

The Growth Effect of Remittances in India: Evidence from a Dynamic Econometric Framework

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Abstract

This study examines the growth effects of remittances in India over the period from 1991 to 2022, with a particular emphasis on their dynamic effects on key macroeconomic variables, including consumption, investment, imports, and income. Adopting a Keynesian econometric framework with a dynamic perspective, the study employs the Two-Stage Least Squares method to address potential endogeneity and estimate the growth effects of remittance flows. The empirical findings reveal that remittances have a significant and positive effect on economic growth in India. Both short-term and long-term marginal propensity to consume and marginal propensity to import are obtained from estimates of the consumption, investment, and import functions, providing insight into the transmission channels of remittance inflows. Impact and dynamic multipliers are computed to evaluate the effects of remittance inflows on macroeconomic aggregates, along with a four-year distributed lag structure to assess their influence on current and future output growth. The findings suggest that remittances stimulate household consumption and imports in the short run, supporting demand-led growth, while in the long run they contribute to sustained income expansion, and macroeconomic stability can be further enhanced through policy measures that promote their productive utilization.

Categories: Labor Economics, Sustainable Economic Development

Keywords: consumption, international migration, remittances, economic growth, income

JEL Classifications: F24, O40, E29, F22, D31

Introduction

Remittances constitute one of the most significant sources of external finance for many developing countries. Broadly defined, remittances refer to the portion of earnings of migrant workers that is transferred to their home countries for household consumption, investment, and savings. As defined by the International Monetary Fund (IMF), workers' remittances refer to the monetary transfers made by individuals who have lived and worked abroad for more than one year, and these transactions are documented under various components of the balance of payments ([International Monetary Fund, 2023](#)). Over the past few decades, remittances have increasingly become a vital and stable source of external financing and capital accumulation for developing nations. Their stability, especially during times of global financial instability, has made remittances an important source of capital accumulation, household welfare, and macroeconomic resilience, as well as a vital absorber against external shocks. Therefore, understanding the macroeconomic effects of remittance inflows has emerged as a crucial aspect of contemporary macroeconomic and development studies. Wider shifts in global migration trends and financial integration are reflected in the sharp rise in remittance inflows. In 2022, remittance flows to low- and middle-income countries hit a historic high of \$US 647 billion, marking an 8% increase compared to the previous year ([World Bank, 2023](#)).

At the global level, changing migration patterns and increasing financial integration have significantly expanded the scale of remittance flows. In 2022, remittances to low- and middle-income countries reached approximately US\$647 billion, reflecting continued growth despite global economic challenges ([World Bank, 2023](#)). India stands out as the largest recipient of remittances worldwide, with inflows rising steadily over time and reaching about US\$125 billion in 2024 ([World Bank, 2025](#)). These inflows play a crucial role in supporting household consumption, improving living standards, and strengthening external sector stability. Compared to other forms of external finance, such as foreign direct investment and official development assistance, remittances are more stable and are directly channeled to households, thereby having an immediate welfare impact.

India holds a leading position in international remittance flows among developing economies. As the largest remittance recipient country worldwide, India has experienced a consistent increase in remittance inflows over recent decades. The inflows of remittances, which reached US\$125 billion in 2024 ([World Bank, 2025](#)), have a substantial impact on the macroeconomic stability and long-term economic growth of the nation. Unlike other external funding sources like foreign direct investment and official development assistance, remittances are more stable and directly benefit households. On the contrary, there are concerns that huge remittance inflows could diminish workforce participation or encourage dependency if not used productively. Therefore, overall economic growth depends upon their successful integration into the economy of the home country.

Review of literature

Theoretical Foundation

Remittances have emerged as one of the most significant and stable sources of external finance for developing economies, often surpassing foreign direct investment and official development assistance. Their growing importance has stimulated extensive debate regarding whether remittances merely improve household welfare or contribute to sustained economic growth. Economic theory suggests that the relationship is multifaceted, operating through several macroeconomic channels whose effects depend on the economic and institutional environment.

From a demand-side perspective, remittances increase household disposable income, stimulate consumption, and generate multiplier effects that raise output and employment ([Taylor, 1999](#)). In economies with limited access to formal credit, remittances also ease liquidity constraints, enabling households and small enterprises to undertake productive investments that would otherwise be financially

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unattainable (Giuliano and Ruiz-Arranz, 2009). Moreover, remittances can enhance long-term productive capacity by financing expenditure on education, healthcare, and other forms of human capital, thereby improving labor productivity (Edwards and Ureta, 2003).

At the macroeconomic level, remittances influence three major components of aggregate demand—consumption, investment, and imports. Higher disposable income encourages household spending, supports capital formation through increased investment, and raises demand for imported consumer and capital goods. Collectively, these transmission channels determine the extent to which remittances contribute to economic growth.

Nevertheless, theoretical perspectives also recognize potential adverse effects. Persistent remittance inflows may reduce labor market participation, create dependency on external income, or appreciate the real exchange rate, thereby reducing the competitiveness of export-oriented sectors, as suggested by the Dutch disease hypothesis (Corden and Neary, 1982). Consequently, the growth effects of remittances are theoretically ambiguous and depend largely on how remittance income is allocated and on the institutional and financial conditions of the recipient economy.

Competing Empirical Evidence

Empirical research on the remittance-growth nexus presents three broad perspectives. The first argues that remittances promote economic growth by relaxing financial constraints, supporting investment, increasing household purchasing power, and stimulating aggregate demand. These effects are particularly evident in economies with underdeveloped financial systems, where remittances substitute for limited access to formal credit (Faini, 2002) (Pradhan et al., 2008).

A second perspective reports limited or even negative growth effects. This literature argues that remittances are frequently directed towards household consumption, housing, and precautionary savings rather than productive investment. As a result, their contribution to capital accumulation and long-term economic growth remains limited, while large inflows may also weaken labor supply incentives and create macroeconomic distortions (Chami et al., 2005).

A third and increasingly influential perspective suggests that these contrasting findings reflect differences in country characteristics rather than conflicting evidence. Recent studies indicate that the growth effects of remittances are conditional upon factors such as financial development, institutional quality, governance, and human capital. Economies with stronger institutions and more developed financial systems are generally better positioned to transform remittance inflows into productive investment, whereas weaker institutional environments tend to channel remittances primarily toward consumption (Eggoh et al., 2019) (Abbas et al., 2025). Consistent with this view, meta-analytic evidence shows that remittances exert a positive but relatively modest impact on economic growth, with substantial variation across regions (Cazachevici et al., 2020).

Critical Synthesis

The absence of consensus in the literature reflects differences in analytical focus, methodology, and economic context rather than inherently contradictory findings. Household-level studies typically report favorable outcomes because they evaluate poverty reduction, consumption smoothing, and improvements in human capital. In contrast, macroeconomic studies often find weaker effects on Gross Domestic Product (GDP) growth because increases in household consumption do not necessarily translate into productive investment or sustained capital formation.

Methodological differences further contribute to these divergent conclusions. Much of the existing evidence is derived from cross-country panel analyses that estimate average relationships across heterogeneous economies. While these studies provide broad empirical insights, they often overlook country-specific institutional characteristics, migration patterns, and structural differences that influence the utilization of remittances. Consequently, findings from multi-country analyses may not adequately explain the experience of individual economies.

Another limitation is that many empirical studies focus primarily on the direct association between remittances and economic growth, treating remittances as an exogenous determinant of GDP. Such an approach provides only a partial understanding of their macroeconomic role because remittances simultaneously influence household consumption, domestic investment, imports, and other macroeconomic aggregates. Examining these interconnected channels is therefore essential for understanding how remittances contribute to economic growth.

Evidence from India

India provides an important context for examining the macroeconomic effects of remittances, as it has consistently remained the world's largest recipient of international remittance inflows (World Bank, 2023). Existing research indicates that remittances improve household welfare by reducing poverty, stabilizing consumption, expanding expenditure on education and healthcare, and promoting financial inclusion (Sutradhar, 2020) (Dutta and Saikia, 2024). Their resilience during periods of economic disruption, including the global financial crisis and the COVID-19 pandemic, further demonstrates their role as a stable source of external finance that supports domestic demand (Jayaraman and Makun, 2022).

Despite these contributions, the macroeconomic transmission process of remittances in India remains insufficiently explored. Most empirical studies have examined remittances in relation to individual outcomes, such as economic growth, poverty alleviation, or financial development. Comparatively less attention has been paid to understanding how remittances influence economic growth through changes in household consumption, domestic investment, and imports. Consequently, the existing literature provides only a partial explanation of the channels through which remittances affect India's macroeconomic performance.

Research Gap and Contribution

Although extensive research has examined the relationship between remittances and economic growth, important gaps remain. First, previous studies have predominantly estimated the direct impact of remittances on GDP, while giving limited attention to the indirect transmission mechanisms through which remittances influence macroeconomic performance. As remittances simultaneously affect household consumption, domestic investment, and imports, analyzing only their direct relationship with economic growth provides an incomplete assessment of their overall economic contribution.

Second, much of the available evidence is based on cross-country panel analyses that estimate average effects across diverse economies. While these studies provide useful generalizations, they often overlook country-specific institutional settings, migration patterns, and structural characteristics that shape the utilization of remittances. Therefore, their findings cannot be directly generalized to the Indian context.

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The Growth Effect of Remittances in India: Evidence from a Dynamic Econometric Framework

Third, existing studies on India have largely examined remittances alongside individual macroeconomic outcomes, such as economic growth, poverty reduction, or financial development, rather than analyzing the interrelationships among remittances, consumption, investment, imports, and economic growth within a single analytical framework. Consequently, limited evidence is available on the dynamic channels through which remittance inflows influence aggregate economic performance.

To address these gaps, the present study develops a unified conceptual and empirical framework that examines both the direct and indirect effects of remittances on economic growth. Specifically, it investigates how remittances influence GDP through three key macroeconomic transmission channels - consumption, investment, and imports. By adopting a dynamic, country-specific framework for India, the study extends the existing literature beyond conventional remittance-growth analyses. It provides new evidence on the mechanisms through which remittances shape macroeconomic performance. This integrated approach contributes to a deeper understanding of the developmental role of remittances and offers policy insights to enhance their productive use.

Based on the theoretical arguments and empirical evidence discussed above, the study develops the conceptual framework presented in Figure 1.

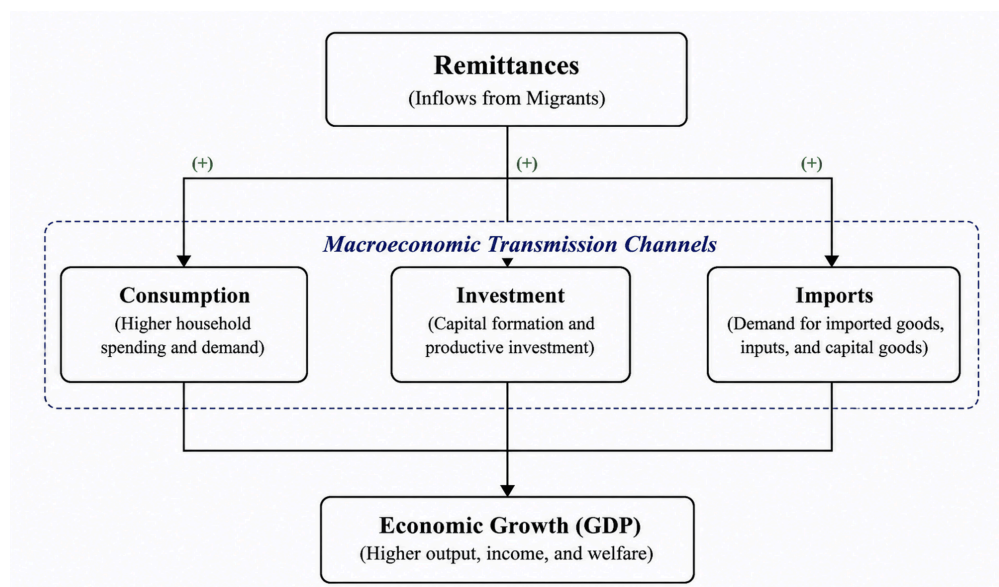


FIGURE 1: Remittance-Growth Transmission Framework

Source: Developed by the author based on the literature

Note: (+) indicates a positive influence

----- The dashed box represents the macroeconomic transmission channels through which remittances influence economic growth

Figure 1 illustrates the conceptual framework of the study. It proposes that remittances influence economic growth through three key macroeconomic transmission channels: consumption, investment, and imports. By increasing household disposable income, remittances affect household spending, savings, investment decisions, and import demand, which together shape aggregate economic activity. Thus, consumption, investment, and imports serve as mediating variables linking remittances to economic growth and provide the theoretical basis for the empirical analysis.

Research Questions

In light of these gaps, the present study is guided by the following key research questions:

1. How do remittance inflows influence economic growth in India over the period 1991-2022?
2. What are the short-run and long-run effects of remittances on key macroeconomic variables such as consumption, investment, and imports?
3. What are the magnitude and timing of the multiplier effects associated with remittance inflows in the Indian economy?
4. To what extent do remittances induce growth in major macroeconomic aggregates over the study period?
5. How do remittances contribute to macroeconomic stability and long-term economic performance in India?

Research Objectives

Accordingly, the main objectives of the study are as follows:

1. To examine the impact of remittance inflows on economic growth in India using a dynamic macroeconometric framework.
2. To estimate consumption, investment, and import functions to derive short-run and long-run marginal propensities.
3. To estimate the induced growth generated by remittances in selected macroeconomic variables.
4. To evaluate the contribution of remittances to India's macroeconomic performance and derive policy implications for enhancing their developmental impact.

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Research Method

This study examines the impact of remittances on economic growth in India using annual time-series data. To ensure the validity of the time-series analysis, the stationarity properties of the variables are examined using the Augmented Dickey-Fuller (ADF) unit root test. This step helps prevent spurious regression results that may arise from using non-stationary data. Given the possibility of a simultaneous relationship between remittances and economic growth, endogeneity may be present in the model. While remittances can contribute to economic growth through increased consumption, investment, and human capital development, the level of economic growth may also influence the volume of remittance inflows. Under such circumstances, estimates obtained through the Ordinary Least Squares (OLS) method may be biased and inconsistent. To overcome this limitation, the study applies the Two-Stage Least Squares (TSLS) estimation technique, which provides consistent parameter estimates in the presence of endogenous regressors.

The TSLS procedure is implemented in two sequential stages. In the first stage, the endogenous variable, remittances, is regressed on a set of instrumental variables (IV) along with other exogenous explanatory variables included in the model. The instruments are selected based on two key conditions: they must exhibit a strong relationship with remittances and must not be directly correlated with the disturbance term of the economic growth equation. The predicted values generated from this regression capture the variation in remittances that is free from endogeneity.

The use of TSLS is justified by the simultaneous-equation structure of the Glytso Keynesian framework, in which income, consumption, investment, and imports are jointly determined (Glytso, 2002). This simultaneity may generate correlation between endogenous regressors and the structural error terms, making OLS estimates potentially inconsistent. The instruments are selected based on the dynamic and structural relationships of the model. Lagged consumption, income, capital stock, and imports are treated as predetermined because they are determined before the current-period disturbances and capture the persistence of economic behavior. Government expenditure and exports provide additional variation in aggregate income and demand, while remittances are treated as an externally generated transfer within the Glytso framework that affects domestic activity through the income and multiplier channels (Glytso, 2002).

The validity of the instruments requires both relevance and exogeneity. In particular, the exclusion restriction assumes that the instruments affect consumption, investment, and imports primarily through the endogenous variables, especially current income, and do not have an independent direct effect on the respective structural disturbances. For remittances, the assumption is one of conditional exogeneity, rather than complete independence from domestic economic conditions. Thus, after controlling for the variables specified in the simultaneous-equation system, the identifying component of remittance inflows is assumed to be uncorrelated with the contemporaneous structural disturbances. These assumptions are grounded in the theoretical structure of the model and are further evaluated using first-stage diagnostics and over-identification tests. The causal interpretation of the TSLS estimates therefore remains conditional on the validity of these identifying restrictions.

In the second stage, these predicted values are substituted for the observed remittance variable in the economic growth equation. By relying on the exogenous component of remittances, the estimation procedure isolates the causal effect of remittance inflows on economic growth and mitigates bias arising from reverse causality and omitted variable bias. To ensure the reliability of the estimation results, a series of diagnostic tests are performed. The relevance of the selected instruments is evaluated through the first-stage F-statistic, with higher values indicating stronger instruments. Where multiple instruments are employed, over-identification tests such as the Sargan or Hansen test are used to assess instrument validity. In addition, endogeneity tests are conducted to verify the appropriateness of the instrumental variable approach. The estimated coefficients obtained from the second-stage regression are subsequently analyzed to determine the magnitude and direction of the relationship between remittances and economic growth.

The Theoretical Framework

The research is based on the work of Nicholas P. Glytso (Glytso, 2002). The Glytso model has been applied in many countries over different time periods, including applications in Kyrgyzstan (Aitymbetov, 2006), Turkey (Tansel and Yasar, 2010), Moldova and Albania (Blouchoutzi and Nikas, 2014), and Palestine (Saad, 2015). Its extensive use in empirical research underscores its robustness and suitability for analyzing the impact of remittances on key macroeconomic variables. In this method, remittances are included in the national disposable income. A one-dollar increase in remittances would substantially enhance disposable income by one dollar, all other things being unchanged. A unit change in remittances will result in a different reaction to the disposable income due to the multiplier effects and demand created by remittances. Theoretically, the effect of remittances on disposable income may be more or less than one, depending on their economic role (Glytso, 2002). To investigate how remittances influence these four variables - private consumption (C), investment (I), imports (M), as well as disposable income (Y) - the study constructs a model with an identity equation that describes three behavioral equations that specify the endogenous variables and the market-clearing conditions. Glytso developed a Keynesian econometric model. Remittance flows are seen as exogenous to India's macroeconomic performance. Using theoretical constraints on the model's parameters is an advantage of the structural model. A study can find a simplified depiction of the link between remittances and the key macroeconomic indicators from the structural model that may not be possible to find theoretically.

On the basis of the above discussion, the present study aims to examine the effect of remittance inflows on economic growth both in the short run and the long run. Specifically, this study explores the impact and dynamic multiplier effect of remittance inflows on selected important macroeconomic variables such as income, consumption, investment, and imports. The study provides empirical evidence that supports policies leveraging remittances for sustainable and inclusive economic growth.

The effect of remittances on economic growth is multidimensional. Remittances may contribute to economic growth by enhancing household consumption, increasing human capital through improved healthcare and educational opportunities, and encouraging small-scale investments in housing and enterprises.

This study examines the effect of remittances on economic growth in India by utilizing annual time series data for all selected variables, and the data have been obtained from the World Development Indicators (World Bank, 2024) (<https://databank.worldbank.org>), covering the years from 1991 to 2022 for empirical analysis. The dataset consists of 32 observations for each variable. The model incorporates the following variables: remittance inflows (R_t), gross domestic product (GDP_t), government final consumption expenditure (G_t), household final consumption expenditure (C_t), gross capital formation (proxy for investment I_t), capital stock (K_t), export of goods and services (X_t), and imports of goods and services (M_t), income (sum of GDP and remittances) (Y_t). The study employs a fundamental linear macroeconomic model derived from Keynesian ideas, using a dynamic approach. The model includes three behavioral equations: a consumption function, an investment function, and an import function, along with a national income identity. The purpose of implementing this dynamic model is to address the lack of data on capital stock in India. The study takes a proxy variable represented by the cumulative

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gross capital formation. To determine the immediate impact of an exogenous shock of remittances on four endogenous variables: consumption, investment, imports, and income. Subsequently, to determine the long-term direction by which remittances promote economic growth.

The Structure of the Model

In developing nations like India, economic instability and significant income fluctuations mostly occur because of remittance inflows. The study utilizes a long-run consumption equation to estimate the short-run and long-run impacts on consumption. The dynamic household final consumption function can be constructed from either partial adjustment or an adaptive expectations theory. Current consumption depends on the current income level and the previous consumption level.

That is;

$$C_t = f(Y_t, C_{t-1}) \quad (1)$$

The study assumes that gross capital formation (investment) is associated with business profits, which are positively associated with national income and less correlated with the capital stock, indicating the desired capital stock that entrepreneurs aim for in their investment activities. Gross capital formation is a function of the level of income and previous capital stocks.

That is;

$$I_t = f(Y_t, K_{t-1}) \quad (2)$$

I_t represents investment at time t , Y_t denotes income at time t , K_t signifies capital stock at time t .

Due to the lack of data on capital stock in India, the study takes a proxy variable represented by the cumulative gross capital formation.

$$K_t = \sum_{i=1991}^t I_i$$

More specifically,

$$I_t = \beta_0 Y_t + \beta_2 K_{t-1} + \epsilon_{2t}$$

ϵ_{2t} is the stochastic disturbance in the investment equation, and it is anticipated that the coefficient of Y_t is positive and a negative coefficient for K_{t-1} , providing a temporal adjustment of investment to the shock, that is, $\beta_1 > 0$ and $\beta_2 < 0$

The study assumes that a significant portion of remittances in India is allocated to obtaining import bills; it formulates the import equation in the system utilizing a life cycle hypothesis, integrating both current income and wealth, thereby introducing lagged income.

As a result, it considers import to be a function of both present and past income, as well as lag import.

That is,

$$M_t = f(Y_t, M_{t-1}) \quad (3)$$

More specifically,

$$M_t = \lambda_0 + \lambda_1 Y_t + \lambda_2 M_{t-1} + \epsilon_{3t} \quad (4)$$

ϵ_{3t} represents the stochastic disturbance for the import equation, we expect $\lambda_1 > 0$ and $\lambda_2 < 0$

Lastly, it considers income identity in the following manner:

$$Y_t = C_t + I_t + G_t + X_t - M_t + R_t \quad (5)$$

Although it is possible that X_t and G_t may be related to the endogenous variables, specifically: C_t , I_t , M_t but since there is no obvious relationship between R_t , X_t , G_t , it consider G_t, X_t as exogenous to R_t in this model.

Structural Model

$$C_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 C_{t-1} + \epsilon_{1t} \quad (6)$$

$$I_t = \beta_0 + \beta_1 Y_t + \beta_2 K_{t-1} + \epsilon_{2t} \quad (7)$$

$$M_t = \lambda_0 + \lambda_1 Y_t + \lambda_2 M_{t-1} + \epsilon_{3t} \quad (8)$$

$$Y_t = C_t + I_t + G_t + X_t - M_t + R_t \quad (9)$$

The model used in this study consists of a set of behavioral and identity equations, and these equations illustrate the relationships between consumption, investment, imports, and income in a changing economy.

Equation (6) represents the consumption function, where current consumption (C_t) is determined by current income and previous consumption (C_{t-1}). The coefficient α_1 determines the marginal propensity to consume (MPC), which reflects how much consumption changes with a change in income and the coefficient α_2 measures the impact of previous consumption on current consumption, indicating trends in household consumption behavior.

Equation (7) depicts the investment function, where investment (I_t) is determined by current income (Y_t) and the previous period's capital stock (K_{t-1}). The coefficient β_1 represents the marginal propensity to invest (MPI), which demonstrates how investment responds to income fluctuations, and the coefficient β_2 reflects the impact of existing capital stock on present investment choices, which implies that firms make adjustments to their investment based on the amount of previously accumulated capital.

Equation (8) represents the import function, where imports (M_t) are decided by national income (Y_t) and past imports (M_{t-1}). The coefficient λ_1 measures the marginal propensity to import (MPM), which shows how much imports change as income increases. The coefficient λ_2 reflects the impact of previous imports on current imports, which indicates the persistence of trade patterns and consumption

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of foreign products.

Equation (9) denotes the national income identity, which states that national income (Y_t) is determined by the sum of consumption, investment, imports, government expenditure (G_t), exports (X_t) and remittances (R_t) minus imports (M_t). This identity integrates the behavioral equations and generates the aggregate level of income in the economy.

These equations together comprise a simultaneous dynamic macroeconomic model in which consumption, investment, and imports are influenced by income and past values, while national income is determined by the aggregate demand identity. The existence of lagged variables ($C_{t-1}, K_{t-1}, M_{t-1}$) introduces dynamic adjustment with an error term representing unpredictable economic shocks.

The OLS technique cannot be used to estimate a simultaneous equation model because it violates the exogeneity assumptions of the classical linear regression model, resulting in biased and inconsistent estimates. Using all of the system's exogenous and predetermined variables as instruments, the study employs an IV method to address this problem. The TSLS approach is used since the model is over-identified. Additionally, the model's identification status under both exact and over-identified situations is investigated. In over-identified scenarios, the Indirect Least Squares method does not produce unique structural parameter estimates, even if it is suitable for exactly identified models. Therefore, the TSLS approach is a superior choice among other methods, such as Maximum Likelihood Estimation.

To estimate the model's structural parameters, the study employed the TSLS approach. Equations are used to estimate the model, and each equation's endogenous variable income is instrumented using the whole set of possible instruments, which includes all exogenous and predetermined variables. This methodological framework enables a comprehensive assessment of both the direct and indirect effects of remittances on economic growth, while addressing econometric challenges associated with endogeneity and simultaneity.

The empirical methodology employed in this study follows a sequential econometric framework to ensure the validity and robustness of the estimated results, as presented below:

ADF Test → Cointegration Test → First-Stage Regression → Instrument Diagnostics → Second-Stage TSLS Estimation → Post-Estimation Diagnostic Tests → Interpretation of Results.

The study used the TSLS method to estimate the structural parameters of the model. The model is estimated on an equation-by-equation basis, with the endogenous variable income in each equation being instrumented using the set of all possible instruments, which includes all exogenous and predetermined variables.

From equation (6)

$$C_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 C_{t-1}$$

Put the Y_t value in equation (6)

$$C_t = \alpha_0 + \alpha_1 (C_t + I_t + G_t + X_t - M_t) + R_t + \alpha_2 C_{t-1}$$

$$C_t = \alpha_0 + \alpha_1 C_t + \alpha_1 I_t + \alpha_1 G_t + \alpha_1 X_t - \alpha_1 M_t + \alpha_1 R_t + \alpha_2 C_{t-1}$$

Put equations (7) and (8) in the above equation

$$C_t = \alpha_0 + \alpha_1 C_t + \alpha_1 (\beta_0 + \beta_1 Y_t + \beta_2 K_{t-1}) + \alpha_1 G_t + \alpha_1 X_t - \alpha_1 (\lambda_0 + \lambda_1 Y_t + \lambda_2 M_{t-1}) + \alpha_1 R_t + \alpha_2 C_{t-1}$$

$$C_t = \alpha_0 + \alpha_1 C_t + \alpha_1 \beta_0 + \alpha_1 \beta_1 Y_t + \alpha_1 \beta_2 K_{t-1} + \alpha_1 G_t + \alpha_1 X_t - \alpha_1 \lambda_0 + \alpha_1 \lambda_1 Y_t + \alpha_1 \lambda_2 M_{t-1} + \alpha_1 R_t + \alpha_2 C_{t-1}$$

$$C_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 C_{t-1}$$

$$\Rightarrow \alpha_1 Y_t = C_t - \alpha_0 - \alpha_2 C_{t-1}$$

$$C_t = \alpha_0 + \alpha_1 C_t + \beta_0 \alpha_1 + \beta_1 (C_t - \alpha_0 - \alpha_2 C_{t-1}) + \beta_2 \alpha_1 K_{t-1} + \alpha_1 G_t + \alpha_1 X_t - \alpha_1 \lambda_0 + \lambda_1 (C_t - \alpha_0 - \alpha_2 C_{t-1}) + \alpha_1 \lambda_2 M_{t-1} + \alpha_1 R_t + \alpha_2 C_{t-1}$$

$$C_t = \alpha_0 + \alpha_1 C_t + \beta_0 \alpha_1 + \beta_1 C_t - \beta_1 \alpha_0 - \beta_1 \alpha_2 C_{t-1} + \beta_2 \alpha_1 K_{t-1} + \alpha_1 G_t + \alpha_1 X_t - \alpha_1 \lambda_0 + \lambda_1 C_t - \lambda_1 \alpha_0 - \lambda_1 \alpha_2 C_{t-1} + \alpha_1 \lambda_2 M_{t-1} + \alpha_1 R_t + \alpha_2 C_{t-1}$$

$$C_t - \alpha_1 C_t - \beta_1 C_t - \lambda_1 C_t = (\alpha_0 - \alpha_0 \beta_1 + \alpha_0 \lambda_1) + (\alpha_1 \beta_0 - \alpha_1 \lambda_0) + \alpha_1 G_t + \alpha_1 X_t + \alpha_1 R_t + \beta_2 \alpha_1 K_{t-1} - \alpha_1 \lambda_2 M_{t-1} + \alpha_2 C_{t-1} + \beta_1 \alpha_2 C_{t-1} - \lambda_1 \alpha_2 C_{t-1}$$

$$C_t (1 - \alpha_1 - \beta_1 - \lambda_1) = \alpha_0 (1 - \beta_1 + \lambda_1) + \alpha_1 (\beta_0 - \lambda_0) + \alpha_1 G_t + \alpha_1 X_t + \alpha_1 R_t + \alpha_2 (1 - \beta_1 - \lambda_1) C_{t-1} + \beta_2 \alpha_1 K_{t-1} - \alpha_1 \lambda_2 M_{t-1}$$

$$Z C_t = \alpha_0 (1 - \beta_1 + \lambda_1) + \alpha_1 (\beta_0 - \lambda_0) + \alpha_1 G_t + \alpha_1 X_t + \alpha_1 R_t + \alpha_2 (1 - \beta_1 - \lambda_1) C_{t-1} + \beta_2 \alpha_1 K_{t-1} - \alpha_1 \lambda_2 M_{t-1} \quad (10)$$

where, $Z = 1 - \alpha_1 - \beta_1 - \lambda_1$

From equation (7)

$$I_t = \beta_0 + \beta_1 Y_t + \beta_2 K_{t-1}$$

Put the Y_t value in equation (7)

$$I_t = \beta_0 + \beta_1 (C_t + I_t + G_t + (X_t - M_t)) + R_t + \beta_2 K_{t-1}$$

Put equations (6) and (8) in the above equation

$$I_t = \beta_0 + \beta_1 (\alpha_0 + \alpha_1 Y_t + \alpha_2 C_{t-1}) + \beta_1 I_t + \beta_1 G_t + \beta_1 X_t - \beta_1 (\lambda_0 + \lambda_1 Y_t + \lambda_2 M_{t-1}) + \beta_1 R_t + \beta_2 K_{t-1}$$

$$I_t = \beta_0 + \beta_1 \alpha_0 + \beta_1 \alpha_1 Y_t + \beta_1 \alpha_2 C_{t-1} + \beta_1 I_t + \beta_1 G_t + \beta_1 X_t - \beta_1 \lambda_0 + \beta_1 \lambda_1 Y_t + \beta_1 \lambda_2 M_{t-1} + \beta_1 R_t + \beta_2 K_{t-1}$$

$$I_t = \beta_0 + \beta_1 Y_t + \beta_2 K_{t-1}$$

$$\Rightarrow \beta_1 Y_t = I_t - \beta_0 - \beta_2 K_{t-1}$$

$$I_t = \beta_0 + \beta_1 \alpha_0 + \alpha_1 (I_t - \beta_0 - \beta_2 K_{t-1}) + \beta_1 \alpha_2 C_{t-1} + \beta_1 I_t + \beta_1 G_t + \beta_1 X_t - \beta_1 \lambda_0 + \lambda_1 (I_t - \beta_0 - \beta_2 K_{t-1}) + \beta_1 \lambda_2 M_{t-1} + \beta_1 R_t + \beta_2 K_{t-1}$$

$$I_t = \beta_0 + \beta_1 \alpha_0 + \alpha_1 I_t - \alpha_1 \beta_0 - \alpha_1 \beta_2 K_{t-1} + \beta_1 \alpha_2 C_{t-1} + \beta_1 I_t + \beta_1 G_t + \beta_1 X_t - \beta_1 \lambda_0 + \lambda_1 I_t - \lambda_1 \beta_0 - \lambda_1 \beta_2 K_{t-1} + \beta_1 \lambda_2 M_{t-1} + \beta_1 R_t + \beta_2 K_{t-1}$$

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$$I_t - \alpha_1 I_t - \beta_1 I_t - \lambda_1 I_t = (\beta_0 - \beta_0 \alpha_1 - \beta_0 \lambda_1) + (\beta_1 \alpha_0 - \beta_1 \lambda_0) + \beta_1 G_t + \beta_1 X_t + \beta_1 R_t - \beta_2 K_{t-1} - \beta_2 \alpha_1 K_{t-1} - \beta_2 \lambda_1 K_{t-1} + \beta_1 \alpha_2 C_{t-1} + \beta_1 \lambda_2 M_{t-1}$$

$$I_t(1 - \alpha_1 - \beta_1 - \lambda_1) = \beta_0(1 - \alpha_1 - \lambda_1) + \beta_1(\alpha_0 - \lambda_0) + \beta_1 G_t + \beta_1 X_t + \beta_1 R_t + \beta_2(1 - \alpha_1 - \lambda_1)K_{t-1} + \beta_1 \alpha_2 C_{t-1} + \beta_1 \lambda_2 M_{t-1}$$

$$ZI_t = \beta_0(1 - \alpha_1 - \lambda_1) + \beta_1(\alpha_0 - \lambda_0) + \beta_1 G_t + \beta_1 X_t + \beta_1 R_t + \beta_2(1 - \alpha_1 - \lambda_1)K_{t-1} + \beta_1 \alpha_2 C_{t-1} + \beta_1 \lambda_2 M_{t-1} \quad (11)$$

From equation (8)

$$M_t = \lambda_0 + \lambda_1 Y_t + \lambda_2 M_{t-1}$$

Put the Y_t value in equation (8)

$$M_t = \lambda_0 + \lambda_1 (C_t + I_t + G_t + X_t - M_t + R_t) + \lambda_2 M_{t-1}$$

$$M_t = \lambda_0 + \lambda_1 C_t + \lambda_1 I_t + \lambda_1 G_t + \lambda_1 X_t - \lambda_1 M_t + \lambda_1 R_t + \lambda_2 M_{t-1}$$

$$M_t = \lambda_0 + \lambda_1 (\alpha_0 + \alpha_1 Y_t + \alpha_2 C_{t-1}) + \lambda_1 (\beta_0 + \beta_1 Y_t + \beta_2 K_{t-1}) + \lambda_1 G_t + \lambda_1 X_t - \lambda_1 M_t + \lambda_1 R_t + \lambda_2 M_{t-1}$$

$$M_t = \lambda_0 + \lambda_1 \alpha_0 + \lambda_1 \alpha_1 Y_t + \lambda_1 \alpha_2 C_{t-1} + \lambda_1 \beta_0 + \lambda_1 \beta_1 Y_t + \lambda_1 \beta_2 K_{t-1} + \lambda_1 G_t + \lambda_1 X_t - \lambda_1 M_t + \lambda_1 R_t + \lambda_2 M_{t-1}$$

$$M_t = \lambda_0 + \lambda_1 Y_t + \lambda_2 M_{t-1}$$

$$\implies \lambda_1 Y_t = M_t - \lambda_0 - \lambda_2 M_{t-1}$$

$$M_t = \lambda_0 + \lambda_1 \alpha_0 + \alpha_1 (M_t - \lambda_0 - \lambda_2 M_{t-1}) + \lambda_1 \alpha_2 C_{t-1} + \lambda_1 \beta_0 + \beta_1 (M_t - \lambda_0 - \lambda_2 M_{t-1}) + \lambda_1 \beta_2 K_{t-1} + \lambda_1 G_t + \lambda_1 X_t - \lambda_1 M_t + \lambda_1 R_t + \lambda_2 M_{t-1}$$

$$M_t = \lambda_0 + \lambda_1 \alpha_0 + \alpha_1 M_t - \alpha_1 \lambda_0 - \alpha_1 \lambda_2 M_{t-1} + \lambda_1 \alpha_2 C_{t-1} + \lambda_1 \beta_0 + \beta_1 M_t - \beta_1 \lambda_0 - \beta_1 \lambda_2 M_{t-1} + \lambda_1 \beta_2 K_{t-1} + \lambda_1 G_t + \lambda_1 X_t - \lambda_1 M_t + \lambda_1 R_t + \lambda_2 M_{t-1}$$

$$M_t - \alpha_1 M_t - \beta_1 M_t - \lambda_1 M_t = (\lambda_0 - \lambda_0 \alpha_1 - \lambda_0 \beta_1) + (\lambda_1 \alpha_0 + \lambda_1 \beta_0) + \lambda_1 G_t + \lambda_1 X_t + \lambda_1 R_t + (\lambda_2 M_{t-1} - \alpha_1 \lambda_2 M_{t-1} - \beta_1 \lambda_2 M_{t-1}) + \lambda_1 \alpha_2 C_{t-1} +$$

$$M_t(1 - \alpha_1 - \beta_1 - \lambda_1) = \lambda_0(1 - \alpha_1 - \beta_1) + \lambda_1(\alpha_0 + \beta_0) + \lambda_1 G_t + \lambda_1 X_t + \lambda_1 R_t + (\lambda_2 M_{t-1} - \alpha_1 \lambda_2 M_{t-1} - \beta_1 \lambda_2 M_{t-1}) + \lambda_1 \alpha_2 C_{t-1} + \lambda_1 \beta_2 K_{t-1}$$

$$ZM_t = \lambda_0(1 - \alpha_1 - \beta_1) + \lambda_1(\alpha_0 + \beta_0) + \lambda_1 G_t + \lambda_1 X_t + \lambda_1 R_t + (\lambda_2 M_{t-1} - \alpha_1 \lambda_2 M_{t-1} - \beta_1 \lambda_2 M_{t-1}) + \lambda_1 \alpha_2 C_{t-1} + \lambda_1 \beta_2 K_{t-1} \quad (12)$$

Impact Multiplier

$$ZC_t = \alpha_0(1 - \beta_1 + \lambda_1) + \alpha_1(\beta_0 - \lambda_0) + \alpha_1 G_t + \alpha_1 X_t + \alpha_1 R_t + \alpha_2(1 - \beta_1 - \lambda_1)C_{t-1} + \beta_2 \alpha_1 K_{t-1} - \alpha_1 \lambda_2 M_{t-1} \quad (10)$$

$$ZI_t = \beta_0(1 - \alpha_1 - \lambda_1) + \beta_1(\alpha_0 - \lambda_0) + \beta_1 G_t + \beta_1 X_t + \beta_1 R_t + \beta_2(1 - \alpha_1 - \lambda_1)K_{t-1} + \beta_1 \alpha_2 C_{t-1} + \beta_1 \lambda_2 M_{t-1} \quad (11)$$

$$ZM_t = \lambda_0(1 - \alpha_1 - \beta_1) + \lambda_1(\alpha_0 + \beta_0) + \lambda_1 G_t + \lambda_1 X_t + \lambda_1 R_t + (\lambda_2 M_{t-1} - \alpha_1 \lambda_2 M_{t-1} - \beta_1 \lambda_2 M_{t-1}) + \lambda_1 \alpha_2 C_{t-1} + \lambda_1 \beta_2 K_{t-1} \quad (12)$$

where, $\frac{\alpha_1}{Z}$, $\frac{\beta_1}{Z}$, $\frac{\lambda_1}{Z}$ represent the impact multipliers for consumption, investment, and import, respectively, and $Z = (1 - \alpha_1 - \beta_1 - \lambda_1)$

Finally, the reduced form equation for income is as follows:

$$Y_t = \psi \left[\frac{\alpha_1 + \beta_1 - \lambda_1}{Z} + 1 \right] G_t + \left[\frac{\alpha_1 + \beta_1 - \lambda_1}{Z} + 1 \right] X_t + \left[\frac{\alpha_1 + \beta_1 - \lambda_1}{Z} + 1 \right] R_t + \frac{\alpha_2}{Z} C_{t-1} + \frac{\beta_2}{Z} K_{t-1} + \frac{\lambda_2}{Z} M_{t-1} \quad (13)$$

The impact multiplier for income, represented as $\left[\frac{\alpha_1 + \beta_1 - \lambda_1}{Z} + 1 \right]$ is equal to the impact multiplier for consumption $\frac{\alpha_1}{Z}$ plus the impact multiplier for investment $\frac{\beta_1}{Z}$ minus the impact multiplier for imports $\frac{\lambda_1}{Z}$, and then adding 1.

Dynamic Multipliers

The study incorporated lagged endogenous variables into the system, which gives the model a dynamic aspect. This also tries to calculate the dynamic impact of remittances on endogenous variables. Specifically, it looks at the dynamic effects of a one-unit change in remittances in year 1 with no additional changes in years, i.e., 2, 3, 5, ... n.

From the reduced form equation (10), the consumption function for the subsequent period can be expressed as;

$$ZC_t = \alpha_0(1 - \beta_1 + \lambda_1) + \alpha_1(\beta_0 - \lambda_0) + \alpha_1 G_t + \alpha_1 X_t + \alpha_1 R_t + \alpha_1(1 - \beta_1 - \lambda_1)C_{t-1} + \beta_2 \alpha_1 K_{t-1} - \alpha_1 \lambda_2 M_{t-1}$$

$$ZC_{t+1} = \alpha_0(1 - \beta_1 + \lambda_1) + \alpha_1(\beta_0 - \lambda_0) + \alpha_1 G_{t+1} + \alpha_1 X_{t+1} + \alpha_1 R_{t+1} + \alpha_2(1 - \beta_1 - \lambda_1)C_t + \beta_2 \alpha_1 K_t - \alpha_1 \lambda_2 M_t$$

Suppose that, $\alpha_0(1 - \beta_1 + \lambda_1) + \alpha_1(\beta_0 - \lambda_0) = C_0$

Then,

$$ZC_{t+1} = C_0 + \alpha_1 G_{t+1} + \alpha_1 X_{t+1} + \alpha_1 R_{t+1} + \alpha_2(1 - \beta_1 - \lambda_1)C_t + \beta_2 \alpha_1 K_t - \alpha_1 \lambda_2 M_t \quad (14)$$

By substituting equation (10) into equation (14), we get;

$$\frac{ZC_{t+1}}{Z} = C_0 + \frac{\alpha_1}{Z} G_{t+1} + \frac{\alpha_1}{Z} X_{t+1} + \frac{\alpha_1}{Z} R_{t+1} + \frac{\alpha_2(1 - \beta_1 + \lambda_1)}{Z} \left[\frac{\alpha_0}{Z} (1 - \beta_1 + \lambda_1) - \frac{\alpha_1}{Z} (\beta_0 - \lambda_0) + \frac{\alpha_1}{Z} G_t + \frac{\alpha_1}{Z} X_t + \frac{\alpha_1}{Z} R_t + \frac{\alpha_2}{Z} (1 - \beta_1 + \lambda_1) C_{t-1} + \frac{\beta_2 \alpha_1}{Z} K_{t-1} - \frac{\alpha_1 \lambda_2}{Z} M_{t-1} \right]$$

$$C_t = C_0 + \frac{\alpha_1}{Z} G_t + \frac{\alpha_1}{Z} X_t + \frac{\alpha_1}{Z} R_t + \frac{\alpha_1 \beta_2}{Z} K_t - \frac{\alpha_1 \beta_2}{Z} M_t + \frac{\alpha_2(1 - \beta_1 + \lambda_1)}{Z} \left[\frac{\alpha_1}{Z} G_t + \frac{\alpha_1}{Z} X_t + \frac{\alpha_1}{Z} R_t + \frac{\alpha_2(1 - \beta_1 + \lambda_1)}{Z} C_{t-1} + \frac{\alpha_1 \beta_2}{Z} K_{t-1} - \frac{\alpha_1 \beta_2}{Z} M_{t-1} \right]$$

Equation (15) indicates that any change in remittances for the current year impacts consumption in the subsequent period as follows:

$$\frac{\partial C_{t+1}}{\partial R_t} = \frac{\alpha_2(1 - \beta_1 + \lambda_1)}{Z} \cdot \frac{\alpha_1}{Z}$$

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$$\frac{\partial C_{t+1}}{\partial R_t} = A \cdot \frac{\alpha_1}{Z}$$

By continuing with the repetitive approach, the dynamic multipliers for the upcoming year can be estimated as follows:

$$\frac{\partial C_{t+2}}{\partial R_t} = A^2 \cdot \frac{\alpha_1}{Z}, \quad \frac{\partial C_{t+3}}{\partial R_t} = A^3 \cdot \frac{\alpha_1}{Z}, \quad \frac{\partial C_{t+n}}{\partial R_t} = A^n \cdot \frac{\alpha_1}{Z}$$

Likewise, the investment function for the following year can be expressed from the reduced form equation (11) as follows:

$$ZI_t = \beta_0(1 - \alpha_1 - \lambda_1) + \beta_1(\alpha_0 - \lambda_0) + \beta_1 G_t + \beta_1 X_t + \beta_1 R_t + \beta_2(1 - \alpha_1 - \lambda_1)K_{t-1} + \beta_1 \alpha_2 C_{t-1} + \beta_1 \lambda_2 M_{t-1}$$

$$\text{Let, } C_1 = (1 - \alpha_1 - \lambda_1) + \beta_1(\alpha_0 - \lambda_0)$$

$$ZI_t = C_1 + \beta_1 G_t + \beta_1 X_t + \beta_1 R_t + \beta_2(1 - \alpha_1 - \lambda_1)K_{t-1} + \beta_1 \alpha_2 C_{t-1} + \beta_1 \lambda_2 M_{t-1}$$

$$ZI_{t+1} = C_1 + \beta_1 G_{t+1} + \beta_1 X_{t+1} + \beta_1 R_{t+1} + \beta_2(1 - \alpha_1 - \lambda_1)K_t + \beta_1 \alpha_2 C_t + \beta_1 \lambda_2 M_t \quad (16)$$

Substituting equation (11) into (14) and dividing by Z on both sides,

$$\text{Let, } K_t = K_{t-1} + I_t$$

$$I_{t+1} = C_1 + \frac{\beta_1}{Z} G_{t+1} + \frac{\beta_1}{Z} X_{t+1} + \frac{\beta_1}{Z} R_{t+1} + \frac{\beta_1 \alpha_2}{Z} C_t + \frac{\beta_2(1 - \alpha_1 - \lambda_1)}{Z} K_{t-1} + \frac{\beta_2(1 - \alpha_1 + \lambda_1)}{Z} \left[\frac{\beta_1}{Z} G_t + \frac{\beta_1}{Z} X_t + \frac{\beta_1}{Z} R_t + \frac{\beta_1}{Z} C_{t-1} + \frac{\beta_2(1 - \alpha_1 - \lambda_1)}{Z} K_{t-1} + \frac{\beta_1 \alpha_2}{Z} C_{t-1} + \frac{\beta_1 \lambda_2}{Z} M_{t-1} \right]$$

Equation (12) indicates that any variation in workers' remittances in the current year has the following effects on investment in the subsequent period.

$$\frac{\partial I_{t+1}}{\partial R_t} = B^* \cdot \frac{\beta_1}{Z}$$

$$\text{where, } B = \frac{\beta_2(1 - \alpha_1 + \lambda_1)}{Z}$$

Through the ongoing process of repetition, the dynamic multipliers for the forthcoming years can be estimated as follows:

$$\frac{\partial I_t}{\partial R_t} = B^2 \cdot \frac{\beta_1}{Z}, \quad \frac{\partial I_t}{\partial R_t} = B^3 \cdot \frac{\beta_1}{Z}, \quad \frac{\partial I_t}{\partial R_t} = B^n \cdot \frac{\beta_1}{Z}$$

Finally, the import function for the coming year can be obtained from the reduced form equation (12) as follows:

$$ZM_t = \lambda_0(1 - \alpha_1 - \beta_1) + \lambda_1(\alpha_0 + \beta_0) + \lambda_1 G_t + \lambda_1 X_t + \lambda_1 R_t + \lambda_2(1 - \alpha_1 + \beta_1)M_{t-1} + \lambda_1 \alpha_2 C_{t-1} + \lambda_1 \beta_2 K_{t-1}$$

$$\text{Let, } C_2 = \lambda_0(1 - \alpha_1 - \beta_1) + \lambda_1(\alpha_0 + \beta_0)$$

$$ZM_t = C_2 + \lambda_1 G_t + \lambda_1 X_t + \lambda_1 R_t + \lambda_2(1 - \alpha_1 + \beta_1)M_{t-1} + \lambda_1 \alpha_2 C_{t-1} + \lambda_1 \beta_2 K_{t-1}$$

$$ZM_{t+1} = C_2 + \lambda_1 G_{t+1} + \lambda_1 X_{t+1} + \lambda_1 R_{t+1} + \lambda_2(1 - \alpha_1 + \beta_1)M_t + \lambda_1 \alpha_2 C_t + \lambda_1 \beta_2 K_t \quad (18)$$

Substituting equation (7) into (13) and dividing by Z on both sides:

$$ZM_{t+1} = C_2 + \frac{\lambda_1}{Z} G_{t+1} + \frac{\lambda_1}{Z} X_{t+1} + \frac{\lambda_1}{Z} R_{t+1} + \frac{\lambda_1 \beta_2}{Z} C_t + \frac{\lambda_1 \beta_2}{Z} K_t + \frac{\lambda_2(1 - \alpha_1 + \beta_1)}{Z} \left[\frac{\lambda_1}{Z} G_t + \frac{\lambda_1}{Z} X_t + \frac{\lambda_1}{Z} R_t + \frac{\lambda_1 \beta_2}{Z} C_{t-1} + \frac{\lambda_1 \beta_2}{Z} K_{t-1} + \frac{\lambda_2(1 - \alpha_1 + \beta_1)}{Z} \left[\frac{\lambda_1}{Z} G_{t-1} + \frac{\lambda_1}{Z} X_{t-1} + \frac{\lambda_1}{Z} R_{t-1} + \frac{\lambda_1 \beta_2}{Z} C_{t-2} + \frac{\lambda_1 \beta_2}{Z} K_{t-2} + \dots \right] \right]$$

Equation (14) indicates that any change in remittances during the current year impacts imports in the following period. That is,

$$\frac{\partial M_{t+1}}{\partial R_t} = C^* \cdot \frac{\lambda_1}{Z}$$

$$\text{where, } C = \frac{\lambda_2(1 - \alpha_1 + \beta_1)}{Z}$$

The dynamic multipliers for subsequent periods can be determined through the ongoing process of iteration as follows:

$$\frac{\partial M_{t+1}}{\partial R_t} = C^2 \cdot \frac{\lambda_1}{Z}, \quad \frac{\partial M_{t+1}}{\partial R_t} = C^3 \cdot \frac{\lambda_1}{Z}, \quad \frac{\partial M_{t+1}}{\partial R_t} = C^n \cdot \frac{\lambda_1}{Z}$$

Dynamic multipliers for the income identity can be calculated by aggregating the multipliers for consumption and investment, followed by deducting the multiplier for imports from the total sum.

Dynamic Multiplier for Income Identity Y_n :

$$\begin{aligned} Y_n &= \frac{\partial C_{t+n}}{\partial R_t} + \frac{\partial I_{t+n}}{\partial R_t} - \frac{\partial M_{t+n}}{\partial R_t} \\ &= A^n \cdot \frac{\alpha_1}{Z} + B^n \cdot \frac{\beta_1}{Z} - C^n \cdot \frac{\lambda_1}{Z} \end{aligned}$$

Again, we can find out that the short-run MPC and long-run MPC are expressed respectively by:

$$MPC_{SR} = \frac{\partial C_t}{\partial Y_t} \text{ and } MPC_{LR} = \frac{\partial \bar{C}_t}{\partial Y_t} = \frac{\partial C_t}{\partial Y_t} \left(\frac{1}{1 - \frac{\partial C_{t-1}}{\partial Y_{t-1}}} \right)$$

Where indicating the long-run equilibrium of consumption $\bar{C}_t = C_{t-1}$. Similarly, the short-run marginal propensity to import (MPM_{SR}) and the long-run marginal propensity to import (MPM_{LR}) are expressed respectively by,

$$MPM_{SR} = \frac{\partial M_t}{\partial Y_t} \text{ and } MPM_{LR} = \frac{\partial \bar{M}_t}{\partial Y_t} = \frac{\partial M_t}{\partial Y_t} \left(\frac{1}{1 - \frac{\partial M_t}{\partial M_{t-1}}} \right)$$

where, $\bar{M}_t$ indicating the long-run equilibrium of imports $M_t = M_{t-1}$.

Again, we can find out that the short-run MPC and short-run MPM are expressed respectively by,

$$MPC_{SR} = \frac{\partial C_t}{\partial Y_t} \text{ and } MPM_{SR} = \frac{\partial M_t}{\partial Y_t}$$

Remittance Multiplier

Assuming a one-unit increase in remittances ($\Delta R = 1$) occurred only in the first year, with no further increments in the subsequent years ($\Delta R = 0$) for years 2, 3, ..., n, and all other predetermined parameters in the model remained constant, the estimated interim multiples experienced a gradual decline over time. The results specifically indicate that the effect of the initial transmitting shock diminishes progressively and converges to zero about four years after the flow. This pattern suggests that remittances have a considerable short-run effect, although their long-term effect on the economy diminishes as the system adjusts and stabilizes.

Impact of Remittances on Macroeconomic Variables

The study aimed to assess the effects of both current and past remittances on the value of the relevant variables for the current year, in addition to evaluating the overall impact of a change in remittances on both current and future variables over several years.

The effects of current and past remittances on the current year's value of the variables concerned may be written as follows:

$$\Delta V_t = \sum_{j=0}^n \frac{\partial V_t}{\partial R_{t-j}} \cdot \Delta R_{t-j}$$

To determine the distributed quantitative impacts on consumption, investment, imports, and income, researchers utilize the estimated interim multipliers concerning the actual annual variations in remittances. For instance, the impact of remittances over a four-year temporal distribution on the endogenous variables can be expressed using the following specific formula:

$$V_t - V_{t-1} = \Delta V_t = \frac{\partial V_t}{\partial R_t} \cdot dR_t + \frac{\partial V_t}{\partial R_{t-1}} \cdot dR_{t-1} + \frac{\partial V_t}{\partial R_{t-2}} \cdot dR_{t-2} + \frac{\partial V_t}{\partial R_{t-3}} \cdot dR_{t-3}$$

where, $\frac{\partial V_t}{\partial R_{t-j}} = \pi_j$ the multiplier of year j,

ΔR_{t-j} = the actual change of remittances between year (t-j) and {(t-j)-1},

V_t = any of our endogenous variables: C, I, M, and Y,

j = 0, 1, 2, ..., n, represents the number of years over which the impact of remittances is distributed, converging to zero,

t = time,

Δ = the difference between the two consecutive years.

After that, researchers can compute the proportional contribution of remittances in year t on any of the V's as follows:

$$\left(\frac{\Delta V_t}{V_t} \right) \times 100$$

For computing the distributed quantitative impacts on consumption, investment, imports, and output, researchers utilize the estimated interim multipliers concerning the actual annual variations in remittances.

The influence of both previous and current remittance changes on existing income, imports, consumption, and investment is examined using estimated multipliers. The effect of remittances is dispersed and converges to zero over four years. Therefore, we have four years of multipliers. The comprehensive effect of the current remittances will be determined over four years.

Reduced form equations explain endogenous variables as a function of all predetermined variables within the model. These can be utilized to determine the short-term or impact multipliers. It is also essential to determine how shocks to exogenous variables affect endogenous variables dynamically. The interim or dynamic multipliers can be determined by the final form of equations of the endogenous variables, and obtained by successive substitutions of the dynamic terms (Intriligator et al., 1996). The formulae for the impact and dynamic coefficients are shown in Table 1.

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	Impact Multipliers	Dynamic Multipliers		
	Year 1	Year 2	Year 3	Year 4
Consumption	α_1/Z	$A(\alpha_1/Z)$	$A^2(\alpha_1/Z)$	$A^3(\alpha_1/Z)$
Investment	β_1/Z	$B(\beta_1/Z)$	$B^2(\beta_1/Z)$	$B^3(\beta_1/Z)$
Import	λ_1/Z	$C(\lambda_1/Z)$	$C^2(\lambda_1/Z)$	$C^3(\lambda_1/Z)$
Income	$(\alpha_1 + \beta_1 \cdot \lambda_1/Z) + 1$	See the text	See the text	See the text
	$Z = 1 - \alpha_1 - \beta_1 + \lambda_1$	$A = \alpha_2(1 - \beta_1 + \lambda_1)/Z$	$B = \beta_2(1 - \alpha_1 + \lambda_1)/Z$	$C = \lambda_2(1 - \alpha_1 + \beta_1)/Z$

TABLE 1: Formulae of Impact and Dynamic Multipliers for the Effect of a Unit Change in Remittances

Source: Intriligator et al. (Intriligator et al., 1996); Tansel and Yasar (Tansel and Yasar, 2010)

Results And Discussion

This section presents the empirical findings of the study and discusses the outcomes of the econometric analysis. The empirical investigation follows a structured sequence to ensure the robustness and reliability of the estimated results. The analysis begins with the ADF unit root test to determine the stationarity properties of the variables. This is followed by the Johansen cointegration test to examine the existence of long-run equilibrium relationships among the variables. Subsequently, the first-stage IV regression is estimated to assess the relevance of the selected instruments, while a series of diagnostic tests is conducted to verify instrument validity and detect the presence of endogeneity. The results of these preliminary analyses provide the econometric basis for employing the TSLS estimation technique to obtain consistent and reliable parameter estimates.

Variables	ADF at Level (t-stats)	p-value	ADF at 1 st diff (t-stats)	p-value
C	-2.219	0.463	-5.974	0.0000
GDP	-1.6506	0.7487	-5.2656	0.0002
I	-1.6153	0.7635	-6.9996	0.0000
K	-1.6160	0.7263	-5.6811	0.0210
M	-1.4750	0.8158	-4.1338	0.0032
R	-1.3990	0.8413	-5.3421	0.0001
X	-0.8944	0.9440	-4.0960	0.0035
Y	-1.8269	0.6671	-6.1399	0.0000

TABLE 2: Results of the Unit Root Test (ADF Test)

Source: Author's own calculations

Note: * represents that the value is significant at the 5% level of significance. ADF, Augmented Dickey-Fuller; GDP, Gross Domestic Product

Table 2 presents the results of the ADF unit root test. The findings reveal that all variables (C, GDP, I, K, M, R, X, and Y) are non-stationary at their level form, as their p-values exceed the 0.05 significance level, indicating the presence of a unit root. However, after applying the first difference, all variables become statistically significant with p-values below 0.05, leading to the rejection of the null hypothesis of a unit root. This confirms that all variables are integrated of order one, I (1). Therefore, after establishing that all variables are stationary at first difference and integrated of order one, I (1), the prerequisite condition for cointegration testing is satisfied. Accordingly, the study proceeds to cointegration analysis to investigate the existence of long-run relationships among the variables.

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Hypothesized	Eigen Value	Trace statistic	Critical value	Max-eigen statistic	Critical value
None *	0.981781	307.6972 (0.0000)	159.5297	120.1591	52.36261 (0.0000)
At most 1 *	0.890077	187.5381 (0.0000)	125.6154	66.23930	46.23142 (0.0001)
At most 2 *	0.852445	121.2988 (0.0003)	95.75366	57.40669	40.07757 (0.0002)

TABLE 3: Results of the Cointegration Test

Source: Author's own calculation

Note: Figures in the parentheses () indicate the p-value, * represents the 1% level of significance

Table 3 presents the results of the Johansen cointegration test, which examines the existence of long-run equilibrium relationships among the variables included in the model. The results of both the Trace Statistic and Maximum Eigenvalue Statistic indicate the presence of cointegration among the variables. For the null hypothesis of no cointegrating vector (None), the Trace Statistic (307.6972) exceeds its critical value (159.5297), while the Maximum Eigenvalue Statistic (120.1591) is also greater than its corresponding critical value (52.36261). Similarly, for the hypotheses of at most one and at most two cointegrating vectors, the calculated test statistics remain higher than their respective critical values. Moreover, the associated p-values are less than 0.01 in all cases, leading to the rejection of the null hypotheses at the 1 percent significance level.

These findings confirm the existence of at least three cointegrating relationships among the variables, indicating that they share a stable long-run equilibrium relationship despite short-run fluctuations. The presence of cointegration suggests that the variables move together over time and do not diverge indefinitely. Therefore, the results provide strong evidence of long-run associations among the variables and justify the estimation of long-run models for further analysis.

Variable	Coefficient
C	6.0497 (0.3860)
G	1.2007 (0.1618)
I	3.2024 (0.3323)
GDP	0.3901 (0.8988)
K	0.3858 (0.7129)
M	1.0240 (0.2841)
X	0.3606 (0.7566)
Y	-11.9094 (0.2672)
Constant	14.9087 (0.1079)
R-squared	0.9821
Adjusted R-squared	0.9758
F-statistic	157.4431*

TABLE 4: First-Stage Instrumental Variable Regression Results

Source: Author's own calculation using EViews.

Note: * denotes significance at the 1 percent level. The highly significant F-statistic (157.4431) exceeds the conventional threshold value of 10, indicating that the instruments are sufficiently strong and relevant for the Two-Stage Least Squares (TSLS) estimation.

Table 4 presents the results of the first-stage regression, where remittances are regressed on the selected instrumental and exogenous variables. The estimated coefficients indicate the direction and magnitude of the relationship between each explanatory variable and remittances. However, none of the individual variables are statistically significant at the conventional 5 percent level, as indicated by their respective p-values. Despite the lack of individual significance, the overall model demonstrates strong explanatory power. The R-squared value of 0.9821 indicates that approximately 98.21 percent of the variation in remittances is explained by the variables included in the model, while the adjusted R-squared of 0.9758 confirms a very good fit after adjusting for the number of regressors. More importantly, the F-statistic of 157.4431 is highly significant, indicating that the explanatory variables are jointly significant in explaining remittances.

Since the first-stage F-statistic is substantially higher than the conventional threshold value of 10, the instruments can be considered sufficiently strong, suggesting the absence of a weak instrument problem. Therefore, the instrument relevance condition is satisfied, and the predicted values of remittances obtained from the first-stage regression can be used in the second-stage estimation. Consequently, the application of the TSLS method is justified for obtaining consistent estimates of the relationship between remittances and economic growth.

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The first-stage regression results presented in Table 4 were carefully examined. Although the individual coefficients of the selected instruments are not statistically significant at the 5% level, the first-stage regression is jointly highly significant, with an F-statistic of 157.4431. This finding indicates that the set of instrumental and exogenous variables collectively explains a substantial proportion of the variation in remittances, as reflected in the high R-squared (0.9821) and adjusted R-squared (0.9758) values. Instrument relevance is therefore assessed on the basis of joint significance rather than the statistical significance of individual coefficients alone. Given the strong overall explanatory power and joint statistical significance of the first-stage model, the existing specification and TSLS estimation are retained. Nevertheless, the lack of statistical significance of the individual instrument coefficients warrants cautious interpretation, and this limitation has been explicitly acknowledged.

Test	Test Statistic	p-value	Threshold	Conclusion
Cragg-Donald F-statistic	46.339	——	F > 10	Instruments are strong
Hansen J-statistic	16.848	0.492	p > 0.05	Instruments are valid
Durbin-Wu-Hausman Test	7.325	0.0036	P < 0.05	Endogeneity exists; 2SLS is appropriate

TABLE 5: Diagnostic Tests for Instrument Validity and Endogeneity in the Two-Stage Least Squares (TSLS) Model

Source: Author's own calculation

Table 5 presents the diagnostic tests conducted to assess the validity of the instruments and the suitability of the TSLS estimation technique. These tests jointly examine instrument strength, exogeneity, and the presence of endogeneity in the model. The Cragg-Donald F-statistic is 46.339, which is substantially above the conventional threshold of 10 (Stock and Yogo, 2005), indicating that the instruments are strongly correlated with the endogenous regressor(s). This confirms that the instruments satisfy the relevance condition required for valid IV estimation. The Hansen J-statistic reports a p-value of 0.492, which is higher than the 0.05 significance level, suggesting that the null hypothesis of instrument validity cannot be rejected. This implies that the instruments are exogenous and appropriately excluded from the structural equation. The Durbin-Wu-Hausman test produces a statistic of 7.325 with a p-value of 0.0036, which is statistically significant and leads to rejection of the null hypothesis of exogeneity, indicating the presence of endogeneity among the regressors. This finding supports the use of the TSLS estimator in place of ordinary least squares. Overall, the results confirm that the instruments are both strong and valid, while also establishing endogeneity in the model, thereby justifying the application of the TSLS approach and supporting the robustness of the estimation results.

The preliminary econometric analysis confirms that all variables are integrated of the same order and exhibit a stable long-run equilibrium relationship. Moreover, the diagnostic tests demonstrate that the selected instruments are both relevant and valid, while providing evidence of endogeneity among the regressors. These results satisfy the essential assumptions for IV estimation and, therefore, justify the use of the TSLS estimation technique to obtain consistent and reliable parameter estimates. The following section presents the TSLS estimation results, focusing on the direction, magnitude, and statistical significance of the estimated coefficients. By incorporating both contemporaneous and lagged effects, the model captures the dynamic interactions among the key macroeconomic variables, offering valuable insights into their short-run adjustments and long-run contributions to economic growth in India.

Explanatory variables	Consumption	Investment	Import
Yt	0.462* (7.88)	0.182* (21.16)	0.537* (2.95)
Ct-1	0.517* (8.35)	—	—
Kt-1	—	0.831* (103.42)	—
Mt-1	—	—	0.598* (4.63)
Constant	0.367 (1.61)	-0.096 (-2.88)	-4.303 (-2.39)
Adjusted R-Square	0.99	0.99	0.98
Durbin-Watson	1.95	1.04	0.92
Number of Observations	31 after adjustments	31 after adjustments	30 after adjustments
Instrumental Variables	CP(-1) Y(-1) K(-1) M(-1) G R X	CP(-1) Y(-1) K(-1) M(-1) G R X C	CP(-1) Y(-1) K(-1) M(-1) M(-2) G R X C

TABLE 6: Result of Two-Stage Least Squares (TSLS) Estimate

Source: Author's own calculations

Note: t-values are in parentheses.

* represents the 5% level of significance

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Table 6 represents the TSLS results, which show that income is an important component for determining consumption, investment, and imports; all the coefficients are highly significant. The significance of income and habitual persistence is reflected in the positive influence of both current income (0.462) and lagged consumption (0.517) on consumption. Investment is primarily influenced by capital accumulation, evidenced by the significant impact of lagged capital stock (0.831) and income (0.182), whereas the negative constant indicates a lack of autonomous investment. Imports are highly influenced by income (0.537) and previous import levels (0.598), indicating trade persistence. The strong explanatory power is confirmed by the adjusted R^2 values above 0.98 in all three equations.

Diagnostic test	Consumption	Investment	Import
LM Test (p-value)	0.6159	0.1806	0.1132
Jarque-Bera Test (p-value)	0.9816	0.8433	0.8904
White Test (p-value)	0.8240	0.4870	0.3022

TABLE 7: Post-Estimation Diagnostic Tests

Source: Author's own calculation

Table 7 reports the results of the post-estimation diagnostic tests conducted to evaluate the adequacy and reliability of the estimated simultaneous equation model. The Breusch-Godfrey LM test yields p-values greater than 0.05 for the consumption, investment, and import equations, indicating the absence of serial correlation in the residuals. The Jarque-Bera normality test also produces p-values exceeding the 5 percent significance level, suggesting that the residuals are normally distributed. Furthermore, the White heteroskedasticity test fails to reject the null hypothesis of homoskedasticity, confirming that the variance of the residuals remains constant across observations. Taken together, these results indicate that the estimated equations are free from major econometric problems such as autocorrelation, non-normality, and heteroskedasticity. Therefore, the TSLS estimates can be considered statistically sound, robust, and suitable for drawing reliable inferences regarding the relationship among the variables included in the model. The study assesses the relative impact of remittances on income, private consumption, imports, and investment. The findings indicate that all of the coefficients exhibit statistical significance. The lagged dependent variable in equations (6), (7), and (8) reveals statistically substantial effects, capturing the dynamic aspect of the model.

To provide additional insights into the estimated model, the implied short-run and long-run MPC and MPM are derived from the TSLS estimates. These measures capture the immediate and cumulative responses of consumption and imports to changes in income, thereby offering a clearer understanding of the economy's adjustment process and the persistence of these effects over time.

MPC		MPM	
Short run	Long run	Short run	Long run
0.462	0.956	0.537	1.335

TABLE 8: Estimated Short-run and Long-run Marginal Propensities to Consume (MPC) and Marginal Propensities to Import (MPM) for India

Source: Author's own calculations

Table 8 presents the estimated short-run and long-run values of the MPC and the MPM, derived from the TSLS estimation. These estimates reflect the behavioral responses of consumption and imports to changes in income over different time horizons and provide the key parameters for assessing the transmission of income changes through the economy. The estimated MPC and MPM serve as the basis for the subsequent multiplier analysis, enabling an evaluation of both short-run adjustments and long-run economic effects. The short-run MPC in the consumption function is calculated at 0.462, indicating that for every one dollar increase in income (including remittances), household spending rises by 0.46 dollars. A reduced MPC signifies elevated saving rates. This finding aligns with the Keynesian absolute income theory, which posits that current consumption is positively correlated with current income (Keynes, 1936). However, when considering the impact of lagged consumption, the long-run MPC increases substantially to 0.956, indicating that nearly all additional income is ultimately expanded over time. This illustrates the concept of habit persistence, where previous consumption patterns affect present decisions, a characteristic also highlighted in the permanent income and life-cycle theories (Friedman, 1957) (Ando and Modigliani, 1963). The high long-run MPC demonstrates the dominance of consumption-driven growth within the economy.

The short-run MPM is 0.537, indicating that more than half of any income rise immediately transfers into increased demand for imports. This implies a considerable reliance on imports, even in the short term. Incorporating dynamic effects via lagged imports results in a long-run MPM of 1.335, indicating that a one-unit increase in income leads to more than a proportionate increase in imports over time. This result indicates significant trade persistence and a structural dependence on imported products and services. These results correspond with empirical evidence from developing economies, where import demand often demonstrates high income elasticity due to constrained domestic production capacity and reliance on foreign capital goods, technology, and other intermediate inputs (Goldstein and Khan, 1985) (Bahmani-Oskooee and Niroomand, 1998).

The different magnitudes of the long-run MPC and MPM possess significant consequences for policy. The long-run MPC implies that household consumption is an important driver of aggregate demand and long-term growth (Keynes, 1936). The elevated MPM argues that income growth simultaneously expands import dependency, thereby exerting a burden on the balance of payments (Thirlwall, 2011). In an economy such as India, where remittances and foreign capital inflows are significant, this dual outcome signifies both an opportunity and a

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challenge. Consistent income growth can improve welfare by increasing consumption; however, without a proportional increase in domestic productive capacity, enhanced import reliance may worsen the trade deficit and generate vulnerabilities in the external sector (Rajan and Subramanian, 2008) (UNCTAD, 2024).

To assess the dynamic effects of remittances on the endogenous variables, the impact, dynamic, and truncated total multipliers are estimated from the reduced-form equations.

	Impact Multipliers (Short-run Effects)	Dynamic Multipliers				Truncated Total Multipliers (Long-run Effects)
	Year 1	Year 2	Year 3	Year 4	Sum of the 4 years	
Consumption	0.41	0.32	0.25	0.20	1.19	
Investment	0.20	0.20	0.20	0.20	0.82	
Imports	0.60	0.29	0.14	0.06	1.10	
Income	1.12	0.23	0.32	0.33	2.02	

TABLE 9: Time Distribution Effects of a Unit Change in Remittances on Endogenous Variables (Impact and Dynamic Multipliers)

Source: Author's own calculations based on the reduced-form equations presented in Table 1

Table 9 presents the estimated impact, dynamic, and truncated total multipliers of a unit increase in remittances on the endogenous variables, computed using the formulae presented in Table 7. These multipliers are estimated to examine how the effects of remittance shocks propagate through the economy over time by capturing both the immediate response and the cumulative adjustments over the four years. The impact multiplier measures the short-run effect of a remittance shock, the dynamic multipliers trace its transmission across successive years, and the truncated total multiplier summarizes the cumulative effect over the specified time horizon. Taken together, these estimates provide a dynamic assessment of the magnitude and persistence of remittances' influence on consumption, investment, imports, and income, thereby facilitating a comprehensive evaluation of their contribution to economic activity.

The estimated results from the time-distribution analysis indicate that a unit increase in remittances exerts both immediate and cumulative effects on the endogenous variables. While these effects persist over time, their magnitude and duration vary across consumption, investment, imports, and income, reflecting the heterogeneous transmission of remittance shocks through the economy. Dynamic multipliers are calculated to display the effect of a one-unit increase in remittances in the current year, holding remittances constant in subsequent years on the endogenous variables. The computation of dynamic multipliers for the income identity involves adding up the investment and consumption multipliers and subsequently subtracting the import multiplier from this total. According to the anticipated multipliers, consumption rises by approximately 0.41 dollars in the first year when remittances increase by one dollar and are sustained for four years. Similarly, consumption increases by 0.32 dollars, 0.25 dollars, and 0.20 dollars over the following three years through the interim multipliers. Thus, during four years, one-dollar remittances generated approximately 1.19 dollars in spending within the Indian economy, attributable to the consumption multiplier. This consumption may be used for the purchase of land, financing the start-up of small enterprises, financing health and education, and the purchase of durable household goods. The significant year 1 effect shows the liquidity effect, in which fast inflows relieve budgetary constraints and facilitate anticipated expenditures. Gradually, the marginal consumption effect diminishes as the initial increase is integrated into usual household budgets. This pattern of behavior is consistent with the Permanent Income Hypothesis (Friedman, 1957) (Taylor, 1999), which states that households adopt consumption choices based on anticipated lifelong income rather than solely on current income. Moreover, it reveals the declining MPC from temporary income (Fullenkamp et al., 2008), as subsequent remittance inflows are progressively allocated to savings, paying off debts, and investment, especially in rural regions.

The consistent investment impacts are crucial for sustained growth as they facilitate capital accumulation, which is the primary driver of GDP increase. The effect of remittances on investment remains stable at 0.20 over all four years, resulting in a cumulative multiplier of 0.82. This stability suggests that a deliberate and sustained allocation of remittance funds to productive uses, including business investments, housing enhancement, and equipment for agriculture, contributes to long-term economic growth. Although the investment multiplier is smaller than that of consumption, its stability has a significant long-term impact on the economy by boosting capital formation and enhancing productivity growth (Giuliano and Ruiz-Arranz, 2009). Furthermore, the relatively small magnitude of the investment multiplier in relation to consumption indicates that, although remittances are used for productive activities, a substantial portion is still allocated to immediate household necessities rather than long-term capital formation. These findings correspond with empirical research demonstrating that the effective utilization of remittances is frequently hampered by structural factors, including inadequate financial literacy, insufficient investment possibilities, and risk avoidance among recipient households (Adams and Cuecuecha, 2013) (World Bank, 2018).

The immediate short-run effect of remittances on imports is significant, which means that a one-dollar increase in remittances increases imports by approximately 0.60 in year 1, demonstrating high demand for imported goods, particularly consumer durables, technological devices, and other necessary items. This is usual in economies where domestic production is inadequate to meet demand for availability, variety, and quality (Acosta et al., 2006). The effect diminishes significantly with time: 0.29 in year 2, 0.14 in year 3, and 0.06 in year 4, resulting in an overall multiplier of 1.10. This reduction signifies that the demand for imports driven by remittances is predominantly short-term, diminishing as households complete major purchases or switch their spending towards domestically produced goods and services. However, the significant overall impact highlights the possible implications for the trade balance, as remittances may indirectly lead to trade deficits if dependence on imports persists (Barajas et al., 2009).

Remittances have the most substantial influence on income, with a year 1 multiplier of 1.12, which is the largest among all selected variables, followed by a decrease to 0.23 in year 2, and subsequent recovery to 0.32 and 0.33 in years 3 and 4, respectively. The cumulative four-year multiplier of 2.02 reveals that remittances generate both an immediate enhancement of the income of households and promote sustained long-term income growth. The recovery pattern reveals a lagged growth impact, where the initial boost in income is driven by the direct

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spending of remittances, but following increases derive from the multiplier effects of previous consumption and investment patterns regenerating domestic output and employment. This is consistent with Keynesian multiplier theory, suggesting that remittances can act as a stabilizing factor during economic downturns and also serve as a stimulus for long-term economic growth when effectively utilized (Ratha, 2013) (International Monetary Fund, 2016).

The results show that remittances in India exhibit immediate and significant impacts on consumption and imports, a modest but stable impact on investment, and the most significant long-term effect on income. In the short run, remittances mainly stimulate demand-driven growth; however, in the long run, they can facilitate persistent income growth, especially if investment opportunities are enhanced. To maximize their growth-oriented impact and minimize adverse consequences like increased import dependency, policy measures should be executed to encourage a larger portion of remittance inflows to be used for productive purposes, such as the development of small and medium enterprises, investments in infrastructure, and skill enhancement. The long-term multiplier for income signifies extensive economic advantages, showing the widespread developmental impact of remittances through indirect mechanisms by increasing demand, job creation, and investment-led growth (Chami et al., 2005). Thus, the study finds that remittance inflows are vital foreign earnings that can promote sustainable economic growth in India.

Estimation of the Induced Growth Rate and Its Effects on Macroeconomic Variables

To evaluate the indirect macroeconomic effects of remittances, an induced growth rate was estimated for consumption, investment, imports, and income. The annual growth rate of remittances was first calculated using year-on-year percentage changes. An induced growth coefficient was then computed to measure the responsiveness of each macroeconomic variable to changes in remittance inflows. The coefficient is defined as:

$$[\beta = \frac{IG_t}{RG_t}]$$

where (IG_t) denotes the induced growth of the respective macroeconomic variable in year (t), and (RG_t) represents the annual growth rate of remittances. The induced growth rate for each variable was subsequently estimated as:

$$[IG_t = \beta \times RG_t]$$

The estimated coefficient captures the marginal effect of a one percent change in remittance inflows on the corresponding macroeconomic variable. This framework assumes a proportional relationship between remittance growth and the induced changes in consumption, investment, imports, and income, thereby providing a consistent measure of the indirect transmission of remittance shocks throughout the economy.

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Year	Annual growth rate of Remittances	Annual growth rate of Consumption	Induced Growth rate of Consumption	Annual growth rate of Investment	Induced Growth rate of Investment	Annual growth rate of Import	Induced Growth rate of import	Annual growth rate of Income	Induced growth rate of Income
1992	-11.91	4.67	0.58	9.04	2.24	20.48	-2.10	7.89	0.98
1993	21.58	-3.52	-0.44	6.65	-2.69	-0.80	3.80	-8.31	-1.03
1994	66.25	16.09	2.00	8.46	4.86	21.63	11.66	21.14	2.63
1995	6.25	8.15	1.01	9.51	2.99	29.89	1.10	12.14	1.51
1996	40.86	10.52	1.31	7.40	-2.02	4.71	7.19	2.55	0.32
1997	17.86	4.79	0.59	8.23	2.65	9.37	3.14	8.62	1.07
1998	-8.24	1.16	0.14	7.49	-0.21	7.71	-1.45	0.39	0.05
1999	17.35	9.24	1.15	9.40	4.76	14.75	3.05	16.48	2.05
2000	15.81	1.66	0.21	7.28	-2.09	6.21	2.78	-3.88	-0.48
2001	10.79	4.30	0.53	8.19	2.82	0.14	1.90	9.02	1.12
2002	10.25	4.23	0.52	8.12	0.99	20.36	1.80	5.20	0.65
2003	33.45	15.16	1.88	9.04	2.76	21.11	5.89	16.83	2.09
2004	-10.71	10.71	1.33	11.01	4.46	46.53	-1.89	18.09	2.25
2005	18.00	13.76	1.71	12.23	3.18	31.89	3.17	17.37	2.16
2006	28.06	12.08	1.50	13.02	2.64	25.16	4.94	14.98	1.86
2007	31.35	28.60	3.55	16.03	5.33	31.68	5.52	32.95	4.10
2008	34.29	0.15	0.02	12.47	-1.33	15.89	6.04	-4.10	-0.51
2009	-1.55	10.51	1.30	12.68	1.95	-1.07	-0.27	12.07	1.50
2010	8.69	22.11	2.74	14.24	3.61	29.61	1.53	23.94	2.98
2011	16.86	11.75	1.46	13.50	1.13	25.93	2.97	10.28	1.28
2012	10.11	0.70	0.09	11.55	-0.39	0.82	1.78	-0.78	-0.10
2013	1.67	3.72	0.46	9.33	-1.34	-7.66	0.29	-1.77	-0.22
2014	0.60	10.74	1.33	9.44	1.44	0.32	0.11	10.69	1.33
2015	-2.10	4.72	0.59	8.34	-0.45	-12.12	-0.37	1.74	0.22
2016	-8.95	9.62	1.19	7.89	0.34	3.24	-1.58	7.11	0.88
2017	9.92	14.43	1.79	8.68	2.54	21.21	1.75	15.85	1.97
2018	14.24	2.92	0.36	8.50	0.87	10.01	2.51	4.13	0.51
2019	5.76	7.78	0.97	7.64	-0.32	-5.93	1.01	4.19	0.52
2020	-0.22	-5.23	-0.65	6.39	-1.36	-15.29	-0.04	-6.80	-0.85
2021	7.49	17.62	2.19	7.69	3.82	49.13	1.32	20.95	2.60
2022	24.44	7.45	0.92	7.70	1.06	18.73	4.30	7.58	0.94

TABLE 10: Effects of Current and Past Changes in Remittances on Current Consumption, Investment, Imports, and Income

Source: Author's own calculations

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The Growth Effect of Remittances in India: Evidence from a Dynamic Econometric Framework

Table 10 reports the annual growth rates of remittances alongside the observed and induced growth rates of consumption, investment, imports, and income for the period 1992–2022. The induced growth estimates quantify the extent to which fluctuations in remittance inflows contribute to changes in these macroeconomic aggregates.

The estimates reveal that consumption exhibits the strongest and most stable response to remittance inflows. Positive induced growth in consumption is observed in almost every year, with larger effects during periods of rapid remittance expansion, such as 1994, 2007, 2010, and 2021. In contrast, negative induced consumption growth is limited to a few years, including 1993 and 2020, indicating that reductions in remittance inflows weaken household spending. This pattern suggests that remittances primarily serve as a source of disposable income, enabling households to maintain and expand consumption.

The relationship between remittances and investment is comparatively less consistent. Although remittance growth is associated with higher induced investment in several years, the estimated effects fluctuate considerably and become negative during periods such as 1993, 1996, 2000, 2008, 2012, 2013, 2015, 2019, and 2020. These results imply that remittances are not systematically transformed into productive investment and are more likely to be directed toward immediate household requirements. A predominantly positive response is also observed for imports. Higher remittance inflows are generally accompanied by increases in induced import growth, reflecting the expansion of household purchasing power and demand for imported goods. Nevertheless, negative induced import growth in a few years indicates that import demand contracts when remittance inflows decline or when economic conditions deteriorate. Income follows a similar pattern, with positive induced growth recorded in most years of the sample. The largest income effects coincide with periods of substantial remittance growth, particularly during the mid-1990s, the mid-2000s, and the post-pandemic recovery. Conversely, negative induced income growth appears only in years characterized by weak remittance performance or adverse macroeconomic shocks, demonstrating the contribution of remittances to sustaining aggregate income.

Overall, the findings indicate that remittances generate significant indirect effects on the Indian economy through demand-side transmission mechanisms. Their contribution is most pronounced in stimulating household consumption, followed by income and imports, whereas the influence on investment remains relatively modest and unstable. This evidence suggests that remittances play a vital role in enhancing household welfare and supporting economic activity, while their long-term developmental impact could be strengthened by policies that encourage the allocation of remittance income toward productive investment.

To evaluate the contribution of remittances to economic growth, the annual output growth rate is compared with the output growth attributable to remittance inflows over the study period. Figure 2 presents this comparison and provides a visual assessment of the role of remittances in supporting India's economic performance during 1992–2022.

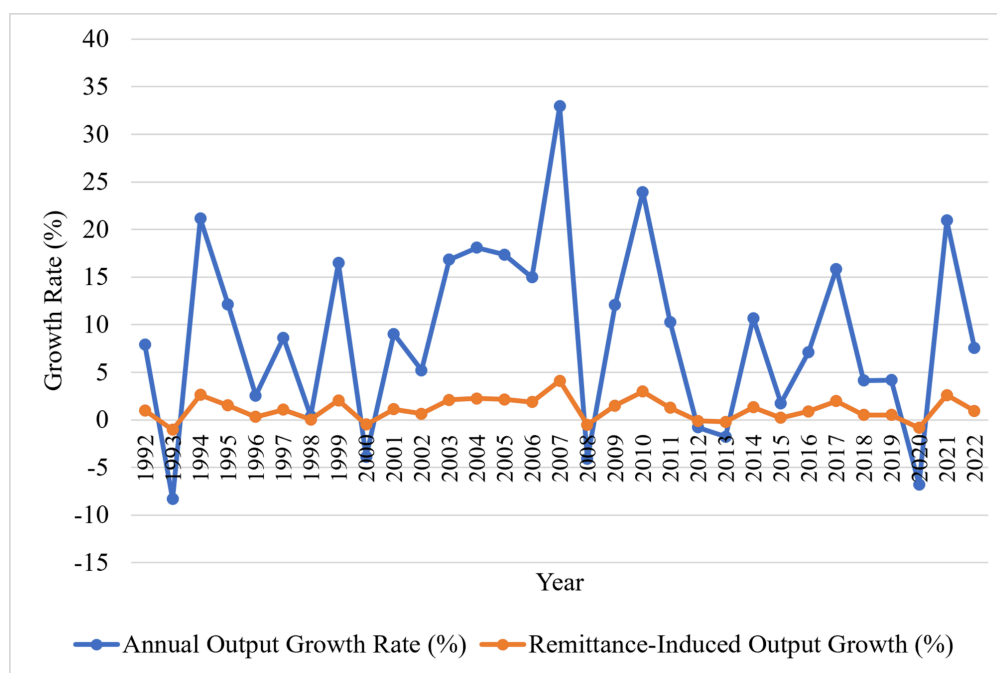


FIGURE 2: Annual Output Growth Rate and Remittance-Induced Output Growth in India (1991–2022)

Source: Author's calculations based on World Development Indicators (WDI)

Figure 2 compares the annual output growth rate with the output growth induced by remittance inflows in India during 1992–2022. The results show that overall output growth fluctuated considerably throughout the study period, reflecting changes in domestic economic conditions, global business cycles, and major external shocks. Strong economic expansion is observed during 1994, 2003–2007, 2010, and 2021, whereas weaker growth or contraction occurred in 1993, 2000, 2008, 2012–2013, and 2020, corresponding to periods of economic slowdown, the global financial crisis, and the COVID-19 pandemic.

In contrast, remittance-induced output growth follows a relatively stable trajectory and remains positive in most years. Although its magnitude is smaller than that of overall output growth, the two series generally move in the same direction, indicating that remittances reinforce economic activity through demand-side multiplier effects. The contribution of remittances is particularly evident during 1994 (2.63%), 2007 (4.10%), 2010 (2.98%), and 2021 (2.60%), while only modest declines are observed during periods of economic stress.

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The comparatively smooth pattern of remittance-induced output growth reflects the resilience of remittance inflows, which depend primarily on migrants' earnings in destination countries rather than domestic economic conditions. Consequently, remittances continue to support household income and consumption even during periods of economic uncertainty, limiting the decline in output growth. This stabilizing role is consistent with the view that remittances constitute relatively stable and, in many cases, countercyclical external financial flows (Ratha, 2013).

Overall, the evidence suggests that remittances complement rather than drive economic growth. By sustaining household demand and generating multiplier effects, they enhance macroeconomic resilience and help moderate the adverse effects of economic downturns. These findings support the broader empirical results of the study, which identify remittances as an important source of long-term economic support and household welfare improvement.

Policy Implications

The findings of this study have several important implications for policymakers seeking to enhance the developmental contribution of remittances in India. Since remittance inflows generate positive multiplier effects on consumption, income, investment, and overall economic growth, policy interventions should focus not only on increasing remittance inflows but also on improving their productive utilization. A comprehensive policy framework that integrates migration, financial inclusion, and investment strategies can substantially enhance the long-term economic benefits of remittances.

An immediate policy priority is to strengthen formal remittance transfer systems. Although India remains one of the world's largest recipients of remittances, a proportion of transfers continues to pass through informal channels, resulting in higher transaction costs and reduced transparency. Expanding affordable digital payment infrastructure, promoting competition among remittance service providers, and simplifying cross-border payment procedures would encourage migrants to use formal financial institutions. Such measures would improve the efficiency, security, and accessibility of remittance transfers while increasing the availability of financial resources within the formal economy.

The empirical analysis also indicates that remittances exert a stronger influence on household consumption than on productive investment. While consumption plays an essential role in supporting aggregate demand and improving living standards, greater economic benefits can be achieved by encouraging households to invest a portion of remittance income in productive activities. Government agencies and financial institutions should therefore introduce savings and investment products specifically designed for remittance-receiving households. Low-interest credit schemes, investment-linked savings accounts, and entrepreneurship development programs could motivate recipients to channel remittance income towards microenterprises, agricultural modernization, manufacturing activities, and service-sector businesses.

Financial literacy constitutes another important policy dimension. Many remittance-receiving households lack adequate information regarding investment planning, risk management, and long-term financial decision-making. Targeted financial education programs can improve households' ability to diversify remittance use beyond immediate consumption and encourage the accumulation of productive assets. Such initiatives would not only strengthen household financial resilience but also contribute to employment generation and income diversification.

The study further highlights the importance of financial inclusion in maximizing the multiplier effects of remittances. Expanding access to banking services, digital finance, insurance products, and formal credit, particularly in rural and semi-urban areas, would facilitate the mobilization of remittance income into productive sectors of the economy. Strengthening financial infrastructure would also improve capital formation and support broader economic development.

Migration policy also plays a significant role in sustaining remittance inflows. Measures aimed at protecting migrant workers, expanding overseas employment opportunities, improving skill development, and strengthening bilateral labor agreements can enhance migrants' earning capacity and contribute to more stable remittance flows. Maintaining active engagement with the Indian diaspora through institutional support mechanisms may further strengthen the long-term developmental contribution of remittances. Taken together, these policy measures would enable remittances to serve not only as a source of household income but also as a catalyst for investment, employment generation, financial development, and sustainable economic growth.

The empirical evidence presented in this study suggests that remittance inflows have meaningful linkages with household consumption, income, investment, and aggregate economic activity in India. These results indicate that the developmental relevance of remittances extends beyond their role as a source of foreign exchange. At the same time, the analysis does not evaluate individual policy programmes or specific financial instruments. Accordingly, the following discussion should be interpreted as potential policy implications of the empirical findings rather than as evidence of the effectiveness of particular interventions.

One important policy consideration is to facilitate the efficient transfer of remittances through formal financial channels. Given the scale of remittance inflows received by India, continued improvements in the accessibility, affordability, and reliability of formal transfer mechanisms could strengthen the connection between migrant income and the domestic financial system. Expansion of digital financial infrastructure, greater accessibility of regulated remittance services, and measures that reduce transaction-related costs may encourage greater use of formal channels. Such measures are consistent with the study's findings, although their individual effects are not directly estimated in the present analysis.

The results also indicate that the effect of remittances on consumption is relatively more pronounced than their effect on productive investment. This finding underscores the contribution of remittances to household welfare and expenditure capacity. From a policy perspective, an enabling environment could be developed to provide interested remittance-receiving households with greater opportunities to save and invest. Accessible savings instruments, suitable investment facilities, formal credit, and business-support services may offer possible mechanisms for this purpose. However, the present study does not test whether any particular investment product or entrepreneurship programme increases productive use of remittances. Therefore, these measures should be regarded as possible policy responses to the observed empirical pattern, rather than as direct findings of the study.

Financial capability may also be relevant to the way households manage remittance income. Initiatives that improve understanding of saving, investment, risk management, and financial planning could potentially assist households in making informed financial decisions. Such efforts may be particularly relevant where remittance recipients have limited access to formal financial services or investment information. Nevertheless, the effectiveness of financial-literacy interventions is outside the scope of the current empirical framework and would require independent evaluation.

The findings further suggest a role for policies that broaden financial inclusion. Greater access to banking facilities, digital financial services, insurance, and formal sources of credit may improve the capacity of households to manage remittance income and participate more effectively in the formal financial system. Particular attention may be given to underserved rural and semi-urban populations. These

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measures are proposed as supportive policy directions rather than as interventions whose effects have been established by the present study.

The sustainability of remittance flows also depends on the broader migration environment. Policies that improve migrants' skills, facilitate access to decent overseas employment, strengthen migrant protection, and support cooperation with destination countries may help maintain India's international migration linkages. Institutional mechanisms for engaging with the Indian diaspora could also support continued economic connections between migrants and their households in India. These aspects, however, are broader policy considerations and were not directly tested in the econometric analysis.

Overall, the findings suggest that remittances represent an important financial resource with implications for household welfare and economic activity. The policy focus may therefore extend from simply facilitating the receipt of remittances toward creating conditions that allow households to manage these resources efficiently and, where appropriate, channel part of them toward longer-term financial and productive objectives. The study does not establish that any particular investment product, entrepreneurship scheme, financial-literacy programme, or migration intervention will produce these outcomes. Future research involving programme-level data or policy evaluations would be necessary to determine which specific interventions are most effective in translating remittance resources into sustained investment, employment, and economic development.

Limitations of the Study

Despite providing comprehensive evidence on the growth effects of remittances in India, the findings of this study should be interpreted within the context of several methodological and data-related limitations.

First, the analysis relies on annual time-series data covering the period from 1991 to 2022. Although the sample adequately captures long-run economic trends and major structural developments, the use of annual observations limits the total number of data points available for estimation. Consequently, the precision of short-run dynamic estimates may be lower than would be possible with higher-frequency data such as quarterly observations.

Second, the empirical investigation is conducted using aggregate macroeconomic indicators. National-level data provide valuable evidence regarding the overall contribution of remittances to economic growth; however, they do not capture variations across states, regions, or household groups. Differences in income levels, financial access, employment opportunities, and local economic conditions may influence how remittance income is allocated among consumption, savings, investment, education, and healthcare. These heterogeneous effects cannot be identified within the current analytical framework.

Third, the study addresses potential endogeneity through the TLS estimation technique. While the selected IVs satisfy the required diagnostic tests, IV estimation inherently depends on the validity, relevance, and exogeneity of the chosen instruments. Alternative identification strategies or different sets of instruments could produce complementary evidence regarding the causal relationship between remittances and economic growth.

Fourth, the empirical specification assumes relatively stable behavioral relationships throughout the sample period. However, the Indian economy experienced several significant structural transformations, including financial liberalization, exchange rate adjustments, changes in migration patterns, the global financial crisis, and the COVID-19 pandemic. Although these events are reflected in the observed data, the model does not explicitly estimate regime-specific parameters or structural break effects. Consequently, possible changes in the transmission mechanism of remittances across different economic regimes remain outside the scope of this study.

Finally, the analysis concentrates on selected macroeconomic transmission channels associated with remittances. Other potentially relevant determinants of economic growth, including institutional quality, governance, technological innovation, labor productivity, demographic changes, and environmental factors, are not explicitly incorporated into the empirical framework. While their omission does not affect the primary objective of the study, including these variables could provide a more comprehensive understanding of the broader development effects of remittances.

Recognizing these limitations provides an appropriate context for interpreting the empirical findings while identifying areas where future research may further strengthen the existing evidence.

Conclusions

This study examined the impact of remittances on economic growth in India within a dynamic Keynesian framework using annual data covering the period 1991–2022. The analysis employed the TLS estimation method to address the potential endogeneity between remittance inflows and economic growth. In addition, multiplier and induced growth analyses were used to evaluate the transmission of remittance shocks through major macroeconomic variables, including consumption, investment, imports, and income.

The empirical findings indicate that remittances contribute positively to economic growth by stimulating aggregate demand through multiple transmission channels. The estimated MPC shows that a substantial proportion of remittance income is directed towards household consumption, thereby generating positive multiplier effects on output and national income. Although part of the increased expenditure is absorbed through higher imports, the overall effect of remittances on economic activity remains favorable. The dynamic multiplier analysis further demonstrates that the influence of remittances extends beyond the initial period of receipt, producing cumulative effects that support economic growth over time.

A key contribution of this study is the application of the TLS approach within a Keynesian multiplier framework to evaluate the indirect macroeconomic effects of remittances while accounting for endogeneity. The combined use of multiplier and induced growth analyses provides a comprehensive understanding of how remittance inflows are transmitted through the economy and influence aggregate output. This integrated framework contributes to the empirical literature by offering a broader assessment of the mechanisms through which remittances affect economic performance.

The findings also suggest that the developmental impact of remittances depends not only on the volume of inflows but also on the efficiency with which these resources are utilized within the domestic economy. Strengthening financial inclusion, improving access to formal financial institutions, expanding investment opportunities, and enhancing productive capacity would increase the ability of remittances to generate sustained economic benefits. Policies that facilitate productive investment while maintaining efficient and low-cost remittance transfer systems can further reinforce the contribution of remittances to long-term economic development.

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Future research may extend the present analysis by employing household-level surveys, state-level panel datasets, or comparative cross-country evidence to investigate regional and socioeconomic differences in remittance utilization. Additional research could also incorporate nonlinear estimation techniques, structural break analysis, or time-varying parameter models to examine how the economic effects of remittances evolve under different macroeconomic conditions. Furthermore, integrating variables such as financial development, institutional quality, digital financial inclusion, and human capital into the analytical framework would provide deeper insights into the factors that shape the long-run growth effects of remittances.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Seemarani Meher, Lopamudra Mishra

Acquisition, analysis, or interpretation of data: Seemarani Meher

Drafting of the manuscript: Seemarani Meher, Lopamudra Mishra

Critical review of the manuscript for important intellectual content: Seemarani Meher

Disclosures

Human subjects: All authors have confirmed that this study did not involve human participants or tissue.

Animal subjects: All authors have confirmed that this study did not involve animal subjects or tissue.

Conflicts of interest: In compliance with the [ICMJE uniform disclosure form](#), all authors declare the following:

- **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work.
- **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.
- **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Data Availability Statements

The data supporting of this study are openly available from the World Bank in the World Development Indicators database at: <https://databank.worldbank.org/source/world-development-indicators>. The dataset can be accessed through the World Bank Data Bank platform. The dataset is publicly accessible and does not require an accession ID.

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