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Macroeconomic determinants of labor migration: An empirical analysis for Nepal

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Abstract

This paper aims to examine the relationship among selected macroeconomic variables—unemployment rate, remittance, foreign direct investment, exchange rate, and labor migration in Nepal—using the time series data spanning the period 1994-2024, based on the Autoregressive Distributed Lag (ARDL) framework. The bounds test indicates a cointegrated long-run association between labor migration and its macroeconomic factors. The study finds that remittances and foreign direct investment are key determinants of labor migration in both the short and long run. Labor migration is negatively associated with unemployment and positively associated with the exchange rate in the long run, though neither relationship is statistically significant. In the short run, both factors have a significant negative effect on labor migration. These findings suggest that the government should introduce programs for reintegrating returning migrants, attract FDI, and create employment opportunities to regulate labor migration.

Keywords
Labor migration, ARDL bound test, macroeconomic determinants, remittance, unemployment, Nepal

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1. Introduction

Labor migration entails the movement of individuals between countries or regions primarily in search of employment opportunities, often driven by economic factors such as wage disparities, job availability, and the desire for better living standards, and is shaped by both push and pull factors (Borjas & Ours, 2010). The growing integration of economies, driven by technological advancements and trade liberalization, has created new opportunities for migration, while simultaneously intensifying the pressures that push individuals from their home countries in search of better employment prospects abroad (International Organization for Migration [IOM], 2019).

Labor migration is strongly shaped by the overall macroeconomic landscape, with individuals and households making decisions based on differences in income, the availability of jobs, and overall economic prospects in both origin and destination countries (Simpson, 2022). Labor migration is primarily driven by unemployment and limited job opportunities, with the desire for higher wages and income differentials further reinforced by remittances that supplement household income and collectively shape individuals' economic incentives to move abroad (Lim et al., 2023). On the other hand, FDI inflows help reduce unemployment by creating job opportunities within the home country, thereby deterring migration by providing local employment prospects (De Haas, 2010; Kuhn, 2019). In addition to domestic economic factors, fluctuations in exchange rates also play a crucial role in shaping labor migration. Favorable exchange rates enhance the real value of remittances, making migration more attractive by increasing the potential earnings and financial transfers for workers from origin countries (Acosta et al., 2009; Giuliano & Ruiz-Arranz, 2009).

Gurkha forces Nepal's migration history dates back to the early nineteenth century, when Nepali people moved to Lahore to serve in the army of the Sikh ruler, Maharaja Ranjit Singh. A major increase in labor migration occurred after the 1816 Anglo-Nepal Treaty, which opened the way for the large-scale recruitment of Nepali soldiers into the British Gurkha forces. The current context of labor migration is mainly towards the Gulf States. The majority of Nepalese workers have migrated to Middle East countries and Malaysia. In the last few years, Romania, Poland, Cyprus, etc., emerged as employment destinations. The government of Nepal has officially recognized 111 countries for institutional foreign employment. According to (Ministry of Labour, Employmnet and Social Security [MolESS], 2022), more than 1.1 million labor permits were issued between 2019/20 and 2021/22. However, labor approvals declined during the COVID-19 period, particularly in 2019/20 and 2020/21. The trend of labor migration from Nepal continues to be predominantly male-oriented, with female migrant workers representing under 10 percent of the total labor approvals granted in the year 2021/22.

Labor migration in a developing country arises due to persistent unemployment and relatively low wages, compelling a youth to migrate to foreign employment for the better living conditions and well-being (Adhikari et al., 2023). In Nepal unemployment, limited job opportunities, weak industrialization, and an unorganized labor market drive worker to seek better economic opportunities abroad. The migrant workers benefit the country of origin through remittances, which drive the country's economic growth and contribute towards the gross domestic product. As per (Nepal Rastra Bank [NRB], 2025) remittance inflows for fiscal year 2024/25 reached Rs.1,723.27 billion, marking a 19.2% increase compared to a 16.5% rise in the previous fiscal year. The remittances sent from foreign workers, the majority in Gulf countries, create a favorable landscape of economic activities, further boosting economic growth (Kunwer, 2019).

Even with economic advancements and substantial remittance inflows, the ongoing issue of youth unemployment in Nepal reveals considerable structural challenges in the labor market. Although remittances have enhanced consumption and economic stability, they have not succeeded in generating enduring job opportunities within the nation (Khatri et al., 2025). Likewise, the modest inflows of foreign direct investment have frequently been allocated to capital-intensive sectors instead of labor-intensive ones, which further intensifies youth unemployment (Pandey, 2021). The escalating unemployment rate in Nepal has led to a notable increase in labor migration, primarily directed towards Gulf Cooperation Council (GCC) countries, where migration costs are relatively lower. These countries attract Nepalese workers with the promise of higher wages and improved employment opportunities, making them a dominant destination for labor migration (Valenta, 2022).

Several studies have attempted to empirically examine the macroeconomic determinants of migration employing both panel data and time series analyses. Adib and Idris (2021) demonstrate that macroeconomic determinants have a significant impact on migrant labor in developing countries in Asia Pacific. Ahmad et al. (2008) analysis revealed significant long-run and short-run relationships between macroeconomic determinants and the migration of workers from Pakistan. Samonte et al. (2019) employed macroeconomic determinants for the factors affecting the Philippines and found a significant effect of macroeconomic determinants from emigration. Lapid and Cruz (2022) analyzed that employed international migration of overseas Filipino workers is determined by macroeconomic determinants. Birundu (2016) examined the economic determinants of migration from Kenya to the OECD block and found that if all the economic factors are held constant, emigration will decline by 63.7638%; therefore, economic factors play a great role in determining emigration. These several studies demonstrate that macroeconomic determinants have a significant impact on labor migration.

Macroeconomic factors driving workers to foreign employment in Nepal have so far been examined only individually through descriptive analysis, without integrating their effects through empirical methods. Identifying the key macroeconomic variables that influence labor migration is therefore important, as this study fills a literature gap by providing evidence on the relevant factors affecting migration in the Nepalese context. It provides policymakers and authorities with evidence-based insights to design effective policies and interventions that address factors influencing foreign employment.

The objective of this study is to investigate the macroeconomic determinants of labor migration through the ARDL model, based on secondary sources of data over the period from 1994 to 2024. To assess the major macroeconomic variables affecting labor migration, a confined set of relevant macroeconomic factors was examined due to restrictions in data availability, analytical constraints, and the predefined scope of the study. This study may be beneficial for researchers, policymakers, and individuals in different manners. This study offers valuable insights for developing labor policies and fostering an environment conducive to productive investments in the country of origin. Apart from the introduction, the paper is divided into four additional sections: literature review, method and materials, conclusion and policy recommendation, and prospects for future research.

2. Literature Review

Theoretical Review

The neoclassical macroeconomic theory, developed by Lewis (1954), explains labor migration as a result of differences in economic development and wage levels between regions. Later, Harris and Todaro (1970) and Massey et al. (1993) broadened the theory by demonstrating that labor migration is driven not only by existing wage gaps but also by expected income, labor market limitations, and wider structural forces associated with economic development. Complementing this economic perspective, labor migration can be understood through the push-pull theory proposed by Lee (1966), which highlights how push factors such as economic hardship, political instability, low income, social challenges, and environmental pressures, along with pull factors like better employment opportunities, higher income potential, improved living standards, and political and social stability in host countries, drive migration.

Empirical Review

Empirical evidence across countries highlights the role of macroeconomic factors in shaping migration flows. Adib and Idris (2021), in their recent study of developing countries in Asia Pacific during the period 2010-2018, found a statistically significant positive effect of unemployment on the flow of migrant workers, whereas foreign direct investment (FDI) reduces them. Ahmad et al. (2008) and Ahad (2015) found that unemployment and remittance positively influence migration from Pakistan. Contrasting this, Samonte et al. (2019) used Ordinary Least Squares Regression on data from the Philippines and confirmed that unemployment had a significant negative influence on emigration, while remittances and exchange rates positively influence emigration.

Empirical studies show mixed evidence on the impact of unemployment on migration. In Pakistan, Nawaz et al. (2022) and Asim and Saddique (2020) found that unemployment has a positive and statistically significant effect on migration using the ARDL model. Similarly, Cınar (2025) reported that

unemployment significantly increased emigration from Turkey during 1995–2020 using Pooled Ordinary Least Square (POLS). In contrast, Anamaria (2025) found a negative and statistically insignificant relationship between unemployment and emigration from Romania. Supporting this view, Atiyatna et al. (2024) identified a significantly negative effect of unemployment on migration in Sumatra Island, while Bourne et al. (2025) observed a negative but statistically insignificant effect of unemployment on net migration in Jamaica.

Akkoyunlu and Siliverstovs (2007) study over the period 1964-2004 highlights that workers remittances are a significant financial source for migration in both the short and long run, acting as a catalyst for chain migration. This supports the 'implicit loan' theory, where kin networks help finance migration. Darkwah and Verter (2014) also argued that remittances have a significant positive effect on international migration. In contrast, Sulaimanova and Bostan (2014) observed that remittance significantly deters emigration from Tajikistan and Kyrgyzstan, while exchange rate movements are found to have a significant positive impact on migration flows.

Dankevych et al. (2022) conduct a regression analysis using data from 2011 to 2018 to explore the factors driving labor migration from Ukraine to Poland. The results indicate that Ukraine's exchange rate has a positive and statistically significant effect on labor migration, implying exchange rate movements influence migration flows between the two countries. Ullah (2012) examines the impact of exchange rates on migration and remittances, finding that depreciation of the local currency increases remittance income, which in turn leads to an influx of higher emigration rates from Bangladesh.

Xu and Sylwester (2016), which employs a gravity model to examine the effect of FDI on emigration from low-income OECD countries to 18 high-income OECD countries between 1970 and 2000, found that FDI flowing from a non-destination OECD country has a negative influence on emigration to specific destination countries. Aroca and Maloney (2005) also found that inflows of FDI deter the influx of emigration from Mexico to the United States. Phyo et al. (2019) depicts that FDI inflows on emigration in less-developed countries vary over time, with a restraining effect in the short term and a stimulating effect in the long term.

Adhikari et al. (2023) explain that labor migration from Nepal is driven by poverty, unemployment, income inequality, relatively higher wages in destination countries, low agriculture productivity, and strong demand for labor-intensive work from abroad. Likewise, Malla & Rosenbaum (2017) and Thapaliya et al. (2023) emphasize that poor economic conditions, limited social protection, and insufficient job opportunities push people toward foreign labor markets. These studies collectively highlight the significance of macroeconomic variables in shaping labor migration.

Despite substantial contributions to the literature on labor migration, particularly in the context of Nepal, important research gaps persist. Although studies from other countries have employed time-series and panel data to examine macroeconomic determinants of labor migration, comparable empirical evidence for Nepal remains limited. Existing studies that consider macroeconomic variables tend to be narrow in scope and fail to capture the combined or dynamic effects of unemployment, wage differentials, inflation, exchange rates, foreign direct investment, and remittance flows on labor migration. Consequently, comprehensive empirical analyses exploring the interrelationships among these factors and their joint impact on labor migration decisions are still lacking.

3. Method and Materials

Data and Method

The study is designed to estimate the number of workers migrating for employment by investigating the determinants of unemployment rate, remittances, foreign direct investment (FDI), and exchange rate, based on secondary data. The study covers 31 sets of time series data from 1994 to 2024, sourced from Nepal Rastra Bank (NRB), the World Bank's World Development Indicators, the Centre for the Study of Labor and Mobility (CESLAM) for the period 1994-2023, and the Department of Foreign Employment (DOFE) for 2024. Following similar empirical studies (Adib & Idris, 2021; Lapid & Cruz, 2022; Samonte et al., 2019) that examine the influence of macroeconomic variables on worker migration, this study employs these variables in the context of labor migration in Nepal. The ARDL bounds test

approach is applied for the empirical analysis, and the stationarity of the time series data is tested using both the ADF and PP unit root tests.

Table 1. *Variables Description and Data Sources*

Description	Variables	Units	Source
Number of workers migrating for foreign employment	NWM	In thousand	CESLAM
Unemployment rate	UNEMP	Percentage	World Bank Data
Remittance	REM	Million	NRB
Foreign direct investment	FDI	Million	Department of Industry, Nepal
Exchange rate	EXCR	US dollar	World Bank Data

An Empirical Model Specification

The model designed for examining a number of workers migrating for employment is taken into account through the macroeconomic determinants. The number of labor permits issued by DOFE is assigned as the number of workers migrating for foreign employment (labor migration). Accordingly, the model is specified as follows:

$$NWM_t = f(UNEMP_t, REM_t, FDI_t, EXCR_t) \quad \text{----------(1)}$$

The econometric model for the above equation (1) can be expressed as follows:

$$NWM_t = \beta_0 + \beta_1 UNEMP_t + \beta_2 REM_t + \beta_3 FDI_t + \beta_4 EXCR_t + \varepsilon_t \quad \text{----------(2)}$$

Writing the above equation in log form:

$$Ln\ NWM_t = \beta_0 + \beta_1\ Ln\ UNEMP_t + \beta_2\ Ln\ REM_t + \beta_3 Ln\ FDI_t + \beta_4 Ln\ EXCR_t + \varepsilon_t \quad \text{-----(3)}$$

Where NWM = Number of workers migrating for foreign employment, UNEMP = Unemployment rate, REM = Remittance, FDI = Foreign direct investment, EXCR = Exchange rate, and = Random disturbance term

Estimation of Auto Regressive Distributed Lag (ARDL) Model

The relationship between labor migration and its determinants has been explored using the Autoregressive Distributed Lag (ARDL) cointegration technique, as proposed by Pesaran and Shin (1995). This model presents several benefits over the residual-based techniques developed by Engle and Granger (1987) and the maximum likelihood methods introduced by Johansen and Juselius (1990). First, the ARDL bound test does not require pre-testing for unit roots and can be applied regardless of whether the variables are I(0), I(1), or mutually cointegrated, although it is not applicable if the variables are I(2). Second, the ARDL approach provides consistent estimates of long-run coefficients that are asymptotically normally distributed, allowing for valid t-tests, even when certain explanatory variables are endogenous. Pesaran and Shin (1995). Third, the ARDL test is effective for estimating and testing hypotheses regarding the long-term relationship between the key variables, even when working with small sample sizes. Pesaran and Shin (1995). Fourth, the ARDL approach treats each variable as an independent equation, minimizing endogeneity issues by eliminating residual correlation, as highlighted by Nkoro and Uko (2016) and Pesaran and Shin (1995).

Following the ARDL approach of Pesaran and Shin (1999) and Pesaran et al. (2001), Equation (3) is expressed in the unrestricted error-correction form as follows:

$$\Delta Ln\ (NWM)_t = \alpha + \sum_{i=1}^{n} b_i\ \Delta\ Ln\ (NWM)_{t-i} + \sum_{i=1}^{n} c_i\ \Delta\ Ln\ (UNEMP)_{t-i} + \sum_{i=1}^{n} d_i\ \Delta\ Ln(REM)_{t-i} + \sum_{i=1}^{n} \Delta\ Ln\ (FDI)_{t-i} + \sum_{i=1}^{n} f_i\ \Delta\ Ln\ (EXCR)_{t-i} + \lambda_1\ Ln\ (NWM)_{t-i} + \lambda_2\ Ln\ (UNEMP)_{t-i} + \lambda_3\ Ln(REM)_{t-i} + \lambda_4\ Ln\ (FDI)_{t-i} + \lambda_5\ Ln\ (EXCR)_{t-i} + \varepsilon_t \quad \text{--------(4)}$$

In the first part of equation (4), the summation signs represent the short-run dynamics of the model, while the second part, which includes the λ_s coefficients, corresponds to the long-run relationship, and

ε denotes a random disturbance term. The presence of a long-run relationship among the variables is examined using an F-statistic under the null hypothesis of no cointegration.

H_0:$\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0$; No cointegration exist

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The computed F-statistic is compared with the critical bounds provided by Pesaran et al. (2001). Cointegration is confirmed if the F-statistic exceeds the upper bound, inconclusive if it lies between the bounds, and rejected if it falls below the lower bound.

4. Result and Discussion

Descriptive Statistics

The overview of descriptive statistics for the macroeconomic variables taken into account in this study is presented in Table 2.

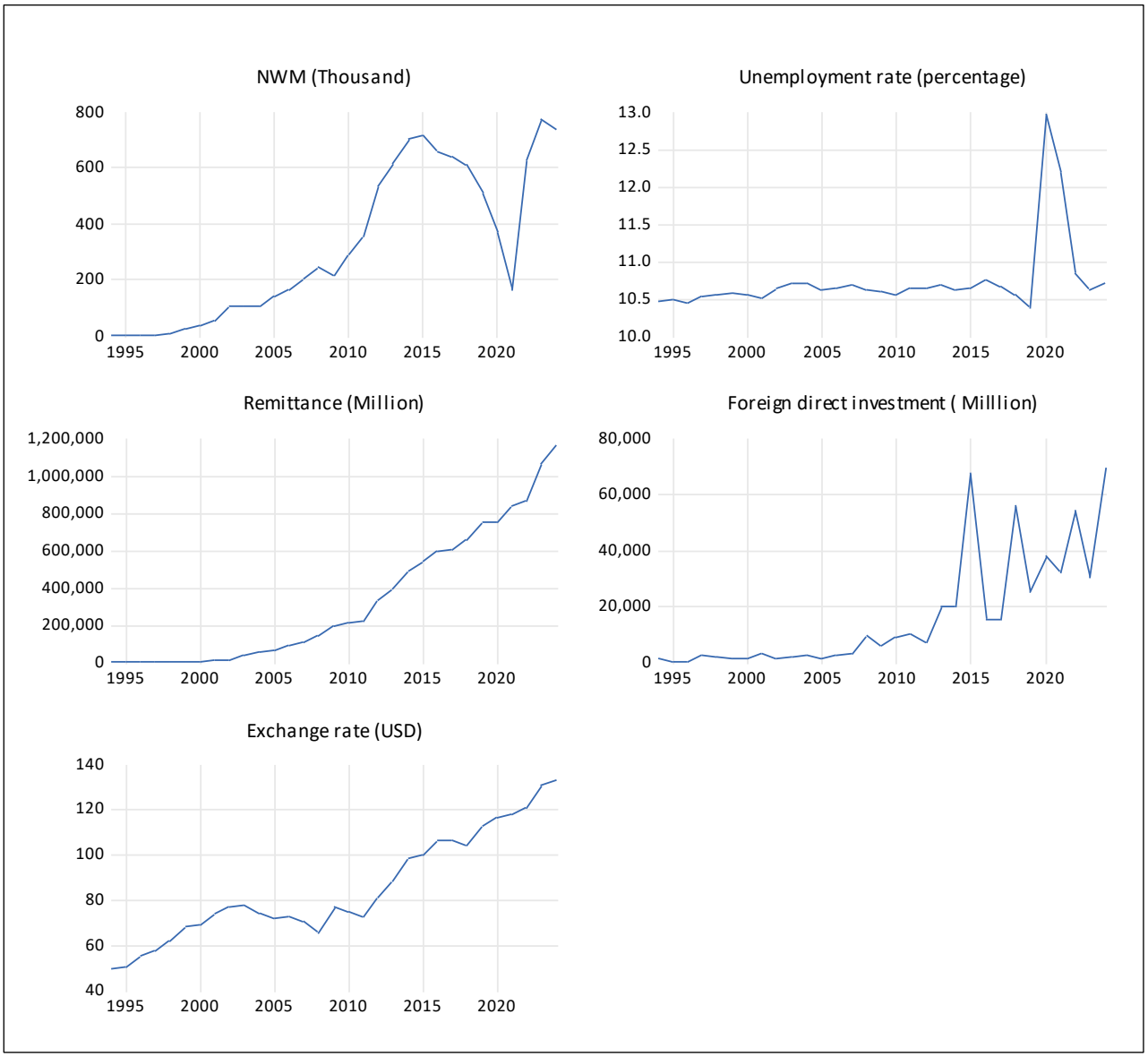
Table 2. *Descriptive statistics of the variables, 1994-2024*

	LNNWM	LNUNEMP	LNREM	LNFDI	LNEXCR
Mean	4.868812	2.372475	11.36258	8.787475	4.407392
Median	5.393628	2.363492	12.17672	8.873231	4.346100
Maximum	6.648077	2.563024	13.96870	11.15387	4.892864
Minimum	0.741937	2.340748	5.407172	5.402209	3.901855
Std. Dev.	1.871641	0.044151	2.309784	1.536750	0.277900
Skewness	-1.106787	3.499826	-0.797448	-0.153240	0.086407
kurtosis	2.991599	14.39555	2.591096	2.123214	2.08854
Jarque-Bera	6.329145	231.0192	3.501574	1.114300	1.110900
Probability	0.042232	0.000000	0.173637	0.572839	0.573814
No. of Obs.	31	31	31	31	31

Descriptive statistics for all selected explanatory variables, based on 31 observations, are utilized to summarize and gain insights into the fundamental characteristics of the dataset. All descriptive statistics fall into two categories: measures of central tendency and measures of variability. The descriptive statistics indicate that the standard deviation of unemployment is smaller than those of the number of workers migrating for foreign employment, FDI, and remittances. As a result, the mean value of unemployment is considered a more accurate representation compared to the other variables. Unemployment and exchange rate are positively skewed due to the positive values of the variables. The number of workers migrating for foreign employment, remittance, and FDI are negatively skewed due to the negative value of these variables. The kurtosis values of all the variables except unemployment are less than three, so the distribution is platykurtic. The kurtosis value of unemployment is more than three, so the distribution is leptokurtic. The results of the Jarque-Bera test reveal that all variables, except for unemployment and the number of workers migrating for foreign employment, follow a normal distribution ($p > 0.05$). Both unemployment and the number of workers migrating exhibit signs of non-normality. This indicates that except for unemployment and the number of workers migrating for foreign employment, all other variables could behave statistically well.

Figure 1 illustrates the pattern of the change in the number of workers migrating for foreign employment (NWM) (in thousands), the unemployment rate (in percentage), remittance (in millions), foreign direct investment (in millions), and the exchange rate (USD) within the time span of 1996 to 2024. The graph illustrates that remittance follows an exponential growth pattern, starting gradually and accelerating more sharply as time progresses. NWM exhibits an overall upward trend, characterized by exponential growth over time. The unemployment rate remains stable for a long time but shows a significant temporary increase around 2020. FDI demonstrates strong exponential growth throughout the period, despite some late-period significant oscillation events. The exchange rate exhibits a steady and consistent upward trend across the entire period.

Figure 1. *Graphical Representation of Data*



Correlation Matrix for the Study Variables

The correlation matrix displays the strength and direction of relationships between the study variables. The correlation coefficient can only take values between −1 and +1, representing the full range from a perfect negative to a perfect positive relationship. The results of the correlations are provided in Table 3 below:

Table 3. *Correlational Matrix for the Study Variables*

	LNNWM	LNUNEMP	LNREM	LNFDI	LNEXCR
LNNWM	1				
LNUNEMP	0.2150	1			
LNREM	0.9347	0.3520	1		
LNFDI	0.8251	0.3652	0.869	1	
LNEXCR	0.8225	0.4225	0.881	0.872	1

Table 3 shows the correlation coefficient between dependent variables and explanatory variables. The correlation between NWM and UNEMP is 0.2150, suggesting a weak positive relationship between these two variables. In contrast, NWM shows very strong and positive correlations with REM (0.9347), FDI (0.8251), and EXC (0.8225). Among all the independent variables, remittance has the strongest correlation with the NWM. Remittance has the strongest correlation with NWM compared to all other independent variables.

Unit Root Test

Prior to estimating the ARDL model, it is necessary to determine the integration properties of the variables to ensure the suitability of the methodology. The ARDL framework permits the inclusion of variables integrated of order zero I(0), order one I(1), or a combination of both, provided that none of the series is integrated of order two I(2) or higher. Compliance with this requirement is crucial to avoid spurious inference and to ensure the validity of the bounds testing procedure. To satisfy this prerequisite, unit root tests were conducted using the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) methods, incorporating both intercept and deterministic trend specifications.

Table 4. *Unit Root Test at Levels and First Difference*

Variables:	Augmented Dickey–Fuller (ADF)				Phillips–Perron (PP)			
	At Level		At First Difference		At Level		At First Difference	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend	Intercept	Intercept & Trend	Intercept	Intercept & Trend
LNNWM	-1.847	-1.218	-4.589***	-5.129***	-1.911	-1.230	-4.585***	-5.520***
LNUNEMP	-3.448**	-4.458***	-4.301***	-4.470***	-3.303**	-3.951**	-11.909***	-11.639***
LNREM	-7.472***	-3.536	-12.306***	-13.235***	-4.045***	-3.769**	-10.307***	-12.701***
LNFDI	-1.034	-5.726***	-8.468***	-8.311***	-0.675	-5.722***	-27.227***	-27.689***
LNEXCR	-0.687	-1.863	-5.503***	-5.407***	-0.703	-2.053	-5.510***	-5.5109***

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

The unit root analysis, conducted through Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests as shown in Table 4, indicates that the variables exhibit a mixed order of integration. The unemployment rate (LNUNEMP) is found to be stationary at its level I(0), while the number of workers migrating (LNNWM), foreign direct investment (LNFDI), and exchange rates (LNEXCR) only achieve stationarity after their first difference I(1). Remittance (LNREM) shows mixed stationarity depending on the test specifications. Given that the variables consist of both I(0) and I(1) processes, the ARDL approach is the most robust framework for estimating long-run relationships among the variables (Pesaran & Shin, 1995).

Lag Length Selection

Optimal lag length involves identifying the appropriate number of lags to assess the presence of long-run relationships among the variables under study. For the estimation of the ARDL model, it is necessary to determine an appropriate lag length, which is essential for applying the bounds test for cointegration and for specifying the error correction model (Pesaran et al., 2001). Common criteria for lag selection include the Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn Criterion (HQ). In this study, the optimal lag length was determined using the AIC criterion. Based on this, the selected lag structure for the ARDL model is (4, 4, 4, 4, 4), as shown in Figure 2.

Figure 2. *Lag length criteria on the basis of AIC*

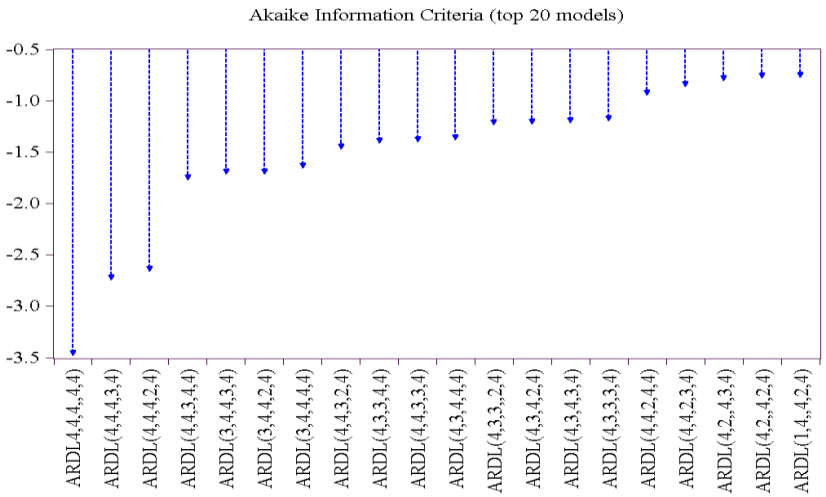


Table 5. *ARDL Bounds Test for Cointegration Analysis*

Test Statistic	Value	Significance level	Upper bound I(0)	Lower Bound I(1)
F-statistic	41.20637	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

As shown in Table 5, the calculated F-statistic in this study is 41.20637. This value exceeds the critical values for both the lower bound (I(0)) and the upper bound (I(1)) at the 1% significance level. Therefore, the null hypothesis of no long-run relationship is rejected, suggesting a statistically significant long-term relationship between labor migration and its macroeconomic determinants.

Table 6. *Long-run Coefficients of the ARDL (4,4,4,4,4) Model*

Variables	Coefficient	Std. Error	t-stats	p-value
LNUNEMP	-2.217829	2.100945	-1.055634	0.4018
LNREM	1.195371	0.034645	34.50361	0.0008
LNFDI	-0.680293	0.118079	-5.761313	0.0288
LNEXCR	0.227720	0.284598	0.800147	0.5076

The estimated long-run coefficients of the model are outlined in Table 6, and the ARDL (4,4,4,4,4) long-run equilibrium relationship can be presented in the equation as

LNNWM= 6.224112+ -2.2178*LNUNEMP +1.1953*LNREM +-0.6802*LNFDI +
0.2277*LNEXCR

ARDL long-run estimates depict that remittances and FDI have a significant long-run influence on labor migration. There is a positive (coefficient = 1.195371) and significant (p-value = 0.0008) effect of remittance on labor migration at the 1% significance level. This result shows that a 1% increase in remittance will increase the labor migration by 1.19%, all the other factors remaining constant. This outcome is consistent with findings reported in prior studies of Ahmad et al. (2008), Samonte et al. (2019), Ahad (2015), and Darkwah and Verter (2014). These results indicate that remittances encourage labor migration by increasing household income, easing migration-related expenses, and strengthening the social networks that support overseas employment. There is a negative (coefficient -0.680293) and significant (p-value=0.0288) effect of FDI on labor migration at the 5% significance level. This result aligns with the findings of Adib and Idris (2021) and Xu and Sylwester (2016). This finding implies that FDI contributes to the expansion of local employment, stimulates job creation, and promotes economic activity in the domestic labor market, thereby decreasing the incentive for workers to seek employment overseas.

Unemployment, however, has a negative but insignificant effect on labor migration in the long run. These findings suggest that unemployed people may not have the resources to finance migration, consistent with the findings of Bourne et al. (2025). Similarly, exchange rate has a positive but insignificant effect in the long run, which aligns with the findings of Ullah (2012). This suggests that exchange rate movements may stabilize over time or influence migration indirectly through wages and remittances.

Short-run Coefficients of the ARDL Model

Table 7 depicts the short-run relationship employing the ARDL model. The coefficient of the error correction term is -1.505 and is statistically significant at the 5% level. Since it lies within the range of -1 to -2, it indicates that any short-run disequilibrium or shocks adjust toward the long-run equilibrium in a damped manner (Gajurel et al., 2021). The adjusted R-squared is 0.99, which suggests that the model explains 99 percent of the variability in the dependent variable (NWM). Furthermore, the low standard error of regression, 0.033, confirms the model's strong fit and high accuracy. The Durbin–Watson statistic of 2.040 falls within the acceptable range of 1.5 to 2.5, indicating that there is no evidence of autocorrelation in the residuals.

Table 7. *Error Correction Regression of ARDL Model (4,4,4,4,4)*

Variables	Coefficient	Std. Error	t-statistic	Prob.
D(LNNWM (-1))	0.682194	0.031471	21.67677	0.0021
D(LNNWM (-2))	0.241937	0.32499	7.444506	0.0176
D(LNNWM (-3))	0.952025	0.040799	23.33450	0.0018
D(LNUNEMP)	-1.423499	0.178244	-7.98622	0.0153
D(LNUNEMP (-1))	-4.464510	0.220639	-1.813364	0.0971
D(LNUNEMP (-2))	0.377382	0.303070	1.245201	0.3392
D(LNUNEMP (-3))	-4.851201	0.410666	-11.81300	0.0071
D(LNREM)	1.3603097	0.060258	22.57632	0.0020
D(LNREM (-1))	-1.116612	0.055538	-20.10538	0.025
D(LNREM (-2))	-0.420595	0.042982	-9.785350	0.0103
D(LREM(-3))	-0.313895	0.025478	-12.32021	0.0103
D(LNFDI)	-0.365544	0.017709	-20.64204	0.0023
D(LNFDI(-1))	0.396041	0.022550	17.56313	0.0032
D(LNFDI(-2))	0.015709	0.018270	0.859833	0.4805
D(LNFDI(-3))	0.071639	0.015664	4.573486	0.0446
D(LNEXC)	-0.112860	0.189814	-0.594581	0.6124
D(LNEXC(-1))	3.312227	0.200863	16.48997	0.0037
D(LNEXC(-2))	2.198069	0.187973	11.69351	0.0072
D(LNEXC(-3))	3.242479	0.199191	16.27826	0.0038
CointEq (-1)*	-1.505686	0.051185	-29.41656	0.0012
R-squared.	0.998446	Mean dependent var		0.200531
Adjusted R-squared	0.994227	S.D. dependent var		0.441486
S.E of regression	0.033546	Alkaline info criterion		-3.820273
Sum squared resid	0.007877	Schwarz criterion		-2.860393
Log likelihood	71.57368	Hannan-Quinn criter.		-3.534850
Durbin-Watson stat	2.040836			

The short-run results indicate that unemployment has a negative and statistically significant effect on NWM, with a one-unit increase in unemployment reducing NWM by 1.423 percent, while the first and third lagged effects are also negative and significant and the second lag is positive but insignificant, suggesting that higher unemployment lowers NWM both immediately and over time as reduced income constrains people's ability to migrate. Remittances exert a positive and significant short-run effect on NWM, with a one-unit increase raising NWM by 1.36 percent by easing income constraints and financing migration costs, although the lagged effect is negative and significant, implying that higher income over time increases the reservation wage and reduces migration incentives. Foreign direct investment (FDI) shows a negative and statistically significant short-run impact on NWM, as a one-unit increase reduces NWM by 0.36 percent by generating domestic investment and employment opportunities, but its lagged effects are mostly positive and significant, except for the second lag, indicating that over time FDI may enhance NWM through capital accumulation and technology transfer. Finally, the exchange rate has a negative but statistically insignificant effect on NWM in the short run, while its lagged effect is positive and significant, suggesting that exchange rate depreciation increases the value of remittances, lowers the relative cost of migration, and gradually encourages migration, thereby influencing NWM over time.

Residual Diagnostics

To confirm the robustness of the ARDL estimates, several diagnostic tests were run after estimation. Table 8 confirms the model's statistical soundness, which satisfied the LM correlation, heteroskedasticity, Jarque-Bera, and Ramsey RESET tests, thereby proving it is correctly specified, has normally distributed residuals, and is free from both serial correlation and heteroskedasticity.

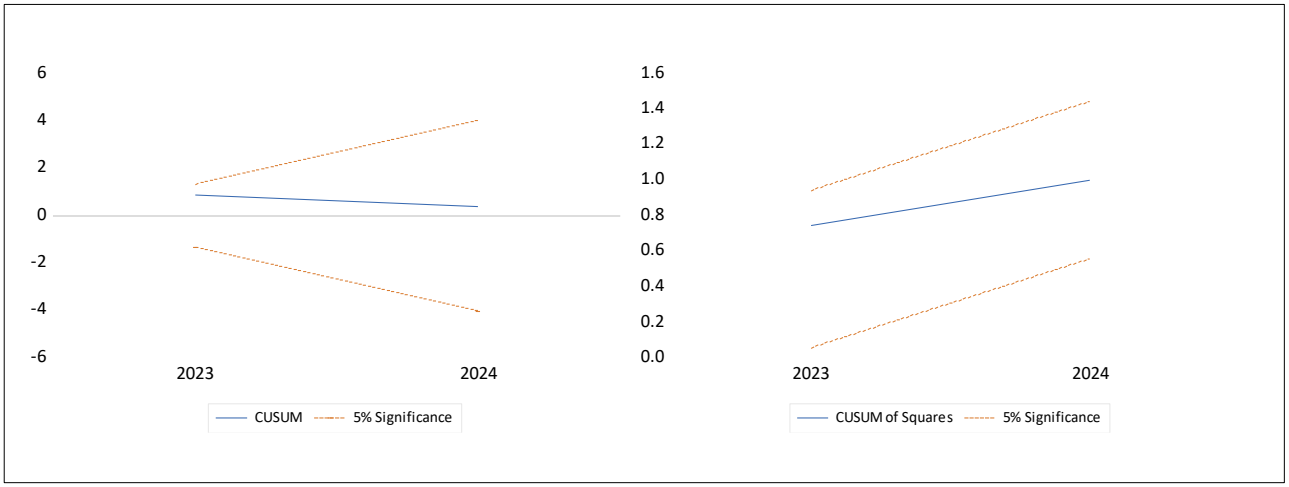
Table 8. *Residual diagnostic and stability test of the ARDL model (4,4,4,4,4).*

Test				Decision
Serial Correlation LM Test: Breusch-Godfrey				
F-statistic	0.001390	p-value : F(1,1)	0.9763	No serial correlation
Obs*R^2	0.037466	p-value : Chi-Square (1)	0.8465	(prob. >5 percent)
Heteroskedasticity Test: Breusch-Pagan-Godfrey				
F-stat	0.211023	p-value : F(24,2)	0.9816	No heteroskedasticity
Obs*R^2	19.35619	p-value : Chi-Square (24)	0.7327	(prob. > 5 percent)
Jarque -Bera	1.847090	p-value	0.397109	Data are normal (prob. > 5 percent)
Functional form :Ramsey RESET Test				
t-statistic	2.077544	p-value(1)	0.2856	Model is well specified
F-statistic	4.316190	p-value(1,1)	0.2856	(prob. > 5 percent)

Stability Test

The robustness of the estimated parameters in the labor migration model was assessed using the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests. These diagnostic tests are designed to detect potential structural breaks in time series data caused by various shocks. For the model to be stable, the CUSUM and CUSUMSQ plots must remain confined within the critical bounds at the 5% level of significance, thereby confirming the structural stability of the model's parameters.

Figure 3. *Graph of CUSUM and CUSUMSQ Test*



As depicted in Figure 3, the CUSUM and CUSUMSQ statistics are confined within the 5% critical bounds, statistically confirming the stability of the estimated model and indicating the absence of structural breaks throughout the study period.

5. Conclusions and Policy Recommendation

This study analyzes the macroeconomic determinants of labor migration, assigning the unemployment rate, remittance, FDI, and exchange rate as determinants over the time span of 1994-2024. The ARDL approach of cointegration is employed to study the relationship between macroeconomic determinants and labor migration. The bounds testing procedure and the significant negative error correction coefficient provide evidence of a long-term cointegrated relationship between labor migration and key macroeconomic factors. The negative association of unemployment to labor migration indicates that an increase in domestic unemployment restricts the ability of potential migrants to finance their journey and demonstrates the presence of a liquidity constraint, which restrains outward movement by diminishing the financial capacity of potential migrants for seeking foreign employment. The study shows a statistically positive association between remittance and labor migration in both the long run and short run**,** which indicates that an increase in remittances causes a demonstration effect, stimulating additional

workers to migrate abroad and a network effect funding the cost of migration for new departures. The significant negative association of FDI with labor migration in both the long run and short run suggests that increased FDI stimulates local economic activity, creates employment opportunities, and raises wages, thereby reducing the need and incentives for workers to migrate. Exchange rate plays a significant role primarily through its short-run dynamics (lags) rather than as a primary long-run determinant because it serves as a short-term financial incentive that affects the timing of migration decisions, which are delayed and realized only in subsequent periods due to the real-world friction of saving, financing, and regulatory processes.

The study's findings suggest that policymakers should adopt the policies of skilled enhancement programs that align with the demand-driven relevant training to bridge the domestic skills gap by equipping the youth with specific competencies to meet the demands of local industries, thereby cultivating desirable and viable avenues for job creation. The government should facilitate the private sector and attract foreign direct investment (FDI) to promote the establishment of labor-intensive industries in the potential areas such as manufacturing, agriculture, and agro-based industries. The government should introduce programs for reintegrating returning migrants' experiences by facilitating financial credit and technical support for initiating micro and small enterprises and introduce proper social safety net programs.

Future Prospects of Research

Further study could incorporate the macroeconomic determinant variables of relative wage rate of host countries to Nepal, income inequality, and poverty incidence to construct a comprehensive framework for analyzing the macroeconomic determinants of labor migration.

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Appendix

Compiled Data Set

Year	NWM	UNEMP	REM	FDI	EXC
1994	3.6	10.465	223	1378.76	49.49
1995	2.2	10.484	2,906.70	477.59	50.18
1996	2.1	10.443	2,660.20	221.896	55.46
1997	3.3	10.535	2,938.00	2395.54	57.30
1998	7.7	10.551	4,084.20	2000.28	62.25
1999	27.8	10.581	6,520.60	1666.42	68.28

Year	NWM	UNEMP	REM	FDI	EXC
2000	35.5	10.551	6,031.40	1417.61	69.40
2001	55	10.504	9,797.60	3002.56	74.18
2002	104.7	10.632	14,859.80	1209.65	77.24
2003	105	10.702	41,630.00	1793.77	78.08
2004	106.3	10.71	56,629.80	2764.8	74.09
2005	139.7	10.617	61,784.80	1635.77	72.36
2006	165.3	10.639	92,748.60	2606.31	72.62
2007	204.5	10.683	107,417.40	3185.98	70.79
2008	249.1	10.613	139,421.50	9812.6	65.32
2009	220	10.587	194,215.60	6255.09	77.18
2010	294.1	10.554	213,998.90	9100	74.84
2011	354.7	10.64	225,909.40	10053.21	72.47
2012	538.4	10.643	333,366.80	7138.31	81.32
2013	618.1	10.687	394,348.70	19818.73	88.26
2014	704.1	10.617	490,302.50	20132.42	98.55
2015	717.6	10.644	540,053.20	67455.04	99.79
2016	656.8	10.742	594,588.30	15254.33	106.65
2017	642.9	10.66	602,497.40	15206.46	106.51
2018	612.7	10.559	654,003.10	55760.48	104.67
2019	508.8	10.389	750,690.00	25484.44	113.18
2020	368.4	12.975	754,470.80	37805.83	116.61
2021	166.7	12.186	841,486.50	32072.82	118.17
2022	630.1	10.844	868,551.70	54158.94	121.14
2023	771.3	10.628	1,068,177.40	30719.45	131.05
2024	741.2	10.706	1,165,546.30	69833.58	133.33