

The Digital Remittance Corridor: Exploring the role of Internet Access on Foreign Remittances Inflow in selected Asian Countries

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Abstract:

This study examines the long-term effects of socioeconomic variables—GDP, inflation, cell phone subscriptions, internet usage, literacy rates, and exchange rates on personal remittances inflow to top remittance-receiving Asian economies like Pakistan, India, Bangladesh, Sri Lanka, and the Maldives. The research utilizes various statistical tools for analysis. The results aim to provide policymakers with insights for optimizing remittance benefits and developing responsive policy frameworks.

Introduction

Remittances play a crucial role in the lives of many individuals in Asia and the Pacific. They serve as a financial lifeline, enabling families to meet their daily expenses and support education, healthcare, and small enterprises. The World Economic Forum estimates that in 2022, migrants sent home almost \$800 billion. In 2022, remittances to South Asia totalled \$176 billion, a 12.2% rise from 2021 and approximately \$13 billion higher than anticipated. With about \$111 billion, India was the world's largest receiver. In South Asian rankings, Pakistan and Bangladesh came in second and third, with roughly \$30 billion and \$21.5 billion, respectively. South Asia had the lowest transfer charges, averaging 4.1%, while Sub-Saharan Africa had the highest at 7.8%. The global community has long acknowledged the significance of remittances and has established various international objectives to tackle associated challenges. Among these objectives is Sustainable Development Goal (SDG) 10, which strives to limit remittance costs to 3% by 2030, with no individual remittance corridor exceeding 5% in cost. Furthermore, Objective 20 of the Global Compact for Safe and Orderly Migration seeks to: "Promote faster, safer and cheaper transfer of remittances and foster financial inclusion of migrants" (United Nations 2019).

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Remittances have experienced significant growth and have become the principal foreign income source for numerous developing nations. What distinguishes remittances is their substantial magnitude and relatively equitable distribution among developing countries compared to capital flows, including foreign direct investment, which tends to concentrate in a select few emerging markets. Remarkably, remittances hold particular significance for low-income nations. In low-income countries, remittance flows constitute nearly 6 percent of their gross domestic product (GDP), substantially contrasting to approximately 2 percent of GDP in middle-income countries (World Bank 2020). Asia has been experiencing a dynamic transformation for over a decade, and so have its people. While Asia is renowned for its remarkable achievements in education, investments, technology, and savings, it is essential to recognize another intertwined aspect that often remains beneath the surface: the migration of individuals in pursuit of improved prospects for themselves and their families. This represents the human aspect of globalization, one that is intricately linked to the region's success.

Cash transactions remain prevalent in the majority of markets. The practice of de-risking has led to challenges for some remittance service providers in obtaining bank accounts. Additionally, certain regulatory frameworks are overly restrictive. The challenges associated with remittances can be effectively addressed through digitization. Digital services, which include bank account transfers, online platforms, and mobile money, have long been recognized as the main means of lowering remittance expenses. In contrast to the 6.75% average of Remittance Prices Worldwide, fees for international mobile money transfers were only 1.7% in 2018, and by 2020, they had risen to 3.51%, according to a 2018 study by the Global System for Mobile Communications Association (GSMA). Digitization reduces expenses while also improving accessibility, promoting transparency, streamlining processes, and helping to manage risks associated with money laundering and the fight against terrorism financing. GSMA. (2018) State of the Industry Report on Mobile Money

In Asia, remittances make a substantial contribution, surpassing more than five times the amount provided through official development assistance. Additionally, nine Asian nations receive remittances equivalent to 10 percent or more of their GDP (Migration and Development Brief, 2020). What's even more significant is that remittances play a crucial role in elevating millions of Asian households above the poverty line, while also providing the opportunity to enhance their living conditions, healthcare, and education. In total, it is estimated that remittances support approximately 70 million Asian households, which translates to one in every ten households in the region. In the grand scheme of things, Asia captures a substantial share, receiving 63 percent of all global remittances. The largest destination countries for these remittances, in descending order of magnitude, include India, China, and the Philippines, making them the top three in the world. Bangladesh, Pakistan, Vietnam, and Indonesia also feature among the top ten countries in terms of remittance receipts. Given their substantial size and sensitivity to economic disruptions, remittances hold the capacity to assist developing nations in various ways, including economic stability, enhanced financial credibility, attracting resources for asset building, and investments in human development. The primary obstacle lies in devising effective policies to stimulate these remittance flows and ensure their beneficial

utilization, all while considering the unique circumstances of each country at any given moment.

Remittances from Asia were significantly impacted by the COVID-19 pandemic. Numerous migrant laborers experienced layoffs and pay cuts, which impacted the remittance stream. In response, governments and international organizations moved quickly to put rules and support systems in place that would guarantee the continuation of remittance flows through this difficult time. Realizing how important remittances are Programs for financial education have been implemented in several nations for both senders and recipients. The aforementioned activities seek to augment financial knowledge, stimulate savings, and advocate for constructive use of remittances, such as allocations towards healthcare and education.

In recent years, a series of significant developments have shaped the landscape of remittances in Asia and the Pacific. Technological advancements have played a pivotal role, with the rapid proliferation of mobile phone usage and internet access facilitating the growth of digital remittance services. Mobile money platforms, in particular, have gained popularity, making it easier and more cost-effective for migrants to send money home. Governments and financial institutions are aggressively encouraging financial inclusion through these technologies, seeing the promise of digital financial services. Even if digital remittances are becoming more popular, unofficial routes like hundi schemes and hawala are still in use in some areas, especially in nations with poor access to formal financial institutions. Although these routes allow migrants to send money, they are frequently more expensive and present regulatory issues. Governments in Asia and the Pacific are making a concerted effort to maximize remittances' potential for wider economic growth. To develop programs and policies that maximize the benefits of these cash flows, they are looking at forming partnerships with financial institutions and international organizations (Migration and Development Brief, 2020). Innovative financial instruments like diaspora bonds are being considered by some countries to tap into the financial resources of their overseas communities. These bonds enable migrants to invest in their home countries, providing a source of development funding and reinforcing the bond between migrants and their nations of origin. These multifaceted developments reflect the dynamic nature of remittances in the region, where technology, policy, and innovation continue to shape the impact of these vital financial flows.

Research Question:

1. In what ways does the amount of personal remittances received in certain Asian countries depend on the number of internet users?
2. How do personal remittance flows in a few Asian countries differ depending on the literacy rates in various nations or regions?
3. How much personal remittances are received in a few chosen Asian countries concerning the rate of inflation?
4. In some Asian countries, what is the relationship between the number of personal remittances received and the number of mobile subscriptions?

5. How do fluctuations in exchange rates impact the amount of personal remittances sent to various Asian countries and regions?
6. In certain Asian nations, what is the correlation between a nation's GDP and the quantity of personal remittances it receives?

Research Objectives:

1. To assess the impact of internet usage on personal remittances:
 - Investigate the correlation between the number of internet users and the volume of personal remittances received.
2. To analyze the effect of literacy rate on personal remittances:
 - Examine how variations in literacy rates across different countries/regions influence personal remittance flows.
3. To evaluate the influence of inflation on personal remittances:
 - Determine the relationship between inflation rates and the amount of personal remittances received.
4. To explore the relationship between mobile subscriptions and personal remittances:
 - Analyze the effect of the number of mobile subscriptions on the volume of personal remittances.
5. To study the impact of exchange rates on personal remittances:
 - Investigate how changes in exchange rates affect the flow of personal remittances to different countries/regions.
6. To assess the effect of GDP on personal remittances:
 - Examine the relationship between a country's GDP and the amount of personal remittances it receives.

Research Gap:

The extant body of studies about the correlation between internet access and overseas remittances in particular Asian nations falls short in its analysis of how remittance utilization is influenced by digital literacy and particular channels. There are few empirical studies examining how different demographic groups are affected by internet-enabled remittances. To optimize the beneficial effects of international remittances, policymakers, and other stakeholders must be aware of these subtleties. Furthermore, there is a lack of research on how internet infrastructure changes over time affect remittance patterns, which could help develop responsive policy frameworks.

Though fintech and mobile banking are becoming more and more important, little study has been done on how they affect the relationship between internet access and overseas remittances. Significant insights can be obtained by examining the influence of mobile financial services integration on cross-border transfers. To create strong regulatory

frameworks, it is also necessary to evaluate the risks connected to the rise in internet-based remittance transactions, such as fraud and cybersecurity hazards.

Finally, it is critical to consider the social, cultural, and environmental effects of the connection between internet availability and overseas remittances. Examining how digital platforms impact social networks and cultural behaviors can yield a more comprehensive understanding. Maintaining financial stability in these dynamic circumstances requires an understanding of the role played by government policies as well as an assessment of how global economic swings affect remittance behavior.

Overview and History:

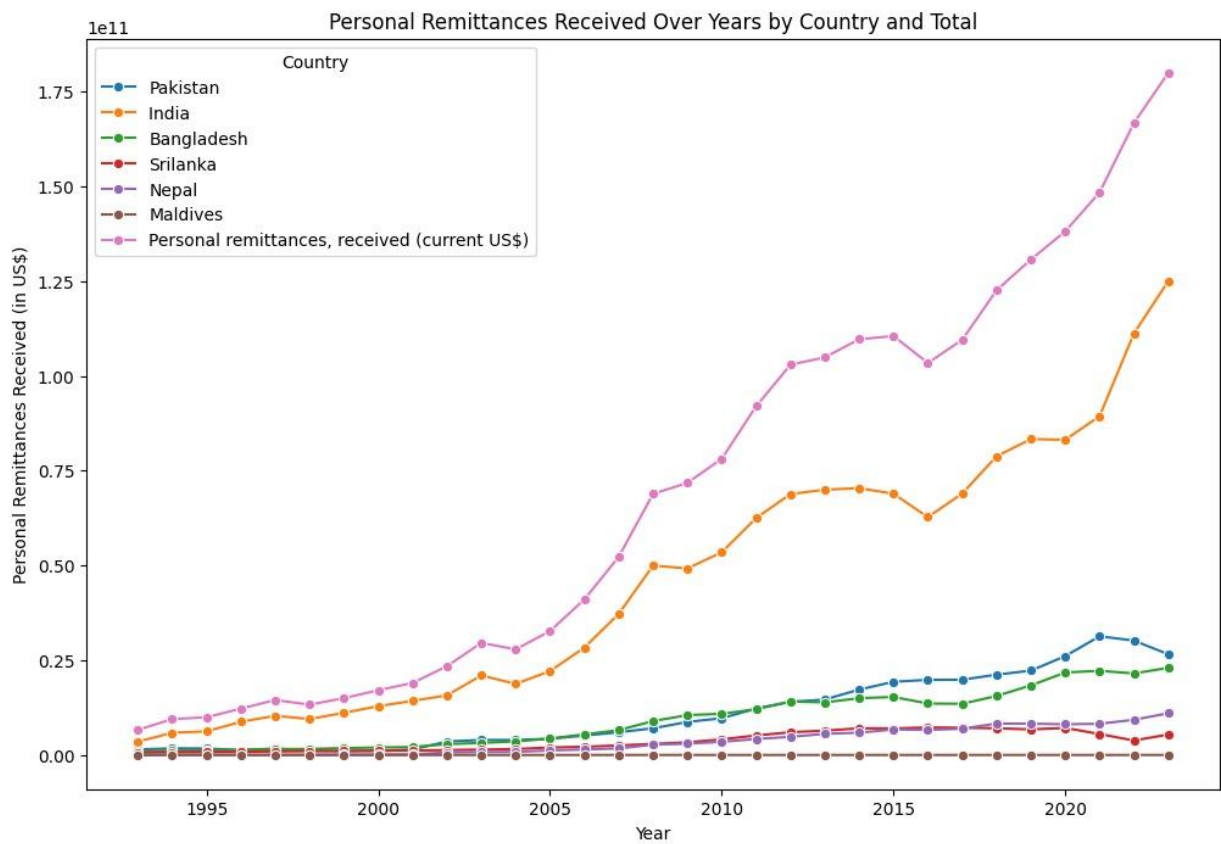
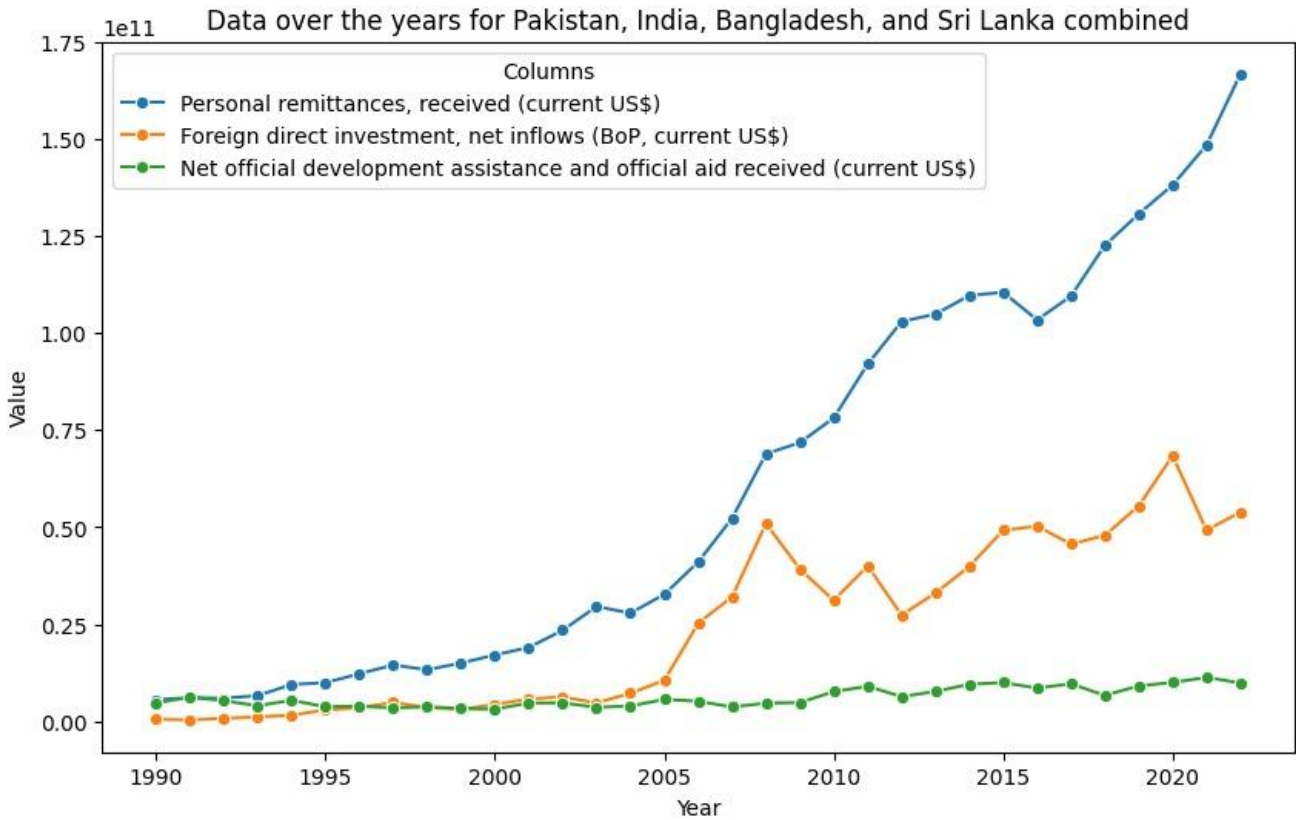
Migration trends and the history of remittances are closely related. The increase in remittances has historically been fueled by migration in search of economic opportunity. For example, European migrants to the Americas and Australia during the Industrial Revolution and later on paid money home. Global migratory patterns in the contemporary era have increased the reach and significance of remittances.

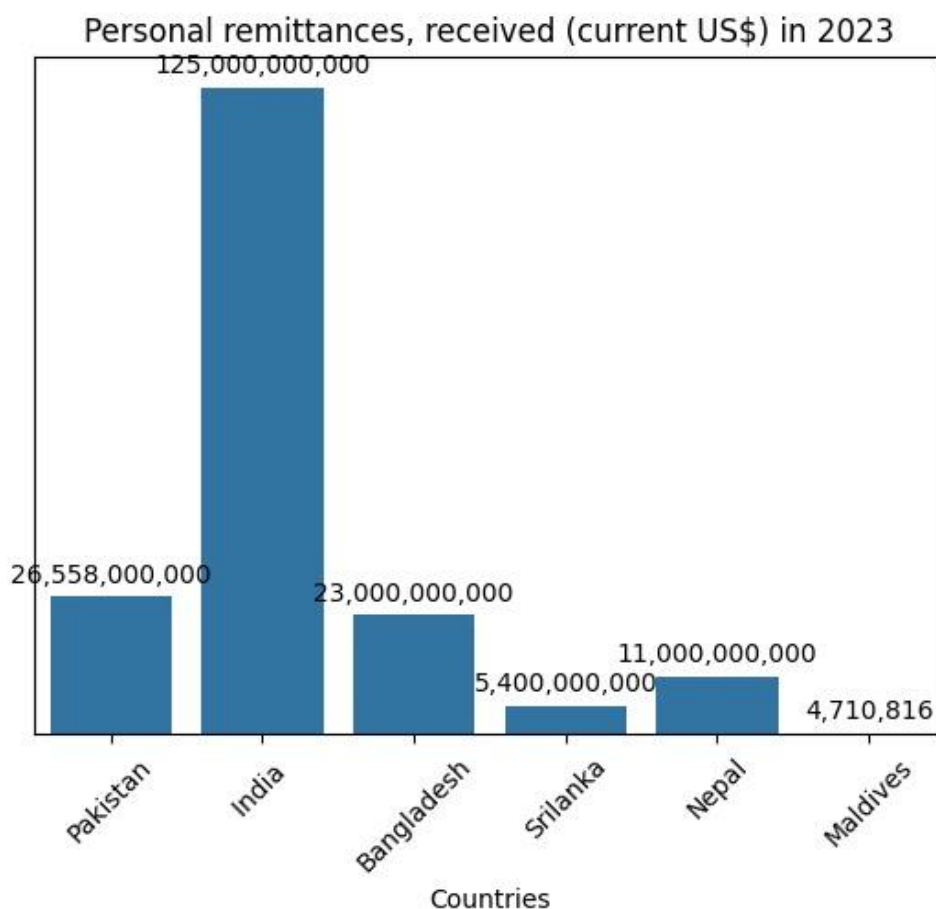
Important Historical Details

Post-World War II Era: A large migration from emerging nations to Europe, North America, and the Middle East occurred in the middle of the 20th century. Significant remittances were sent home by migrant workers, bolstering the economy of their home nations.

2000s Onward: Growing globalization and mobility around the turn of the century contributed to a notable growth in remittances. Remittances to developing nations reached over \$93 billion in 2003, according to the World Bank, demonstrating their expanding significance.

Current Trends: For many nations, remittances have emerged as a reliable and essential source of foreign funding in recent years. For instance, the Pew Research Center notes a notable increase in remittance flows to other regions of the world, especially Asia and Latin America, from nations such as the United States.





Remittances are a common form of money transfer that occurs across borders; they are typically sent between families of migrants. Financial intermediaries in both nations, a recipient in a different country, a sender from one country, and a payment mechanism used by the intermediaries are usually involved in remittance transactions. Banks and credit unions are among the financial institutions participating in the \$540 billion remittance business, although money transmitters like MoneyGram, Western Union, and PayPal are more common (Migration and Development Brief, 2021).

Over the last thirty years, remittances have risen significantly, surpassing official development aid (ODA), portfolio investments, and foreign direct investment (FDI) as the main external funding source for low- and middle-income nations. India was the nation that received the greatest amount of remittances in 2022 (\$100 billion), followed by Mexico (\$60 billion), China (\$51 billion), and the Philippines (\$38 billion), (World Bank's "Migration and Development Brief" titled "Remittances Brave Global Headwinds." 2022). The global economic downturn caused by the Coronavirus Disease in 2019 and travel bans together were expected by the World Bank to have a much greater negative impact on remittance flows; however, new research indicates that the pandemic's border closures caused remittances to move from informal to formal channels. Informal remittance flows are not included in official remittance statistics. Informal remittance flows are estimated to represent between 50% and 250% of total remittance flows, a wide range of values (Congressional Research Service report (2023) . The significant increase in remittances' significance to worldwide capital flows has also piqued the

curiosity of legislators in Congress. Members might want to look over the remittance provider regulatory environment. Effective remittance regulations can lessen corruption, improve transparency, and support a more vibrant economic climate. In addition, new regulations on digital remittances or consumer protection obligations found in the Dodd-Frank Wall Street Consumer Protection Act may cause consumers and remittance providers to worry about the expense of complying with new regulations. Sending remittances to receivers in poor nations with lax regulatory frameworks raises the possibility of money laundering and potential terrorism financing.

Literature Review:

For many Asian nations, foreign remittances are vital to their economies. Remittances are now delivered and received more efficiently and economically because of the internet's accessibility. The study aims to explore the relationship between internet accessibility and the flow of remittances in these 6 Asian nations: Bangladesh, India, Srilanka, Pakistan, Nepal, and Maldives. The remittance scene in these nations has completely changed as a result of increased internet availability. It is now simpler for migrants to send money home and for receivers to access funds. According to a study by Amuedo-Dorantes and Pozo (2006), Tahir et al., (2022) remittance costs have decreased due to increased internet accessibility, making them more inexpensive for both senders and recipients. The remittance industry has been significantly shaped by technological and regulatory factors, which highlights the significance of laws that support secure and effective cross-border transfers. According to the World Bank (2020), developments in cryptocurrency and blockchain technology may also make the remittance process even more efficient. Notwithstanding the advantages, problems with internet connectivity still exist. Remittances cannot be accessed digitally in some of these countries' rural areas because there is still a lack of consistent internet connectivity in those areas. Maimbo and Ratha (2005) emphasize the necessity of implementing inclusive policies to tackle these disparities. Comparing the top 5 Asian nations can provide valuable insights into the region. The study by Li and Singh (2017) offers a comparative analysis of the digital remittance environments in China and India, providing insightful details about various approaches and challenges. These Asian nations' governments are aware of the importance of digital remittances. Information on various programs is available from the International Organization for Migration (IOM) (2017), including collaborations with fintech firms, that are intended to advance digital remittance solutions. Technological innovations such as distributed ledger technology (DLT) and blockchain have the potential to simplify international remittances. The World Economic Forum looked into ways to use blockchain technology to increase the efficiency and security of remittance transactions in a 2018 study. Numerous case studies demonstrate how successful digital remittance initiatives can be. The 2019 edition of the International Fund for Agricultural Development (IFAD) offers insights into creative methods that have improved the effectiveness and accessibility of remittance services. In these top 5 Asian countries, remittances from overseas seem to have a bright future. According to the World Bank's Migration and Development Brief (2020), this industry will probably continue to grow and develop as long as government policies remain supportive and technological advances continue. Programs that emphasize digital literacy and education are necessary to fully realize the benefits of digital remittances. Research conducted by Chander and Ali in 2019 assesses how digital literacy initiatives affect migrants' comprehension and utilization of digital remittance platforms. The internet has become a crucial enabler of remittances, reducing

costs and increasing accessibility. However, challenges related to internet infrastructure in some areas persist, and governments are actively promoting digital solutions to address these issues (World Bank 2020). Remittances have emerged as a crucial external financing source for all developing economies, including those in Asia, surpassing foreign direct investment in significance, which includes both cash and goods sent home by migrant workers. However, to ascertain whether remittances directly contribute to the reduction of poverty, one must look beyond headcount and take other factors into account. Policymakers should consider ways to lower transaction costs for migrant workers who are sending money home, as evidenced by the finding that remittance levels do contribute to the reduction of poverty. These costs differ greatly based on the payment method and the country from which the funds are being sent. According to the data, when transferring funds from affluent nations to developing economies, the expenses tend to be greater, and Internet payment systems usually involve higher fees compared to alternative payment methods. Although remittances have gained global recognition for their significance, various obstacles persist. The cost of remittance transfers remains notably elevated in certain regions within Asia and the Pacific. Informal remittance channels, such as hawala or hundi systems, continue to flourish with high usage. Cash remains the predominant mode of transaction in most markets. De-risking practices have led to some service providers encountering difficulties in obtaining bank accounts, and certain regulatory frameworks are excessively restrictive. International mobile money to mobile money service fees were merely 1.7% in 2018 and 3.51% in 2020, according to a 2018 Global System for Mobile Communications Association [GSMA] study, whereas the Remittance fees Worldwide average was 6.75%. Digital services, such as mobile money, online, and bank account credits, have long been acknowledged as the primary means of reducing remittance prices. They also help manage anti-money laundering (AML) and combating the financing of terrorism (CFT) risks. The COVID-19 pandemic has highlighted the significance of having an all-encompassing and effective digital remittance ecosystem. During the initial stages of the crisis, numerous primary sender and recipient countries had to shut down their physical agent locations. As a result, individuals sending remittances were often restricted to using digital services wherever they were accessible (World Bank 2020). Rural communities often lack extensive access to digital and financial education. In 2018, an estimate indicated that one out of every three migrants globally originated from Asia (International Organization for Migration, 2018). An encouraging development has been the growing recognition in certain communities of the advantages of digital remittances and the need for providers to provide digital solutions. But the quick rise in the use of digital services has brought up new issues, one of which is how to get digitally driven solutions to the people and places that need them the most, as soon as possible. In rural communities, there is a lack of widespread access to digital and financial education. In 2018, it was estimated that one out of every three global migrants originated from the Asian region, highlighting the significant and common role of migration in the lives of many individuals in Asia. (ADB, 2018b). Asia is the region that receives the most remittances, with \$315 billion in remittances in 2019 (ADB, 2020). With nearly \$80 billion received, India is the recipient nation by far, ahead of the PRC, Pakistan, the Philippines, and Vietnam (World Bank, 2019). Important Countries: Bangladesh, China, India, Indonesia, Nepal, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam. The cost of remittances varies throughout Asia, and thus far, no subregion has been able to meet the SDG-10 target. Remittances are typically most expensive when sent to Pacific Island nations, and least expensive when sent to Central Asia. Notably, remittance prices in this iteration may have been affected by the COVID-19 pandemic. Since most remittances are sent from the Russian Federation and are received and

sent in rubles, there is no exchange rate involved, sending money to Central Asia is the least expensive option. The operator's fee is the only factor that affects the price. Moreover, the islands have a weak digital network infrastructure, resulting in a prevalence of cash-based transactions. Notably, it's important to highlight that only a portion of the unrecorded remittances can be attributed to "pure leakages." The majority of these unrecorded remittances are channeled through informal methods to support local consumption, investments, and foreign trade activities in the migrants' home countries. A key finding of this study indicates that the extent of remittance leakages is significantly linked to the macroeconomic policies of labor-sending nations. Therefore, the most ideal solution to enhance the developmental impact of remittances would involve implementing comprehensive policy reforms to stabilize the macroeconomic environment. Promoting remittance inflows through official channels by utilizing microfinance tools and strengthening the current banking network to effectively compete with unofficial market arrangements would be a secondary strategy, thereby directing funds toward productive investments. In 1993, remittances in Bangladesh accounted for approximately 44% of total merchandise exports, while in India, it was around 13% in 1990. In the Philippines, it represented roughly 22% in 1993, and in Pakistan, about 24% in 1993.

Leakages resulting from the use of unofficial, unregulated channels for remittances and accounting errors are the two main categories of unrecorded remittance flows. "Leakages" also include remittance items such as: (1) "personal imports" sent home duty-free by migrant workers, or goods included in personal baggage or gifts; and (2) savings returned home by return migrants, which are exchanged for local currency at domestic banks.

The actual leakage of remittances takes three forms:

1. Some migrant workers retain part of their savings in personal accounts with overseas banks for purposes such as meeting children's educational expenses overseas and to be used in the event of subsequent permanent emigration.
2. A portion of the money that migrants carry back to their home countries in the form of cash and traveler's checks may seep into the unofficial foreign exchange market. For any of the sample countries, there are no exact computations available to ascertain the degree of this specific kind of leakage.
3. To make transfers, migrant workers use middleman financial agents in the unofficial foreign exchange market. With this remittance method, the worker sends a sum of money in foreign currency to an agent abroad, and the agent agrees to send the migrant worker's family or nominee the local currency equivalent at a predetermined exchange rate (usually higher than the official rate). Because this kind of remittance mainly entails the internal transfer of the designated monetary amount, its macroeconomic impact on the economy is restricted. Remittances of this kind may be in high demand when foreign exchange regulations are strict, which could lead to capital flight from the migrant's country of origin. These leaks into unofficial channels are more common in some nations—such as Pakistan, the Philippines, India, Sudan, and Egypt—than in others—such as Sri Lanka, Thailand, Korea, and Bangladesh. Significant price differences between the nations where remittances originate and are received are another factor causing leakages. In these situations, the preferred method is to send or transport remittances in the form of goods (in-kind remittances), either for the recipient's personal use or to resell in unofficial markets. However, when the exchange

rate in the nation receiving the remittance is overvalued, informal foreign exchange markets are more frequently used. This serves as a kind of covert tax on people who send money through official channels. Strict trade and exchange control policies can also fuel the desire for capital flight by encouraging illegal activities like smuggling and undervaluing imports. Additionally, money transfers to overseas bank accounts may result from financial repression, which is typified by abnormally low real interest rates on domestic savings. Economic analysis is significantly impacted by these unreported remittances. Some economists contend that economic analysis is unpredictable and unreliable due to the absence of comprehensive data on unrecorded remittances.

Determinants of Remittances:

Numerous factors affect remittances: the number of migrant workers; wage levels; economic conditions in both the sending and receiving countries; exchange rates; interest rate differentials between labor-sending and receiving countries; political stability; ease of fund transfers; marital status; migrant workers' educational backgrounds; whether or not they are accompanied by dependents; length of time since migration; and household income levels. Among the countries in our study, only Korea has effectively utilized mandatory requirements as a means to encourage remittances through the domestic banking system. The Korean government imposed a condition for exit permits, necessitating that at least 80 percent of migrant workers' earnings should be remitted through the Korean banking system. The success of this Korean policy can be attributed to the distinctive nature of the Korean labor export process, often described as a "package" approach. Most Korean migrant laborers are directly employed by Korean businesses that are involved in Middle Eastern construction projects.

As part of its export promotion strategy, the government actively engages in the process by directly assisting businesses in securing contracts. Salary deposits made by Korean corporations to foreign currency accounts held by Korean banks are made. The "package" approach guarantees a greater rate of remittances and promotes overall cost savings for employees. To preserve family ties and offer incentives for maximizing remittances, these laborers are housed in work camps furnished by the company, where their basic needs are satisfied. Their employment terms typically do not exceed a year (Kim 1986). Unlike workers from Korea, a sizable portion of workers from the Philippines, Thailand, and Bangladesh use unofficial channels to look for work abroad. These nations don't have a comprehensive strategy with set incentives and limitations. As a result, remittance levels are generally lower in these nations, particularly when combined with problems like overvaluation of exchange rates, exorbitant bank fees, hold-ups in clearing foreign currency checks, negative interest rates on domestic savings, and economic uncertainty brought on by political unrest at home. This implies that a policy requiring legal remittances can only work when the labor migration process is directly under the authority of the authorities. Although governments in labor-exporting countries in Asia have shown strong interest in developing policies to attract remittances, they have paid less attention to policies aimed at influencing how remittances are used. This is somewhat surprising, given that directing remittances into productive investments is generally seen as a crucial element for promoting growth in labor-exporting countries. Where such policies have been implemented, they have primarily taken three major forms:

- Providing facilities for migrants to import machinery and equipment at reduced rates of duty.
- Offering business counseling and training.
- Implementing entrepreneurship programs.

In the top 5 Asian nations, the connection between internet access and overseas remittances is evolving quickly. Remittances are now greatly facilitated by the Internet, which also lowers costs and improves accessibility. Nonetheless, certain regions continue to face obstacles concerning internet infrastructure, and authorities are proactively advocating for digital remedies to tackle these problems. Apart from the problems associated with connectivity in rural areas, there are other challenges associated with identifying and gaining access to financial services. To get over these obstacles, inclusive financial services are crucial, as the World Bank's "Universal Financial Access" initiative emphasizes. In digital remittances, digital wallets are becoming an indispensable tool. Remittances and other smooth digital transactions have been made possible by innovations like China's WeChat Pay and Alipay and India's Unified Payments Interface (UPI). The impact of UPI on remittances in India is examined in research by Bansal and Kumar (2020), Tahir et al., (2020), which emphasizes the convenience and accessibility of the system. As the use of digital platforms for remittances increases, worries regarding security and privacy have drawn more attention. The cybersecurity issues and the significance of data protection in remittance transactions are examined by Kapoor et al. (2019). The social and economic ramifications of internet access and overseas remittances are more extensive. The Asian Development Bank (2019) looks at how remittances affect the region's economic growth and efforts to reduce poverty, and it links this to the availability of digital channels. The dynamics of foreign remittances were considerably impacted by the COVID-19 pandemic. Because digital remittance solutions are contactless, the pandemic hastened their adoption, according to a study by Ratha et al. (2021). It's critical to comprehend how consumers behave and how digital remittance services are adopted. Shrestha and Pyakurel's (2018) research looks at the variables influencing consumers' preferences and choices when it comes to digital remittance services. The Sustainable Development Goals (SDGs) of the United Nations state that remittances are essential to achieving sustainable development and reducing poverty. ADB and IFAD research from 2020 examines how digital remittances can help achieve these objectives. The proliferation of internet connectivity has resulted in heightened cooperation between digital payment providers and microfinance institutions. Arun and Hulme's (2019) research highlights how microfinance institutions help marginalized communities have access to digital remittance services. Innovations in technology like distributed ledger technology (DLT) and blockchain could make international remittances easier. The World Economic Forum (2018) researched the application of blockchain technology to improve the efficiency and security of remittance transactions. Regional differences can be better understood by conducting comparative studies among the top 5 Asian nations. Li and Singh's (2017) research compares and contrasts the digital remittance environments in China and India, highlighting the disparities in strategies and difficulties. Protecting consumers is a vital component of digital remittances. In the context of digital financial services, including remittances, research by The Consultative Group to Assist the Poor (CGAP) (2017) emphasizes the significance of regulatory frameworks that protect consumers. Digital literacy and education initiatives are required to optimize the advantages of digital remittance transfer. Research by Chander and Ali (2019) looks at how digital literacy programs improve migrant users' comprehension and utilization of digital remittance

platforms. There's growing interest in the effects that digital remittance systems have on the environment. The "Green Remittances" initiative of the World Bank investigates the possibility of sustainable and environmentally friendly remittance solutions. Partnerships between remittance service providers and telecom companies are crucial in extending the reach of digital remittances. The case of Grameenphone in Bangladesh, as studied by Kabir et al. (2021), showcases how collaboration with telecom providers has facilitated mobile money remittances. Recent advancements in decentralized finance (DeFi) and peer-to-peer (P2P) platforms offer new opportunities for individuals to engage in remittances without traditional intermediaries. Research in this area, such as the work of Zhang and Lai (2021), explores the potential of DeFi for remittances.

Data and Methodology:

Data:

To answer our research question, we have made a model where the Dependent variable used is personal remittances received (current US\$) while the independent variables are GDP current US\$, Individuals using the internet, Literacy rate adult total, Inflation consumer price (annual %), Mobile cellular subscription, Official exchange rate (LCU per US\$ period average). Panel data which includes countries such as Pakistan, India, Bangladesh, Sri Lanka, Maldives, and Nepal, covering the years 2000–2022 has been employed in this study to assess the empirical findings. The World Bank Data provides the source of all variables.

Econometric Model:

To analyze the effects of Remittances, we have used the following model:

$$\text{Personal Remittances} = \alpha + \beta_1 \text{Internet_Users}_{it} + \beta_2 \text{Literacy_Rate}_{it} + \beta_3 \text{Inflation}_{it} + \beta_4 \text{Mobile_Subscriptions}_{it} + \beta_5 \text{Exchange_Rate}_{it} + \beta_6 \text{GDP}_{it} + u_{it}$$

Where:

- i denotes the cross-sectional units (countries/regions)
- t denotes the time period
- $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are coefficients for the independent variables

u_{it} is the error term

From the literature, such as Ouhibi (2020), Kajtazi and Fetai (2022), and Iqbal and Sattar (2005) we found evidence of the above-mentioned model:

Statistical Tools:**Unit Root Test:**

When dealing with panel data (data that combines both cross-sectional and time series dimensions), unit root tests need to account for the presence of both dimensions. Panel unit root tests extend the concept of unit root testing to panel data, allowing for more power and flexibility compared to individual time series unit root tests. Panel data analysis requires unit root tests for several reasons.

To ascertain whether the panel data series are stationary, unit root tests are helpful. Many econometric models rely heavily on the assumption of stationarity because non-stationary data might produce false regression results that make it challenging to understand the relationships between variables. The Levin, Lin & Chu (LLC) test, the Im, Pesaran, and Shin (IPS) test, and the Fisher-type tests are common unit root tests for panel data. These tests were created to address the heterogeneity and cross-sectional dependence that are frequently found in panel data.

Hausman Test:

When analyzing panel data, the Hausman test is a statistical tool that helps decide between a fixed effects and a random effects model. It assesses an estimate's consistency by contrasting it with a different, less effective estimator that has a proven track record of consistency. The test evaluates if there is a correlation between the regressors and the unique mistakes, or individual effects, in the setting of panel data. The fixed effects model should be applied since it offers reliable and impartial estimates if the null hypothesis—which claims that there is no link and the random effects model is appropriate—is rejected. On the other hand, because of its efficiency, the random effects model is favored if the null hypothesis is not rejected. In econometric analysis, this test is essential for guaranteeing accurate model definition and trustworthy inference.

PMG/ARDL TESTING:

Long-run correlations between variables in time series data are analyzed using econometric techniques such as PMG (Pooled Mean Group) and ARDL (Autoregressive Distributed Lag) models. The PMG technique (Pesaran, Shin, & Smith) is appropriate for heterogeneous panels because it confines the long-run coefficients to the same value while permitting the short-run dynamics to vary within groups. As opposed to this, the ARDL model does not require unit root pre-testing and may be used for both time series and panel data. It can handle variables with varying integration orders ($I(0)$ or $I(1)$). To accommodate the lags of the dependent and independent variables, it simultaneously estimates the short- and long-term dynamics.

Result and Discussion:**Descriptive Statistics:**

This table presents information about mean, maximum, minimum, variance, and standard deviation values of the variables used in the study.

Table 1: Descriptive Statistics of the Variables

Variable	Mean	Maximum	Minimum	Standard deviation
PRR	1.45E + 10	1.11E + 11	1823119	2.20E + 10
OER	76.12890	204.8672	11.77988	43.04267
MCS	1.43E + 08	1.18E + 09	7638.00	3.00E + 08
LRAT	70.87000	99.0987	38.98675	18.78087
ICPI	6.650466	49.72110	-1.68541	5.452821
IUTI	16.82969	86.98765	0.067099	19.73648
GDPCUS	3.66E + 11	3.42E + 12	6.24E + 08	7.14E + 11

Source: Author Calculation

Unit root test:*H₀*: There exists unit root in the series*H₁*: There does not exist unit root in the series**Table 2: Results of Unit Root Tests**

Variables	Level/First difference	IPS	ADF
GDP current US\$	Level	4.76912 (1.0000)	6.799900 (0.870548)
	First difference	-6.17839 (0.0000)	58.9154 (0.0000)
Individuals using the internet	Level	9.02401 (1.0000)	0.01584 (1.0000)
	First difference	-5.59406 (0.0000)	55.4011 (0.0000)
Inflation consumer prices annual	Level	-2.68288 (0.0036)	26.6216 (0.0088)
	First difference	-8.01361 (0.0000)	75.4739 (0.0000)
Literacy rate adult total	Level	-1.68009 (0.0464)	29.2672 (0.0036)
	First difference	-18.2641 (0.0000)	219.434 (0.0000)
Mobile cellular Subscription	Level	2.01692 (0.9781)	4.26846 (0.9781)
	First difference	-2.46389 (0.0069)	24.1665 (0.0193)
Official exchange rate	Level	4.93392 (1.0000)	1.47416 (0.9999)
	First difference	-4.29558 (0.0000)	50.4785 (0.0000)
Personal rem received	Level	2.83427 (0.9977)	5.371489 (0.9443)
	First difference	-5.14193 (0.0000)	51.4442 (0.0000)

Table 2 shows the results of unit root tests for several variables at both their levels and first differences. The test used is the Im, Pesaran and Shin (IPS) W-statistic, ADF – Fisher Chi-square. The results indicate that for most variables, the original series (level) are non-stationary, but they become stationary after first differencing. This implies that these series follow an I(1) process, meaning they are integrated order one.

Hausman Test:

The Hausman test compares the fixed effects model with the random effects model to determine which is more appropriate. The null hypothesis for the Hausman test is that the preferred model is the random effects model, and the alternative hypothesis is that the fixed effects model is preferred. Since the p-value (0.0005) is less than 0.05, we reject the null hypothesis. This means the fixed effects model is more appropriate.

Table 3: Hausman Test Results

Variables	Coefficient	Prob
GDP current US\$	0.030026	0.0000
Individuals using the internet	52701317	0.0176
Inflation consumer prices annual	1.17E + 08	0.1046
Literacy rate adult total	65209819	0.1893
Mobile cellular Subscription	53.68060	0.0000
Official exchange rate	92842339	0.0000

A strong model fit is suggested by the large impacts of GDP current US dollars, mobile cellular subscription, and official exchange rate. The use of the internet by individuals is still relevant and only slightly significant. Both the annual percentage of consumer price inflation and the overall adult literacy rate are unimportant in this context. Because of the importance of the variables being examined, the fixed effects model is probably appropriate.

Table 3: Results of the Fixed Effect model

Variables	Coefficient	Prob
GDP current US\$	0.020661	0.0000
Individuals using the internet	-35532148	0.0889
Inflation consumer prices annual	-4039935	0.9461
Literacy rate adult total	629396423	0.13100
Mobile cellular Subscription	16.29605	0.0016
Official exchange rate	1.08E + 08	0.0000

Policies targeted at raising the GDP and the number of mobile phone subscribers may significantly improve the dependent variable. Policies that optimize or stabilize exchange rates may also be advantageous, given the official exchange rate's considerable positive impact. Even while the number of people utilizing the internet has a negative coefficient, its marginal significance indicates that more research may be necessary to fully comprehend its effects. Inflation and the literacy rate do not appear to have a direct or immediate effect on the dependent variable in this model, even though they might still be significant under different conditions or in other situations. Overall, the findings shed light on the significance of GDP, cell subscriptions, and exchange rates in explaining variations in the dependent variable, offering insightful information for formulating policies and making decisions.

Evaluating the Need for Fixed Effects:

A redundant fixed effects test's main function is to determine if the fixed effects model outperforms the pooled ordinary least squares (OLS) model in the absence of fixed effects. The null hypothesis, according to which the fixed effects are unnecessary and may be removed from the model without reducing its explanatory ability, is tested.

Model selection:

Assists in choosing between a more straightforward model without fixed effects and a model with fixed effects. Because of its ease of interpretation and simplicity, a pooled OLS model may be better if the test shows that the fixed effects are redundant.

Enhancing Fit of the Model:

Unobserved heterogeneity between entities (people, businesses, nations, etc.) or periods is taken into account by fixed effects. A more accurate and objective model may result from accounting for time-invariant features of entities or entity-invariant qualities over time through the use of fixed effects.

Results of PMG / ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob
Long Run Equation				
GDP current US\$	0.29678	0.003745	7.924418	0.0000
Indv using int	4.22E + 08	1.08E + 08	3.909877	0.0002
Inflation cons prices annual	5.38E + 09	5.03E + 09	1.069560	0.2875
Literacy rate adult total	71552.52	311127.8	0.229978	0.8185
Mobile cellular 0.0000 subscription	81.97512	1.322238	61.99724	
official exchange 0.0000 rate	1.75E + 08	13910526	12.54934	
Short Run Equation				

D(GDP current 0.6266 US\$)	0.010868	0.2268	0.488071	
D(Indv using int) 0.6695	67637393	1.58E + 08	0.428066	
D(Inflation cons prices annual)	91398137	1.75E + 08	0.522292	0.6027
D(Literacy rate adult total)	-2.45E + 08	2.06E + 08	-1.188752	0.2372
D(Mobile cellular 0.8071 Subscription)	5.590545	22.81724	0.245014	
D(Official Exchange rate) 0.6316	-74397288	1.55E + 08	-0.481243	

The PMG/ARDL approach allows for distinguishing between long-run and short-run relationships between the variables. The long-run equation results suggest that GDP, individuals using the internet, mobile cellular subscriptions, and the official exchange rate have significant long-term effects on the dependent variable. In contrast, inflation and literacy rates do not show significant long-term impacts. The short-run equation results indicate that none of the variables have significant short-term effects on the dependent variable. The presented outcomes stem from a panel data model test using the Pooled Mean Group (PMG) and Autoregressive Distributed Lag (ARDL) models. Examining the short and long-term associations between the dependent variable and several independent factors is helpful when using the PMG/ARDL model. In the Long Run GDP, individuals using the internet, mobile cellular subscriptions, and the official exchange rate are significant predictors of the dependent variable. Inflation and literacy rate are not significant and in the Short Run, None of the differenced variables are significant predictors of the dependent variable. This suggests that the independent variables have a stronger influence on the dependent variable in the long run than in the short run.

Conclusion:

The conclusions have important policy ramifications for the way the variables are managed. The long-term relationship and error correction mechanism indicate that preserving equilibrium among the variables should be the main focus of measures meant to achieve long-term stability. The short-run dynamics emphasize how crucial it is to take policy' delayed effects into account. A coordinated approach to policymaking is essential, as changes in one variable can have a substantial impact on others, as demonstrated by the Granger causality results. The panel data analysis offers a thorough comprehension of the correlations between the variables. The results point to potential future study areas and have significant policy consequences.

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