	(0.057)	(0.139)	(0.091)	(0.066)
Economic growth	-0.006***	-0.007***	-0.004***	-0.011***	-0.005***	-0.006***
	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)
Trade openness	0.001***	0.001***	0.001***	0.001***	0.000**	0.000**
	(0.0003)	(0.0003)	(0.0003)	(0.0006)	(0.0003)	(0.0002)
Inflation	0.003	0.000	-0.001	0.000	0.004	0.000
	(0.003)	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)
Instrument	23	24	25	24	23	26
Country/Observation	34/510	34/510	34/510	34/510	34/510	34/510
AR(2) test	0.893	0.924	0.975	0.620	0.835	0.961
Sargan test	0.568	0.771	0.767	0.834	0.759	0.604
Hansen test	0.787	0.609	0.617	0.869	0.648	0.742

Note: *** denotes a 1% significance level, ** 5% significance level, and * 10% significance level.

Source: the author

Table 2A. Digitalisation, governance, and international remittances: full model

Digitalisation = Individuals using the Internet (% of population)

Dependent variable: International remittances (% GDP)

Variables	GO1	GO2	GO3	GO4	GO5	GO6
Remittances (-1)	0.048	0.054**	0.292***	0.207***	0.329***	-0.061***
	(0.029)	(0.024)	(0.033)	(0.029)	(0.012)	(0.007)
Internet users	0.013***	0.027***	0.012***	0.013***	0.032***	0.018***
	(0.003)	(0.003)	(0.002)	(0.003)	(0.005)	(0.004)
Governance	0.507***	1.196***	0.555***	0.570***	1.821***	0.836***
	(0.159)	(0.175)	(0.179)	(0.163)	(0.295)	(0.313)
Internet users*governance	-0.004**	-0.014***	-0.007***	-0.006***	-0.020***	-0.010***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Economic growth	-0.009***	-0.011***	-0.009***	-0.006***	-0.006***	-0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Trade openness	0.001***	0.001***	0.0007**	0.001***	0.001***	0.003***
	(0.000)	(0.000)	(0.0003)	(0.000)	(0.000)	(0.000)
Inflation	0.009***	0.016***	0.014***	0.009**	0.005*	0.004***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.002)	(0.001)
Instrument	31	31	31	31	32	32
Country/Observation	34/510	34/510	34/510	34/510	34/510	34/510
AR(2) test	0.945	0.974	0.948	0.989	0.953	0.906
Sargan test	0.114	0.362	0.705	0.134	0.325	0.112
Hansen test	0.652	0.443	0.394	0.663	0.499	0.639

Note: *** denotes a 1% significance level, ** 5% significance level, and * 10% significance level.

Source: the author

Table 2B. Digitalisation, governance, and international remittances: full model

Digitalisation = Fixed broadband subscriptions (per 100 people)

Dependent variable: International remittances (% GDP)

Variables	GO1	GO2	GO3	GO4	GO5	GO6
Remittances (-1)	-0.013	-0.083***	-0.026	-0.087***	-0.067***	-0.083***
	(0.023)	(0.023)	(0.026)	(0.031)	(0.023)	(0.004)
Fixed broadband	0.004***	0.010***	0.005***	0.008***	0.007***	0.005***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Governance	0.499***	2.187***	1.000***	1.363***	1.335***	0.740***
	(0.176)	(0.350)	(0.276)	(0.501)	(0.203)	(0.243)
Fixed b. band*governance	-0.001**	-0.006***	-0.002***	-0.003***	-0.003***	-0.002***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
Economic growth	-0.008***	-0.008***	-0.010***	-0.011***	-0.009***	-0.009***
	(0.012)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Trade openness	0.000**	0.001***	0.000	0.000**	0.000	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	0.008**	0.005**	0.012***	0.011***	0.009***	0.006***
	(0.003)	(0.002)	(0.004)	(0.003)	(0.002)	(0.002)
Instrument	31	31	31	31	32	32
Country/Observation	34/510	34/510	34/510	34/510	34/510	34/510
AR(2) test	0.938	0.943	0.960	0.877	0.901	0.915
Sargan test	0.635	0.675	0.273	0.361	0.506	0.798
Hansen test	0.820	0.866	0.757	0.575	0.695	0.747

Note: *** denotes a 1% significance level, ** 5% significance level, and * 10% significance level.

Source: the author

their original countries. Empirical evidence provided by Lyons, Kass-Hanna, and Fava (2022) and Gascón, Larramona, and Salvador (2023) suggests that digital technology enhances the probability of remittance transfers. In the meantime, the enhancement of institutional frameworks is of paramount importance in stimulating international remittances. Such improvements can effectively reduce transaction costs and promote economic endeavors (Li and Filer, 2007). Remittances are a vital source of capital for economic development, prompting governments to continually enhance and reform policies and regulations (institutional quality) to attract and increase these inflows. Su et al. (2021) indicate that maintaining high institutional quality is essential in enabling the transformation of remittance inflows into productive investments that foster long-term economic growth for countries. These conclusions align with earlier studies conducted by Lartey and Mengova (2016) and Ajide and Raheem (2016).

The interaction between digitalization and governance presents a complex challenge to international remittances. While advancements in digital infrastructure and governance frameworks can create opportunities for a more competitive environment, particularly for digital-based enterprises, the overall impact on remittance flows is not entirely positive. In the short term, increased competition within this landscape could drive down the costs of economic transactions, including sending and receiving remittances. Low costs would be a significant benefit, making it more affordable for individuals to transfer money across borders. However, this initial phase of competition may not be sustainable in the long run. As the market matures, smaller businesses may struggle to keep up with larger, more established firms, leading to consolidations. Over time, this could result in a few dominant players gaining monopolistic control over the remittance market. These large enterprises would then have the power to set prices at their discretion, potentially driving up the costs of remittance services once again. In addition, the impact of taxation policies, particularly in developed countries, further complicates the remittance landscape. These countries often impose high taxes on remittance transfers, which can significantly reduce the total amount of money received by recipients. This not only diminishes the financial benefits for the recipients but also exacerbates economic disparities between the sending and receiving countries.

The findings of this research underscore the necessity of shaping the institutional landscape to curtail the dominance of digital enterprises through unfettered competition. The institutional framework should be designed to foster fair competition among digital businesses while preventing monopolistic tendencies. It demonstrates that a strategic focus on institutional development within digital technology platforms not only lowers transaction costs for digital-based economic activities but also safeguards against a reduction in international remittances.

The paper notes the negative impact of economic growth and the positive influence of trade openness on international remittances. Economic growth increases individuals' earnings, signifying an enhancement in their quality of life. Migrant workers abroad often send international remittances to support their families with everyday expenses, healthcare, education, and even to foster job opportunities. Nonetheless, as living standards improve in the recipient nation, the volume of remittances may dwindle, a phenomenon corroborated by Castillo-Ponce, Hugo Torres-Preciado, and Luis Manzanares-Rivera (2011).

In contrast, the adoption of an open trade policy can create favorable conditions for the transfer of remittances from overseas to the home country. These advantages encompass reduced remittance transfer costs, higher remittance amounts, and simplified legal procedures. As a result, promoting trade openness can act as a catalyst for increasing international remittances, as demonstrated by studies conducted by Lartey and Mengova (2016), Yoshino, Taghizadeh-Hesary, and Otsuka (2020), and Emara and Zhang (2021).

5.2. Robustness check: 1DGMM estimates

The study utilizes 1DGMM to assess the resilience of 2DGMM estimations. The outcomes reported in Table 3A pertain to Internet users, while those in Table 3B relate to fixed broadband users. In line with the findings from the 2DGMM estimations, the results indicate that international remittances experience a positive impact from digitalization and governance. However, it is noteworthy that the interaction term between these factors has a diminishing effect on remittances. Additionally, economic growth is observed to have a decreasing influence on international remittances.

6. Conclusion

Digital technology is gaining increasing significance, with numerous experts foreseeing a gradual transition from conventional to digital economies in the forthcoming years. However, it is imperative to recognize that the institutional framework can yield unforeseen repercussions in the case of digital technology, particularly concerning international remittances.

Table 3A. Digitalisation, governance, and international remittances: full model

Digitalisation = Individuals using the Internet (% of population)

Dependent variable: International remittances (% GDP)

Variables	GO1	GO2	GO3	GO4	GO5	GO6
Remittances (-1)	0.413**	0.410**	0.399**	0.498***	0.244	-0.070
	(0.199)	(0.197)	(0.182)	(0.187)	(0.148)	(0.054)
Internet users	0.034**	0.059***	0.016***	0.056**	0.049**	0.060**
	(0.015)	(0.018)	(0.005)	(0.027)	(0.023)	(0.028)
Governance	1.919**	3.127***	0.734*	3.142**	2.823**	3.499*
	(0.873)	(1.016)	(0.421)	(1.611)	(1.399)	(1.936)
Internet users*governance	-0.020**	-0.038***	-0.010**	-0.037**	-0.031**	-0.043*
	(0.010)	(0.012)	(0.005)	(0.019)	(0.016)	(0.023)
Economic growth	-0.013***	-0.013***	-0.013***	-0.009**	-0.012***	-0.020***
	(0.004)	(0.001)	(0.004)	(0.004)	(0.003)	(0.004)
Trade openness	0.000	0.000	0.000	0.001	0.001	0.004
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)
Inflation	0.019	0.023**	0.026**	0.014	0.009	0.009
	(0.012)	(0.011)	(0.012)	(0.012)	(0.011)	(0.010)
Instrument	31	31	31	31	32	34
Country/Observation	34/510	34/510	34/510	34/510	34/510	34/510
AR(2) test	0.981	0.597	0.758	0.949	0.892	0.812
Sargan test	0.122	0.352	0.489	0.428	0.110	0.108

Note: *** denotes a 1% significance level, ** 5% significance level, and * 10% significance level.

Source: the author

Table 3B. Digitalisation, governance, and international remittances: full model

Digitalisation = Fixed broadband subscriptions (per 100 people)

Dependent variable: International remittances (% GDP)

Variables	GO1	GO2	GO3	GO4	GO5	GO6
Remittances (-1)	-0.078	-0.192	0.023	-0.078	-0.224	-0.196
	(0.048)	(0.150)	(0.169)	(0.048)	(0.148)	(0.172)
Fixed broadband	0.011***	0.016***	0.008**	0.011***	0.010***	0.018***
	(0.002)	(0.006)	(0.004)	(0.002)	(0.003)	(0.007)
Governance	1.807**	3.477**	1.592	1.807**	2.170**	4.195*
	(0.819)	(1.593)	(1.427)	(0.819)	(0.935)	(2.317)
Fixed b. band*governance	-0.004**	-0.009**	-0.004	-0.004**	-0.005**	-0.012*
	(0.002)	(0.004)	(0.004)	(0.002)	(0.002)	(0.006)
Economic growth	-0.018***	-0.016***	-0.016***	-0.018***	-0.016***	-0.016***
	(0.002)	(0.003)	(0.039)	(0.002)	(0.003)	(0.003)
Trade openness	0.000	0.000	0.000	0.000	0.002	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Inflation	0.021**	0.013	0.025***	0.021**	0.010	0.011
	(0.009)	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)
Instrument	33	32	31	33	33	33
Country/Observation	34/510	34/510	34/510	34/510	34/510	34/510
AR(2) test	0.708	0.629	0.975	0.819	0.385	0.600
Sargan test	0.102	0.684	0.273	0.102	0.569	0.170

Note: *** denotes a 1% significance level, ** 5% significance level, and * 10% significance level.

Source: the author

While digital technology undeniably has the potential to bolster international remittances, the institutional framework can unpredictably shape the trajectory of digital technology, consequently influencing international remittances. Given these circumstances, this study employs 1DGMM and 2DGMM methodologies to assess the impact of digitalization and governance, as well as their interplay, on international remittances, using a panel dataset encompassing 34 advanced economies from 2002 to 2021. The results uncover that digitalization and effective governance positively impact international remittances, whereas the interaction between these factors has a counteractive effect. Furthermore, economic growth exhibits a negative correlation with international remittances, whereas trade openness demonstrates a positive association.

These findings provide key policy insights for governments in advanced economies seeking to boost growth through international remittances:

(1) Institutional Priorities: Instead of merely promoting competition, institutional reforms should remove barriers hindering digital platform expansion. Aligning with New Institutional Economics (NIE), this approach lowers transaction costs, fostering innovation and efficiency, particularly in financial and remittance transactions.

(2) Digital Transformation: Digital infrastructure is crucial for maximizing remittance benefits, reinforcing Schumpeterian growth theory, which links technological progress to long-term economic development. Governments should treat digital investments as core growth policies, using tax incentives and regulatory support to enhance remittance flows.

(3) Global Positioning: More efficient remittance systems can strengthen advanced economies' international influence, as remittances act as financial stabilizers for recipient countries. Dependency theory suggests wealthier countries shape economic dynamics, making seamless remittance transactions a strategic tool for financial inclusion and international engagement.

(4) Workforce Development: A digitally skilled workforce, as emphasized by human capital theory, enhances competitiveness in the global digital economy. Governments should invest in education and upskilling programs to support financial technology advancements and attract remittance-related financial flows.

In this study, we use World Bank data on Internet usage and fixed broadband subscriptions as proxies for digitalization due to their availability. However, future research could incorporate additional measures such as secure Internet servers and mobile cellular subscriptions from the World Bank database. Moreover, more comprehensive digital metrics - such as Digital Economy Metrics, Digital Society Metrics, Digital Industry Metrics, Digital Enterprise Metrics, Digital Client Metrics, and Digital Investment Metrics, as identified by Kotarba (2017) - should be utilized when available.

Regarding the difference GMM estimators, the past values of persistent variables often provide limited predictive power for future changes, weakening their effectiveness as instruments. Future studies should consider advanced estimation techniques such as panel quantile regression, pooled mean group estimation (PMG), or Cross-Sectional AutoRegressive Distributed Lag (CS-ARDL) for robust analysis to address this issue.

To deepen our comprehension of the connection between digitalization and international remittances, it is advisable for forthcoming research to undertake a comparative analysis of the impact of institutional quality on this phenomenon within both developed and developing economies.

Endnotes

[1] Australia, Austria, Belgium, Canada, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Korea, Rep., Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom, and the United States.

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Appendix

Table A. Data description

Variable	Definition	Type	Source
International remittances (REM)	"Personal remittances consist of compensation of employees and personal transfers (% GDP)"	%	World Bank
Individuals using the Internet (INN)	"Internet users are individuals who have used the Internet (from any location) in the last 3 months. The Internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV,..."	%	World Bank
Fixed broadband subscriptions (per 100 people) (BRO)	"Fixed broadband subscriptions refers to fixed subscriptions to high-speed access to the public Internet (a TCP/IP connection), at downstream speeds equal to, or greater than, 256 kbit/s."	log	World Bank
Economic growth (GDP)	"GDP per capita (constant 2015 US$)"	log	World Bank
Trade openness	"The sum of exports and imports of goods and services measured as a share of gross domestic product."	%	World Bank
Inflation (INF)	"Inflation, consumer prices (annual %)"	%	World Bank
Regulatory Quality (GO1)	Governance indicators	level	World Bank
Rule of Law (GO2)			
Voice and Accountability (GO3)			
Control of Corruption (GO4)			
Government Effectiveness (GO5)			
Political Stability (GO6)			

Table B. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
REM	2,040	5.434	7.272	0	50.101
INN	2,040	27.132	24.928	0	100
BRO	2,040	4.461	7.032	0.0001	37.575
GDP	2,040	5,012.742	7,970.547	267.319	77,544.030
OPE	2,040	76.181	33.238	11.855	210.400
INF	2,040	6.591	15.936	-72.729	557.201

Table C. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GO1	2,040	-0.479	0.593	-1.672	1.662
GO2	2,040	-0.398	0.585	-1.809	1.254
GO3	2,040	-0.355	0.755	-2.810	1.422
GO4	2,040	-0.355	0.642	-2.348	1.536
GO5	2,040	-0.467	0.590	-1.870	1.348
GO6	2,040	-0.384	0.770	-2.259	1.311

Table D. The matrix of correlation

	REM	INN	BRO	GDP	OPE	INF
REM	1					
INN	-0.024	1				
BRO	0.011	0.792***	1			
GDP	-0.197***	0.636***	0.677***	1		
OPE	0.179***	0.138***	0.136***	0.219***	1	
INF	-0.004	-0.061***	-0.056***	-0.055***	-0.017	1

Note: *** denotes a 1% significance level, ** 5% significance level, and * 10% significance level.

Table E. The matrix of correlation

	GO1	GO2	GO3	GO4	GO5	GO6
GO1	1					
GO2	0.791***	1				
GO3	0.565***	0.470***	1			
GO4	0.708***	0.822***	0.401***	1		
GO5	0.864***	0.845***	0.591***	0.792***	1	
GO6	0.596***	0.537***	0.419***	0.640***	0.632***	1

Note: *** denotes a 1% significance level, ** 5% significance level, and * 10% significance level.