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Remittances and Trade Deficit in Nepal: A VECM Analysis of Long-Run and Short-Run Dynamics

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Abstract

Background: Remittances constitute a vital source of foreign exchange for Nepal, accounting for 25–30 percent of GDP. Despite substantial inflows, the country continues to experience a persistent and widening trade deficit, presenting a paradox that warrants empirical investigation.

Objective: This study examines the long-run and short-run dynamics between remittance inflows, merchandise imports, and the merchandise trade deficit in Nepal, addressing three key questions: the long-run relationship between remittances and imports; the long-run and short-run relationship between remittances and the trade deficit; and the adjustment mechanisms toward equilibrium.

Methods: Using annual time-series data from 1990 to 2022, the study employs the Johansen cointegration test and Vector Error Correction Model (VECM) to capture both short-run dynamics and long-run equilibrium relationships. All variables were transformed into natural logarithms and tested for stationarity using the Augmented Dickey–Fuller test.

Findings: Results reveal that all variables are integrated of order one. A 1 percent increase in remittances leads to approximately a 1.05 percent increase in imports in the long run, indicating substantial import leakage. Remittances exhibit opposing effects on the trade deficit: a slight short-run reduction (−0.0357%) followed by a long-run widening (+0.0587%). Diagnostic tests confirm model reliability with no serial correlation or heteroskedasticity.

Conclusion: The findings provide indirect evidence of Dutch Disease effects, where remittance inflows appreciate the real exchange rate, making exports less competitive while stimulating import demand. Policy recommendations include enhancing domestic absorptive

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capacity, encouraging productive investment of remittances, and integrating remittance policies with broader development planning.

Novelty: This study contributes to the literature by using the most recent data (1990–2022), employing VECM to capture both short-run and long-run dynamics, separately analyzing remittances–imports and remittances–trade deficit relationships, and providing updated policy recommendations tailored to Nepal's current economic context.

Keywords: Dutch Disease, imports, Nepal, remittances, trade deficit

I. Introduction

Remittances have become a vital source of foreign exchange for many developing countries, supporting household incomes, poverty reduction, and overall economic stability. However, despite significant inflows, several countries continue to experience persistent trade deficits, highlighting a complex remittance-trade nexus that warrants closer examination.

Nepal is one of the most remittance-dependent economies in the world, with migrant remittances accounting for about 25–30 percent of GDP (World Bank, 2024). While these inflows have improved household consumption and poverty outcomes, the country's trade deficit has remained persistent and continues to widen. Structural challenges, such as its landlocked geography, high import dependency, and limited export base, exacerbate this imbalance, constraining the economy's ability to translate remittance inflows into external trade stability (see Appendix 1, Figure 1). This paradox raises a critical question: why does Nepal's trade deficit persist despite the benefits of remittance inflows? Although prior studies have explored the impact of remittances on consumption, investment, and poverty alleviation, the relationship between remittances and the trade deficit—particularly the mechanisms linking inflows to imports, exports, and the balance of trade—remains underexplored.

This study aims to fill this gap by addressing the following research questions:

1. What is the long-run relationship between remittance inflows and merchandise imports in Nepal?
2. What is the long-run and short-run relationship between remittance inflows and the merchandise trade deficit?
3. How do deviations from long-run equilibrium adjust over time?

The findings are expected to provide policymakers with evidence on how remittances can be leveraged to reduce trade imbalances and promote sustainable economic growth. The paper is structured as follows: Section I Introduction; Section II literature review, Section III outlines the methodology, IV result and discussion, and Section V concludes with recommendations.

II. Literature Review

The relationship between remittance inflows and trade deficits has been widely discussed in the context of developing countries, including Nepal. Several studies have examined the direct impact of remittances on imports and trade balances. Bhatta (2013), Sunuwar (2016), Karki (2017), and Acharya (2018) consistently find that remittances increase imports, thereby

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widening the trade deficit. While the magnitude of these effects varies across studies, Bhatta (2013) estimated that the long-run elasticity of imports with respect to remittances is 0.87, indicating that a 1percent increase in remittances raises imports by 0.87 percent.

Another perspective in the literature involves the Dutch Disease arguments, which explain how remittance inflows can affect the broader economy. Paudel & Bhusal (2021) argue that remittances negatively impact exports by causing currency appreciation, making Nepalese exports less competitive. Similarly, Ucler & Özşahin (2017) suggest that remittances increase household consumption of imported goods, reinforcing trade deficits. In contrast, Hien (2017) finds no Dutch Disease effects in Malaysia, highlighting the importance of local structural and economic contexts in moderating these outcomes.

Beyond remittances, other studies highlight additional determinants of trade deficits. Silwal (2008) emphasizes geopolitical challenges and economic policies, while Mahat (2015) identifies geographical constraints and political instability as key contributors to Nepal's persistent trade imbalance. These findings suggest that remittances interact with broader structural factors, and understanding this nexus requires both macroeconomic and microeconomic analysis.

The literature also draws on several theoretical frameworks to explain these dynamics. The Dutch Disease Theory posits that remittance inflows increase domestic demand, leading to currency appreciation, which makes exports less competitive and imports cheaper, thereby worsening the trade deficit. The Consumption Smoothing Hypothesis suggests that remittances increase household disposable income, which is often spent on imported goods, particularly in countries with limited domestic production capacity. The Permanent Income Hypothesis further argues that when remittances are perceived as permanent income, they sustain higher levels of consumption, including imports, over time.

While previous studies have examined the remittance–trade deficit nexus in Nepal using various methodologies (Bhatta 2013; Acharya 2018), most rely on older data and simpler econometric techniques. This study contributes to the literature by: (1) using the most recent data available (1990–2022); (2) employing a Vector Error Correction Model (VECM) to capture both short-run and long-run dynamics; (3) separately analyzing remittances–imports and remittances–trade deficit relationships; and (4) providing updated policy recommendations tailored to Nepal's current economic context.

III. Research Methodology

This study examines the relationship between remittance inflows, merchandise imports, and the merchandise trade deficit in Nepal using annual time-series data for the period 1990–2022. The data were obtained from reliable secondary sources, including the World Bank and Nepal Rastra Bank (NRB). The analysis focuses on three key macroeconomic variables: remittance inflows, merchandise imports, and the merchandise trade deficit.

3.1 Variable Definitions

Table 1 below presents the definitions of the variables used in the analysis

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Table 1: Variable Definitions

Variable	Definition	Source	Measurement
REM	Personal remittances received	World Bank / NRB	NPR millions
IMP	Merchandise imports of goods	NRB	NPR millions
TD	Merchandise trade deficit (Imports – Exports)	NRB	NPR millions

Note: To interpret the coefficients as elasticities and reduce heteroskedasticity, all variables are transformed into natural logarithms.

To interpret the coefficients as elasticities and reduce heteroskedasticity, all variables are transformed into natural logarithms.

3.2 Unit Root Test

Since time-series data may contain stochastic trends, the Augmented Dickey–Fuller (ADF) test is applied to examine the stationarity properties of the variables. The ADF regression equation is specified as:

$$\Delta Yt = \alpha + \beta t + \gamma Yt - 1 + \sum_{i=1}^{k} \delta i \Delta Yt - i + \varepsilon t$$

where Yt represents the variable under consideration, t is the time trend, and εt is the error term. The null hypothesis H0: γ=0 indicates the presence of a unit root, while rejection of the null implies stationarity.

3.3 Cointegration Test

If the variables are integrated of the same order, the Johansen cointegration test is used to determine whether a long-run equilibrium relationship exists among them. The Johansen procedure includes two statistics: the Trace statistic and the Maximum Eigenvalue statistic.

The cointegration test in this study is conducted assuming an intercept but no deterministic trend in the cointegrating equation, based on visual inspection of the time-series plots.

3.4 Vector Error Correction Model (VECM)

Since the variables are non-stationary but cointegrated, a Vector Error Correction Model (VECM) is employed to capture both short-run dynamics and long-run equilibrium relationships between remittances, imports, and the trade deficit.

The optimal lag length was selected based on the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC). A lag length of 9 was chosen because it minimized the information criteria values while ensuring no serial correlation in the residuals.

Model I: Remittances and Imports

$$\Delta lnIMPt = \alpha 1 + \sum_{i=1}^{9} \beta 1 i \Delta lnREMt - i + \sum_{i=1}^{9} \gamma 1 i \Delta lnIMPt - i + \lambda 1 ECTt - 1 + \varepsilon 1 t$$

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where:

- Δ denotes the first difference operator
- ECTt−1 represents the error correction term, capturing the speed of adjustment toward long-run equilibrium
- ε1t is the error term

Model II: Remittances and Trade Deficit

$$\Delta lnTDt = \alpha 2 + \sum_{i=1}^{9} \beta 2i \Delta lnREMt - i + \sum_{i=1}^{9} \gamma 2i \Delta lnTDt - i + \lambda 2ECTt - 1 + \varepsilon 2t$$

Where: TD denotes the merchandise trade deficit.

The coefficient of the error correction term (ECT) indicates the speed at which short-run deviations from the long-run equilibrium are corrected.

3.5 Diagnostic Tests

To ensure the reliability of the estimated models, several diagnostic tests are conducted, including:

- Serial correlation test
- Heteroskedasticity test
- Normality test of residuals

These tests confirm whether the estimated models satisfy standard econometric assumptions.

3.6 Endogeneity Consideration

While the VECM framework assumes weak exogeneity of the explanatory variables, there may be potential reverse causality between remittances and the trade deficit. For instance, persistent trade deficits may influence migration decisions and remittance behavior. Although this study focuses on the dynamic relationship within the VECM framework, future research could employ instrumental variable approaches to address potential endogeneity concerns.

IV. Results and Discussion

This section presents the empirical results of the study, including descriptive statistics, unit root tests, cointegration analysis, and the Vector Error Correction Model (VECM) estimates. The results are interpreted to examine the dynamic relationship between remittance inflows, merchandise imports, and the trade deficit in Nepal.

4.1 Descriptive Statistics

Table 1 presents the descriptive statistics for the main variables used in the analysis. The statistics include mean, median, maximum, minimum, standard deviation, skewness, kurtosis, and the Jarque–Bera (JB) test for normality, as shown in Table 2.

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Table 2: Descriptive Statistics

Statistic	RGDP (Mil NPR)	REM (Mil NPR)	IMP (Mil NPR)	EXP (Mil NPR)	TB (Mil NPR)
Mean	1,460,056	314,482	489,239	63,995	-425,244
Median	727,827	100,145	194,695	59,383	-135,312
Maximum	5,381,300	1,220,560	1,920,448	200,031	-15,839
Minimum	120,370	2,128	23,227	7,388	-1,720,417
Std. Dev.	1,512,889	371,277	547,537	41,847	509,830
Skewness	1.22	0.94	1.20	1.32	-1.18
Kurtosis	3.31	2.52	3.17	5.21	3.04
JB Statistic	8.29**	5.20*	7.90**	16.36***	7.63**
Observations	33	33	33	33	33

*Note: *, *, *** *indicate significance at the 10%, 5%, and 1% levels respectively.*

The descriptive statistics reveal substantial variation across the variables. Imports show a significantly higher mean compared to exports, indicating Nepal's persistent trade deficit. Remittance inflows also exhibit substantial growth during the study period. The positive skewness observed for most variables indicates a long right tail distribution, reflecting rapid increases in remittances and imports in recent years.

The Jarque–Bera test indicates that several variables deviate from normal distribution. However, this is common in macroeconomic time-series data and does not affect the validity of the econometric analysis.

4.2 Unit Root Test

Before conducting the cointegration analysis, the stationarity properties of the variables were examined using the Augmented Dickey–Fuller (ADF) test, as shown in Table 3.

Table 3: ADF Unit Root Test Results

Variable	Level t-statistic	p-value	First Difference t-statistic	p-value	Decision
LnEXP	-1.124	0.694	-6.314***	0.000	I(1)
LnIMP	-0.277	0.918	-5.962***	0.000	I(1)
LnREM	-1.380	0.580	-6.216***	0.000	I(1)
LnTD	-0.601	0.857	-5.758***	0.000	I(1)

*Note: *** indicates rejection of the null hypothesis of a unit root at the 1% significance level.*

The ADF results indicate that all variables are non-stationary at levels but become stationary after first differencing, implying that the variables are integrated of order one, I (1). This finding justifies the use of Johansen cointegration analysis and the Vector Error Correction Model (VECM) to examine long-run relationships.

4.3 Results of the Cointegration Test

Model I: Remittances and Imports

Table 4 presents the results of the Johansen cointegration test between remittances (LNREM) and imports (LNIMP) using a lag length of 9. Both the Trace test and the Maximum Eigenvalue test confirm the existence of a long-run equilibrium relationship between the two variables.

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The Trace test rejects the null hypothesis of no cointegration, as the test statistic (110.0002) exceeds the 5 percent critical value (15.49471), with a p-value of 0.0001. Similarly, the Maximum Eigenvalue test also rejects the null hypothesis, with a statistic of 85.87614 exceeding the critical value of 14.26460.

Both tests indicate the presence of two cointegrating equations at the 5 percent significance level, suggesting that remittances and imports move together in the long run. This result indicates the existence of a stable long-term relationship between remittance inflows and import demand in Nepal.

Table 4: Johansen Cointegration Test Results (LNREM and LNIMP)

Test	Hypothesized No. of CE(s)	Eigenvalue	Statistic	Critical Value (0.05)	p-value	Result
Trace Test	None*	0.976097	110.0002	15.49471	0.0001	
	At most 1*	0.649668	24.12408	3.841466	0.0000	2 Cointegrating Equations
Max-Eigenvalue Test	None*	0.976097	85.87614	14.26460	0.0000	
	At most 1*	0.649668	24.12408	3.841466	0.0000	2 Cointegrating Equations

*Note: * indicates rejection of the null hypothesis at the 5 percent level.*

Model II: Remittances and Trade Deficit

Table 5 presents the results of the Johansen cointegration test between remittances (LNREM) and the trade deficit (LNTD). The Trace test rejects the null hypothesis of no cointegration, as the test statistic (58.63817) exceeds the critical value (15.49471) with a p-value of 0.0000. However, the null hypothesis of at most one cointegrating equation is not rejected.

Similarly, the Maximum Eigenvalue test confirms the presence of **one cointegrating equation** between remittances and the trade deficit. These results indicate the existence of a stable long-run equilibrium relationship between remittance inflows and Nepal's trade deficit.

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Table 5: Johansen Cointegration Test Results (LNREM and LNTD)

Test	Hypothesized No. of CE(s)	Eigenvalue	Statistic	Critical Value (0.05)	p-value	Result
Trace Test	None*	0.921094	58.63817	15.49471	0.0000	
	At most 1	0.009937	0.229699	3.841466	0.6317	1 Cointegrating Equation
Max-Eigenvalue Test	None*	0.921094	58.40847	14.26460	0.0000	
	At most 1	0.009937	0.229699	3.841466	0.6317	1 Cointegrating Equation

4.4 Statistical Output

Result of Model-I

Table 6 presents the VECM estimation results examining the impact of remittances (LNREM) on imports (LNIMP). The long-run cointegration equation is rearranged with imports as the dependent variable, showing that a 1 percent increase in remittances leads to approximately a 1.05 percent increase in imports. The short-run error correction models capture adjustments toward long-run equilibrium, with lagged changes in remittances and imports influencing current import dynamics. Diagnostic tests confirm the model's reliability.

The VEC Residual Serial Correlation LM Tests indicate no serial correlation at lags 1 and 2, with high probabilities (0.6580, 0.5342, 0.6580, and 0.8129), confirming the reliability of the model's residuals. The VEC Residual Heteroskedasticity Tests show no evidence of heteroskedasticity. The joint test yields a probability of 0.8366**,** and the individual components also show high probabilities (e.g., 0.8181, 0.5296, 0.8854), indicating that the residuals are homoscedastic R-square values 0.096 for D(LNIMP) and 0.149 for D(LNREM) indicated weak explanatory power of the short run equation.

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Table 6: VECM Estimation Results: Impact of Remittances (LNREM) on Imports (LNIMP)

Estimated Equation	Coefficients
Cointegration (Long-Run)	$LNIMP_{t-1} \approx 1.053\ LNREM_{t-1} - 0.416$
Error Correction Model for D(LNIMP)	$D(LNIMP) = 0.006758 - 0.2638\varepsilon_{t-1} - 0.2672D(LNREM_{t-1}) - 0.06965D(LNREM_{t-2}) - 0.1317D(LNIMP_{t-1}) + 0.2684D(LNIMP_{t-2})$
Error Correction Model for D(LNREM)	$D(LNREM) = -0.07860 - 0.1265\varepsilon_{t-1} + 0.1706D(LNREM_{t-1}) - 0.1003D(LNREM_{t-2}) - 0.2445D(LNIMP_{t-1}) + 0.2525D(LNIMP_{t-2})$

Results of Model-II

Table 7 presents the VECM results examining the impact of remittances (LNREM) on Nepal's trade deficit (LNTD). In the long run, a 1 percent increase in remittances leads to approximately a 0.0587 percent increase in the trade deficit, indicating a positive association over time. The short-run error correction models reveal that remittances initially reduce the trade deficit slightly (−0.0357%) while past changes in remittances and the trade deficit influence current short-run adjustments toward equilibrium.

The VEC residual Serial Correlation LM tests show no evidence of serial correlation at lags 1 and 2, with p-values of 0.1116 and 0.5883, respectively. Heteroskedasticity tests indicate no significant heteroskedasticity, with a joint p-value of 0.4149 and all individual components above 0.05. These results confirm the statistical reliability of the estimated model.

Table 7: VECM Estimation Results: Impact of Remittances (LNREM) on Trade Deficit (LNTD)

Estimated Equation	Coefficients
Cointegration (Long-Run)	$LNTD_{t-1} \approx 0.0587\ LNREM_{t-1} - 206.4$
Error Correction Model for D(LNREM)	$D(LNREM) = -0.035671\ \varepsilon_{t-1} - 0.175808\ D(LNREM_{t-1}) + 0.150017\ D(LNREM_{t-2}) - 0.086688\ D(LNTD_{t-1}) - 0.183782\ D(LNTD_{t-2}) + 0.265604$
Error Correction Model for D(LNTD)	$D(LNTD) = -0.056408\ \varepsilon_{t-1} - 0.321543\ D(LNREM_{t-1}) - 0.053527\ D(LNREM_{t-2}) - 0.122812\ D(LNTD_{t-1}) - 0.343772\ D(LNTD_{t-2}) + 0.427128$

4.5 Discussion

Comparison with Previous Studies:

The estimated long-run elasticity of imports with respect to remittances (1.05) aligns with prior findings. Bhatta (2013) reported a slightly lower elasticity of 0.87 using data from 1975–2010, suggesting that the import intensity of remittance spending has increased over time. Sunuwar

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(2016) found similar elasticities ranging from 0.72 to 0.98. The long-run effect of remittances on the trade deficit (0.0587%) is smaller than the import effect because exports, though limited, also respond positively to remittances via increased domestic demand and productivity. However, as Paudel and Bhusal (2021) note, this export response is insufficient to offset import growth, leading to a net widening of the trade deficit.

Economic Significance

With remittances averaging 25–30 percent of GDP, a 1percent increase corresponds to roughly 0.25–0.3 percent of GDP. The estimated long-run effect on imports, approximately 0.95 percent, indicates that nearly the entire gain from increased remittances is spent on imports, highlighting substantial import leakage. This limits the potential multiplier effects of remittances on the domestic economy, as the inflows largely leave the country through import payments.

Short-Run vs. Long-Run Dynamics

The VECM results reveal that remittances reduce the trade deficit in the short run (−0.0357%) but increase it in the long run (+0.0587%). This pattern may reflect several factors:

1. Lag in consumption adjustment: Households initially save remittances or use them to repay debts before increasing consumption.
2. Supply-side responses: Domestic production may rise temporarily to meet demand, but structural constraints limit sustained increases.
3. Exchange rate dynamics: Gradual currency appreciation over time makes imports cheaper and exports less competitive.

Dutch Disease Evidence

The widening trade deficit despite stable or growing remittances provides indirect evidence of Dutch Disease effects. As remittance inflows appreciate the real exchange rate (documented in prior studies), the tradable sector—particularly exports and import-competing industries—loses competitiveness, while demand for non-traded goods and imports rises.

V. Conclusion and Recommendations

Conclusion

This study examined the role of remittances in influencing imports and the trade deficit in Nepal using VECM analysis. The key findings are:

1. A 1percent increase in remittances leads to approximately a 1.05 percent increase in imports, indicating that remittance gains are largely offset by import leakage.
2. Remittances have opposite effects on the trade deficit in the short and long run: a slight reduction in the short run (−0.0357%) and a widening in the long run (+0.0587%).
3. These dynamics suggest lagged household consumption adjustments, supply-side constraints, and exchange rate effects, highlighting the limited domestic multiplier of remittance inflows.

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4. The widening trade deficit alongside stable or growing remittances provides indirect evidence of Dutch Disease effects, with tradable sectors losing competitiveness while demand for imports rises.

Recommendations

Based on these findings, the following policy actions are suggested:

1. Enhance domestic absorptive capacity: Promote local production and import-substituting industries to reduce import leakage from remittance inflows.
2. Encourage productive investment: Incentivize households to channel remittances into savings, entrepreneurship, and small-scale productive activities that generate domestic employment.
3. Monitor macroeconomic effects: Strengthen exchange rate and trade policies to mitigate Dutch Disease effects and maintain competitiveness of tradable sectors.
4. Integrate remittance policies with development planning: Consider remittance flows as part of broader economic planning to maximize their contribution to sustainable growth.

Strengths of the Study

- Clearly summarizes key findings with quantitative evidence.
- Provides actionable and specific policy recommendations.
- Recognizes the dual role of remittances in stimulating consumption and influencing trade dynamics.

Limitations of the Study

- Sample size: With only 33 annual observations and 9 lags, the model may be overparameterized
- Aggregate data: The study uses aggregate remittance and trade data, masking heterogeneity across remittance sources, household types, and import categories
- Endogeneity: Potential reverse causality between remittances and trade deficit is not addressed
- Missing variables: Exchange rates, domestic production capacity, and trade policies are not included in the model
- Landlocked constraints: Specific mechanisms through which landlockedness affects the remittance-trade nexus are not explicitly modeled

Transparency Statement: The author confirms that this study has been conducted with honesty and in full adherence to ethical guidelines.
Data Availability Statement: Author can provide data.
Conflict of Interest: The author declares there is no conflicts of interest.
Authors' Contributions: The author solely conducted all research activities i.e., concept, data collecting, drafting and final review of manuscript.

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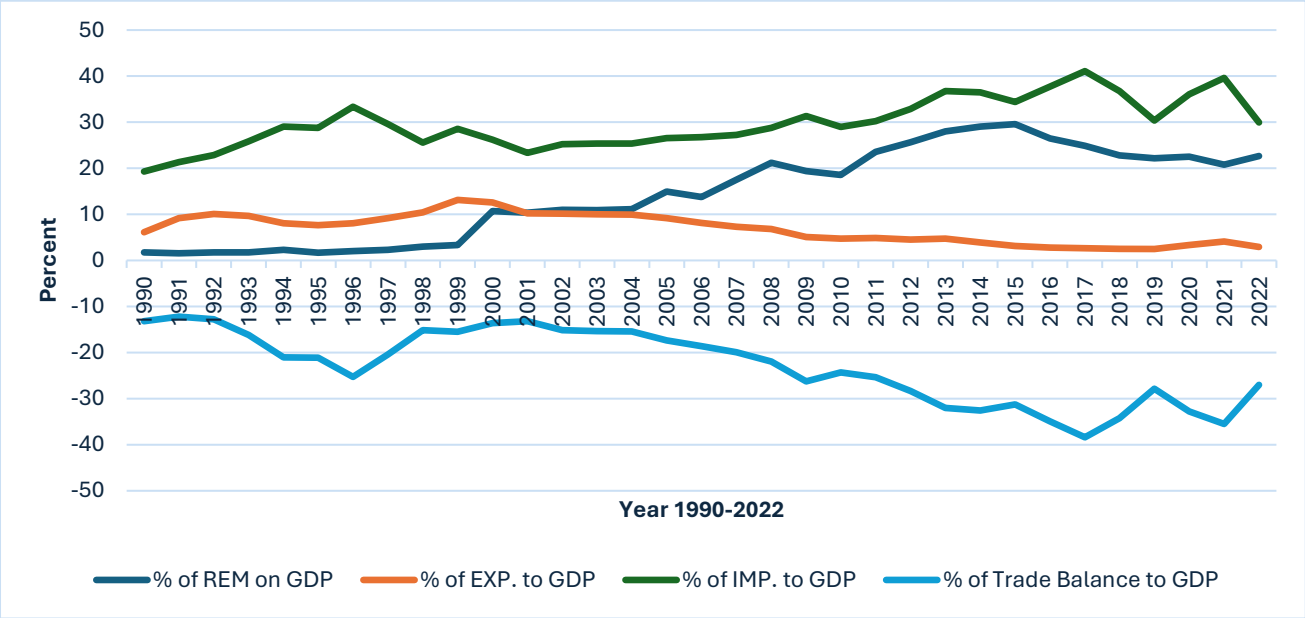
Appendix 1.

Figure 1 Proportions of Remittance, Export, Import and Trade Balance to GDP



Sources: Economy Survey, NRB bulletin up to 2024