

Macroeconomic Drivers of Inflation in South Asia amid Global Oil Price Shocks, Exchange Rate Volatility, and Geopolitical Tensions

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Macroeconomic Drivers of Inflation in South Asia amid Global Oil Price Shocks, Exchange Rate Volatility, and Geopolitical Tensions

Abstract

South Asia is dealing with geopolitical tension and uncertainty, leading to an oil price hike and causing worries about inflation in the region. This study examines the extent to which inflation in South Asia is driven by rising oil prices and exchange rates, and how much is offset by foreign exchange reserves and remittances. We used data from seven South Asian countries from 1990 to 2024 and applied specialised statistical methods that consider the differences between countries and their interconnections. Our results show three main results. First, when the exchange rate goes down, inflation goes up “for every 1 percent decrease in the exchange rate, inflation increases by 0.2 percent”. Second, foreign exchange reserves can contribute a little bit to reduce inflation, but only in certain situations. Third, if a country has a surplus in its current account, or if its deficit decreases, inflation goes down by a small amount, but this effect is not very strong. We also found that oil prices don’t have a direct and significant impact on domestic inflation, but after the global financial crisis, high oil prices started to put pressure on inflation and local currencies. Our findings suggest that central banks in South Asia should focus on keeping their exchange rates stability to control inflation during the oil shock period, as foreign exchange reserves and remittances contribute a smaller role.

Keywords: Inflation dynamics; Reserve, Exchange rate pass-through; remittances; Oil price shocks; South Asia.

JEL Codes: E31, F31, Q43, C33

1. Introduction

Global oil price shocks are considered as a major driver of inflation, defined as “when too much money chases too few goods”; however, its transmission mechanism is more complex than we often assume. Globally, oil price fluctuations may arise through supply or demand factors, and in either case, they may have asymmetric effects on domestic prices. First, positive shocks generally lead to stronger inflationary pressures compared to negative shocks (Nantob, 2025; Choi et al., 2017). In developing economies such as Asia or African regions, oil price volatility, global economic policy uncertainty and geopolitical issues are considered key external long-term inflation drivers and their impact is measured through several factors, including the share of transport in the consumer price index, energy subsidies, and exchange rate regimes (Hmadouch, 2024; Ha et al., 2023). Additionally, oil-importing countries have structural exposure to global commodity markets, which makes them vulnerable to external shocks. Exchange rate pass-through dynamics increase this vulnerability regularly (Al-Sawaie et al., 2025; Paul, 2025).

In South Asia, most of the economies, including Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka, face significant macroeconomic challenges, including exchange rate volatility, persistent inflation, and heavy reliance on oil imports. Exposure to crude oil price fluctuations has significant effects on GDP, inflation, and exchange rates; however, countries respond differently, depending on their unique economic structures and policy frameworks (Ahmad et al., 2022). Inflation in South Asia results from various factors, including domestic policies, external shocks, and structural issues, which require customised management strategies (Rana et al., 2025). On the other hand, exchange rate pass-through tends to be stronger in more vulnerable emerging markets due to dollarisation, and current account deficits exacerbate pass-through. Moreover, central bank forex reserve buffers and foreign direct investment (FDI) can be important factors in this regard (Kazdal & Yilmaz, 2021). Consistent inflows of remittances and stable foreign exchange reserves are crucial for managing balance of payments pressures and currency depreciation (Hmadouch, 2024; Ötoker et al., 2009). Despite these region-specific vulnerabilities in South Asia, a comprehensive analysis of “how oil price shocks and the exchange rate volatility affect inflation in South Asian countries” still has not been conducted within a unified panel framework.

The main issue of this paper is to identify the channels through which oil price shocks affect inflation. For example, such shocks can directly affect inflation through increasing fuel and transport costs. In the case of foreign currency, it can have an indirect effect through exchange rate depreciation, which increases import prices. Apart from distinguishing these pathways, policymakers might attribute inflation changes to global oil price spikes wrongly, leading to inappropriate policy responses (Ahmadov et al., 2018). Studies on Nepal, a single South Asian country, indicate that exchange rate depreciation affects inflation significantly; however, structural breaks and shifts in policy regimes complicate this analysis (Bhattarai et al., 2025). Other than South Asia, research on Algeria and Turkey shows that the significance of public spending, exchange rates, and money supply channels varies over time and depends on the merit, experience and model used (Mehibel et al., 2024; Tunc & Kilinc, 2018). These findings underscore the need for a unified empirical framework for the South Asian economy that estimates the impacts of

oil and exchange rates simultaneously. This framework must also consider all aspects that can affect, such as cross-sectional dependence and slope heterogeneity, which prior studies in South Asia have largely overlooked (Burdisso & Sangiácomo, 2016; Moon & Perron, 2014).

To address the research gap, this study asks three research questions. First, does the exchange rate channel outweigh the direct oil price channel in transmitting global energy shocks to domestic inflation in South Asia? Second, do international reserves and remittances provide significant inflationary buffers? Third, after controlling for exchange rates and reserves, do current account imbalances and US monetary policy have independent long-term effects? To answer these questions, we propose four hypotheses. First, exchange rate depreciation has a stronger long-term positive effect on inflation than direct oil price pass-through (H1). Second, higher reserves decrease inflation, although the effect may depend on the estimator used (H2). Third, remittance inflows do not exert significant inflationary pressure (H3). Fourth, a current account surplus slightly reduces inflation (H4).

By conducting the study, this research contributes to three key areas. First, it tests channel dominance between the exchange rate and direct oil in South Asia using a unified panel cointegration framework. Prior studies treat oil prices and exchange rates in isolation; however, in this paper, we directly compare their coefficients and examine robustness across estimators. Second, we employ second-generation panel estimators, which account for cross-sectional dependence and slope heterogeneity. Third, we quantify the buffer role of international reserves and test the remittance neutrality hypothesis. This provides policy-relevant evidence for central banks in the region. They challenge the conventional oil-centric inflation narrative and redirect policy focus toward exchange rate management and reserve adequacy.

We utilise annual panel data from 1990 to 2024 for seven South Asian countries. After confirming mixed integration orders from IPS and CIPS tests and establishing cointegration with the Kao test, we estimate long-run relationships using CCEMG and the Driscoll-Kraay estimator. Our findings indicate that a 1 percent exchange rate depreciation increases inflation by 0.2 percent in the CCEMG model. In contrast, oil price effects are not statistically significant, although they are relevant in the context of recent global geopolitical tension. International reserves reduce inflation only in the Driscoll-Kraay specification, with a coefficient of -0.002.

The remainder of this paper is organised as follows. Section 2 reviews the literature and develops hypotheses. Section 3 explains the data and methodology. Section 4 presents the empirical results. Section 5 discusses the findings. Section 6 concludes with policy implications and limitations.

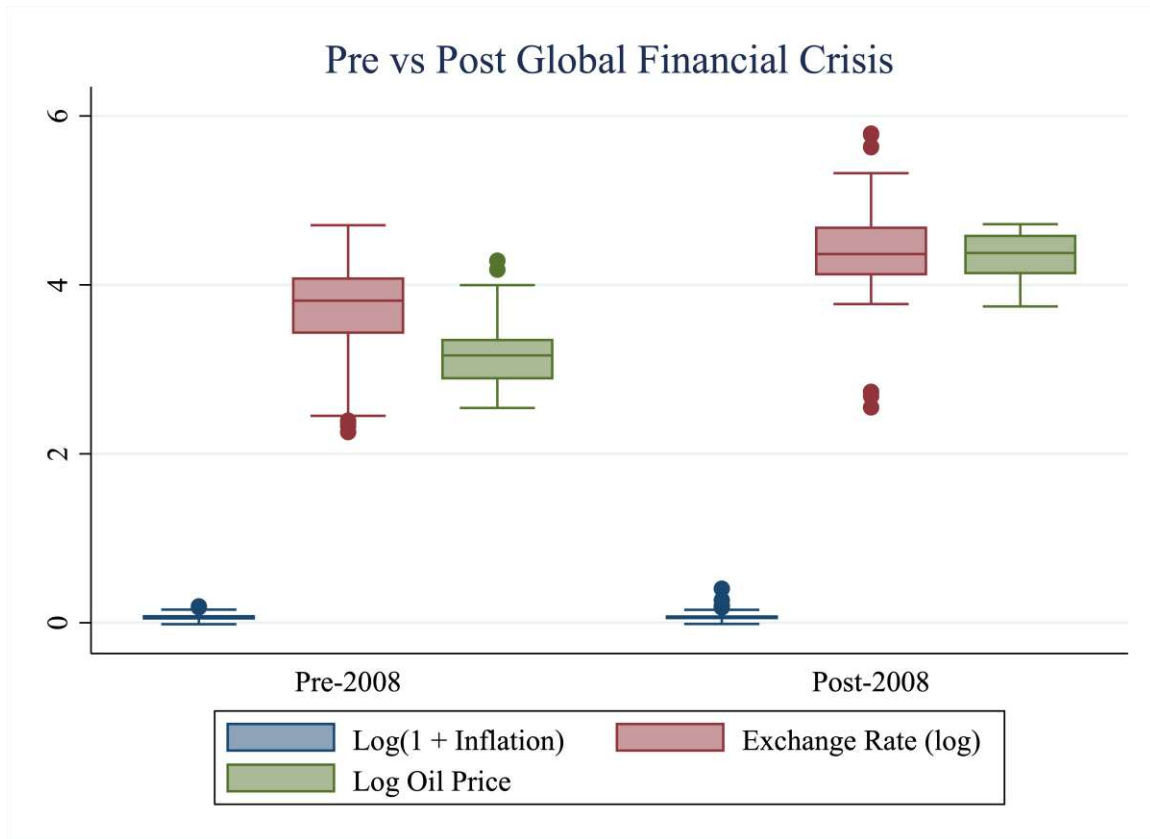


Figure 1. Pre- and Post-Global Financial Crisis Comparison
Source: Authors' calculations.

The Interconnected Trio: Inflation, Oil, and Currency. The figure suggests a clear transmission of shocks: “soaring oil prices” leading to “high domestic inflation” and then to “rapid currency depreciation”. A sharp rise in oil prices is followed by increasing domestic inflation and pressure on local currencies. The surge in oil prices in 2008 acted as a significant external shock. It contributed to a noticeable rise in inflation across South Asian economies. Rising inflation and deteriorating trade balances then exerted additional pressure on domestic currencies. As import costs rose, external imbalances widened, and currencies weakened further. This sequence demonstrates how external oil shocks can ripple through the economy and ultimately affect exchange rate stability in the region.

2. Literature Review and Hypotheses Development

2.1 Theoretical Framework and Contributions

This study is grounded in the exchange rate pass-through theory, which explains how exchange rate fluctuations impact domestic prices in the South Asian economy. Pass-through is often partial in many open economies, and its degree depends on factors such as the credibility of monetary policy, the share of tradable goods, and the persistence of shocks (Ortega & Osbat, 2020; Jamilov, 2013). Currency depreciation does not lead to higher import or consumer prices. In emerging markets, pass-through is typically more significant due to dollarisation, current account deficits, and lower reserve levels (Kazdal

& Yilmaz, 2021). Within this framework, the exchange rate directly affects inflation by increasing the local currency cost of imported goods, including oil. Therefore, the exchange rate pass-through theory provides a foundation for expecting a positive relationship between the exchange rate and inflation.

On the other hand, the balance of payments theory and the monetary approach to exchange rates have expanded this understanding. The monetary approach argues that balance of payments imbalances arise from differences between domestic and international currency demand and supply. These imbalances greatly influence exchange rate stability and capital flows (Diallo, 2025; Pramesti et al., 2024). This indicates that international reserves can serve as buffers against external shocks, in which higher reserves enabling central banks to stabilise the exchange rate and thus reduce inflationary pressures (Bianchi & Sosa-Padilla, 2020; Allegret & Allegret-Sallenave, 2018). Furthermore, remittance inflows influence inflation either through demand-side pressures or by stabilising household consumption and facilitating the import of cheaper goods (Dahal et al., 2019; Nguyen et al., 2023). Current account deficits can induce inflationary pressures through currency depreciation and higher import costs, and this impact may vary based on the context (Afonso et al., 2026; Animashaun & Mensah, 2024). Additionally, US monetary policy may impact South Asian inflation through global financial cycles, interest rate differentials, and volatility in capital flows; however, the extent of this transmission is debated (Bhattarai et al., 2017; Degaspero et al., 2020; Miranda-Agrippino et al., 2020).

Furthermore, US monetary policy is considered a control for global spillovers. Theory suggests that shifts in US interest rates influence global financial conditions, capital movements, and exchange rates. These effects can, in turn, impact inflation in emerging markets (Xu, 2024; Degaspero et al., 2020). Empirical evidence indicates that tightening US monetary policy results in currency depreciation, reduced capital inflows, and economic contraction in emerging economies (Bhattarai et al., 2017). The extent of spillovers varies depending on exchange rate regimes and capital controls (Lastauskas & Nguyen, 2024). Regarding South Asia, our preliminary findings show no significant impact of the US Federal Funds Rate on inflation. We include the US interest rate as a control variable without presuming a specific direction of effect. Nonetheless, we observe a lack of strong spillover effects.

Despite extensive research on inflation and exchange rates, there are also many limitations that persist. Many existing studies examine these determinants in isolation, overlooking the interaction between oil prices and exchange rates in the context of geopolitical shocks. Additionally, empirical results are mixed due to methodological differences and country-specific analysis. One specific point such as first-generation panel methods neglect cross-sectional dependence, whereas second-generation methods account for it. These limitations impede a thorough understanding of inflation drivers in South Asia and weaken the capacity to provide coherent policy advice. To address these research gaps, this study develops an integrated framework that simultaneously considers oil prices, exchange rates, reserves, remittances, the current account, and US interest rates. This approach examines channel dominance and employs robust estimators that are invariant to cross-sectional dependence and heterogeneity. This provides a more comprehensive and policy-relevant understanding of inflation dynamics in the region.

2.2 Hypotheses Development

2.2.1 Exchange Rate Pass-Through and Oil Price Effects

Oil price shocks influence inflation through two primary channels. The direct channel, first, operates through higher fuel and transportation costs, while the indirect channel, second, operates through exchange rate depreciation. According to the exchange rate pass-through theory, the indirect channel may dominate in net oil-importing countries with flexible exchange rates. However, empirical evidence is mixed, with some studies indicating that oil price shocks affect domestic prices significantly in transition economies, surpassing the effects of direct exchange rate changes (Jamilov, 2013). Other studies indicate that fluctuations in oil prices influence the US dollar exchange rate, thereby enhancing its predictability and subsequently impacting inflation in dollarised economies (Rasasi, 2018). In Türkiye, exchange rate increases lead to higher inflation, highlighting the importance of exchange rate stability in economies dependent on foreign currency (Naimoğlu, 2024). Nevertheless, these studies tend to focus on single-country analyses or fail to formally compare the relative sizes of the coefficients. Furthermore, structural dependency analyses suggest that the financial channel primarily transmits oil shocks through exchange rates (Ji et al., 2024). In South Asia, there is no existing research that has explicitly tested whether the exchange rate coefficient is larger and more significant than the oil price coefficient within a unified panel framework. Therefore, we hypothesise the following.

H₁: Exchange rate depreciation has a stronger positive long-run effect on inflation than direct oil price pass-through.

2.2.2 International Reserves as a Macroeconomic Stabiliser

Foreign exchange reserves act as a buffer against external shocks. They stabilise the exchange rate, provide liquidity during crises, and boost macroeconomic resilience; however, empirical evidence is varied in different reasons. Some studies indicate that reserve accumulation can decrease inflationary pressures in the short term by stabilising exchange rate fluctuations (Bianchi & Sosa Padilla, 2020; Crispolti & Tsibouris, 2012). However, other research contends that substantial reserve holdings may be inflationary if they result in monetary expansion (Kuncoro, 2024). In low-income countries, reserves have functioned as effective buffers, but their effect may be nonlinear and depend on the amount of accumulation (Allegret & Allegret-Sallenave, 2018). More recent evidence indicates that the inflationary effects of foreign exchange reserves depend on country-specific institutional and macroeconomic conditions, including exchange rate regimes, reserve adequacy, and monetary policy credibility (Oman, 2025). In South Asia, the role of reserves as an inflation buffer has not been tested using cross-sectionally dependent panel models. Our initial results suggest that the effect is sensitive to the estimator used. It is significant only in the Driscoll-Kraay model and not in the CCEMG model. Therefore, we hypothesise the following.

H₂: Higher international reserves decrease inflation, but the effect may be modest and reliant on estimators.

2.2.3 Remittances, Aggregate Demand, and Price Stability

Remittances can influence inflation through demand-side pressures, as they increase consumption. They can also affect inflation through supply-side effects, as they facilitate the import of cheaper goods. Empirical evidence shows that, in some instances, remittances decrease output volatility and support consumption smoothing without significantly impacting inflation (Emam, 2024; Sawadogo et al., 2025). In Nepal, remittances aid in controlling inflation by facilitating the import of more affordable goods (Dahal et al., 2019). Conversely, in SAARC countries, remittances have been associated with a modest long-term rise in inflation (Dahal et al., 2024). Other studies suggest that remittances can lower inflation in developing economies, suggesting that the impact depends on broader economic factors, including the money supply and trade openness (Nguyen et al., 2023). The remittance neutrality hypothesis finds support in The Gambia and Ecuador, where remittances mainly sustain consumption rather than investment (Minteh et al., 2025; Montalvo et al., 2026). In South Asia, despite substantial remittance inflows to Bangladesh, Nepal, and Pakistan, no research has yet tested remittance neutrality within a panel framework that accounts for cross-sectional dependence. Therefore, we hypothesise the following.

H₃: Remittance inflows do not have a significant long-run inflationary pressure in South Asia.

2.2.4 External Imbalances and Price Stability

Current account deficits can lead to inflationary pressures through currency depreciation and higher import costs. The extent of this pass-through depends on the exchange rate regime and the level of economic openness. Evidence shows that in emerging markets, current account deficits are linked to higher inflation due to substantial exchange rate pass-through (Kilinc et al., 2016). Conversely, in advanced economies, current account reversals often have a disinflationary effect (Afonso et al., 2026). The Greek case demonstrates that structural reforms and policy adjustments are vital for maintaining external sustainability and reducing inflationary impacts (Brissimis et al., 2012). In India, consistent current account deficits have historically resulted in macroeconomic instability, including inflationary pressures (Nexus between Current Account Balance, Price Stability, and Economic Growth in India, 2023). However, most studies either focus on individual countries or examine advanced economies. In South Asia, the long-term impact of current account balances on inflation has not been studied using panel cointegration methods that account for cross-sectional dependence. Therefore, we hypothesise the following.

H₄: A current account surplus, or a reduced deficit, reduces inflation slightly.

3. Methodology

3.1 Data and variable construction

We develop an annual panel dataset for seven South Asian countries: Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. The sample period spans from 1990 to 2024. All variables, except crude oil price and US federal funds rate, are obtained from the

World Bank's World Development Indicators (WDI), with the starting year chosen based on the availability of key macroeconomic data. The dataset is unbalanced, and after listwise deletion of missing observations for the seven core variables, the final sample comprises 224 country-year observations covering 35 years, forming a small-N, large-T panel. We recognise that the number of cross-sectional units is modest, but the estimators we employ are suitable for such data structures (Pesaran, 2006; Driscoll and Kraay, 1998).

The dependent variable is inflation, defined as the natural logarithm of one plus the annual CPI inflation rate. The transformation is:

$$\text{LINF}_{it} = \ln \left(1 + \frac{\text{CPI inflation}_{it}}{100} \right)$$

The shift by 1 avoids negative or zero values, since the raw inflation rate can be negative in some years. On the other hand, the independent variables are constructed as follows. The oil price is the natural logarithm of the Brent crude oil price in US dollars per barrel:

$$\text{LOIL}_t = \ln(\text{Brent oil price}_t)$$

Remittances are personal remittances received as a percentage of GDP, taken at level:

$$\text{REMIT_GDP}_{it} = \frac{\text{Remittances received}_{it}}{\text{GDP}_{it}} \times 100$$

Reserves are total foreign exchange reserves scaled by GDP, also expressed as a percentage:

$$\text{RES_GDP}_{it} = \frac{\text{Total reserves}_{it}}{\text{GDP}_{it}} \times 100$$

The exchange rate is the natural logarithm of the official exchange rate in local currency units per US dollar, taken as the period average:

$$\text{LEXR}_{it} = \ln(\text{Official exchange rate}_{it})$$

The current account balance is expressed as a percentage of GDP, measured at the national level. The US Federal Funds Rate signifies the annual average rate, also measured at the national level. All variable definitions, sources, and transformations are summarised in Table 1.

Table 1. Variable Definition and Construction

Variable	Definition	Source	Transformation
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LINF	Log(1 + CPI inflation)	World Bank, WDI	Log
LOIL	Log crude oil price (Brent)	World Bank, Pink Sheet	Log
REMIT_GDP	Remittances received (% of GDP)	World Bank, WDI	Level
RES_GDP	Total reserves (% of GDP)	World Bank, WDI	Ratio
LEXR	Log official exchange rate (LCU/USD)	World Bank, WDI	Log
CAB_GDP	Current account balance (% of GDP)	World Bank, WDI	Level
FFR	US Federal Funds Rate (%)	Federal Reserve	Level

Note: Annual panel data for 7 South Asian countries (1990-2024). Unbalanced panel, N=224 after listwise deletion.

3.2 Econometric strategy

We specify a long-run relationship where inflation depends on oil prices, remittances, reserves, the exchange rate, the current account balance, and the US interest rate. The functional form for the country in year is:

$$\text{LINF}_{it} = f(\text{LOIL}_t, \text{REMIT_GDP}_{it}, \text{RES_GDP}_{it}, \text{LEXR}_{it}, \text{CAB_GDP}_{it}, \text{FFR}_t)$$

3.2.1 Panel diagnostic tests

Before estimation, we conduct a series of diagnostic tests to determine the appropriate panel methods.

(i) Cross-section dependence is evaluated using the Pesaran CD test (Pesaran, 2004). The null hypothesis posits that residuals are cross-sectionally independent. Rejection indicates that a shock in one country affects others, which is plausible in South Asia due to trade, financial, and remittance linkages. The test statistic is:

$$\text{CD} = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij} \right)$$

where $\hat{\rho}_{ij}$ is the sample estimate of the pairwise correlation of residuals.

(ii) Slope heterogeneity is tested using the Pesaran and Yamagata (2008) delta test. The null hypothesis states that slope coefficients are consistent across countries. Rejection implies that estimators accommodating heterogeneous slopes, such as the Common Correlated Effects Mean Group (CCEMG) estimator, are more suitable than pooled methods. The test statistic is:

$$\tilde{\Delta} = \sqrt{N} \left(\frac{N^{-1}\tilde{S} - k}{\sqrt{2k}} \right)$$

where $\tilde{S}$ is the modified Swamy statistic and k is the number of regressors.

(iii) Serial correlation is tested with the Wooldridge test for panel data (Wooldridge, 2002). The null hypothesis is that there is no first-order autocorrelation. The test involves regressing residuals from a fixed effects model on their lagged values.

$$\hat{\varepsilon}_{it} = \rho \hat{\varepsilon}_{i,t-1} + \eta_{it}$$

The null hypothesis $H_0: \rho = 0$ is tested with an F-statistic.

(iv) Heteroskedasticity is evaluated using the modified Wald test for groupwise heteroskedasticity, performed after a fixed effects regression. The null hypothesis assumes uniform variance across groups. The test statistic is:

$$W = \sum_{i=1}^N \frac{(\hat{\sigma}_i^2 - \hat{\sigma}_{\text{pooled}}^2)^2}{\hat{\sigma}_i^4}$$

where $\hat{\sigma}_i^2$ is the estimated error variance for group i . The statistic follows a chi-squared distribution with N degrees of freedom.

(v) Multicollinearity is assessed by calculating the variance inflation factor (VIF) from a pooled OLS regression. A VIF below 5 is considered acceptable, indicating that multicollinearity does not significantly distort coefficient estimates.

3.2.2 Panel unit root tests

We test for unit roots to verify that no variable is integrated of order two, $I(2)$. The CCEMG and Driscoll-Kraay estimators are appropriate for mixed $I(0)$ and $I(1)$ processes. We use two types of tests. The first-generation test is the Im-Pesaran-Shin (IPS) test (Im, Pesaran, and Shin, 2003). The individual ADF regression for each panel unit is:

$$\Delta y_{it} = \alpha_i + \rho_i y_{i,t-1} + \sum_{j=1}^p \phi_{ij} \Delta y_{i,t-j} + \varepsilon_{it}$$

The null hypothesis is that all panels contain a unit root ($\rho_i = 0$ for all i). We select one lag based on the Akaike Information Criterion, given the small sample. The second-

generation test is the Pesaran CIPS test (Pesaran, 2007), which addresses cross-sectional dependence by including cross-sectional averages of lagged levels and first differences in the ADF regression. The augmented test equation is:

$$\Delta y_{it} = \alpha_i + \rho_i y_{i,t-1} + \sum_{j=1}^p \phi_{ij} \Delta y_{i,t-j} + \gamma_i \bar{y}_{t-1} + \sum_{j=0}^p \delta_{ij} \Delta \bar{y}_{t-j} + \varepsilon_{it}$$

where $\bar{y}_t = \frac{1}{N} \sum_{i=1}^N y_{it}$. If a variable is non-stationary at level but stationary at first difference, we classify it as I(1). Mixed integration is permissible in our estimation framework.

3.2.3 Panel cointegration test

We evaluate a long-run equilibrium relationship using the Kao residual cointegration test (Kao, 1999). The test is based on residuals from a pooled regression of the dependent variable on the independent variables. The null hypothesis indicates no cointegration. We present the modified Dickey-Fuller t statistic, the Dickey-Fuller t statistic, and the augmented Dickey-Fuller t statistic. Rejecting the null in at least two of these tests provides evidence of a long-run relationship.

3.3 Primary Model of this Paper: CCEMG

We choose the Common Correlated Effects Mean Group estimator proposed by Pesaran (2006) for three main reasons. First, it is robust to cross-sectional dependence, as our diagnostic tests confirm. Second, it allows slope coefficients to differ across countries, which is reasonable given that each South Asian economy has its own policy framework, trade patterns, and institutional setup. Third, it is compatible with mixed integration orders and does not require a common error correction term. This estimator is especially suitable for panels where N is small relative to T, as in our sample. The CCEMG estimator accounts for unobserved common factors, such as global oil prices or US monetary policy, by augmenting the country-specific regression with cross-sectional averages of the dependent and independent variables. The country-specific equation is:

$$\text{LINF}_{it} = \alpha_i + \beta_{1i} \text{LOIL}_t + \beta_{2i} \text{REMIT_GDP}_{it} + \beta_{3i} \text{RES_GDP}_{it} + \beta_{4i} \text{LEXR}_{it} \\ + \beta_{5i} \text{CAB_GDP}_{it} + \beta_{6i} \text{FFR}_t + \gamma_{1i} \bar{Y}_t + \gamma_{2i} \bar{X}_t + \varepsilon_{it}$$

where $\bar{Y}_t = \frac{1}{N} \sum_{i=1}^N \text{LINF}_{it}$ and $\bar{X}_t$ is a vector of cross-sectional averages of all independent variables. The mean group coefficients are computed as the simple average of the country-specific coefficients, for example:

$$\beta_1 = \frac{1}{N} \sum_{i=1}^N \beta_{1i}$$

We estimate the model using the xtmg command with the cce option in Stata.

3.4 Model 2: Driscoll-Kraay fixed effects (Robustness check)

We utilise Driscoll-Kraay standard errors (Driscoll and Kraay, 1998) as a robustness check. This estimator employs a fixed effects panel regression and adjusts the standard errors for cross-sectional and time dependence. It is less flexible than CCEMG because it assumes slope coefficients are equal across countries. However, it provides a useful comparison. If the sign and significance of the coefficients are consistent across both estimators, our confidence in the results increases. If some coefficients differ, we regard this as estimator sensitivity and discuss it openly. The fixed effects regression is specified as:

$$\text{LINF}_{it} = \alpha_i + \beta_1 \text{LOIL}_t + \beta_2 \text{REMIT_GDP}_{it} + \beta_3 \text{RES_GDP}_{it} + \beta_4 \text{LEXR}_{it} + \beta_5 \text{CAB_GDP}_{it} + \beta_6 \text{FFR}_t + \varepsilon_{it}$$

We then compute Driscoll-Kraay standard errors with a maximum lag of three, chosen to account for potential autocorrelation up to three years. The Driscoll-Kraay covariance matrix estimator is:

$$\hat{V}(\hat{\beta}) = (X'X)^{-1} \hat{S}_T (X'X)^{-1}$$

where $\hat{S}_T$ is a heteroskedasticity and autocorrelation consistent estimator that averages across cross-sections.

3.5 Additional diagnostic considerations

We consider two potential concerns raised in the literature. First, the possibility of structural breaks. The sample period from 1990 to 2024 includes several global and regional events, such as the 1997 Asian financial crisis, the 2008 global financial crisis, the 2014 oil price crash, and the COVID-19 pandemic. We do not impose an ad hoc structural break dummy because the CCEMG estimator is robust to unknown common breaks through its use of cross-sectional averages. As a supplementary check, we re-estimate the model on a post-2000 subsample to assess whether the coefficients are stable. The results are shown in the robustness section. Second, the small cross-section dimension ($N=7$). We acknowledge that this is modest. However, Monte Carlo simulations by Pesaran (2006) and Chudik and Pesaran (2013) demonstrate that the CCEMG estimator performs well for N as low as 5 when T is at least 20. Our T is 35, so the estimator remains reliable. The Driscoll-Kraay estimator does not depend on asymptotic N ; it employs a non-parametric correction that is valid for fixed N and large T .

4. Results

This section presents empirical results, starting with summary statistics before showing the main estimation outcomes. Table 2 displays summary statistics. Inflation averages 0.069 (log form), and the log of oil prices averages 3.809. Remittances account for 5.5 percent of

GDP, while reserves constitute 14.8 percent of GDP. The log-average exchange rate is 3.974. The current account averages -4.6 percent of GDP. The US interest rate averages 2.68 percent.

Table 2. Summary Statistics (Panel: South Asia, 1990-2024)

Variable	Obs	Mean	Std. Dev.	Min	Max
Log(1 + Inflation)	224	0.069	0.046	-0.017	0.404
Log Oil Price	224	3.809	0.672	2.543	4.718
Remittances (% GDP)	224	5.524	6.214	0.077	27.626
Reserves (% GDP)	224	14.849	12.485	1.756	66.917
Log Exchange Rate	224	3.974	0.762	2.257	5.792
Current Account (% GDP)	224	-4.601	7.590	-35.748	10.043
US Interest Rate	224	2.677	2.291	0.080	8.100

Note: Based on panel dataset (7 countries, 1990-2024). No missing values after cleaning.

Table 3 displays correlations. Here, inflation is weakly linked to oil price (0.07) and negatively correlated with reserves (-0.20). Variance inflation factors are all below 2, with an average of 1.60. Multicollinearity is not a concern.

Table 3. Correlation Matrix and Multicollinearity

Variable	(1)	(2)	(3)	(4)	(5)	(6)
(1) Inflation	1.00					
(2) Oil Price	0.07	1.00				
(3) Remittances	0.10	0.29***	1.00			
(4) Reserves	-0.20***	0.27***	0.12	1.00		
(5) Exchange Rate	0.28***	0.36***	0.55***	0.02	1.00	
(6) Current Account	0.15**	-0.16**	0.37***	-0.37***	0.35***	1.00
(7) US Interest Rate	0.10	-0.58***	-0.23***	-0.27***	-0.28***	0.10

Note: VIF Results: Mean VIF = 1.60. No multicollinearity concerns (VIF < 5).

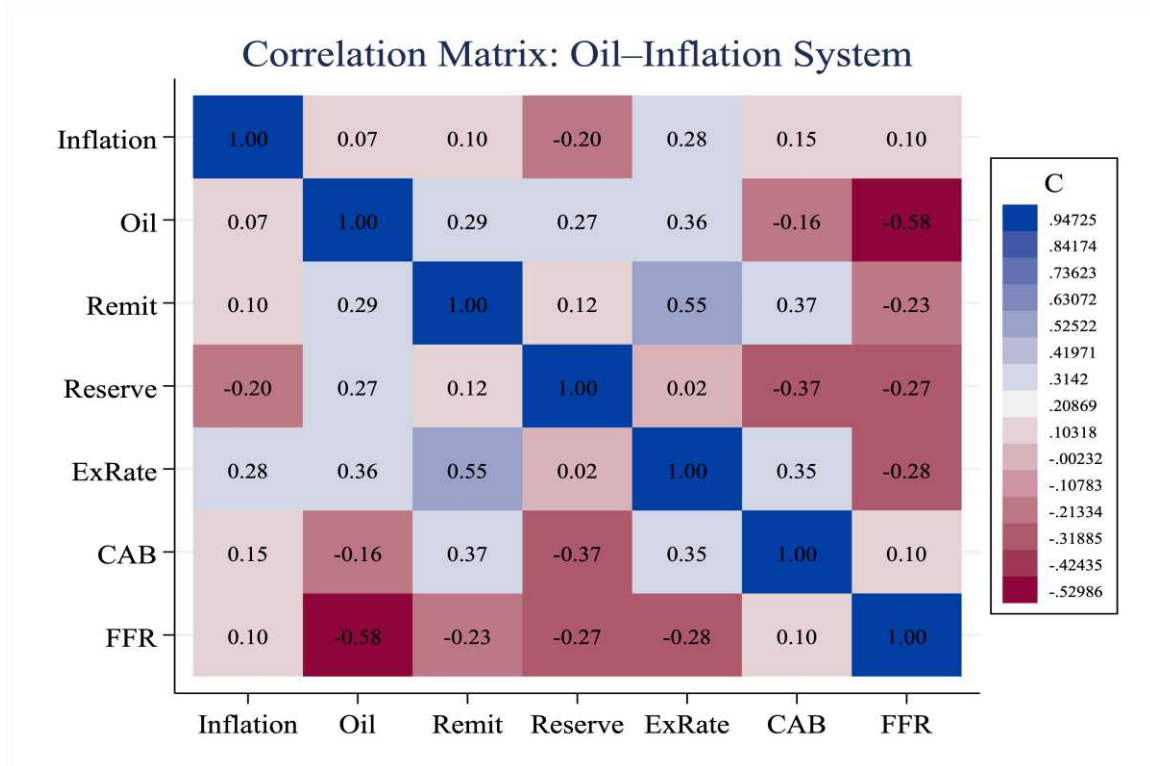


Figure 2. Correlation Matrix of the Oil-Inflation System

Source: Authors' calculations.

The figure shows the pairwise correlations among inflation, oil prices, remittances, reserves, exchange rates, the current account balance, and US interest rates. Inflation is more strongly associated with exchange rate movements than with oil prices. Oil shows a weak direct correlation with inflation but has stronger links to exchange rates and external variables. Overall, the correlations are moderate, indicating no significant multicollinearity issues.

Table 4 presents diagnostic tests. The Pesaran CD test rejects cross-sectional independence (statistic -2.765, $p=0.006$). The slope heterogeneity test rejects homogeneity ($\Delta=4.709$, $p=0.000$). The Wooldridge test does not detect serial correlation ($F=2.163$, $p=0.192$). The modified Wald test indicates heteroskedasticity ($\chi^2=247.78$, $p=0.000$). These results support the use of second-generation estimators (CCEMG) that account for cross-sectional dependence and slope heterogeneity.

Table 4. Panel Diagnostic Tests

Test	Statistic	p-value	Conclusion
Pesaran CD	-2.765	0.006	Cross-sectional dependence
Slope Heterogeneity (Δ)	4.709	0.000	Heterogeneous slopes
Adj. Δ	5.438	0.000	-
Wooldridge Test	2.163	0.192	No serial correlation
Modified Wald	247.78	0.000	Heteroskedasticity
Mean VIF	1.60	-	No multicollinearity

Note: Presence of cross-sectional dependence and heterogeneity justifies second-generation estimators (CCEMG, AMG).

Table 5 presents the results of unit root tests. Inflation and the current account are I(0), while oil prices, remittances, reserves, and the exchange rate are I(1). The US interest rate is I(1) according to most evidence. Mixed integration is acceptable for the CCEMG estimator.

Table 5. Panel Unit Root Tests (IPS & CIPS)

Variable	IPS Stat	p-value	CIPS Stat	p-value	Order
Inflation (LINF)	-3.191	0.001	-3.066	0.000	I(0)
Oil Price (LOIL)	-0.116	0.454	1.700	1.000	I(1)
Remittances	0.777	0.781	-2.018	0.822	I(1)
Reserves	-1.602	0.055	-1.799	0.471	I(1)
Exchange Rate	2.793	0.997	-1.754	0.521	I(1)
Current Account	-3.619	0.000	-2.437	0.033	I(0)
FFR	-3.756	0.000	2.610	1.000	I(0)/I(1)

Note: Mixed integration supports ARDL/PMG framework.

Table 6 presents the Kao cointegration test. The modified Dickey-Fuller statistic is -3.135 ($p=0.001$), and the Dickey-Fuller statistic is -4.066 ($p=0.000$), indicating rejection of no cointegration. The augmented Dickey-Fuller is -1.482 ($p=0.069$). We find evidence of a long-run relationship.

Table 6. Panel Cointegration Test (Kao)

Test	Statistic	p-value
Modified DF	-3.135	0.001
DF	-4.066	0.000
ADF	-1.482	0.069

Note: Evidence of long-run cointegration among variables.

Table 7 shows the long-run estimates. In the CCEMG model, the exchange rate coefficient is 0.200 and significant at the 1 per cent level. A 1 per cent depreciation of the local currency is linked to a 0.2 per cent increase in inflation. The oil price coefficient is 0.004 and not significant. Remittances are not significant (-0.009). Reserves are not significant (-0.001). The current account coefficient is -0.004, significant at the 10 per cent level. The US interest rate is close to zero and not significant.

Table 7. Long-Run Estimates (CCEMG & Driscoll-Kraay)

Variable	CCEMG	Driscoll-Kraay
Oil Price	0.004 (ns)	0.015 (ns)
Remittances	-0.009 (ns)	0.001 (ns)

Reserves	-0.001 (ns)	-0.002**
Exchange Rate	0.200***	-0.001 (ns)
Current Account	-0.004*	0.001 (ns)
FFR	0.000 (ns)	0.003 (ns)

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$, ns = not significant CCEMG accounts for cross-sectional dependence. Driscoll-Kraay provides robust standard errors.

In the Driscoll-Kraay model, the exchange rate coefficient is -0.001 and not statistically significant. The oil price coefficient remains insignificant at 0.015. Remittances are also insignificant at 0.001. Reserves have a coefficient of -0.002, which is significant at the 5 per cent level. The current account (0.001) and the US interest rate (0.003) are not significant.

Table 8 summarises hypothesis testing. The exchange rate channel dominates direct oil price pass-through. Oil price effects are not significant. Reserves reduce inflation only in the Driscoll-Kraay model, so the buffer role is dependent on the estimator. Remittances have no significant long-run effect. Current account improvements only weakly lower inflation in the CCEMG model. US interest rates do not spill over robustly.

Table 8. Hypothesis Testing Synthesis - Support Assessment

Hypothesis	Description	CCEMG	DKSE	Support
H ₁	Exchange rate depreciation has a stronger positive effect on inflation than direct oil prices.	Significant (+) ***	Insignificant (-)	Yes (CCEMG)
H ₂	Higher international reserves decrease inflation (buffer role).	Insignificant (-)	Significant (-)**	Partial (DKSE)
H ₃	Remittance inflows do not exert significant inflationary pressure (neutrality).	Insignificant (-)	Insignificant (+)	Yes (Robust null)
H ₄	Current account surplus (or reduced deficit) reduces inflation.	Significant (-)*	Insignificant (+)	Partial (CCEMG)

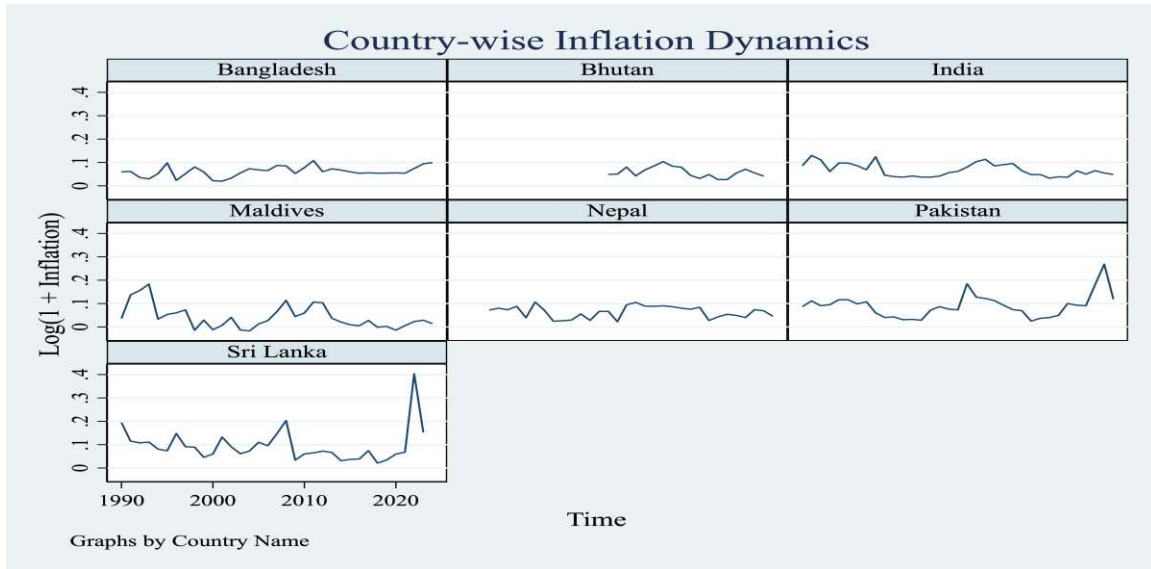


Figure 3. Country-wise Inflation Dynamics
Source: Authors' calculations.

Note: The figure illustrates inflation trends across South Asian countries over time. Inflation dynamics differ significantly, with episodes of volatility in countries such as Pakistan and Sri Lanka. Other economies exhibit relatively stable patterns. This heterogeneity justifies the use of estimators that account for country-specific effects.

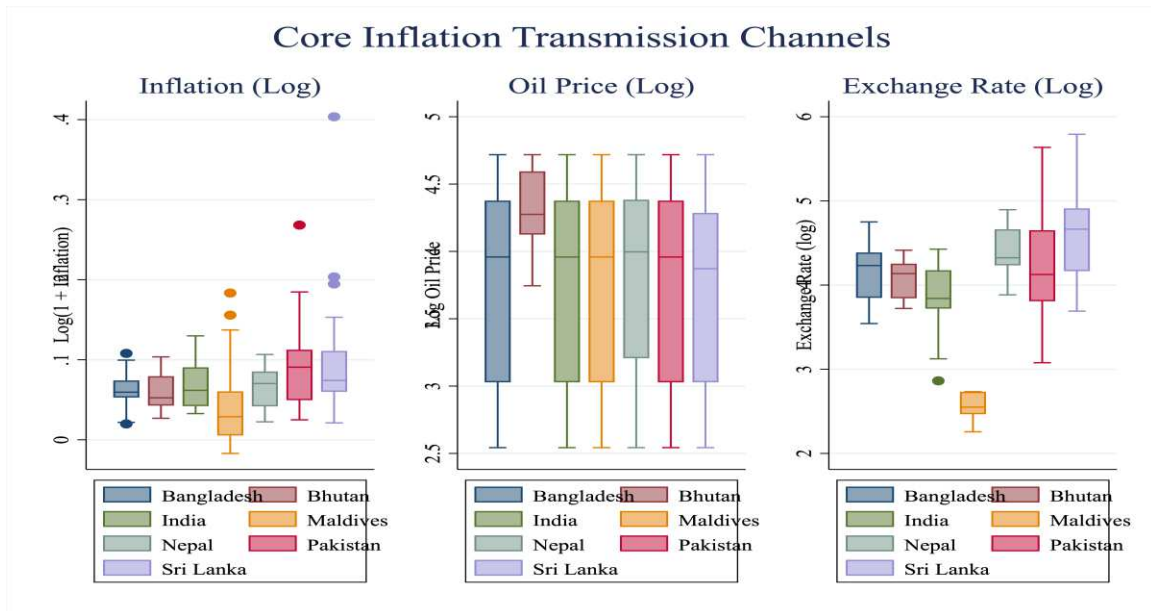


Figure 4. Core Inflation Transmission Channels
Source: Authors' calculations.

Boxplots show the distribution of inflation, oil prices, and exchange rates across countries. Exchange rates display more variability than oil prices, indicating diverse currency

behaviours. Inflation variability correlates more strongly with exchange rate movements than with oil price changes.

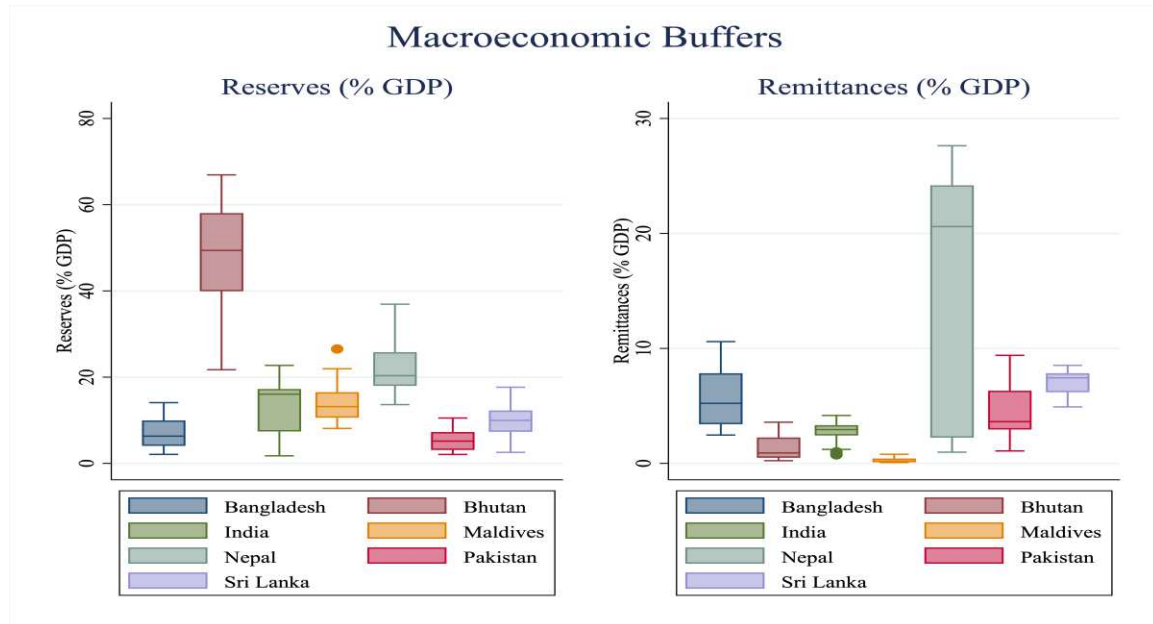


Figure 5. Macroeconomic Buffers: Reserves and Remittances
Source: Authors' calculations.

The figure illustrates the distribution of reserves and remittances across countries. Remittances show considerable variation, reflecting uneven dependence. Reserves are more stable but differ among economies. Their stabilising impact appears modest and varies.

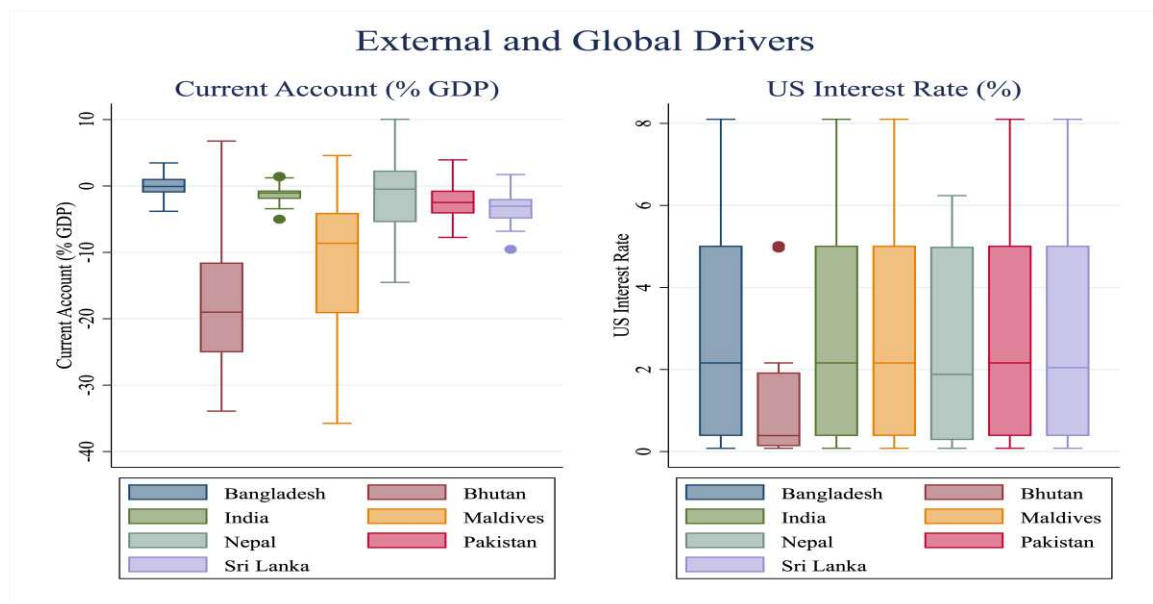


Figure 6. External and Global Drivers
Source: Authors' calculations.

Boxplots illustrate current account balances and US interest rates. External balances vary significantly across countries, while US interest rates exhibit limited variation. This suggests that domestic external conditions differ considerably despite shared global financial influences.

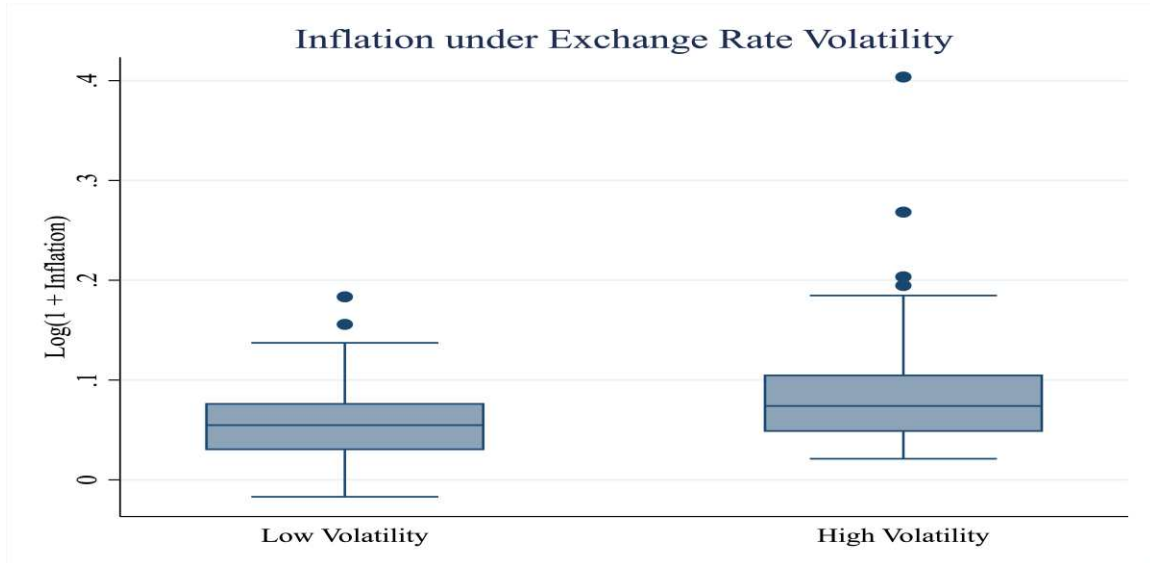


Figure 7. Inflation under Exchange Rate Volatility

Source: Authors' calculations.

Inflation dispersion increases with high exchange-rate volatility. This highlights the presence of exchange rate pass-through effects and emphasises the importance of currency stability in managing inflation.

5. Discussion

The results indicate that exchange rate depreciation is the primary channel through which inflation is transmitted in South Asia, whereas the direct pass-through from oil prices is not significant.

Nonetheless, oil prices are significant due to ongoing geopolitical tensions and war-related volatility. This finding aligns with studies on Nepal (Bhattarai et al., 2025) and Turkey (Naimoğlu, 2024), which show that exchange rate movements greatly influence domestic prices. It challenges the traditional view that focuses solely on global oil shocks as the main cause (Choi et al., 2017).

One possible explanation is that South Asian governments often subsidise fuel prices or enforce price controls, which reduces the immediate pass-through of oil price changes (Hmadouch, 2024). However, exchange rate depreciation increases the local currency costs of all imported goods, including oil, food, and intermediates, functioning as a broader and more potent channel.

The reserve buffer effect manifests only in the Driscoll-Kraay model, not in the more flexible CCEMG specification, suggesting that the impact of reserves on inflation is moderate and varies across approaches to addressing cross-sectional dependence. Allegret and Allegret-Sallenave (2018) also found that the buffer role of reserves can be nonlinear and context-dependent. In South Asia, reserves may help stabilise the exchange rate in the short term, but their direct long-term impact on inflation seems limited.

Remittances do not show significant inflationary pressure, consistent with findings from Nepal (Dahal et al., 2019) and The Gambia (Minteh et al., 2025). This suggests that large remittance inflows to Bangladesh, Nepal, and Pakistan do not necessarily cause demand-driven inflation, possibly because they lead to increased imports of cheaper goods or are allocated towards savings and asset purchases rather than immediate consumption. The marginal negative impact of current account surpluses on inflation aligns with economic theory but is inconsistent across different estimators.

The lack of US interest rate spillovers indicates that domestic factors and regional dynamics primarily drive inflation in South Asia. This supports the notion that emerging markets with managed exchange rates can somewhat shield themselves from global monetary cycles (Lastauskas & Nguyen, 2024).

Lastly, the limitations should be acknowledged, such as the sample including only seven countries and annual data, which may not capture short-term fluctuations. The cross-sectional size is small, although the estimators are appropriate for such panels. The results are specific to South Asia and may not be applicable to other regions. Future research could use quarterly data or expand the sample to include other emerging economies. Despite these limitations, the findings clearly show that exchange rate management, rather than oil price targeting, should be the main policy tool for controlling inflation in South Asia.

6. Conclusion and policy implications

This paper uncovers a distinctive pattern in South Asian inflation dynamics. The exchange rate channel surpasses the direct oil price channel, while remittances are neutral and reserves offer only a limited, estimator-dependent buffer. These findings challenge the conventional view that global oil shocks are the primary cause of inflation in net oil-importing regions.

Our key findings are threefold. First, exchange rate depreciation has a strong positive long-run effect on inflation, with a 1 percent depreciation raising inflation by 0.2 percent in the CCEMG model. Direct oil price pass-through is not significant but remains highly relevant given current geopolitical tensions and war-driven volatility in oil prices. Second, international reserves decrease inflation only in the Driscoll-Kraay specification and not in the more adaptable CCEMG model, indicating that the buffer role is limited and inconsistent. Remittances do not have a significant inflationary effect in either estimator. Third, improvements in the current account slightly reduce inflation, but US interest rates do not spill over into the region.

These results imply several policy implications for South Asian central banks and finance ministries. First, managing the exchange rate should be the primary tool for controlling inflation. Policymakers should avoid large and rapid depreciations. A managed float with active intervention during volatile periods is advisable. Second, reserve accumulation acts mainly as a secondary buffer. Maintaining reserves above traditional thresholds (for example, three months of imports) is advantageous, but reserves cannot replace exchange rate stability. Third, fuel price subsidies or tax adjustments do not need to be fully aligned with global oil prices, given the weak direct pass-through. However, indirect effects through exchange rates are important. Fourth, remittance inflows do not raise inflation concerns. Governments can continue encouraging remittances without fearing they will cause price pressures.

Future research could build on this study in three ways. Researchers might explore the same channel dominance hypothesis in other net oil-importing regions, such as Sub-Saharan Africa or Latin America, using similar second-generation panel methods. Quarterly or monthly data could uncover short-term dynamics that annual data might miss. Including domestic monetary policy rates from South Asian countries would provide a more comprehensive model of inflation determination. Ultimately, this paper presents a puzzle for future investigation: “If exchange rate depreciation is the main channel, why does direct oil price pass-through remain insignificant even in countries without fuel subsidies?”

Statements and Declarations

Data Availability

The raw panel data are publicly available from the World Development Indicators (WDI) and the Worldwide Governance Indicators (WGI). The cleaned dataset, construction codebook, and replication scripts are available from the corresponding author upon reasonable request.

Competing Interests

The author declares no competing interests.

Funding

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Data Availability

All data are publicly available. Inflation, remittances, reserves, exchange rates, and current-account balance were obtained from the World Bank's World Development Indicators: <https://databank.worldbank.org/source/world-development-indicators>. Brent crude oil prices were obtained from the World Bank's Commodity Markets Pink Sheet: <https://www.worldbank.org/en/research/commodity-markets>. The US Federal Funds Rate was obtained from the Federal Reserve Bank of St. Louis FRED database: <https://fred.stlouisfed.org/series/FEDFUNDS>.

Ethics Approval

Not applicable. This study used secondary aggregate data and did not involve human or animal subjects.

Consent to Participate

Not applicable.

Consent for Publication

Not applicable.

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