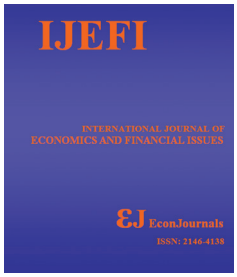

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Do Remittances Boost Productivity? Asymmetric Evidence from Leading Asian Recipient Countries

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ABSTRACT

This study attempts to examine the asymmetric effect of remittances on total factor productivity (TFP) growth in India, China, and the Philippines over 1982–2023 using a nonlinear ARDL (NARDL) benchmark specification that decomposes remittances into positive and negative shocks. The long-run nonlinear estimates show that TFP responses to remittances are state-dependent rather than uniform. Remittance adverse shocks have no significant effect in any country, suggesting that downturns are cushioned by countercyclical remitting, coping mechanisms, and diversified financing. Remittance positive shocks, however, are decisive: in India and China they boost TFP by easing liquidity constraints and supporting human and physical capital formation, while in the Philippines they reduce TFP through Dutch-disease effects, as inflows appreciate the exchange rate, shift resources to non-tradables, and weaken productivity gains. Thus, while India and China should channel remittance surges into productive investment to enhance TFP, the Philippines needs policies that curb Dutch-disease pressures and redirect inflows toward tradables, skills, and technology.

Keywords: Remittances, Total Factor Productivity, Asymmetric Effects, NARDL
JEL Classifications: C32, 24, O47

1. INTRODUCTION

The role of remittances in fostering economic growth and development has long been a subject of extensive debate in the economics literature. Historically rooted in labor migration dating back to at least the 19th century, remittances represent financial transfers from migrants–most often working in developed economies–to households in their countries of origin. These flows have become a reliable source of funding, being continuous, regular, and relatively insulated from inefficiencies or corruption for many less developed economies, with significant support for micro-level investments, education, and healthcare expenditures among recipient households (Kumar, 2017). In fact, remittances increasingly stand out as a dominant form of external financing for developing economies. Ratha et al. (2024), for instance, emphasize that remittances have surpassed both Official Development Assistance (ODA) and Foreign Direct Investment (FDI), exceeding the latter by more than USD 270 billion in 2023. Furthermore, the growing complexity of global financial linkages has positioned remittances as an increasingly critical mechanism for fostering resilience and inclusive growth in developing economies (Verma et al., 2024). In this sense, remittances not only act as a buffer during episodes of economic distress but also serve as a cornerstone for achieving sustained economic growth and advancing the Sustainable Development Goals (SDGs), particularly Goal 8 on decent work and economic growth (United Nations, 2022).

Reflecting this significance, the total value of global remittance flows has also recorded upward trend of USD 865 billion in 2023 and are projected to grow by 4.6 percent to USD 905 billion in 2024 with low- and middle-income countries (LMICs) consistently receive the majority of global remittances amounting to USD 656 billion in 2023 and are expected to expand more sharply to USD 685 billion in 2024 as reported by World Bank (2024). This

reinforces the resilience of remittances as a vital source of external finance and their growing role in sustaining household welfare and macroeconomic stability in developing economies (Sutradhar, 2020). In particular, remittances make a significant contribution to economic development in Asia, amounting to about 1.3% of the region's GDP in 2023. India, China, and the Philippines remained at the forefront of remittance inflows, receiving US$120 billion, US$50 billion, and US$39 billion, respectively with India appears to be reached an all-time high in 2023. The figure underscores the scale of these remittances, which account for about 37% of Asia's total remittance inflows. This phenomenon of economic outcome clearly evident in India, China and the Philippines where remittances constitute a crucial external financing source, equivalent to 3.4%, 0.2% and 8.7% in 2023, respectively (World Bank, 2024).

Building on this debate, a growing body of empirical research highlights the favorable contributions of remittances to economic development. These studies emphasize that remittances not only support household welfare but also play a broader role in advancing human capital development, mitigating credit constraints, smoothing household consumption, alleviating poverty, and stabilizing output volatility (Cox-Edwards and Ureta, 2003; Hanson and Woodruff, 2003; Quartey and Blankson, 2004; Hildebrandt and McKenzie, 2005; Adams and Jr. Page, 2005; Page and Plaza, 2006; Gupta et al., 2009; Fayissa and Nsiah, 2010; Ahamada and Coulibaly, 2011; Arun and Ulku, 2011; Rao and Hassan, 2011; Siddique et al., 2012; Feeny et al., 2014; Borja, 2014; Jouini, 2015; Dilanchiev and Sekreter, 2016; Ahmadov, 2022; Basnet et al., 2022). In addition, remittances foster savings and capital accumulation, ease investment constraints, and support financial market integration, all of which contribute to long-run growth (Giuliano and Ruiz-Arranz, 2009; Chiodi et al., 2012; Kakhkharov and Rohde, 2020; Adekunle et al., 2022). Nevertheless, remittance inflows are not without drawbacks. They may create disincentives to work among recipients (Shonkwiler et al., 2011) and reduce labor force participation due to moral hazard associated with altruistic transfers (Chami et al., 2008). Moreover, remittances can generate Dutch disease effects by appreciating the local currency, which undermines export competitiveness and industrial output (Acosta et al., 2007; Chami et al., 2008; Hassan and Holmes, 2013; Daway-Ducanes, 2019). They also respond negatively to exchange rate volatility (Higgins et al., 2004) and global financial crises (Ruiz and Vargas-Silva, 2010), thereby limiting their contribution to long-term growth.

Given these mixed channels of influence, it becomes essential to explore the relationship between remittance inflows and economic growth. A large number of studies find that remittances exert a positive and statistically significant impact on growth, suggesting that increases in remittance inflows contribute to improved economic performance (John et al., 2015; Meyer and Shera, 2017; Eggoh et al., 2019; Kadozi, 2019; Das and Sethi, 2020; Pal et al., 2021; Collaku, 2021; Islam, 2022; Kajtazi and Fetai, 2022; Tolcha and Rao, 2022). However, not all evidence aligns with this optimistic view. Pradhan and Charan (2016) report that rising remittances may depress growth, while Sutradhar (2020) similarly identifies negative effects. Other studies suggest that remittances and growth may not be causally related at all (Siddique et al., 2012; Mabula and Uprasen, 2019). This inconclusiveness has led some scholars to adopt a more skeptical stance. For example, Barajas et al. (2009), argue that remittances contribute little to long-term growth, noting that their role as a driver of development appears limited. Such findings challenge the hypothesis that remittances could substitute for other forms of external finance such as FDI and ODA in promoting growth, and instead suggest that policy should focus elsewhere to enhance long-run performance. More recently, Clemens and McKenzie (2018) contend that any growth-enhancing effects of remittances must operate primarily through improvements in total factor productivity (TFP). This perspective reframes the debate by highlighting the productivity channel as the key mechanism linking remittances to growth. In this context, productivity growth—defined as the efficiency with which inputs are transformed into outputs over time—becomes central to understanding the broader economic role of remittances. Higher productivity implies that more output is generated with the same or fewer inputs, thereby raising living standards, strengthening competitiveness, and ensuring sustainable growth (Mankiw, 2022).

In this regard, remittances can play a role in improving domestic productivity in recipient countries, particularly developing economies, by optimizing the labor–capital ratio. According to the classical growth model (Solow, 1957), correcting a suboptimal allocation of labor and capital at a given level of technology can act as a potential driver of long-run economic growth. Beyond this, remittances can serve as financial resources for investment in physical capital—such as machinery, equipment, and infrastructure—that enhances production capacity and technological adoption (Griffin, 1976; Stark, 1991; Rapoport, 2002; Mohammed and Karagol, 2023). They are also frequently channeled into human capital investment, for instance through education and skills development, which strengthens the knowledge base and productivity of the labor force (Perotti, 1993; Rao and Hassan, 2011; World Bank, 2021). Together, these channels reinforce the view that remittances can contribute to productivity improvements, and hence to sustained economic growth, especially in developing countries. However, remittances can also distort domestic productivity through the labour–leisure framework (Airola, 2008; Nath and Mamun, 2010; Amuedo-Dorantes and Pozo, 2004; Imai et al., 2014). Remittance inflows provide household members with sufficient income to meet consumption needs, thereby reducing the incentive to work and encouraging greater leisure. This behaviour lowers labour force participation, increases unemployment, and ultimately weakens local productivity, particularly in labour-intensive economies. Moreover, remittances may further reduce domestic productivity by negatively affecting industrial output and undermining export competitiveness, as exchange rate appreciation associated with Dutch disease effects can occur (Daway-Ducanes, 2019). Although remittances contribute to capital accumulation, Senbeta (2013) finds their impact on TFP growth to be negligible.

Taken together, these mixed findings highlight that the impact of remittances on productivity and TFP growth is far from straightforward. In fact, the relationship may vary depending on the

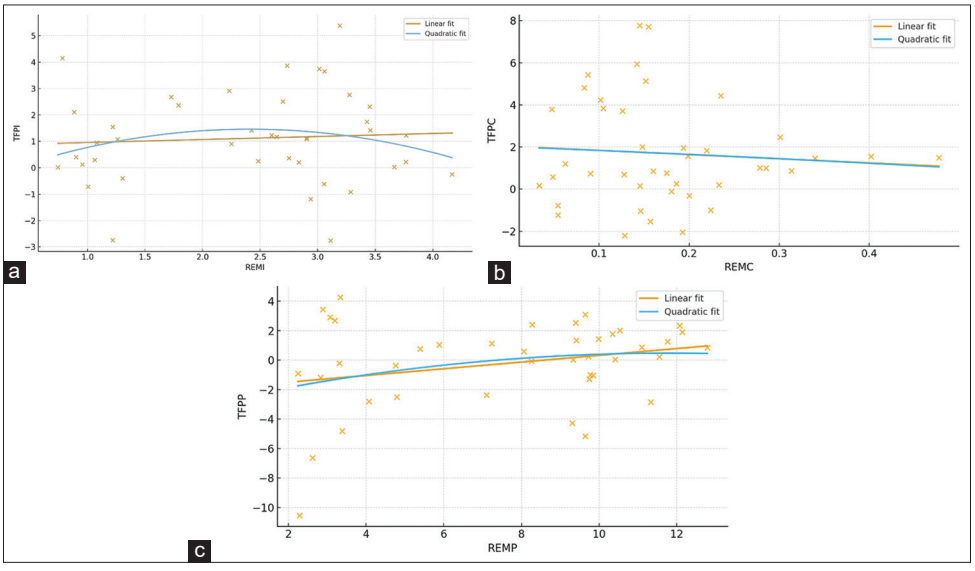
size and direction of remittance flows. This leads to a conflicting upshot on how remittances received affect TFP growth, by which means that the TFP growth effect of remittances may have changed when the remittances increase as compared to when it declines. Hassan et al. (2016) and Makhlouf (2019), for instance, found that TFP growth has a negative response to remittances initially before the threshold level, while later turning out to be positive above the level. This suggests that a linear relationship between remittances and TFP growth is an inappropriate measurement, which might be incorrectly specified. It therefore signifies that the effect of remittances on the productivity of remittance recipients' countries may be nonlinear in nature, depending on the direction of change (increase vs. decrease), not just their overall level.

Despite the extensive literature on the developmental role of remittances, empirical studies that explicitly investigate their impact on total factor productivity (TFP) growth remain limited. Existing research has predominantly relied on linear or symmetric specifications, which may overlook the possibility that the effects of remittances are nonlinear and depend on the direction of change in flows. This limitation is particularly striking in the case of India, China, and the Philippines, the three largest remittance recipients worldwide, where rigorous empirical evidence on the remittances–TFP growth nexus is largely absent. Addressing this gap is crucial, as these economies not only dominate global remittance inflows but also represent key drivers of growth in Asia. Accordingly, this study attempts to exclusively emphasize the innovative nonlinear ARDL technique, an extension of ARDL, to explore the asymmetric effect of remittances on TFP growth for the largest remittance recipients in Asia, namely India, China, and the Philippines that spans from 1982 to 2023.

Preliminary evidence supporting this perspective is presented in the scatter plots in Panel A, Panel B and Panel C of Figure 1, which illustrate the relationship between remittances and TFP growth for India, China and the Philippines, respectively. A striking pattern that emerges is that the association is far from linear or uniform. Instead, the data reveal a complex interaction that is both asymmetric—depending on whether remittance flows increase or decrease in which may shift in sign and magnitude at different levels of remittance intensity. In Panel (a), which relates the TFP growth to remittance (REMI) of India indicates that the quadratic fit directs a hump-shaped relationship: at low levels of REMI, TFP growth stagnates or declines, while higher remittance inflows begin to support investment, technology adoption, and efficiency improvements. This finding directly contradicts the conventional linear view that assumes remittances are uniformly beneficial. Panel (b) further reinforces this contradiction by showing that China remittances directed primarily toward weaken TFP growth (TFPC), suggesting a nonlinear crowding-out effect where excessive remittances erode the potential for productivity. By contrast, Panel (c) highlights a more favorable pattern, as remittances of the Philippines (REMP) exhibit a positive and convex association with TFP growth, whereby increases in REMP strengthen TFP gains, while declines exert disproportionately harmful effects. Across all panels, the asymmetric response is evident: declines in remittances tend to depress productivity more strongly than increases enhance it. Overall, this analysis highlights the central contradiction in the remittance–TFP nexus in India, China, and the Philippines, underscoring that the developmental impact of remittances cannot be adequately captured by linear models but must instead be analyzed within a nonlinear and asymmetric framework that accounts for both the composition and direction of remittance flows.

This study advances the literature in several important respects. First, this study advances the existing literature by explicitly testing the nonlinear hypothesis in the remittances–TFP growth relationship, in contrast to the majority of prior studies that impose linear or symmetric assumptions. By employing the nonlinear ARDL (NARDL) approach of Shin et al. (2014), the analysis is able to capture potential asymmetries in the adjustment process, thereby reducing the risk of model misspecification and producing more reliable estimates. Secondly, unlike much of the existing empirical work that proxies productivity through labour productivity alone, this study adopts a more comprehensive

Figure 1: The Scatter Plots of Remittances and TFP Growth for (a) India, (b) China and the (c) Philippines



measure of TFP growth. Specifically, TFP growth is decomposed into contributions from GDP growth, labour quantity, labour quality, and total capital, offering a richer representation of technological progress and efficiency dynamics. This broader specification ensures that the empirical model better reflects the underlying growth process and mitigates measurement error associated with narrow proxies. Thirdly, the empirical strategy explicitly addresses potential omitted variable bias by incorporating additional control variables, including fixed capital and the real effective exchange rate. These variables are theoretically justified and empirically relevant in mediating the remittances–TFP growth nexus, as capital accumulation and exchange associated with narrow proxies. Thirdly, the empirical strategy explicitly addresses potential omitted variable bias by incorporating additional control variables, including fixed capital and the real effective exchange rate.

These variables are theoretically justified and empirically relevant in mediating the remittances–TFP growth nexus, as capital accumulation and exchange rate dynamics may jointly influence both remittance flows and productivity outcomes. Their inclusion strengthens model specification and enhances the credibility of the causal inferences drawn. Finally, the study extends beyond country-specific analyses by adopting a panel perspective for three of the world's largest remittance recipients—India, China, and the Philippines—over the period 1982–2023. This design not only improves external validity but also allows the analysis to exploit both time-series and cross-sectional variation. By doing so, the study contributes to the limited but growing body of panel-based evidence on the asymmetric effects of remittances on productivity in emerging economies. The subsequent section sets out the model specification, the econometric framework, and the cointegration analysis, followed by a rigorous examination of the empirical results obtained from the estimations. The final chapter concludes by synthesizing the principal findings and discussing their theoretical contributions and policy implications within the broader context of economic development.

2. MODEL SPECIFICATION

Drawing on the neoclassical growth model and the growth accounting framework, the production function describing the relationship between output and factor inputs is expressed through a standard Cobb–Douglas specification:

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha} \quad (1)$$

where Y_t denotes aggregate output at time t, A_t captures the level of technology (or total factor productivity), K_t and L_t represent the capital and labor stocks, respectively, and α denotes the capital share of income, with $0<\alpha<1$.

Dividing equation (1) by labor yields output per worker:

$$y_t = A_t K_t^{\alpha}, 0 < \alpha < 1 \quad (2)$$

Taking natural logarithms of equation (2) gives:

$$ln\, y_t = ln\, A_t + \alpha\, ln\, k_t \quad (3)$$

Differentiating with respect to time produces the growth rate form:

$$lny_t = \Delta lnA_t + \alpha \Delta lnK_t \quad (4)$$

Rearranging equation (4) provides an expression for the growth rate of total factor productivity (TFP):

$$lnA_t = \Delta TFP = \Delta lny_t - \alpha \Delta lnk_t \quad (5)$$

To investigate the symmetric and asymmetric effects of remittances on TFP growth, the study adopts a specification broadly consistent with Mamun et al. (2015), expressed as:

$$TFP_t = \theta + \beta_0 REM_t + \beta_1 FC_t + \beta_2 REER_t + u_t \quad (6)$$

where TEP_t denotes total factor productivity growth, REM_t represents remittances received (as a percentage of GDP), FC_t is gross fixed capital formation (constant USD), and $REER_t$ is the real effective exchange rate (CPI-based), where increase in the $REER_t$ indicates an appreciation of the domestic currency. The error term u_t is assumed to be stationary under the null hypothesis of no cointegration, thereby serving as the basis for testing the presence of a long-run equilibrium relationship among the variables. All variables are expressed in natural logarithms.

Based on the literature, the sensitivity of total factor productivity (TFP) growth to the explanatory variables can be assessed through the expected signs of their respective coefficients, β_0, β_1, and β_2. The expected effect of remittances (β_0) is theoretically ambiguous. On the one hand, several studies (e.g., Ssozi and Asongu, 2016) find a positive relationship, arguing that remittance inflows serve as an important source of external finance that can be channeled into productive investments in sectors such as agriculture, small-scale manufacturing, tourism, and services. In this view, remittances augment capital availability, stimulate entrepreneurship, and thereby enhance productivity. On the other hand, other studies highlight a potential negative effect. For instance, Nath and Mamun (2010) argue from a labor–leisure framework that higher remittances may reduce labor supply, as household members substitute away from market work in response to higher non-labor income. This reduction in labor effort can lead to lower productivity growth. Consequently, the sign of β_0 remains indeterminate ex ante.

For gross fixed capital formation (β_1), the expected coefficient is unambiguously positive. Capital accumulation enhances the productive capacity of the economy and contributes directly to output growth by facilitating technological adoption and improving production efficiency (Sharma, 2010). Thus, higher investment in fixed capital is expected to exert a positive effect on TFP growth. The expected effect of the real effective exchange rate (β_2) is more nuanced and may be either positive or negative, depending on whether the domestic currency appreciates or depreciates. An appreciation of the exchange rate can enhance TFP growth through two main channels (Krugman, 1989; Porter, 1990; Diallo, 2010). First, it reduces the relative cost of imported capital

goods, encouraging technological upgrading and a shift toward capital-intensive production. Second, it raises real wages, which, according to the efficiency wage hypothesis (Leibenstein, 1966; Harris, 2001), can increase worker effort, reduce X-inefficiency, and strengthen productivity. In addition, higher real wages may mitigate "brain drain" by incentivizing skilled labor to remain in the domestic economy. Conversely, exchange rate depreciation could exert downward pressure on these mechanisms, implying a potentially negative effect. Therefore, the sign of β_2 is theoretically ambiguous.

3. ECONOMETRIC STRATEGY: SYMMETRIC AND ASYMMETRIC SPECIFICATIONS

This study employs both the linear Autoregressive Distributed Lag (ARDL) model of Pesaran et al. (2001) and its nonlinear extension (NARDL) developed by Shin et al. (2014) to examine the relationship between remittances and total factor productivity (TFP) growth. The ARDL framework is particularly suitable for the present analysis for three reasons. First, it allows for a mixture of stationary variables at levels $I(0)$ and first differences $I(1)$, while producing valid results as long as none of the series are integrated of order two $I(2)$ (Naseem and Hamizah 2013, Abdlaziz et al., 2022). Second, it provides reliable results in small-sample contexts through the bounds testing procedure, whereas conventional approaches such as Engle and Granger (1987) or Johansen and Juselius (1990) often suffer from size distortions in limited samples (Mah, 2000 and Naseem et al., 2009). Third, both short-run and long-run dynamics are estimated within a single-equation framework, ensuring analytical consistency. The general ARDL specification applied in this study can be expressed as:

$$\Delta TFP_t = \lambda_0 + \lambda_1 TFP_{t-1} + \lambda_2 REM_{t-1} + \lambda_3 FC_{t-1} + \lambda_4 REER_{t-1} + \sum_{k=1}^{n} \beta_k \Delta TFP_{t-k} + \sum_{k=0}^{n} \delta_k \Delta REM_{t-k} + \sum_{k=0}^{n} \varphi_k \Delta FC_{t-k} + \sum_{k=0}^{n} \partial_k \Delta REER_{t-k} + \varepsilon_t \quad (7)$$

where Δ denotes the first-difference operator and ε_t is a white-noise error term. The short-run effects are captured by the coefficients on the differenced terms, while the long-run parameters are identified by λ_2 to λ_4. The presence of cointegration is tested using the bounds F-statistics of Pesaran et al. (2001). If the calculated F-statistic exceeds the upper critical bound, the null of no long-run relationship is rejected; if it falls below the lower bound, the null cannot be rejected; values between the two bounds yield inconclusive results. Given the relatively small sample size (less than 80 observations), this study employs the critical values tabulated by Narayan (2005). While the ARDL approach is well suited to detect symmetric long-run relationships, the effect of remittances on TFP growth may be inherently asymmetric. To accommodate potential asymmetric effects, the study further extends the baseline specification by employing the nonlinear autoregressive distributed lag (NARDL) framework proposed by Shin et al. (2014). The application of the NARDL approach has been widely supported in recent empirical literature, including Kriskkumar and Naseem (2019), Saidu et al. (2021), Kriskkumar et al. (2022), and Babuga and Naseem (2022), which reinforces its suitability for capturing dynamic and asymmetric adjustments in the variables under investigation. This approach decomposes remittance inflows into positive and negative partial sum processes as follows:

$$REM^{pos} = \sum_{j=1}^{t} \Delta REM_j^{+} = \sum_{j=1}^{t} \max\left(\Delta REM_{j,} 0\right)$$

$$REM^{neg} = \sum_{j=1}^{t} \Delta REM_j^{-} = \sum_{j=1}^{t} \min\left(\Delta REM_{j,} 0\right)$$

By incorporating these decomposed variables into the ARDL framework, the NARDL model becomes:

$$TFP_t = \lambda_0 + \lambda_1 TFP_{t-1} + \lambda_2 REM_{t-1}^{pos} + \lambda_3 REM_{t-1}^{neg} + \lambda_4 FC_{t-1} + \lambda_5 REER_{t-1} + \sum_{k=0}^{n} \delta_k^{+} \Delta REM_{t-k}^{pos} + \sum_{k=0}^{n} \delta_k^{-} \Delta REM_{t-k}^{pos} + \sum_{k=0}^{n} \varphi_k \Delta FC_{t-k} + \sum_{k=0}^{n} \partial_k \Delta REER_{t-k} + \varepsilon_t \quad (8)$$

The NARDL model allows for testing both short- and long-run asymmetries. Short-run symmetry is examined using Wald tests of the null hypothesis $H_o : \sum_{k=0}^{n} \delta_k^{+} : \sum_{k=0}^{n} \delta_k^{-}$, while long-run symmetry is tested through the restriction $H_0: \lambda_2 = \lambda_3$. Together, the ARDL and NARDL models provide a robust empirical strategy: the ARDL model captures the symmetric long-run dynamics of remittances, capital formation, and exchange rates on TFP, while the NARDL model allows for a more nuanced investigation of asymmetric remittance effects.

This study employs annual data for the period 1982–2023, yielding 42 observations for each of the three sample countries: China, India, and the Philippines. Data on remittances (REM) and gross fixed capital formation (FC) are sourced from the *World Development Indicators* (WDI) of the World Bank, while real effective exchange rate (REER) data are obtained from the BRUEGEL database. Total factor productivity (TFP) is drawn from *The Conference Board* (TCB). The TFP series is constructed based on a growth accounting framework, incorporating contributions from GDP growth, labor quantity, labor quality, and capital input. The variables are measured as follows: remittances (REM) are expressed as a percentage of GDP, gross fixed capital formation (FC) is reported in constant U.S. dollars, and the real effective exchange rate (REER) is based on consumer price index (CPI) weights. A summary of the variables and their sources is provided in Table 1.

Next the descriptive statistics for the data set in China, India and Philippines are reported in Table 2. The reported measures include the mean, minimum, maximum, and standard deviation for each variable. The results indicate that the standard deviations of total factor productivity growth (TFP), remittances (REM), and gross

fixed capital formation (FC) are relatively close to their respective means, suggesting the absence of extreme outliers in the dataset. At the same time, the degree of variation observed across the variables is sufficient to allow meaningful econometric investigation. These patterns provide a rationale for examining whether fluctuations in remittance inflows can help explain cross-country differences in TFP growth for the three selected economies.

Moreover, the correlation analysis using the Pearson Correlation Coefficient is utilized to investigate the relationships between the variables used in the analysis as presented in Table 3. The tables indicate no correlation between TFP and REM in any of the sample countries. Nevertheless, even if such a correlation were present, it would not imply causation, which is the central focus of this study. If REM truly influences TFP, it would be expected to have a significant effect. In addition, *FC* in China turns out a positive correlation with *TFP* growth while *REER* in Philippines is negatively correlated with *TFP* growth, is consistent with theoretical expectations. Overall, this suggests heterogeneous dynamics across countries, underscoring the need for more rigorous econometric methods to assess causal effects.

Table 1: Sources of Data

Variables	Description	Measurement	Source of data	Expected sign
TFP	Total Factor Productivity growth	% of GDP growth	TCB	-
REM	Remittances	% of GDP	WDI	+/-
FC	Gross Fixed Capital Formation	Constant USD	WDI	+
REER	Real Effective Exchange Rate	CPI based	Bruegel	-

TCB denotes as The Conference Board, WDI is the acronym for World Development Indicator, Bruegel represents as Bruegel Datasets, CPI refers to Consumer Price Index

Table 2: Descriptive statistics

Country	Variable	Mean	Min	Max	Standard deviation
India	TFP	3.787	0.190	11.69	2.988
	REM (% GDP)	299.8	55.10	816.5	245.3
	FC (USD, constant)	2.336	0.740	4.170	1.029
	REER (CPI-based)	110.8	77.97	175.7	27.31
China	TFP	10.70	0.51	28.80	7.000
	REM (% GDP)	0.177	0.033	0.477	0.100
	FC (USD, constant)	1.790	0.143	5.960	1.820
	REER (CPI-based)	100.2	87.91	113.7	6.801
Philippines	TFP	2.228	0.000	10.90	2.266
	REM (% GDP)	7.671	2.300	12.80	3.357
	FC (USD, constant)	36.01	12.40	101.8	23.04
	REER (CPI-based)	103.3	77.20	138.6	15.07

TFP: Total Factor Productivity growth, REM: Remittances as % of GDP, FC: Gross Fixed Capital Formation in constant USD, REER: Real Effective Exchange Rate, CPI-based index

Table 3: Pearson correlation matrix

Country	Variable	TFP	REM	FC	REER
India	TFP	1.000			
	REM	0.181	1.000		
	FC	0.095	0.727[a]	1.000	
	REER	−0.086	0.005	−0.351[b]	1.000
China	TFP	1.000			
	REM	−0.231	1.000		
	FC	0.370[b]	−0.445[a]	1.000	
	REER	−0.105	0.226	0.265	1.000
Philippines	TFP	1.000			
	REM	0.087	1.000		
	FC	−0.193	0.501[a]	1.000	
	REER	−0.349[b]	−0.052	0.529[a]	1.000

N=38. Superscripts [a],[b], and [c]denote significance at the 1%, 5%, and 10% levels, respectively (two-tailed tests)

4. DISCUSSION OF RESULTS

Prior to estimating the ARDL and NARDL models, it is necessary to examine the order of integration of the variables. The bounds testing procedure of Pesaran et al. (2001) requires that the regressors be either stationary at levels, $I(0)$, at first differences, $I(1)$, or a combination of both, but not integrated of order two, $I(2)$. To this end, the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests are employed. The result reported in Table 4 shows that all variables are stationary either at levels or at first differences, with no evidence of $I(2)$) processes. This finding confirms the suitability of the ARDL bounds testing approach for examining the long-run cointegration relationships among total factor productivity growth (TFP) and its determinants (REM, FC, and REER). Consequently, the study proceeds with ARDL and NARDL estimation.

Subsequently, the linear ARDL model is estimated to examine the effect of remittances on *TFP* growth. As a first step of the analysis, the bounds test is used to test the existence of a long-run relationship among the selected variables in the *TFP* growth model. Based on the results as displayed in Table 5, the computed *F*-statistics for all three countries, i.e. China is 7.07, India is 10.34 and the Philippines is 12.14 found to be greater than the upper bound critical value at 1 per cent significance level. This implies that the null hypothesis of no long-run coefficient can be rejected and thereby confirming the presence of a long-run co-movement relationship among the selected variables.

As an alternative, the existence of long-run cointegration can also be established through the negative and significance coefficient of the error correction term, ECM_{t-1} (Banerjee et al., 1998 and Bahmani-Oskooee and Saha, 2016). The result shows that the ECM_{t-1} terms turn out to be negatively significant at 1 per cent level, which further signifies that China, India and the Philippines' *TFP* growth model is cointegrated in the long-run. It is also worth mentioning that the ECM_{t-1} term, which appeared to be -0.79, -0.75 and -0.90 for China, India and the Philippines, respectively, depicts relatively rapid speed of adjustment of the growth model in perceiving changes in its determinants before converging to its equilibrium level. For instance, approximately 1.26 years are deemed to be needed in order to ensure the the disequilibria of the previous period's shock adjust back to its long-run equilibrium path.

Next, the reliability of error correction model is also ascertained through number of diagnostic tests such as the Lagrange Multiplier (LM) test and Ramsey's RESET tests. The result suggests that all

Table 4: Unit root test results

Variables	Level				First Difference			
	ADF		PP		ADF		PP	
	No Trend	Trend	No Trend	Trend	No Trend	Trend	No Trend	Trend
India								
TFP	−4.89 (0)[a]	−4.83 (1)[a]	−4.89 (0)[a]	−4.89 (0)[a]	−6.08 (1)[a]	−6.01 (1)[a]	−7.51 (0)[a]	−7.40 (0)[a]
REM	−1.21 (0)	−1.79 (0)	−1.21 (0)	−1.78 (2)	−6.51 (0)[a]	−3.95 (3)[b]	−6.56 (2)[a]	−6.55 (3)[a]
FC	3.31 (0)	−1.10 (0)	3.22 (3)	−1.01 (6)	−3.61 (0)[b]	−4.74 (0)[a]	−3.57 (1)[b]	−4.33 (8)[a]
REER	−2.09 (0)	−1.28 (0)	−2.01 (4)	−1.32 (2)	−3.80 (0)[a]	−5.26 (0)[a]	−3.98 (3)[a]	−5.26 (2)[a]
China								
TFP	−3.73 (1)[a]	−5.82 (1)[a]	−3.25 (0)[b]	−4.43 (1)[a]	−5.80 (0)[a]	−5.72 (0)[a]	−5.80 (1)[a]	−5.72 (1)[a]
REM	−4.03 (0)[a]	−4.89 (1)[a]	−4.07 (1)[a]	−4.66 (1)[a]	−6.26 (1)[a]	−6.15 (1)[a]	−7.17 (1)[a]	−7.06 (1)[a]
FC	−1.78 (0)	−2.78 (1)	−1.78 (0)	−2.10 (2)	−1.66 (0)	−3.97 (0)[b]	−1.47 (1)	−3.91 (2)[b]
REER	2.07 (1)	0.92 (0)	5.80 (4)	0.58 (3)	−4.18 (0)[a]	−4.21 (0)[b]	−4.10 (5)[a]	−4.07 (6)[b]
Philippines								
TFP	−4.07 (0)[a]	−4.00 (0)[b]	−3.77 (6)[a]	−3.67 (6)[b]	−5.35 (1)[a]	−5.35 (0)[a]	−7.43 (0)[a]	−7.38 (0)[a]
REM	−1.41 (0)	−0.95 (0)	−1.41 (0)	−0.95 (0)	−7.38 (0)[a]	−7.52 (0)[a]	−7.27 (2)[a]	−7.41 (2)[a]
FC	3.93 (0)	0.82 (0)	3.64 (2)	0.69 (1)	−3.41 (0)[b]	−4.78 (0)[a]	−3.47 (3)[b]	−4.87 (2)[a]
REER	−2.56 (0)	−3.49 (0)	−2.81 (4)[c]	−3.47 (2)[c]	−6.65 (0)[a]	−6.67 (0)[a]	−6.68 (1)[a]	−6.67 (0)[a]

ADF is the Augmented Dicker-Fuller, and PP is the Phillips Perron test. [a], [b] and [c] are significant to 1%, 5% and 10% level respectively. For the ADF test, numbers inside parentheses are the optimum lag order in the ADF test selected by Schwarz Information Criterion (SIC). As for the PP test, numbers in parentheses are the selection of bandwidth based on the Newey-West nonparametric plug-in method

Table 5: Linear ARDL estimation results and diagnostic checks

Variables	India	China	Philippines
Constant	0.22 (0.57)	−0.62 (0.23)[a]	0.06 (8.33)
TEP_{t-1}	−1.50 (0.25)[a]	−1.52 (0.26)[a]	−0.94 (0.14)[a]
REM_{t-1}	−4.13 (0.24)[a]	−0.20 (0.44)	1.77 (0.60)[a]
$REER_{t-1}$	−5.04 (3.77)	−1.73 (3.42)	1.01 (2.02)
FC_{t-1}	−1.43 (7.10)	5.50 (2.12)[b]	−2.38 (0.72)[a]
ΔTEP_{t-1}	0.50 (0.17)[a]	0.28 (0.12)[b]	-
ΔTEP_{t-2}	-	-	-
ΔREM_{t}	-	−0.24 (0.15)	−0.87 (1.53)
ΔREM_{t-1}	−4.13 (0.25)[a]	0.07 (0.25)	−2.77 (1.51)[c]
ΔREM_{t-2}	-	−0.19 (0.16)	−1.73 (1.42)
$\Delta REER_{t}$	3.77 (3.03)	0.66 (2.62)	0.51 (2.59)
$\Delta REER_{t-1}$	8.24 (4.40)[c]	−4.89 (2.77)[c]	−5.82 (2.47)[b]
$\Delta REER_{t-2}$	3.59 (4.15)	-	-
$\Delta REER_{t-3}$	5.74 (3.25)[c]	-	-
ΔFC_{t}	−0.01 (3.14)	4.51 (1.38)[a]	7.67 (1.78)[a]
ΔFC_{t-1}	2.37 (6.30)	3.97 (1.46)[b]	-
ΔFC_{t-2}	0.44 (4.82)	−3.26 (1.82)[c]	-
ΔFC_{t-3}	−5.26 (2.99)[c]	-	-
ECM_{t-1}	−0.75 (0.16)[a]	−0.79 (0.15)[a]	−0.90 (0.15)[a]
F-test	10.34	7.07	12.14
Adj R^2	0.67	0.73	0.61
LM (1)	1.16	1.87	0.13
RESET test	0.34	0.02	0.09
Critical values	***F-test Lower bound***	***F-test Upper bound***	
10%	2.37	3.20	
5%	2.79	3.67	
1%	3.65	4.66	

[a,b]and [c]are significant to 1%, 5% and 10% level respectively. The number in parenthesis shows the standard error for the respective coefficient. LM is the Breusch-Godfrey serial correlation test with the number of lags as stated in parenthesis and the RESET test is the Ramsey's reset test for misspecification of the model. *F*-statistics lower and upper bound critical values are based on Narayan (2005). The critical values of ECM_{t-1} based on Banerjee et al. (1998, Table 1), when k=3 are−4.59, −3.82 and−3.45, denoting significance at the 1%, 5%, and 10% levels, respectively

Table 6: Linear Long-run results

Variables	India	China	Philippines
Constant	0.15 (0.37)	−0.41 (0.15)[b]	0.07 (8.87)
REM	−2.76 (1.04)[b]	−0.13 (0.29)	1.89 (0.65)[a]
FC	−0.95 (4.72)	3.63 (1.40)[b]	−2.53 (0.84)[a]
REER	−3.36 (2.61)	−1.14 (2.24)	1.08 (2.20)

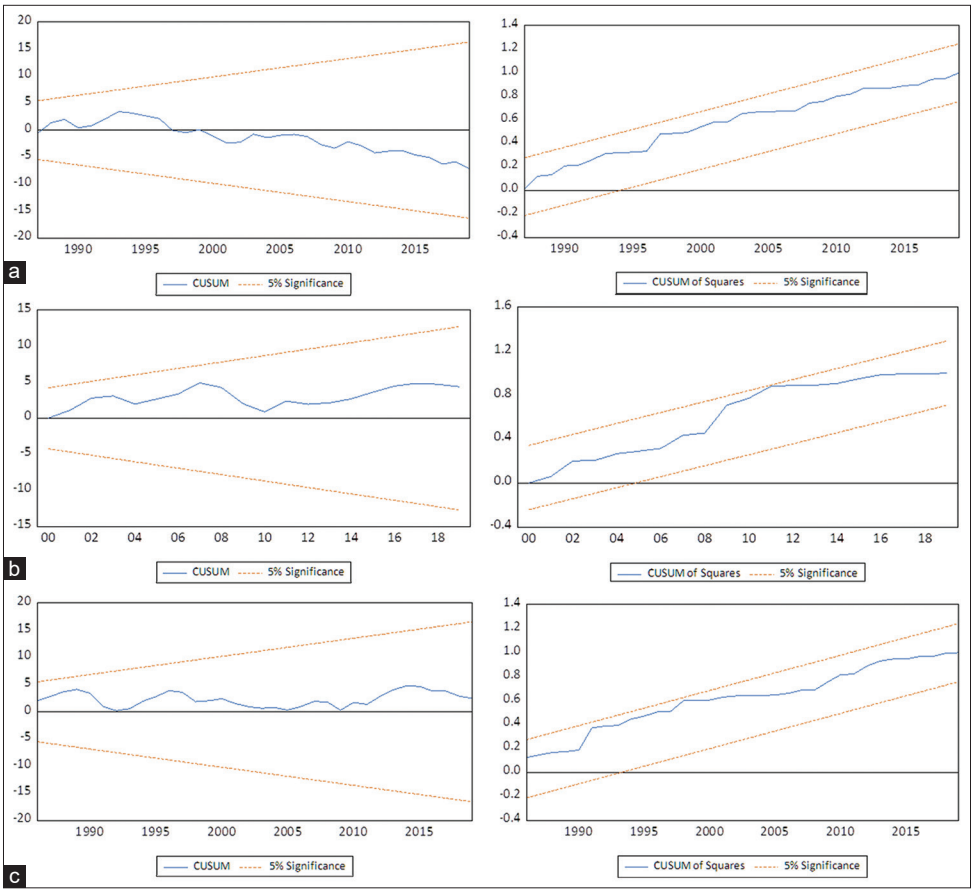
[a,b]and [c]are significant to 1%, 5% and 10% level respectively. The number in parenthesis shows the standard error for the respective coefficient

the growth models appeared to be autocorrelation free, and the estimated model has no misspecification problem. Moreover, the stability test of the CUSUM (cumulative sum) and CUSUMQ (cumulative sum of square) statistics are used to ensure the growth models are sufficiently stable. The result in Figure 2 illustrates that both statistics appeared to be within the critical bounds, showing that it is stable at the 5 per cent significance level. Finally, the variation of each of the growth models are also found to be well explained by the explanatory variables as shown by the goodness of fit of the estimated models (adjusted *R*-squared – $Adj.R^2$). Hence, the estimated model can be used to construct the following explanation on the behavior of economic progress for China, India and the Philippines.

Based on the results from Table 5, the short-run coefficients of the remittance variable is observed to be significance for India and the Philippines while not for China. This implies that remittances affect *TFP* growth in the short-run. Then, the long-run estimates of the ARDL model are then investigated in order to ensure that the short-run effect of remittances last into the long-run relationship. The estimated long-run relationship is presented in Table 6. The result shows that the remittances appeared to be significant for India and the Philippines. A 1 per cent increases in *REM* leads to approximately increase (decrease) *TFP* growth by 1.89 (2.76) in the Philippines (India). The results appear to be consistent with theoretical and empirical predictions that *TFP* growth is considerably affected by the remittances.

As for Philippines, the result signifies the favorable effect of remittances on *TFP* growth that contributes to the betterment of productivity of the Philippines. This is in line with Ssozi and Asongu (2016), which found that remittance is positively

Figure 2: CUSUM and CUSUMSQ Plots for Linear Stability Tests. (a) India, (b) China and the (c) Philippines. CUSUM refers to the *cumulative sum of recursive residuals* while CUSUMSQ denotes cumulative sum of squares of recursive residuals.



significant with total factor productivity. Meaning that the higher the remittances in terms of cash or kind (tools and equipment), usually accompany with entrepreneurial ideas that believed to boost the economic progress. Meanwhile for India, the remittances seem to have deleterious effect on the *TFP* growth as stressed by Chami (2003). This may due to to moral hazard problem, in which the asymmetric information between remitter and the recipient led to a reduction in the labour force participation, limit their job searchers, invest in riskier projects and many more. The finding is also in agreement with the labour-leisure framework as highlighted by Nath and Mamun (2010). For instance, the family of the migrants in the origin country, may have reduce their labour participation rate as more remittances received, which considered as a non-wage income is substituted with their wage income. As such individuals may substitute for more leisure time rather than to go to work and earn any sort of income.

In addition, gross fixed capital formation (FC) is found to be significant for China and the Philippines at the 5% and 1% levels, respectively, while the REER is insignificant in all cases. The results further indicate that remittances are insignificant for China, although they exhibit mixed effects on TFP growth in India and the Philippines. Notably, despite China being one of the largest remittance-recipient countries globally, the impact on TFP growth appears statistically negligible. This raises the important question of whether the assumption of a linear, symmetric relationship between remittances and TFP growth is appropriate, as emphasized by Hassan et al. (2016) and Makhlouf (2019). In particular, increases and decreases in remittances may exert different effects on TFP growth.

In favor to investigate this possibility, the analysis proceeds by examining asymmetric effects using the NARDL framework developed by Shin et al. (2014). Given the mixed long-run estimates for China, India, and the Philippines, remittance inflows are decomposed into partial sums of positive and negative changes, denoted as REM^{pos} and REM^{neg}, respectively. These variables replace the aggregate remittance variable (REM) in estimating the asymmetric effects through the NARDL specification. The corresponding results, reported in Table 7, present the estimated coefficients and standard errors for the unrestricted ECM.

As in the ARDL procedure, the presence of a long-run cointegration relationship must first be established. Based on the results, the computed *F*-statistics of 8.77 for China, 8.17 for India and 10.12 for the Philippines are found to be significant at 1 per cent level, showing the presence of the long-run co-movement in the relationship of remittances and *TFP* growth. The results also showed that the ECM_{t-1} term in all sample countries appeared to be negatively significant, and thereby confirming a long-run relationship does exist. In addition, a series of diagnostic tests are performed on the estimated models, showing no autocorrelation and misspecification issues. The CUSUM and CUSUMSQ tests also found to be stable at the 5 per cent significance as

Table 7: Nonlinear ARDL estimation results and diagnostic checks

Variables	India	China	Philippines
Constant	0.72 (0.66)	−29.5 (18.6)	5.19 (2.96)[c]
$LTFP_{t-1}$	−1.31 (0.22)[a]	−0.97 (0.23)[a]	−0.92 (0.13)[a]
$LREMIT_{t-1}$	-	-	-
$LREER_{t-1}$	0.84 (4.87)	7.40 (2.17)[a]	−1.37 (1.67)
LFC_{t-1}	−1.48 (3.07)	−0.06 (0.50)	−2.55(0.69)[a]
POS_{t-1}	−2.50 (1.07)[b]	0.74 (0.48)	0.45 (0.58)
NEG_{t-1}	−2.35 (1.07)[b]	1.00 (0.41)[b]	−2.86 (1.51)[c]
$\Delta LTFP_{t-1}$	0.28 (0.15)[c]	0.47 (0.15)[a]	0.10 (0.76)
$\Delta LTFP_{t-2}$	-	-	-
$\Delta LREM_{t}$	-	-	-
$\Delta LREM_{t-1}$	-	-	-
$\Delta LREM_{t-2}$	-	-	-
$\Delta LREER_{t}$	7.07 (3.44)[b]	5.20 (3.04)	−1.37 (1.67)
$\Delta LREER_{t-1}$	5.52 (3.32)	−6.97 (2.12)[a]	-
$\Delta LREER_{t-2}$	-	3.48 (2.50)	-
$\Delta LREER_{t-3}$		−8.16 (3.23)[b]	
ΔLFC_{t}	−1.48 (3.07)	5.80 (1.92)[b]	5.47 (1.39)[a]
ΔLFC_{t-1}	-	4.23 (1.42)[b]	-
ΔLFC_{t-2}	-	−3.48 (1.47)[b]	-
ΔLFC_{t-3}		4.82 (1.47)[a]	
ΔPOS_{t}	−2.50 (1.07)[b]	0.62 (0.37)	0.45 (0.58)
POS_{t-1}	-	−1.03 (0.56)[c]	-
POS_{t-2}	-	−0.54 (0.34)	-
POS_{t-3}		0.49 (0.50)	
ΔNEG_{t}	−2.35 (1.07)[b]	−0.03 (0.18)	−2.86 (1.51)[c]
NEG_{t-1}	-	−0.17 (0.26)	-
NEG_{t-2}	-	−0.68 (0.18)[a]	-
NEG_{t-3}		−0.17 (0.18)	
ECM_{t-1}	−0.71 (0.17)[a]	−0.84 (0.16)[a]	−0.96 (0.15)[a]
F-test	8.17	8.77	10.12
SUM POS SR	−2.50 (1.07)[b]	0.62 (0.37)	0.45 (0.58)
SUM NEG SR	−2.50 (1.07)[b]	−0.03 (0.18)	−2.86 (1.51)[c]
W_{LR}	2.22 (1.09)[b]	−10.2 (2.85)[a]	3.31 (1.12)[a]
W_{SR}	2.22 (1.09)[b]	9.74 (3.28)[b]	3.31 (1.12)[a]
Adj R^2	0.46	0.84	0.61
LM (1)	0.81	0.27	0.84
RESET test	0.48	8.35[b]	0.98
Critical values	***F-test Lower bound***	***F-test Upper bound***	
10%	2.37	3.20	
5%	2.79	3.67	
1%	3.65	4.66	

[a],[b] and [c]are significant to 1%, 5% and 10% level respectively. The number in parenthesis shows the standard error for the respective coefficient. LM is the Breusch-Godfrey serial correlation test with the number of lags as stated in parenthesis, RESET test is the Ramsey's reset test for misspecification of the model. *F*-statistics lower and upper bound critical values are extracted from Narayan (2005). Shin et al. (2014, p. 291) argue that the same critical values should be used for co-integration in the nonlinear model. The critical values of ECM_{t-1} based on Banerjee et al. (1998, Table 1), when k=3 are −4.59, −3.82 and -3.45, denoting significance at the 1%, 5%, and 10% levels, respectively

demonstrated in Figure 3. Also, the goodness of fit of the estimated models (adjusted *R*-squared – $Adj.R^2$) implies that that the estimated model to the data is found to be satisfactory. This validates that the estimated model can be used to interpret the behavior economic progress for China, India and the Philippines.

In order to examine whether the remittances are indeed asymmetric, the Wald tests of short-run and long-run symmetry are conducted as proposed by Shin et al. (2014). The results of the Wald test are displayed in the Table 7. The results show that the remittances in the short-run (W_{SR}) found to be significant in all countries, suggesting the existence of the short-run asymmetric effect of remittances is recorded. Moreover, the Wald test (W_{LR}) also prove that remittances have asymmetric effects, in the long-run, confirming the short-run asymmetric effect of remittances lasts into the long-run for all the sample countries. This supports the presence of the nonlinear relationship between remittances and the *TFP* growth. The results are also in agreement with Taasim (2021), Mamun et al. (2016), signifying that the remittances and the *TFP* growth relationship seems to be well explained using the asymmetric effect, particularly on the remittance-recipients' countries.

In addition, the results of the long-run estimates of asymmetric effect are presented in Table 8. An appealing part of the results is that the variable representing REM^{pos} carries a significant coefficient in all three countries. For instance, in India the REM^{pos} is found to be positive and significant at the 1 per cent level, indicating that a 1 per cent increase in remittances fosters *TFP* growth by about 2.13 per cent. This effect reflects the role of remittances in easing liquidity and credit constraints, particularly in rural and semi-urban areas where access to formal finance remains limited. By relaxing these constraints, remittance inflows enable households and small firms to invest in education, health, housing, and entrepreneurial activities, thereby enhancing long-term productivity and *TFP* (Giuliano and Ruiz-Arranz, 2009; Aggarwal et al., 2011). Evidence further shows that remittance-receiving households allocate a portion of inflows to both human capital and physical assets, reinforcing their contribution to sustained *TFP* improvements (Rajan and Subramanian, 2005; Catrinescu et al., 2009). The positive significance of REM^{pos} thus highlights the financing channel through which remittances alleviate capital market imperfections and support growth-enhancing investments, distinguishing India from economies where remittances are primarily directed toward consumption.

In the case of China, the REM^{pos} is again positively significant at 5 per cent level, indicating that a 1 per cent decrease in remittances leads to an approximate 1.91 per cent decline in TFP growth. This asymmetric outcome implies that the growth-enhancing effect of positive shocks may reflect the role of remittances as a supplementary source of financing in an economy characterized by high investment demand. Although China has relatively deep domestic capital markets compared with India and the Philippines, remittances may still relax liquidity constraints at the household or small-firm level, supporting productivity-enhancing investments in in small businesses, agricultural modernization, education, and health (Giuliano and Ruiz-Arranz, 2009; Cooray, 2012). The positive coefficient is therefore consistent with the argument that remittances, when channeled into investment rather than consumption, can foster long-term growth through *TFP* improvements (Catrinescu et al., 2009). This significance of REM^{pos} suggests that remittances are not trivial in China's productivity story, particularly at the microeconomic level.

Unlike India and China, the Philippines exhibits the opposite response, with remittances dampening *TFP* growth. This asymmetric effect is reflected in the negative and marginally significant coefficient on REM^{pos}, suggesting that a 1 per cent increase in remittances is associated with an impediment of about 1.03 per cent in *TFP* growth. The negative coefficient on

Figure 3: CUSUM and CUSUMSQ plots for nonlinear stability tests. (a) India, (b) China and the (c) Philippines. CUSUM refers to the *cumulative sum of recursive residuals* while CUSUMSQ denotes cumulative sum of squares of recursive residuals.

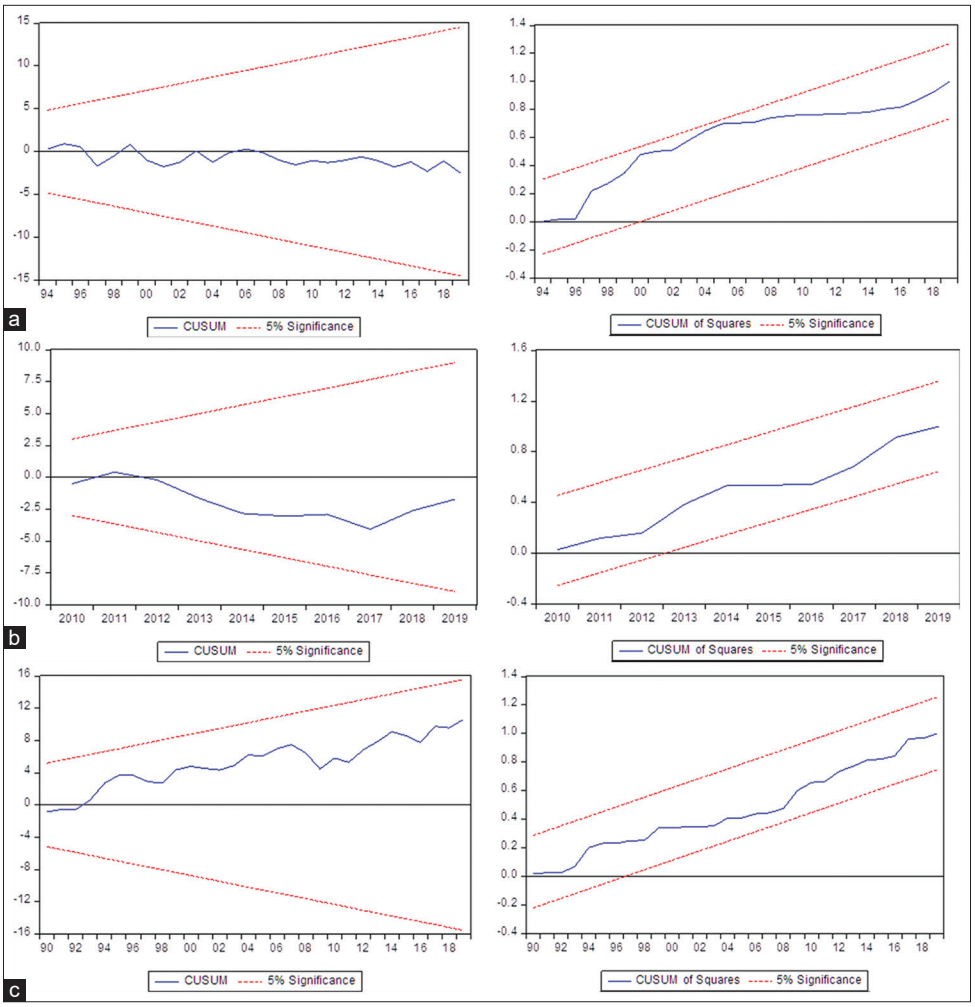


Table 8: Nonlinear long-run results

Variables	India	China	Philippines
Constant	−2.03 (1.03)[c]	−0.55 (0.51)	-1.62 (0.94)
REM^{pos}	−2.13 (033)[a]	−1.91 (0.82)[b]	−1.03 (0.76)[b]
REM^{neg}	−0.67 (0.46)	−1.48 (1.73)	−0.49 (0.62)
FC	−1.12 (0.53)[b]	−1.35 (0.43)[a]	−0.06 (0.55)
REER	−1.59 (1.92)	−0.64 (0.93)	−2.76 (0.81)[a]

[a,b]and [c]are significant to 1%, 5% and 10% level respectively. The number in parenthesis shows the standard error for the respective coefficient

REM^{pos} points toward the possibility of Dutch disease effects, whereby large and sustained remittance inflows appreciate the real exchange rate and shift resources away from the tradable sector toward non-tradables. Since the tradable sector is typically more productivity-enhancing, such sectoral reallocations can slow down *TFP* growth (Acosta et al., 2009; Barajas et al., 2009). This interpretation is also consistent with the Philippines' status as one of the most remittance-dependent economies in the world, where inflows often exceed 9 per cent of GDP. Empirical studies further show that a large share of remittances in the Philippines is directed toward consumption expenditures—notably housing, durable goods, and everyday consumption rather than productivity-enhancing investment (Ang, 2007; Yang and Choi, 2007). While such expenditures can improve household welfare, their direct effect on long-run *TFP* growth is limited. The negative response of *TFP* to REM^{pos} therefore reflects a structural pattern in which remittance-driven demand expansion contributes to inflationary pressures and reduced competitiveness, outweighing any marginal productivity gains.

On the other hand, the long-run estimates indicate that REM^{neg} is statistically insignificant across India, China, and the Philippines, suggesting that declines in remittances do not exert a measurable impact on TFP growth. This resilience can be attributed to the countercyclical nature of remittances, as migrants often increase transfers during adverse domestic shocks, thereby cushioning households and sustaining productivity-enhancing investments (Chami et al., 2003). In India, even when remittances fall marginally, alternative coping mechanisms such as public transfers, borrowing, or domestic savings that offset the adverse effects or reduced inflows. Meanwhile, in China the absent of significant effect reflects the economy's diversified external financing structure, including FDI inflows, trade surpluses, and sovereign lending programs, which lowers the elasticity of *TFP* with respect to remittance fluctuations. By contrast, in the Philippines, where remittances remain a critical source of foreign exchange and macroeconomic stability, contractions may heighten vulnerabilities

in the current account and fiscal balance; however, these shocks do not immediately undermine productivity, as the reductions primarily affect consumption rather than investment channels directly linked to TFP. Overall, the insignificance of REM^{neg} across the three economies underscores how countercyclical flows, structural buffers, and financial diversification operate differently across contexts to shield productivity growth from adverse remittance shocks.

Synthesizing these country-specific results reveal important heterogeneity in the remittance–TFP nexus across India, China, and the Philippines. India's results are most similar to China's: in both cases, positive remittance shocks (REM^{pos}) significantly enhance productivity, while negative shocks (REM^{neg}) are insignificant, implying resilience to remittance declines. However, the effect is stronger in India (coefficient = 2.13) than in China (1.91), reflecting India's greater reliance on remittances at the household level, particularly in rural and semi-urban regions where inflows finance education and small business activities (Rajan, 2018; Chami et al., 2003). By contrast, the Philippines presents the opposite pattern: REM^{pos} exerts a negative effect on *TFP* growth, consistent with Dutch disease-type pressures whereby large inflows—often exceeding 9% of GDP—appreciate the real exchange rate and divert resources into less productive non-tradable sectors (Acosta et al., 2009; Barajas et al., 2009). These divergent outcomes underscore the importance of domestic financial structures and allocation mechanisms: while remittances in India and China serve as a complementary source of finance that supports productivity growth, in the Philippines their predominance fosters structural dependence and resource misallocation, ultimately constraining *TFP* growth.

5. CONCLUSION AND POLICY IMPLICATIONS

This paper examined the long-run nexus between remittances and total factor productivity (*TFP*) growth in India, China, and the Philippines using both a linear specification and an asymmetric framework that allows for potentially different effects of positive and negative remittance shocks (following Shin et al., 2014). The linear estimates suggest heterogeneous average relationships across countries, but the asymmetric model supported by Wald tests of short- and long-run symmetry reveals state-contingent responses that the linear approach masks. The asymmetric results are strikingly consistent on one dimension and sharply divergent on another. Across all three economies, negative remittance shocks (REM^{neg}) are statistically insignificant in the long run, indicating weak transmission from remittance declines to *TFP* growth, consistent with countercyclical remitting behavior, public and private smoothing mechanisms, and, in China's case, diversified external financing that absorbs adverse shocks (e.g., FDI and trade surpluses). By contrast, positive shocks (REM^{pos}) are the operative margin and differ by country: they are *TFP*-enhancing in India and China, while *TFP*-reducing in the Philippines, where appreciation pressures and a significant negative *REER–TFP* link point to competitiveness/Dutch-disease channels. In sum, these findings show that long-run productivity responds primarily to remittance upswings and in a country-specific manner while downswings are largely buffered.

Overall, asymmetric estimates imply a common policy stance—manage and productively channel remittance surges rather than devote scarce resources to stabilizing temporary downturns with country-specific instruments reflecting different transmission channels. In particular, India should turn remittance upswings into capital that builds capacity, not just consumption. Cut transfer costs and make formal intermediation effortless—interoperable digital rails that auto-sweep balances into time-locked deposits, equity, and infrastructure funds—so a larger share of each remitted rupee finances productive use. Expand remittance-linked SME credit and guarantees, diaspora bonds, and matching grants for technology adoption, export upgrading, and workforce skills. With financial conditions supportive and the REER not binding, favor targeted risk-sharing (e.g., first-loss guarantees) over blanket easing, and deploy practical micro- and meso-level tools that steer inflows into high-TFP projects and crowd in private investment. Likewise, China remittances should work with the country's deep financial system, not alongside it. That means launching tax-advantaged diaspora funds and blended public/DFI co-investment vehicles aimed at innovation, green upgrading, digitalization, and rural productivity—plus remittance-linked savings that automatically flow into long-horizon, high-TFP assets. To turn surges into lasting gains, clear the pipes: strengthen credit analytics, make credit registries interoperable, recognize IP and receivables as collateral, and standardize project-pipeline appraisal so viable firms get funded fast. Given that declines show little pass-through to TFP, a light touch—targeted household/SME liquidity support—suffices; heavy macro intervention is unnecessary.

Conversely, the Philippines should treat remittance surges as a gift that must be stewarded, not simply spent—managing them to avoid Dutch-disease and real-exchange-rate pressures. In practice, pair sterilized FX intervention with a rules-based saving/stabilization fund to park part of the inflows, and activate macro-prudential tools (tighter LTV/DTI caps, countercyclical buffers) to keep non-tradable booms in check. At the same time, rechannel money toward the tradables engine and skills: time-locked investment products, exporter matching grants, and diaspora co-investment funds focused on manufacturing, agro-processing, and ICT/BPO, backed by vocational and technology training. Finally, align incentives by limiting tax credits to genuine productivity vehicles—SME equity, infrastructure, and innovation funds—rather than consumption or speculative assets. As a coherent policy package, these measures enhance the long-run TFP response to remittance surges and sustain resilience during remittance shortfalls.

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