International Remittance Inflows & Economic Growth: Some Evidences from India

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Abstract

This paper aims to empirically investigate the impact of international remittance inflows on economic growth. For this purpose, we consider the case of the Indian economy, which has received large remittance inflows in the recent past. We employ the autoregressive distributed lag model (ARDL) to investigate the relationship between international remittance inflows and economic growth over the period from 1990 to 2023. Next, we use the FMOLS and DOLS estimators to establish the robustness of our results. Finally, we use the stability test to confirm the structural stability of our estimated model. Contrary to the results of many earlier studies, the results of the study indicate that international remittance inflows do not have a significant effect on the long-term economic growth of the economy. Finally, we observe a statistically significant but negative impact of remittance inflows on the short-term economic growth. These findings hold important policy implications for the largest recipient of remittance inflows.

Keywords:

Remittance Inflows, Economic Growth, ARDL, FMOLS, DOLS

INTRODUCTION

The inflows of remittances have emerged as one of the critical elements of economic policy debates in many developing countries. This is mainly because of the fact that an increasingly large number of workers from labor-surplus developing countries are continuously flowing out towards the rich countries in search of employment opportunities. This outflow of surplus labor, which otherwise largely remained unemployed in these developing countries, helps them receive a significant inflow of foreign currencies over time. Indian economy, in this context, stands in a relatively better position after becoming the largest recipient of remittances globally (Cazachevici *et al*., 2020). According to the World Migration Report (WMR) 2024, the Indian economy received a total of $111 billion in remittances during the year 2022 and surpassed China, Mexico, and the Philippines by a large margin (*Published by the World Bank in collaboration with the Global Knowledge Partnership on Migration and Development (KNOMAD)*). The inflow of funds through remittances is expected to impact the internal and external sectors of the Indian economy in the long run by affecting the domestic absorption, exchange rate, employment, domestic production, and balance of payment of the country (Fatima *et al*., 2022). Hence, a clear understanding of the impact of workers' remittances inflows on the economy's overall functioning is critical from a policy-making viewpoint.

The total world remittance inflows are expected to reach the height of USD 905 billion in 2025, and the Indian economy received an estimated $129.1 billion worth of remittance flows in the year 2024, which is around 14.3% of the total global remittance inflows in the

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year (Ratha et al., 2024). This relatively large share of remittance receipts from the total global remittance inflows has been generated by a relatively smaller number of migrated workers from India. International migrants from the Indian economy tripled from 6.6 million in 1990 to around 18.5 million in 2024. This increase in migration from India led to an increase in its share from 4.3 per cent to over 6 per cent of total global migration during the same period. India's total remittance receipt has increased considerably in the recent past, and within 15 years, it has doubled from the level of USD 55.6 billion in the year 2010-11 to USD 118.7 billion in 2023-24. The remittance inflow in India has consistently revolved around 3% of gross domestic product (GDP) in the recent past, which is a significantly higher ratio compared to China over the same period. It is important to note that, in recent years, total remittance inflows to India have consistently exceeded gross inward foreign direct investment (FDI) flows. Furthermore, India's net remittance inflows have been substantial enough to cover approximately 42% of the trade deficit (merchandise, annual average) experienced by the economy from 2010-11 to 2023-24 (*This excludes the Covid-19 pandemic affected year 2021-21*). This highlights the significance of remittance inflows as a relatively stable source of external financing (RBI, 2025). Therefore, a clear understanding of the nature and direction of the relationship between remittances and economic growth is important from a policy viewpoint. The issue is equally important for other developing countries that are making policy efforts to expand their employment creation possibilities for their surplus labour forces and a stable source of external financing to fund their current account deficit. In this study, we attempt to investigate the influence of remittances on economic growth by examining the case of the Indian economy.

Although the available literature assigns an important role to remittance inflows in the economic growth of countries but the debate over the nature of its impact on the economy is still unsettled. While the findings of some previous studies are optimistic about the positive effect of international remittance inflows on the economy, the findings of some other studies suggest that the impact of remittances on economic growth is negative. It is argued that remittance inflows play a critical role in stabilising the balance of payments for countries experiencing a negative trade balance. In developing nations, large remittance inflows contribute immensely in the improvement of recipients' well-being, create pressure on policymakers to enhance political accountability and governance, and, notably, do not generate a public moral hazard issue (Motha et al., 2022). Furthermore, the continuous inflows of remittances contribute to the income diversification of households, reducing the vulnerability to economic uncertainties and shocks in developing countries. The income diversification leads to further economic growth and resilience at the individual and macro levels. Remittances also play an important role in promoting household welfare, health, and education in developing countries. Some other studies have confirmed the positive link between remittance and economic development by establishing that remittances promote migration and contribute to economic development in the regions where they are received (Bedi et al., 2023; Jijin et al., 2022). International remittance inflows have also become a significant source of foreign reserve earnings for many developing countries, including the Indian economy (Shastri, 2022).

Developing countries with a relatively young workforce and high population growth rate are facing a mismatch between the demand and supply of labor. These economies with relatively low investment rates are unable to create sufficient employment for their rapidly growing labor force. In this context, the outflow of workers from these countries and the significant inflow of remittances contribute to alleviating unemployment issues in middle and low-income countries (Vo, 2023). Most importantly, remittances help in bridging the gap between low domestic savings and large investment requirements of developing countries. Findings of some recent studies have confirmed the role of remittances in covering the savings gap in developing countries, allowing local financial institutions to channel credits toward employment creation and economic development-related activities (Alhassan et al., 2022). Therefore, the role of remittances goes beyond the cycle of foreign exchange earnings and immediate domestic consumption needs, and it plays an important role in fostering investment and creating employment in developing countries (Noor *et al*., 2022). However, notwithstanding the above findings in the available literature, some recent studies have highlighted the possibility that large remittance inflows may lead to a decline in domestic investment and have offered empirical support to the Dutch disease phenomenon (Wilastra et al., 2022). These contrary empirical findings make the issue of the remittance and growth linkage relevant for further investigation.

Against this background, we attempt to investigate the impact of remittances on economic growth by using data from the Indian economy. By doing so, we aim to contribute to the

available literature in the following ways. First, India has received a large inflow of remittances in the recent past, and the current value stands at $124 billion in 2023-24. Any evidence of the positive impact of remittances on the Indian economy will have policy implications for India and other developing countries. Recently, the Indian government has introduced various policies aimed at maximizing the benefits and overall impact of remittances. Initiatives such as financial inclusion programs, streamlined remittance channels, and collaborative development projects have been implemented to achieve these goals (Motha *et al*., 2022). These policies acknowledge the dual nature of remittances as both a driver of economic growth and a bridge connecting the Indian diaspora with their homeland (Noor *et al*., 2022). Our findings will help in evaluating the impact of these policy initiatives of the Indian government, and they will offer new insights for other countries. Three, we aim to examine the economic linkage between international remittance inflows and the growth of the Indian economy by using the most recent data from the Indian economy.

The remaining study is organised in sections containing an overview of remittance inflows in India, a review of empirical literature, an empirical specification, results and conclusions based on the results of the study.

The importance and overview of remittance inflows in the Indian Economy

The importance of remittance receipts has increased considerably for the Indian economy, at least for three main reasons. First, it has emerged as one of the stable sources of external financing for funding the merchandise trade deficit and helping to cover a significant portion of the current account deficit. India's overall exports (merchandise and services) crossed USD 776 billion, and overall imports reached the level of USD 898 billion, resulting in the merchandise trade deficit of USD 122 billion in 2023. The current account deficit (CAD) narrowed to USD 23.2 billion (which is equal to 0.7 per cent of GDP) in the financial year 2024 from USD 67 billion (or 2 per cent of GDP) during 2023. It is noteworthy that the improvement in the CAD for 2024 was supported by a surplus due to an increase in net service exports and improved remittance inflows (Economic Survey, 2023-24). India's receipt of international remittance inflows has increased from USD 55.6 billion in the year 2010-11 to USD 118.7 billion by the end of the year 2023-24. In some sense, net remittance receipts during the period were sufficient to easily fund around half of India's merchandise or goods trade deficit and proved to be an important absorber of external shocks. Second, India's total remittance receipts in the recent past have roughly remained slightly higher than the total inward foreign direct investment (FDI) flows in the Indian economy, and hence, it can be viewed as a stable and easy source of external financing. Three, the ratio of remittance receipt to GDP has broadly remained around 3%, which is sufficient to fund India's social expenditure on education and health, which were around 2.7% and 1.9% of GDP in 2023, respectively (Economic Survey, 2023-24). Four, India has a large pool of young workforce, and the economy needs to generate around 78.5 lakh (or 7.85 million) non-farm jobs until 2030 on an annual basis to productively employ its young working population (Economic Survey 2023-24). Failure to do so will lead to the wastage of the potential demographic dividend. The outflow of workers helps in solving the problem of unemployment in the economy, and it will also help in securing foreign exchange reserves through remittance inflows (Economic Survey 2023-24).

Table 1: Inflow of personal remittances and public expenditure on education and health

Item	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Government Expenditure (on social services)	6.7	6.8	6.8	7.5	7.6	8.0	7.8
Government expenditure on Education	2.8	2.8	2.9	2.9	2.7	2.9	2.7
Government expenditure on Health	1.4	1.4	1.4	1.6	1.9	1.9	1.9
Government expenditure on Other social services	2.4	2.6	2.6	3.0	2.9	3.2	3.1

Note: (i) Source: Economic Survey, 2023-24 published by Ministry of Finance, Government of India; (ii) the total expenditure on 'Education' includes expenditure on 'Education, Sports, Arts, and culture; (iii) the total expenditure on 'Health' includes expenditure on 'Medical and Public Health', 'Family Welfare', and 'Water Supply and Sanitation.

Further, according to the Migration and Development Report (MDR) 2024, total workers' remittance inflows are projected to grow by 2.3 percent in 2024 and approximately 2.8 percent in 2025 worldwide. The report indicates that the overall share of remittances slowed down in 2023; however, it is expected to experience faster growth in the near future. The primary reason for this downside risk is the economic stability of migrant workers in high-income countries, as well as geopolitical tensions among various nations (Ratha et al., 2024)

Table 2: Recent trends in remittances inflows in India and other countries

Rank	Country (2020)	Country (2022)	Remittances (2020)	Remittances (2022)
1	India	India	$83.15	$111.22
2	China	Mexico	$59.51	$51.00
3	Mexico	China	$42.88	$61.10
4	Philippines	Philippines	$34.88	$38.05
5	France	France	$30.04	$30.04
6	Pakistan	Pakistan	$29.60	$29.87
7	Egypt	Egypt	$26.09	$28.33
8	Bangladesh	Bangladesh	$21.75	$21.50
9	Germany	Nigeria	$19.32	$20.13
10	Nigeria	Germany	$17.21	$19.29

Source: World Migration Report 2024, the International Organization for Migration (IOM)

Table 2 presents the details of the top ten recipients of remittances in 2022. The Indian economy, with a total estimated inflow of $111.22 billion in the year 2022, is placed ahead of China and Mexico. The MDR (2024) also indicates that the inflows of remittances have been significantly affected in countries like Mexico, India, China, Pakistan, the Philippines, and Germany due to combinations of different structural and cyclical factors such as natural calamities, COVID-19, migration of workers, unemployment, and urbanization.

Table 3: Inflow of Remittances in Low, Middle and High-Income Countries, 2010-22

Personal remittances, received (current US$)													
Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
South Asia	820	964	108	111	116	118	111	117	132	140	147	157	176
Sub-Saharan Africa	317	371	372	376	397	422	386	423	495	500	431	500	536
Europe and Central Asia	134	150	150	168	171	155	156	172	186	194	185	206	214
Low and Middle Income	298	335	359	377	407	406	396	435	473	493	498	563	614

High Income	118	131	130	143	139	140	148	156	161	156	171	170	172
World	419	469	492	524	560	551	541	588	634	659	657	740	791
Personal remittances, received (% of GDP)													
Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
South Asia	3.93	4.2	4.63	4.63	4.42	4.3	3.67	3.41	3.72	3.82	4.21	3.84	4.07
Sub-Saharan Africa	2.21	2.3	2.23	2.11	2.14	2.55	2.49	2.59	2.73	2.75	2.53	2.6	2.61
Europe and Central Asia	0.63	0.64	0.66	0.72	0.72	0.75	0.76	0.79	0.8	0.84	0.83	0.81	0.84
Low and Middle Income	1.62	1.55	1.57	1.53	1.57	1.63	1.57	1.57	1.6	1.62	1.68	1.63	1.72
High Income	0.26	0.27	0.26	0.29	0.3	0.3	0.29	0.3	0.3	0.31	0.3	0.29	0.27
World	0.64	0.65	0.66	0.68	0.71	0.74	0.72	0.74	0.74	0.76	0.78	0.77	0.8

Source: World Bank

The net inflow of remittances in the low, middle, and high-income countries grew by 1.62 percent in 2010 to 1.72 percent in 2022 (low- and middle-income countries) and 0.26 percent in 2010 to 0.27 percent in 2022 (high-income countries). Remittances to South Asia, Sub-Saharan Africa, and Europe & Central Asia grew by $820, $317, and $134 to $176, $536, and $214 in the years 2010 and 2022. The information in Table 3 suggests that the total remittances received by the world economy were $419 in the year 2010 and $791 in the year 2022, which is almost twice the initial flow of total remittances. Overall, the recent trends suggest that the trend of net inflow of total remittances in the year 2025 is expected to be high in several low and middle-income economies, specifically in Asia and parts of African countries.

LITERATURE REVIEW

There is a substantial body of empirical literature examining the impact of remittances on economic growth across various countries, time periods, empirical models, and estimation methods. Previous studies have generally produced mixed results, indicating positive, negative, or sometimes no effect of remittances on economic growth (see Cazachevici et al., 2020). This section aims to briefly review the relevant literature on the economic linkage between remittances and economic growth.

The theoretical foundation of the link between remittance inflows and economic growth is grounded in the neoclassical growth theory and the New Economic Geography theory (see Fingleton *et al.*, 2010). In the existing literature on economic growth, the Neoclassical growth theory suggests that long-term economic growth is influenced by factors such as capital accumulation, technological advancement, and the expansion of the labor force. This theory was initially proposed by Ramsey in 1928 and further developed by Solow in 1956. Remittances, as a form of financial inflow, can be considered a component of capital accumulation, impacting both human and physical capital in the recipient country. Remittances can support investments in education and healthcare, thereby indirectly enhancing human capital and improving labor productivity. Additionally, since remittances are often directed to specific regions or households, they have the potential to help mitigate regional disparities within countries experiencing uneven economic growth. The New Economic Geography theory posits that remittances can promote more balanced regional development by impacting factors such as income distribution and employment opportunities. Existing literature indicates that remittances act as a vital link between migration and development, serving as a source of financial capital capable of catalyzing economic growth (Alkhathlan,

2013). The migration-development nexus provides a theoretical framework for understanding how remittances flowing into an economy can influence its economic dynamics, particularly in relation to the Indian diaspora. Additionally, it aids in analyzing how remittances may affect both the formal and informal financial sectors, as well as their role in enhancing financial inclusion and fostering entrepreneurship in the recipient country (Allen et al., 1997).

The empirical literature is broadly indicative of a positive impact of remittances on household welfare, poverty reduction, investment in education and healthcare (Pushpalatha et al., 2022), augmenting domestic savings and fostering employment opportunities (Hussain et al., 2022), human capital formation, which finally leads to long-term growth (Virak et al., 2022). Furthermore, remittances promote the use of formal financial services such as credit and savings, highlighting the need for the government to encourage the transformation of informal remittances into formal ones. Previous studies have explored the influence of remittance patterns on income inequality and regional disparities within India (Khurshid *et al*., 2018). Broadly, the effects of remittances on economic growth have been observed to vary across regions, with remittances being growth-enhancing in Asia but not in other regions. Vargas and Huang (2006) discovered that total remittance inflows tend to have a more detrimental impact on the host country than on the home country. Their findings suggest that if workers intend to remain temporarily in the host country, they are likely to send larger amounts of money back home to their families. Additionally, the outflow of workers' remittances from a home country is influenced by the migrants' plans regarding their settlement in the host nation. Zuniga (2011) observed a significant positive correlation between remittances and economic growth in recipient countries. The study broadly indicates that remittances have a considerable effect on the economic growth of these countries, underscoring the importance of remittance inflows for nations aiming to achieve robust economic development. The findings also reveal that Eastern European economies benefit the most from these inflows, followed by countries in the Americas and Asia. In recent years, remittances have surpassed foreign direct investment (FDI) as the second-largest source of foreign inflows (Debabrata et al., 2003). Pradhan (2016) found that while remittances negatively impacted economic growth in Brazil, the Russian Federation, and India, they had a significantly positive effect in China. Similarly, Zuniga's (2011) findings reaffirm the positive influence of remittances on economic growth, even when controlling for institutional factors. Furthermore, Ganic (2023) established that the relationship between economic growth and remittances is stronger and statistically more significant in the short run compared to the long run.

The results of the previous studies also suggest that remittances from non-resident Indians (NRIs) have significantly influenced India's macroeconomic progress. NRI deposits have aided India in carrying out economic projects, avoiding balance of payments issues, and paying off foreign debt (Sahay, 2007). For example, workers from the state of Punjab have been travelling abroad for two centuries, but migration on a large scale has only begun to take place since the 1960s. In the last four decades, more than a million workers have migrated to several parts of the world and become a global community (Puri, 2003). They are well-settled and respected citizens of their host countries (Basi, 2007). Those who migrated in the 1960s and 1970s have kept alive their links to their home state in India, and many are now in a financial position to pay back to their native land to which they feel indebted. Cumulatively, the remittances of these NRIs to their native villages in India are changing the appearance of their homeland, particularly in the Doaba region (Chana, 2009).

Several studies have explored the role of other factors like ICT and the financial sector in the remittance-growth relationship (Jayaraman & Makun, 2022a) and argue that it is crucial to design appropriate policies that consider the interaction of remittances with ICT and financial markets to promote economic growth. Some previous studies have investigated the impact of remittances on economic growth for Bangladesh, India, and Sri Lanka. Studies have observed the evidence of a causal relationship between remittances and economic growth for Bangladesh (see Siddique *et al*., 2012). In the case of Sri Lanka, a two-way causality was observed, with economic growth influencing remittance growth and vice versa (Sutradhar, 2020). However, no causal relationship was observed between the two variables for the Indian economy (Saha *et al*., 2022). In the case of Bangladesh and Pakistan, findings indicate that remittances positively impact economic growth (Abbas et al., 2022; Siddique et al., 2012). The findings also suggest that a more stable inflow of remittances contributes to economic growth in all countries. Therefore, it

is recommended that governments implement policies to lower transaction costs and promote consistent remittance inflows in countries that experience these positive effects.

Overall, these studies have revealed mixed empirical findings concerning the impact of remittances on economic growth. They have emphasized the necessity for appropriate policies to mitigate the negative effects of remittances on economic progress. Moreover, this topic remains relatively under-explored in the context of India, one of the largest recipients of remittances globally. This study aims to offer empirical evidence from the Indian economy.

DATA AND EMPIRICAL METHODOLOGY

The annual data for this phase of the empirical analysis are collected from the World Development Indicators (WDI), covering the period from 1990 to 2023. The WDI offers a comprehensive and internationally comparable set of indicators, making it an appropriate resource for analyzing the relationship between key economic variables. Table 4 presents details on the notations, measurements, and definitions of the various economic variables utilized in this study.

Table 4: Data Source and Variable Description

Variable (I)	Measurement (II)	Notation (III)	Variable Name after logarithmic transformation (IV)	Source (V)
GDP Growth	GDP per capita growth (annual percentage)	GDP	gdp	WDI
Remittances	Personal remittances, received (Percentage of GDP)	REM	rem	WDI
Gross Capital Formation	Gross capital formation (Percentage of GDP)	GCF	gcf	WDI
Foreign Direct Investment	Foreign direct investment, net inflows (Percentage of GDP)	FDI	fdi	IFS
Government Expenditure	Government final consumption expenditure (Percentage of GDP)	GEXP	gexp	WDI
Saving Rate	Gross savings (Percentage of GDP)	SAV	sav	WDI
Total Factor Productivity	Log of GDP divided by the product of labor force and gross capital formation	TFP	tfp	WDI
Exports	Exports of goods and Services (Percentage of GDP)	EX	ex	WDI

Note: WDI stands for World Development Indicator (provided by the World Bank), and IFS stands for International Financial Statistics (provided by the International Monetary Fund).

Model Specification and Empirical Methodology

This study aims to empirically investigate the relationship between economic growth and remittances for the case of the Indian economy. For this purpose, we use the following empirical specification:

$$Y_t = \beta_0 + \beta_1 REM_t + \beta_2 X_t + \mu_t \quad (1)$$

where *Y* represents the annual percentage growth of GDP, *Rem* indicates personal remittances received as a percentage of GDP, and *X* indicates other control variables in the model that includes FDI (foreign direct investment), *Gexp* (total

government expenditure as a percentage of GDP), *Ex* (export of goods and services as a percentage of GDP), *Gcf* (gross capital fixed formation as a percentage of GDP), *Sav* is the gross savings and *Tfp* is a measure of total factor productivity. Further, by using the logarithmic transformation, the above model can be rewritten as:

$$lnY_t = \beta_0 + \beta_1 . lnREM_t + \beta_2 . lnX_t + \mu_t \quad (2)$$

here, ln (*Yt*) denotes the natural logarithm of the annual percentage growth of GDP, and u_t represents the error term. The log-linear transformation is applied to facilitate the interpretation of the estimated coefficients in percentage terms, offering insights into the elasticity of GDP growth with respect to changes in remittances and other control factors, namely foreign direct investment, government expenditure, gross capital formation, savings, exports, and total factor productivity.

In this paper, we employ the Autoregressive Distributed Lag (ARDL) model to analyze the economic relationship between inflows of remittances and economic growth. ARDL models are commonly used in economic literature to examine both long-term and short-term relationships between variables (Wstabdullah et al., 2023). These models allow for dynamic adjustments over time, providing insights into the immediate and sustained effects of the variables included in an empirical specification (Humbatova *et al*., 2023). Hence, by using the ARDL model, we can capture both the short-term and long-term effects of remittances on economic growth, leading to a better understanding of the temporal dimensions of this relationship (Xu *et al*., 2023).

The ARDL model can be briefly presented in the following way (see Pesaran and Pesaran,1997; Pesaran et al., 2001):

$$\Omega(L,p)y_t = \propto_0 + \sum_{i=1}^{k}(L,q_i)x_{it} + \delta' w_t + \mu_t \quad (3)$$

where,

$$\Omega(L,p) = 1 - \Omega_1\delta_1 L^1 - \Omega_2\delta_2 L^2 - \ldots - \Omega_p L^p \quad (3.1)$$

$$\beta_i(L,q_i) = \beta_{i0} + \beta_{i1} L + \beta_{i2} L^2 + \cdots + \beta_{iQi} L^{qi}, \; i=1,2,\ldots\ldots,k \quad (3.2)$$

here, y_t is the endogenous variable; α_0 is a constant; L is the lag operator; and w_t is an s x 1 vector of other factors such as dummies or independent variables. The long-run relationship among the variables can be specified in the following way:

$$y = \propto_0 + \sum_{i=1}^{k}\beta_{ix_i} + \delta' w_t + v_t \quad (4)$$

In order to investigate the short- and long-run relationship between remittances and economic growth in the present study, we first test the presence of cointegration using the bounds test and then estimate the short- and long-run relationship based on the ARDL model (see Narayan and Narayan, 2005). For this purpose, we can estimate the following unrestricted error correction regression, considering each of the other variables in the empirical specification as a dependent variable in the long-run relationship model:

$$\Delta lnGDP_t = a_{0GDP} + \sum_{i=1}^{n} b_{iGDP}\,\Delta lnGDP_{t-i} + \sum_{i=0}^{n} c_{iGDP}\,\Delta lnREM_{t-i} + \sum_{i=0}^{n} d_{iGDP}\,\Delta lnGCF_{t-i} + \sum_{i=1}^{n} e_{iGDP}\,\Delta lnFDI_{t-i} + \sum_{i=0}^{n} f_{iGDP}\,\Delta lnGEXP_{t-i} + \sum_{i=0}^{n} g_{iGDP}\,\Delta lnSAV_{t-i} + \sum_{i=0}^{n} h_{iGDP}\Delta lnTFP_{t-i} + \sum_{i=1}^{n} i_{iGDP}\,\Delta lnEX_{t-i} + \lambda_{1GDP} lnGDP_{t-1} + \lambda_{2GDP} lnREM_{t-1} + \lambda_{3GDP} lnGCF_{t-1} + \lambda_{4GDP} lnFDI_{t-1} + \lambda_{5GDP} lnGEXP_{t-1} + \lambda_{6GDP} lnSAV_{t-1} + \lambda_{7GDP} lnTFP_{t-1}\,\delta_7 + \lambda_{8GDP} lnEX_{t-1} + \varepsilon_{1t} \quad (5)$$

In the equation no (5), the null hypothesis for no co-integration between the variables included in the model is given by

H_0: $\lambda_{1y} = \lambda_{2y} = \lambda_{3y} = \lambda_{4y} = \lambda_{5y} = \lambda_{6y} = \lambda_{7y} = \lambda_{8y} = 0$

for the long-run relationship among variables. If the value of the F-statistic exceeds the upper bound critical value proposed by Pesaran et al. (2001), we can reject the null hypothesis of no co-integration among the variables in the model. Conversely, if the F-statistic is below the lower bound critical value, we do not reject the null hypothesis of no co-integration between the variables. In cases where the F-statistic falls within the critical bounds, the results are inconclusive. The bound testing procedure comprises two stages: the first stage focuses on establishing the existence of a long-run relationship. Once a long-run relationship is confirmed, a two-step approach is employed to estimate this relationship. Initially, an investigation into the long-run relationship suggested by the theory among the variables is conducted, followed by the estimation of both long-run and short-run parameters.

$$\Delta lnREM_t = a_{0REM} + \sum_{i=1}^{n} b_{iREM}\,\Delta lnREM_{t-i} + \sum_{i=0}^{n} c_{iREM}\,\Delta lnGDP_{t-i} + \sum_{i=0}^{n} d_{iREM}\,\Delta lnGCF_{t-i} + \sum_{i=1}^{n} e_{iREM}\,\Delta lnFDI_{t-i} + \sum_{i=0}^{n} f_{iREM}\Delta lnGEXP_{t-i} + \sum_{i=0}^{n} g_{iREM}\,\Delta lnSAV_{t-i} + \sum_{i=0}^{n} h_{iREM}\Delta lnTFP_{t-i} + \sum_{i=1}^{n} i_{iREM}\Delta lnEX_{t-i} + \lambda_{1REM} lnGDP_{t-1} + \lambda_{2REM} lnREM_{t-1} + \lambda_{3REM} lnGCF_{t-1} + \lambda_{4REM} lnFDI_{t-1} + \lambda_{5REM} lnGEXP_{t-1} + \lambda_{6REM} lnSAV_{t-1} + \lambda_{7REM} lnTFP_{t-1} + \lambda_{8REM} lnEX_{t-1} + \varepsilon_{2t} \quad (6)$$

Similarly, in the above equation (6), remittance (Rem) inflow is considered as the dependent variable in the assumed cointegrating relationship along with other variables, namely Fdi, Gexp, Ex, Gcf, Sav etc.

$$\Delta lnGCF_t = a_{0GCF} + \sum_{i=1}^{n} b_{iGCF}\,\Delta lnGCF_{t-i} + \sum_{i=0}^{n} c_{iGCF}\,\Delta lnGDP_{t-i} + \sum_{i=0}^{n} d_{iGCF}\,\Delta lnREM_{t-i} + \sum_{i=1}^{n} e_{iGCF}\,\Delta lnFDI_{t-i} + \sum_{i=0}^{n} f_{iGCF}\Delta lnGEXP_{t-i} + \sum_{i=0}^{n} g_{iGCF}\Delta lnSAV_{t-i} + \sum_{i=0}^{n} h_{iGCF}\Delta lnTFP_{t-i} + \sum_{i=1}^{n} i_{iGCF}\Delta lnEX_{t-i} + \lambda_{1GCF} lnGCF_{t-1} + \lambda_{2GCF} lnGDP_{t-1} + \lambda_{3GCF} lnREM_{t-1} + \lambda_{4GCF} lnFDI_{t-1} + \lambda_{5GCF} lnGEXP_{t-1} + \lambda_{6GCF} lnSAV_{t-1} + \lambda_{7GCF} lnTFP_{t-1} + \lambda_{8GCF} lnEX_{t-1} + \varepsilon_{3t} \quad (7)$$

In equation no (7), we consider Gross capital fixed formation (Gcf) as dependent variable for testing the null hypothesis of no co-integration expressed as H_0: $\lambda_{1y} = \lambda_{2y} = \lambda_{3y} = \lambda_{4y} = \lambda_{5y} = \lambda_{6y} = \lambda_{7y} = \lambda_{8y} = 0$, with the alternative hypothesis H_1: : $\lambda_{1y} \neq \lambda_{2y} \neq \lambda_{3y} \neq \lambda_{4y} \neq \lambda_{5y} \neq \lambda_{6y} \neq \lambda_{7y} \neq \lambda_{8y} \neq 0$, indicating that there is a long-term relationship.

Similarly, the other remaining variables in our empirical specification can also be used as a dependent variable in an equation, and the test of cointegration can be performed as explained for equations (5), (6), and (7). The related results are presented in Table 6 in the following abbreviated ways:

(i) FREM (REM | GDP, GCF, FDI, GEXP, SAV, TFP, EX)
(ii) FGCF (GCF | GDP, REM, FDI, GEXP, SAV, TFP, EX)
(iii) FFDI (FDI | GDP, REM, GCF, GEXP, SAV, TFP, EX)
(iv) FSAV (SAV | GDP, REM, GCF, GEXP, FDI, TFP, EX)
(v) FTFP (TFP | GDP, REM, GCF, GEXP, FDI, SAV, EX) .

EMPIRICAL RESULTS

In this section, we begin the empirical analysis by graphically analyzing our key variables. Figure 1 provides the plot of workers' remittances and the GDP of India from 1990 to 2023. A clear positive trend, although growing slowly, is visible in the distribution of remittances in India over time.

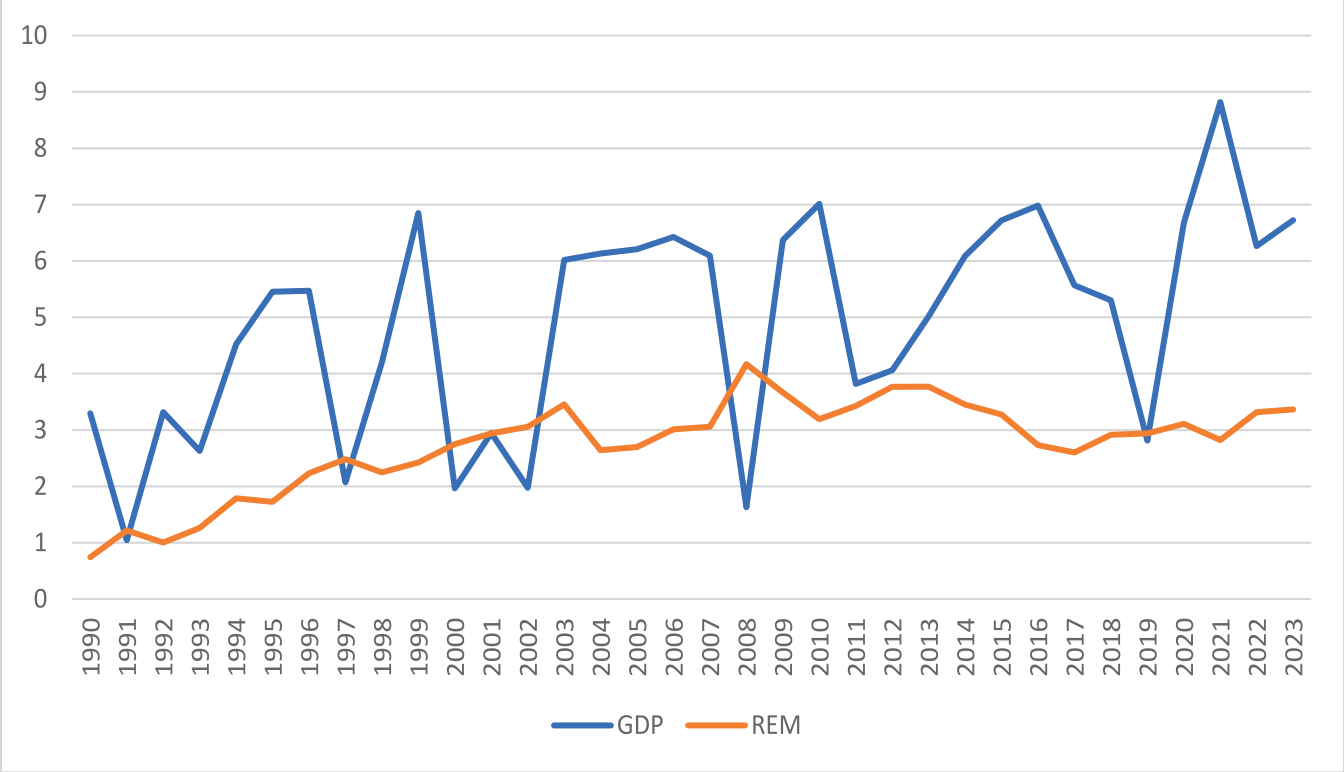

Figure 1: Plot of Remittances and GDP from 1990-2023

Before moving to estimate the model, Table 5 provides descriptive statistics of all the variables. As we can see in Table 5, the mean GDP growth rate is approximately 4.896%, and has a standard deviation of 1.94, which broadly indicates a moderate level of variation around the mean. The skewness values provide insights into the distribution's asymmetry. GDP growth exhibits a negatively skewed distribution (-0.335), indicating a longer left tail and a propensity for negative growth outliers. Rem displays a slightly negatively skewed distribution (-0.803). The Jarque-Bera (JB) test assesses the normality of the data, with TFP showing a statistically significant departure from normality. However, Rem, Gcf, Fdi, Ge, Sav, and Ex do not exhibit any significant deviations from normality because the p-values of the JB test are greater than 0.05, which means they are normally distributed.

Table 5: Descriptive Statistics of Variables included in Empirical Analysis

Variables	Gdp	Rem	Gcf	Fdi	Gexp	Sav	Tfp	Ex
Mean	4.896	2.743	29.096	1.252	10.857	30.110	0.440	17.020
Median	5.462	2.926	28.593	1.184	10.795	30.180	0.509	18.737
Std. Dev.	1.941	0.823	3.500	0.827	0.574	4.491	0.148	5.609
Variance	3.765	0.677	12.251	0.684	0.330	20.172	0.021	31.469
Maximum	8.818	4.168	35.812	3.620	12.175	37.011	0.642	25.430
Minimum	1.045	0.742	23.358	0.027	9.802	21.213	0.013	7.053
Skewness	-0.335	-0.803	0.163	0.622	0.498	-0.187	-1.131	0.241
Kurtosis	2.126	3.098	1.975	3.236	2.751	2.017	3.539	1.643
JB (P value)	1.720 (0.423)	3.676 (0.159)	1.641 (0.440)	2.272 (0.321)	1.496 (0.473)	1.567 (0.456)	7.669 (0.021)	2.937 (0.230)

Note: (i) See Table 3 for details and definitions of variables. (ii) Values in (#) are p-values

Results of Stationarity Test

In order to examine the effect of migrant's remittances on economic growth, we first investigate the stationarity of the variables included in the study. Table 6 presents the results of stationarity, which suggest that variables are not affected by a unit root process, and hence, they are stationary either at the level or at the first difference. The ADF test statistic, whether at level or first difference, has a p-value of 0.05, which indicates that the null hypothesis of non-stationarity is strongly rejected. It is observable that Gdp, Rem, and Tfp are stationary at the level or I(0) based on the ADF unit root results. The PP test also broadly confirms the unit root finding or the ADF test. Further, Gcf, Fdi, Gexp, Sav and Ex are stationary at the first difference or they are I(1). The results of the ADF test are also broadly confirmed by the PP test results.

Results of the Bounds Test

The estimated results of the bounds test for the presence of cointegration, performed using two lags selected by using the Schwartz criteria, are presented in Table 7. The decision criteria of the Bound test says that if the calculated value of the F-statistic is more than the given critical upper bound I(1) value, then we can draw the inference that there is cointegration or a long-run relationship among the set of variables considered in the empirical specification of the study (Pesaran et al., 2001). Table 7 presents the results of the bounds test while considering each variable in the system as an endogenous variable in one model. The calculated F-value is 3.771 when GDP is considered as the dependent variable (indicated as FGDP) in the model. The calculated F-value is more than the given upper bound value of 3.21at the 5% significance level. This result indicates that the null of no cointegration is strongly rejected when we consider Gdp, as a dependent variable in the model. Further, the null of no cointegration among the included variables is also rejected when we consider Gcf, Sav, and Tfp as dependent variables in the model. The null hypothesis of no cointegration is not rejected when we consider the Rem and Fdi as a dependent variable. As output growth, measured by GDP per capita, is our primary dependent variable of interest, and the above results have confirmed the presence of cointegration using this variable, we will now estimate the long- and short-run impact of international remittance inflows on the economic growth of the Indian economy by using GDP per capita growth an indicator.

Table 6: Results of the stationarity test

Variable	ADF				PP			
	Level		First Difference		Level		First Difference	
	C	C&T	C	C&T	C	C&T	C	C&T
Gdp	-4.484***	-5.766***	-	-	-4.455***	-7.965***	-	-
Rem	-3.869***	-3.227*	-	-	-4.577***	-3.227*	-	-
Gcf	-1.276	-1.454	-6.503***	-6.445***	-1.311	-1.566	-6.457***	-6.409***
Fdi	-2.478	-1.651	-6.173***	-7.655***	-2.854*	0.942	-6.123***	-7.338***
Gexp	-2.424	-2.45	-5.134***	-5.043***	-2.425	-2.45	-5.144***	-5.055***
Sav	-2.357	-1.816	-3.017**	-3.353*	-2.294	-1.374	-3.070**	-3.483*
Tfp	-4.633***	-5.690***	-	-	-4.596***	-8.250***	-	-
Ex	-2.441	-1.499	-5.888***	-6.202***	-2.489	-1.534	-5.874***	-6.193***

Note: (i) ADF stands for Augmented Dickey-Fuller test, (ii) PP stands for Phillips-Perron test (iii) C denotes constant and C&T denotes constant with rends (iv) ***,**, and * denotes significance at 1%, 5%, and 10%, respectively

Table 7: Results of the Test for cointegration among the variables

Critical value bounds of the *F*-statistic: intercept and no trend						
k	90% level		95% level		99% level	
7	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	1.92	2.89	2.17	3.21	2.73	3.9
Calculated *F*-statistic						
F_{GDP} (GDP | REM, GCF, FDI, GEXP, SAV, TFP,EX)						3.771
F_{REM} (REM | GDP, GCF, FDI, GEXP, SAV, TFP, EX)						1.542
F_{GCF} (GCF | GDP, REM, FDI, GEXP, SAV, TFP, EX)						3.855
F_{FDI} (FDI | GDP, REM, GCF, GEXP, SAV, TFP, EX)						2.707
F_{SAV} (SAV | GDP, REM, GCF, GEXP, FDI, TFP, EX)						3.932
F_{TFP} (TFP | GDP, REM, GCF, GEXP, FDI, SAV, EX)						4.335

Note: I(0) stands for the lower bound, and I(1) stands for the upper bound.

After confirming the presence of co-integration, indicating a long-run linkage among variables included in the empirical analysis we attempt to estimate equation (2) based on the following ARDL specification:

$$lnY_t = \beta_0 + \sum_{i=0}^{n} \beta_1 . lnREM_{t-1} + \sum_{i=0}^{P} \beta_2 . lnGFC_{t-1} + \sum_{i=0}^{q} \beta_3 . lnX_{t-1} + \mu_t \quad (8)$$

where X includes the set of other control variables included in the model that are known to determine the growth of GDP per capita in the related literature and are discussed in equation (1). The estimated coefficients of the long-run elasticities from the level equation are presented in Table 8, which indicates that the impact of remittance inflows is statistically insignificant on the growth of GDP per capita, and hence, inflows of remittances have no statistically significant impact on India's economic growth. Further, only the Gfc and Tfp have a positive and significant effect on the growth of GDP per capita in the list of other control variables included in the model.

Table 8: Estimated long-term coefficient of the ARDL model (dependent variable GDP)

Variable	Coefficient	t-Statistics
rem	-0.006	-0.349 (0.732)
gcf	0.511***	7.889 (0.000)
fdi	-0.012	-1.621 (0.127)
gexp	0.091	1.308 (0.211)
sav	-0.043	-0.838 (0.415)
tfp	1.484***	83.509 (0.000)
ex	0.014	0.736 (0.473)
Constant	-0.803***	-7.636 (0.000)

*Note: (i)***,**, and * denotes significance at 1%, 5%, and 10%, respectively (ii) Values in (#) are p values*

The estimated short-run results, along with the set of diagnostic tests, are presented in Table 9. The results suggest that the workers' remittances have a negative and statistically significant impact on the indicator of economic growth (GDP per capita) of India in the short run. This observation suggests that the outflow of workers from the Indian economy, leading to inflows of remittances, is expected to adversely impact the economic growth process of the Indian economy at least in the short term, with an insignificant effect on economic growth in the long run time horizon. The estimates of short-run coefficients also suggest that the impact of other control variables included in the model, such as the total factor productivity (TFP), gross capital formation (GCF), and foreign direct investment (FDI), is significant and broadly positive in the short run. The error correction term is negative and statistically significant, which indicates that long-run equilibrium is attainable as the error correction process is relatively fast in response to any shock in the given system of cointegrated variables.

Table 9: The short-run results and related diagnostic test

Variable	Coefficient	t-Statistics
$\Delta(gdp)_{t-1}$	0.422**	2.779 (0.014)
$\Delta(rem)$	-0.061***	-3.419 (0.004)
$\Delta(gcf)$	0.426***	9.712 (0.000)
$\Delta(gcf)_{t-1}$	-0.240**	-2.827 (0.013)
$\Delta(fdi)$	-0.004	-0.901 (0.382)

$\Delta(fdi)_{t-1}$	0.021***	3.693 (0.002)
$\Delta(sav)$	0.097	1.523 (0.150)
$\Delta(tfp)$	1.463***	188.817 (0.000)
$\Delta(tfp)_{t-1}$	-0.629**	-2.826 (0.013)
$ECM(-1)$	-1.793***	-7.303 (0.000)
Diagnostic Test		
$\bar{R}^2$ = 0.999 DW stat = 2.172 JB test = 8.33 (0.016) BPG test = 3.39 (0.120) $RESET$ test = 1.20 (0.331)		

*Note: (i)***,**, and * denotes significance at 1%, 5%, and 10%, respectively (ii) Values in (#) are p values*

We further conducted a battery of diagnostic tests to confirm the specification of our error correction model. The Adjusted R-Square value, a measure of the model's goodness of fit, is 0.999. This suggests that approximately 99.9% of the variations in the dependent variable are explained by the list of exogenous variables in the model, indicating a relatively high explanatory power. We use the Jarque-Bera (JB) normality test to confirm the normality of the data used for empirical analysis. The null hypothesis of the JB test is that there is no difference between the sample data used in the analysis and a normal distribution. If the related p-values are below the conventional significance level of 5%, we reject the null hypothesis and conclude that the sample data significantly deviates from normality. In this case, the errors are not normally distributed. The Ramsey RESET test is used to check for misspecification in the functional relationship between the dependent and independent variables in a model. A significant result from the RESET test indicates potential model misspecification, while insignificant results suggest that the model is correctly specified. In this case, the RESET test result is insignificant, which confirms that our model is appropriately specified. Therefore, these diagnostic test results broadly support the reliability of our estimated ARDL model in explaining the relationship between remittance inflows and economic growth in this study.

Parameter Stability Test

In this section, we aim to establish the long-run stability of estimated parameters for the empirical model in which GDP growth (Y) is the dependent variable. It is very important to confirm the stability of parameters, as unstable parameters can lead to model misspecification and consequently biased results. We employ two commonly used tests, namely the CUSUM and CUSUMSQ tests, as introduced by Brown et al. (1975), to evaluate the long-term stability of the estimated parameters. Given the significant policy changes and numerous economic reforms the Indian economy has experienced since 1991, it is expected that the macroeconomic data may have undergone one or more structural breaks. Therefore, we apply the CUSUM and CUSUMSQ tests to assess the stability of both the short-term and long-term coefficients (refer to Brown et al., 1975). The CUSUM and CUSUMSQ tests do not depend on prior knowledge regarding the timing of past structural breaks, which is very important for conducting the Chow stability test (Ozturk et al., 2013). Figures 2 and 3 display the plots of the CUSUM and CUSUMSQ tests, which remain within the critical bounds of the 5% significance level. Therefore, the tests confirm that the estimated coefficients are stable throughout the estimation period and are unaffected by any exogenous structural breaks.

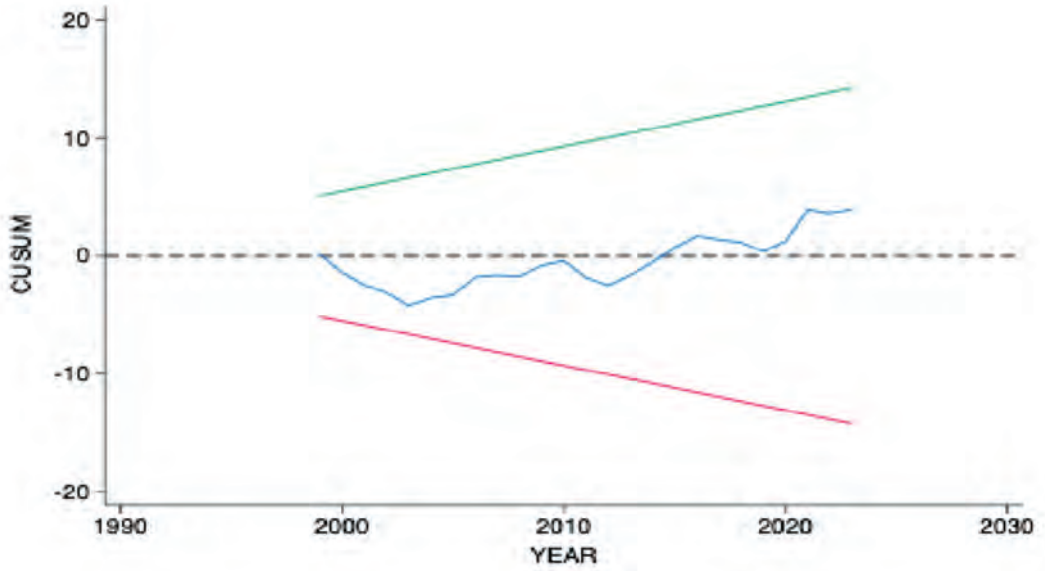

Figure 2: Plot of the cumulative sum of recursive residuals (CUSUM).

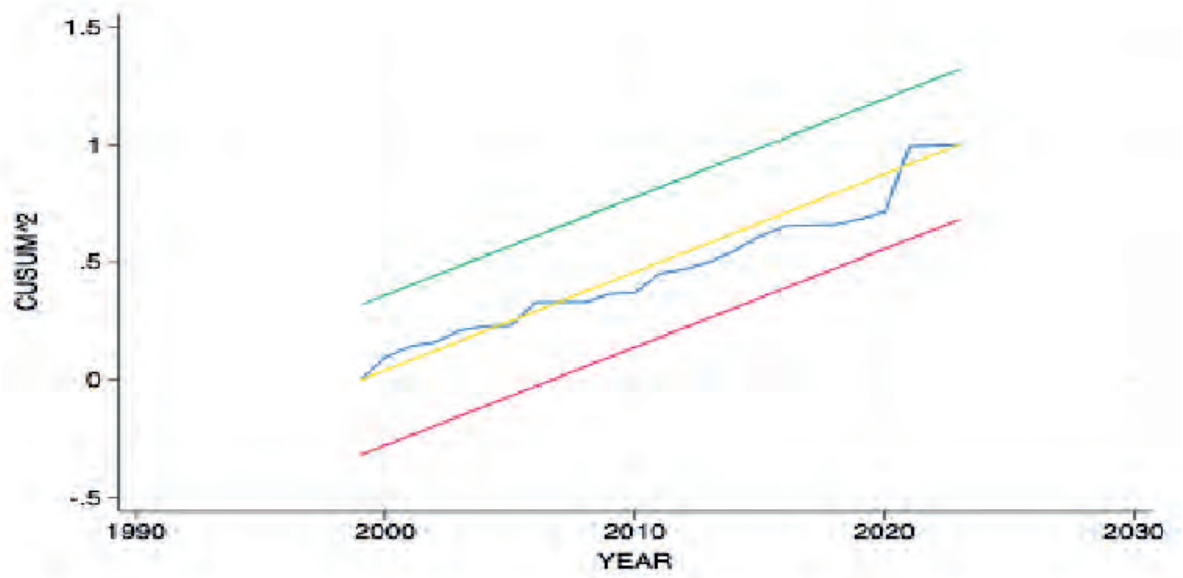

Figure 3: Plot of the cumulative sum of squares recursive residuals (CUSUMsq).

Robustness Check

In this section, we attempt to estimate the long-run elasticities using the FMOLS method developed by Phillips and Hansen (1990) and the DOLS method proposed by Stock and Watson (1993). This is important from the viewpoint of establishing the robustness of our ARDL-based results. Dynamic OLS is a parametric approach in which lags and leads are introduced to address the problem of endogeneity. An important advantage of using FMOLS is that it is free from the problem of endogeneity, serial correlation, and small sample size-related problems. Table 10 presents the estimated results from the ARDL, FMOLS, and DOLS estimators for comparison and robustness checks. The findings indicate that remittances have an insignificant effect on the growth of India's GDP per capita, and this conclusion remains consistent regardless of the estimation technique used. In contrast, the analysis confirms a positive and statistically significant impact of GFC and total factor productivity, as evidenced by the long-run coefficients estimated using the FMOLS and DOLS methods.

Table 10: Results of Robustness check: FMOLS and DOLS estimators

Variables	ARDL (I)	FMOLS (II)	DOLS (III)
Constant	-0.803*** (0.000)	-0.731*** (0.000)	-3.613** (0.037)
rem	-0.006 (0.732)	-0.004 (0.722)	0.592 (0.120)
gcf	0.512*** (0.000)	0.412*** (0.000)	0.499* (0.059)
fdi	-0.012 (0.127)	-0.017*** (0.0001)	-0.103 (0.187)
gexp	0.092 (0.212)	0.052 (0.256)	2.663* (0.050)
sav	-0.043 (0.416)	0.032 (0.436)	-0.379* (0.078)
tfp	1.485*** (0.000)	1.456*** (0.000)	2.286** (0.011)
ex	0.014 (0.474)	0.028** (0.039)	0.031 (0.607)

*Note: (i)***,**, and * denote significance at 1%, 5%, and 10% levels, respectively. (ii) Values in (#) are p-values*

CONCLUSION

The primary objective of this study was to investigate the economic linkage between international remittance inflows and economic growth in India by utilising annual data from 1990 to 2023. We employ the ARDL method to analyze both the short-run and long-run linkage between workers' remittance inflows and GDP per capita, which serves as an indicator of economic growth. Additionally, we use the FMOLS and DOLS estimators to establish the robustness of our empirical results.

The major findings of this study can be summarized as follows. First, the ARDL-based estimates of the long-run impact of remittances on GDP per capita growth indicate that remittance inflows in India do not contribute to the country's economic growth. The estimated coefficient was statistically insignificant. This finding contrasts with the results of other international studies, which affirmed a positive relationship between remittances and economic growth in various countries. For instance, Giuliano and Ruizarranz (2005), Acosta and Mandelman (2009), Ahortor and Adenutsi (2009), Abida and Shgaier (2014), and Odugbesan and Olowu (2021) all reported a positive correlation between remittances and economic growth. Given that India has recently been the leading recipient of remittances, the lack of a significant impact of these inflows on economic growth is puzzling and warrants further investigation. Second, contrary to previous studies, we observed a negative impact of remittances on economic growth in the short run. Third, the insignificant effect of remittance inflows on India's per capita GDP growth is confirmed to be robust and remains consistent regardless of changes in estimation techniques.

Based on the findings outlined above, it can be argued that although remittance inflows to India have doubled from USD 55.6 billion in the fiscal year 2010-11 to USD 118.7 billion in 2023-24, their impact on GDP growth is not positive. While remittances may assist the Indian economy in covering part of

its current account deficit and increasing foreign exchange reserves, their long-term impact on economic growth is insignificant, and their short-term effects are negative. These findings suggest a need to reconsider our policies regarding remittance enhancement and worker migration to reduce the negative short-term impact on economic growth. However, before arriving at a definitive conclusion, we believe further research is necessary, utilizing large datasets or state-level data from the Indian economy, to better understand the true effects of remittances on India's economic growth.

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