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Do Remittances Stimulate Human Capital Development? Empirical Evidences from Nepal

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Abstract

Remittances have become an increasingly important driver of economic development, as they are more stable and reliable and are among the most emerging sources of funds for developing economies, including for human capital development. Nepal consistently ranks among the world's top remittance recipients relative to Gross Domestic Product, as many Nepalese work abroad. Remittance inflows not only sustain the consumption of necessities but also finance investment in education and health, thereby advancing human development. Despite the prominent role of human development in the growth of the Nepalese economy, the relationship between remittances and human capital development has been examined only sparsely. The objective of the paper is to analyze the effect of remittances on human capital development using annual time series data spanning 1993 to 2023, collected from the World Development Indicators and the World Bank, and employing the ARDL and ECM approaches to investigate the short-run and long-run dynamics. Human development is regressed on remittance inflows as the key explanatory variable, along with education expenditure and health expenditure as other control variables. The findings show a statistically significant positive relationship between remittance inflows and human development in both the short and long run. The study contributes to a broader understanding of how foreign migration-induced income inflows support human development in remittance-receiving developing countries like Nepal.

Keywords: Remittance, Human Development, ARDL bounds testing, Long Run, Nepal.

JEL Classification: F24, J24, C22, E25, R12

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Introduction

Remittance inflows represent significant injections into the domestic economy by migrant workers, especially during economic crises (Huay et al., 2019). Remittance inflows are playing an increasingly significant role in developing countries, serving as a stable and trustworthy source of funds (World Bank, 2011a); inflows have been rising sharply and now exceed the volume of official development assistance in low- and middle-income countries (Mohammed, 2021). Human capital, on the other hand, is an intangible asset that comprises the capabilities, commitments, and competencies of the workforce within a particular society or nation (Mozumdar & Islam, 2013). Investment in human capital formation results in the creation of skilled and healthy manpower, which supports the growth of the economy (Khan et al., 2024), which is an imperative concern in the world as educated and healthy people are considered the most crucial assets for the nurturing of an economy (Becker, 1993). That is why human capital is considered the driving force for the long-term growth of the economy (Romer, 1990).

Nepal has become one of the world's most remittance-dependent economies, with money sent home by migrants playing a central role in national income and household wellbeing. In FY2024, officially recorded remittance inflows to Nepal accounted for more than one-fourth of the country's GDP (25.32%), the highest proportion globally, far exceeding that of many peer countries (NRB, 2024). In the most recent fiscal year, Nepalis abroad remitted approximately Rs. 1444.32 billion, reflecting a year-on-year growth of around 17 % (MOF, 2024). Not only is the aggregate remittance figure large, but its penetration is deep: a majority of households rely on these inflows to meet basic consumption needs, health and education expenditures (Lamsal et al., 2025).

Human development in Nepal, measured by life expectancy, educational attainment, nutritional status, and poverty reduction, has shown steady improvement in recent decades due to remittance inflows and an increase in the number of remittance-receiving households (MOF, 2024). For example, absolute poverty dropped from about 42 percent in 1995/96 to approximately 25.2 percent by 2010/11, and then fell to 20.27 percent by the end of 2024/25. The multi-dimensional poverty rate dropped to 17.4 percent, and the HDI index has increased from 0.404 in 1990 to 0.622 in 2025. Nutritional deficits remain a concern: roughly 36 percent of children under five are stunted, though evidence suggests that remittance receipt is associated with lower odds of stunting, especially when households receive significant amounts (Lamsal, 2023). The increased inflow of

remittances has also improved access to education and health among remittance-receiving households, even in many rural and remote areas of Nepal.

The year-wise inflow of remittances in Nepal over the past few decades and the status of human development are depicted in Appendix Figures A1 and A2. Figure A1 shows the trend of foreign remittance inflow in Nepal since 2000/01 to 2022/23. There is a steady rise in remittance inflows throughout the period, except in 2010/11 and 2019/20, due to the impact of Covid-19. There has been a sharp rise in remittance inflows in Nepal since 2022, and in recent years they have exceeded one-fourth of GDP. Figure A2 demonstrates the HDI values of Nepal from 2000 to 2023. HDI values have been steadily increasing, except in 2021 and 2022, due to the effects of COVID-19.

Most previous studies are based on cross-country-specific panel data. A limited number of international studies have examined the impact of foreign remittances on human resource development in Sub-Saharan African (SSA) countries, the Gambia, and other developing countries (Rajkumar & Nagarajan, 2026; Sanneh, 2026; Barkat et al., 2026). However, to the best of my knowledge, there is a scarcity of such studies in Nepal. This study attempts to shed light on how remittances affect human capital development in Nepal. To this end, we examined the empirical relationship between remittance inflows and human capital development in Nepal. Thus, the extent to which foreign remittance inflows contribute to an increase in Nepal's HDI is the main motivating factor for this research. The concept of HDI was introduced by UNDP in 1990 to measure socio-economic development, depending upon life expectancy at birth (health index), educational attainment (education index), and real per capita income (income index).

The major research question of the study is "How do remittance inflows support human development," and the objective is to empirically explore the effects of remittances on human development in Nepal. However, the specific objectives are to identify the effects of remittance inflow, education expenditure, and health expenditure of the Nepal government on human development in Nepal.

The remaining content of the paper is organized into five different sections as follows: Section two is the review of literature from where research gap is identified; Section three shows research methodology including data and methods (methods and materials); Section four presents the results from empirical findings; Section five is about discussion; and the last Section six is about summary, conclusion and policy suggestions followed by area of further research.

Literature Review

Theoretical Review

The Human Capital Theory, developed by Schultz (1961) and Becker (1964) posits that investment in education and health enhances productivity and contributes to human development. Empirical studies further show that remittance inflows support human capital formation by increasing spending on schooling and healthcare (Edwards & Ureta, 2003; Mansuri, 2006). Subsequently, the New Economics of Labour Migration, introduced by Stark and Bloom (1985), conceptualizes migration as a household strategy aimed at diversifying income sources and minimizing economic risks, rather than merely an individual decision. Additionally, migrants' sense of responsibility and emotional satisfaction from supporting relatives facing adverse economic conditions further motivate remittance flows (OECD, 2006). More recent perspectives, such as the pure altruism theory, explain remittance behavior as driven by migrants' concern for their families' welfare. This theory assumes that remittances increase with migrants' income, depend on the income levels of household members in the country of origin, and are shaped by the degree of familial attachment (Kaasschieter, 2014; Orekoya & Tijani, 2023).

Empirical Review

Most of the existing literature on the effects of remittances on human development is found covering cross-country studies rather than country-specific studies. Among these studies, Ustubici & Idram (2012) and Salas (2014) found that foreign remittances help develop human capital by increasing the likelihood of sending children to school and reducing their absenteeism. Likewise, Cooray et al. (2016) examined the effect of remittances on female human capital development. Using panel data for 103 developing countries from 1970 to 2012, the study found that remittance inflows positively support human development in these countries.

Huay and Bani (2018) examined the effect of remittances on poverty and human capital development in 54 developing countries. The study used the GMM technique and found empirically that remittance inflows supported poverty reduction and, thus, the development of human resources. Ahmad et al. (2019) claimed that investment in human capital is the nation's key responsibility for achieving sustainable development. Using 26 years of data (1990 to 2016) from 151 developing countries and employing the Generalized Method of Moments (GMM), the study found that foreign remittances inflows help promote human

resource development by reducing child mortality and boosting the school enrollment rate.

Another study conducted by Huay et al. (2019) used a panel dataset of 67 developing nations over 24 years, spanning 1980 to 2014, to identify the effects of remittances on human capital development. The study found a statistically significant positive relationship between remittance inflow and human capital development; a 10 percent rise in foreign remittances will lead to a 0.016 percent increase in human development. Holding other variables constant, a rise in remittance inflow resulted in improvement in human development.

A study conducted by Sahoo et al. (2020) explored the relationship between remittance inflows and human development in South Asia from 1990 to 2018. By employing the VECM method, the authors found a positive effect of remittances and government expenditure on human development through their channel effects. Using panel data for five African nations from 2009 to 2018, Tasinda et al. (2021) investigated the effects of remittances on human capital growth. Using the ARDL model and cointegration techniques, the study found positive effects of Chinese remittances on human development in African countries. A study conducted by Mohammed (2021) also claimed that foreign remittances positively support human development in SSA nations. This outcome also aligns with the studies by Shafiq et al. (2022) and Zhunio et al. (2021).

Exploring the effects of remittances on human capital development, Xia et al. (2022) investigated how remittance inflows affect human capital development in 10 countries with the highest remittance inflows from 1980 to 2019 and found a positive correlation between remittance inflows and human capital development. Arshad et al. (2022) analyzed the impact of government spending, population growth, and foreign remittance inflow on human development in Pakistan using an ARDL bounds testing approach of cointegration and an error correction model. This study confirmed significant positive long-run and short-run relationship between remittance inflow and human development in Pakistan.

Another study by Nasrin et al. (2024) investigated the effects of foreign remittances on human development in seven South Asian countries, employing panel regression on data spanning 1995 to 2020. The empirical findings revealed that personal remittances positively and significantly support human capital development. Using a panel dataset of the top 10 remittance-receiving countries over 30 years (1990 to 2020), Ali et al. (2024) investigated the relationship between foreign remittance inflows and the components of the HDI (Health, Education, and PCI). Using the GMM technique, the study found that remittance inflows support the development of human capital, particularly by improving

health, education, and income levels. Using 32 years of time-series data from 1990 to 2021, Khan et al. (2024) studied the impact of remittances and official development assistance on Pakistan's human capital development and obtained empirical results using the ARDL model. The study found a strongly supportive effect of remittances on human capital development in Pakistan.

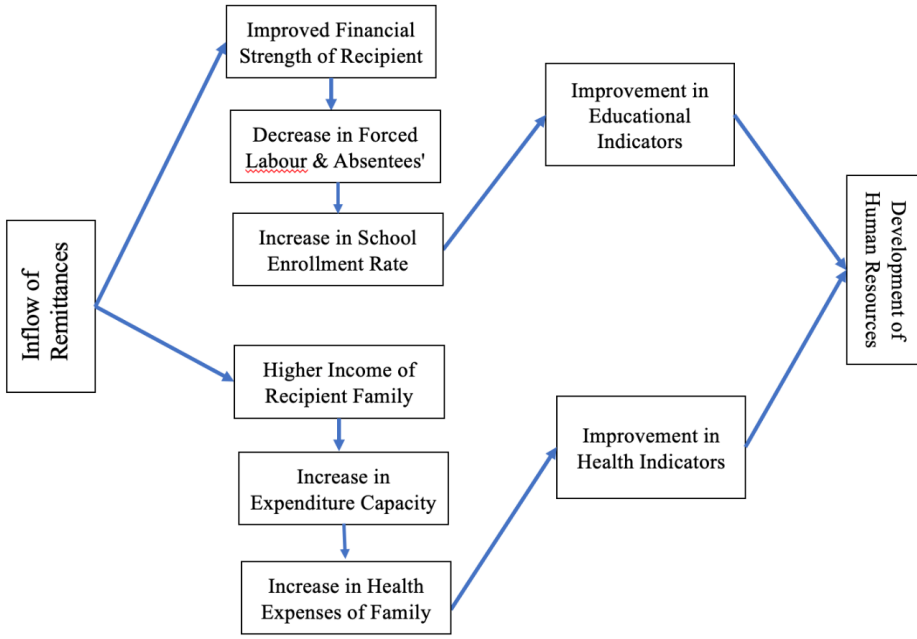
Khan (2025) investigated the effect of foreign remittances on human capital development. Using cross-country panel data from 1995 to 2020 for 61 developing nations and the GMM technique, the study found that remittance inflows have a positive and significant effect on health and educational outcomes, and thus on human development.

The inflow of international remittances supports human development in 45 Sub-Saharan African countries (Onyia et al., 2025) and in developing countries such as Gambia (Rajkumar & Nagarajan, 2026; Sanneh, 2026). Barkat et al. (2026) found that remittance inflows lead to significant gains in schooling and health, thereby enhancing human development in 111 developing countries by reducing budget constraints and domestic workload and improving access to public spending and credit information. Ali (2026) found that international remittances have supported human development in Russia.

To sum up, the majority of earlier research has found positive effects of foreign remittance inflow on the development of human resources, particularly covering international perspective studies. To the best of my knowledge, there is a dearth of literature in these perspective studies in Nepal. This study seeks to fill this lacuna in Nepal: What shall be its effect in Nepal?

After reviewing recent and relevant literature and drawing on my own intuition, I have sketched the conceptual framework for this study in Figure 1.

Figure 1: Conceptual Framework



Source: Author

Methods and Materials

Data Sources and Variables

This analysis relies on a quantitative research design, using yearly time-series secondary data covering 31 years (1993-2023), obtained from the World Bank database. This source is usually accepted for its methodological rigor, consistency, and international comparisons, thereby warranting the reliability and validity of the dataset employed in the study.

The dependent variable is Human Development Index (HDI), and the prime explanatory variable is foreign remittance inflow (REMI), and other control variables are education expenditure (EDEXP) and health expenditure (HEEXP). Health and education expenses among remittance-receiving families in Nepal are rising sharply. To what extent have remittance, health, and education support for human development motivated me while developing the model. The ARDL bounds testing approach introduced by Pesaran et al. (2001) is applied to examine the long-run and short-run associations between the dependent variable and the chosen explanatory variables. Before applying the ARDL technique, the ADF

unit root test is performed to identify the stationarity of the data. All empirical estimates are performed using EViews 10.

Model Specification

The study aims to investigate the effects of foreign remittances on Nepal's human development index (HDI). Remittance inflow (REMI) is the core independent variable; other control variables of the study are education expenditure of the government (EDEXP) and health expenditure (HEEXP). Our general equation framework is based on Huay et al. (2019) model with few modifications, and the human development function is expressed as:

$$HDI_t = f(REMI_t, EDEXP_t, HEEXP_t) \quad \ldots\ldots. (1)$$

Logarithmic (ln) linear specification of function (1) is as follows so that coefficients read as elasticities:

$$LnHDI_t = \beta_0 + \beta_1 LnREMI_t + \beta_2 LnEDEXP_t + \beta_3 LnHEEXP_t + \epsilon_t \quad \ldots. (2)$$

Where:

HDI_t = Human development index as the dependent variable in year 't',

$REMI_t$ = Remittance received as % of GDP in year 't' as the core independent variable,

$EDEXP_t$= Education expenditure as % of GDP in year 't' as the first control variable,

$HEEXP_t$ = Health expenditure as % of GDP in year 't' as the second control variable,

β_0 = Constant.

B_1, β_2, and β_3 are the parameters to be estimated, where the expected sign of the parameters β_1, β_2, and β_3 are positive, assuming that HDI increases due to an increase in inflow of foreign remittances, education expenditure, and health expenditure made by the government, and ϵ_t = error term.

Hypothesis of the Study

Based on the stated research question and objective of the study, the null and alternative hypotheses of this study are as follows:

$(H)_0$: REMI, EDEXP and HEEXP have no any effects on human development.

$(H)_1$: REMI, EDEXP and HEEXP have effects on Human development.

Econometric Methods

Unit Root Test

In time-series econometric analysis, testing for stationarity is an essential preliminary step to avoid obtaining spurious regression results. Prior to applying the ARDL bounds testing approach to cointegration, it is necessary to determine the integration properties of the variables included in the model. The ARDL framework permits variables to be integrated of order I(0), I(1), or a combination of both; however, the presence of any variable integrated of order I(2) violates the assumptions of the model and renders the approach inappropriate (Pesaran et al., 2001; Dahal, 2013; Lamsal, 2024). Among the various methods available for testing stationarity, the Augmented Dickey–Fuller (ADF) test, developed by Dickey and Fuller (1979), is one of the most widely used techniques. To examine the order of integration of the variables incorporated in the human development model, the following general ADF unit root test equation is employed:

$$\Delta Y_t = \alpha + \beta t + \lambda Y_{t-1} + \delta_1 \Delta Y_{t-1} + \cdots + \delta_p \Delta Y_{t-p} + \varepsilon_t \qquad \ldots\ldots (3)$$

Estimation of an ARDL Model

The study employed the ARDL model, a popular technique developed by Pesaran and Shin (1999) to identify cointegration relationship among the variables developed by Pesaran et al. (2001), which is a superior method to Engel and Granger (1987) and Johansen (1991). It is one of the most popular methods applied to time series data. The ARDL framework corresponding to the human development equation (2) is as outlined in equation (4), and the error correction model is given in equation (5).

$$\Delta (\text{LnHDI})_t = \alpha_0 + \sum_{i=1}^{p} a_{1i} \Delta (\text{LnHDI})_{t-i} + \sum_{i=1}^{q} a_{2i} \Delta (\text{LnREMI})_{t-i} + \sum_{i=1}^{r} a_{3i} \Delta (\text{LnEDEXP})_{t-i} + \sum_{i=1}^{s} a_{4i} \Delta (\text{LnHEEXP})_{t-i} + \alpha_{11} (\text{LnHDI})_{t-1} + \alpha_{12} (\text{LnREMI})_{t-1} + \alpha_{13} (\text{LnEDEXP})_{t-1} + \alpha_{14} (\text{LnHEEXP})_{t-1} + \varepsilon_{1t.} \qquad \ldots. (4)$$

Where Δ is the first-difference operator.

$$\Delta (\text{LnHDI})t = \alpha_0 + \sum_{i=1}^{p} a_{1i} \Delta (\text{LnHDI})_{t-i} + \sum_{i=1}^{q} a_{2i} \Delta (\text{LnREMI})_{t-i} + \sum_{i=1}^{r} a_{3i} \Delta (\text{LnEDEXP})_{t-i} + \sum_{i=1}^{s} a_{4i} \Delta (\text{LnHEEXP})_{t-i} + \beta\ \text{ECT}_{t-1} + \varepsilon_{1t} \ldots. (5)$$

Where:

a_{1i}, a_{2i}, a_{3i} and a_{4i} = Short run dynamic coefficients,

$\alpha_{11} = \alpha_{12} = \alpha_{13} = \alpha_{14}$ = Long run coefficients

β = Speed of adjustment parameter with negative sign

ECT = Error correction term

Empirical Findings and Discussion

Unit Root Test

Table 1 presents the ADF unit root tests and results for the variables used in this study.

Table 1: Results of the ADF Test for Unit Root

Variables	Model	Level: I (0)		First Difference: I (1)	
		t-statistic	p-value	t-statistic	p-value
Ln HDI	None	- 3.5859	0.0008	- 4.6565	0.0009
Ln REMI	Intercept	- 1.2653	0.6322	- 4.7757	0.0006
Ln EDEXP	Intercept	- 2.5133	0.1224	- 7.1442	0.0000
Ln HEEXP	Intercept	- 0.5015	0.8775	- 4.8526	0.0005

Source: Calculated using EViews10

Table 1 shows a mixed order of integration among the variables, with LnHDI being stationary at level and the other variables becoming stationary after first differencing. As no variable is found to be integrated of order I(2), the ARDL framework can be employed to examine both the short-run and long-run relationships among the variables (Pesaran et al., 2001).

Descriptive Statistics

The summary of descriptive statistics for selected variables is presented in Table 2.

Table 2: Descriptive Statistics

Particulars	Ln HDI	Ln REMI	Ln EDEXP	Ln HEEXP
Mean	-0.6727	2.2450	1.0427	1.3989
Median	-0.6694	2.9724	1.0612	1.3737
Maximum	-0.5041	3.3185	1.4350	1.9139
Minimum	-0.8556	-0.0202	0.6981	0.9477
Std. Dev.	0.1189	1.2530	0.1445	0.2507
Skewness	- 0.0734	-0.8670	-0.3084	0.1119
Kurtosis	1.5713	1.9465	4.4151	2.3836
Jarque-Bera	2.6643	5.3175	3.0783	0.5554
Probability	0.2639	0.70003	0.2145	0.7575
Sum	-20.8562	69.5958	32.3252	43.3670
Sum Sq. Dev.	0.4242	47.1065	0.6268	1.8858
Observations	31	31	31	31

Source: Calculated using EViews 10.

Table 2 presents the descriptive statistics of the dependent and independent variables included in the study. The table reports key statistical measures, including the mean, median, standard deviation, minimum, and maximum. The results of the Jarque–Bera normality test indicate that all variables are normally distributed, as the associated p-values exceed the 5 percent significance level.

Lag Length Selection

Prior to estimating the ARDL Bounds Test and deriving the long-run and error correction estimates, it is necessary to identify the appropriate lag length (Dahal, 2013; Lamsal et al., 2025). Commonly used lag selection criteria by researchers include the FPE, AIC, SC, and HQ statistics. Following the standard procedure, the optimal lag order is selected based on the lowest value among these criteria (Pesaran & Shin, 1999; Pesaran et al., 2001). Table 3 presents the corresponding lag selection results.

Table 3: VAR Lag length Criteria

Lag	Log L	LR	FPE	AIC	SC	HQ
0	45.0501	NA	5.62e-07	- 3.0407	- 2.8487	- 2.9836
1	165.0089	195.4883	2.59e-10	- 10.7414	- 9.0515	- 10.4559
2	190.2068	33.5971*	1.43e-10	- 11.4227	- 9.6949	- 10.9089
3	212.6559	23.2805	1.13e-10*	- 11.9004	- 9.4047	- 11.1583
4	234.3331	16.0572	1.27e-10	-12.3209*	- 9.7873*	- 11.3505*

Source: Calculated using EViews 10.

*Note: * = Optimum Lag Length.*

ARDL Model Estimation

Selecting and estimating the appropriate ARDL model is a prerequisite for conducting the cointegration bounds test, estimating long-run coefficients, and developing the error correction model. The lag selection results reported in Table 3 indicate that the ARDL (4,4,4,2) specification is optimal according to the AIC, SC, and HQ criteria. As the study uses 31 years of annual data, the maximum lag length is 4, following Pesaran et al. (2001). The estimated results of the selected ARDL model are presented in Table 4 and subsequently used to assess the existence of a long-run relationship among the variables.

Table 4: Empirical Result of the ARDL Model

Dependent Variable: LnHDI			Method: ARDL (4,4,4,2)	
Variables	**Coefficients**	**Std. Error**	**t-Statistic**	**Prob.***
LnHDI (-1)	0.6136	0.2465	2.4887	0.0321
LnHDI (-2)	-0.0561	0.2385	-0.2351	0.8188
LnHDI (-3)	-0.0141	0.1776	-0.0796	0.9381
LnHDI (-4)	0.3397	0.1544	2.1994	0.0525
LnREMI	0.0122	0.0053	2.2769	0.0460
LnREMI (-1)	-0.0042	0.0065	-0.6521	0.5290
LnREMI (-2)	0.0085	0.0070	1.2094	0.2543
LnREMI (-3)	-0.0018	0.0070	-0.2609	0.7994
LnREMI (-4)	0.0081	0.0051	1.5827	0.1445
LnEDEXP	-0.0270	0.0144	-1.8680	0.0913
LnEDEXP (-1)	-0.0312	0.0140	-2.2215	0.0506
LnEDEXP (-2)	0.0062	0.0120	0.5191	0.6149
LnEDEXP (-3)	0.0152	0.0132	1.1503	0.2767
LnEDEXP (-4)	0.0228	0.0122	1.8591	0.0926
LnHEEXP	0.0099	0.0157	0.6344	0.5400
LnHEEXP (-1)	-0.0112	0.0212	-0.5321	0.6063
LnHEEXP (-2)	-0.0653	0.0220	-2.9604	0.0143
R-squared	0.9993	Mean dependent var		-0.6470
Adjusted R-squared	0.9982	S. D. dependent var		0.1047
S. E. of regression	0.0044	Akaike info criterion		-7.7431
Sum squared resid	0.0001	Schwarz criterion		-6.9272
Log likelihood	121.5322	Hannan -Quinn criterion		-7.5005
		Durbin-Watson Stat		2.3469

Source: Calculated using EViews 10

ARDL Bounds Test for Cointegration and Error Correction Model

The ARDL bounds testing approach is used to examine whether a stable long-run relationship exists between the dependent variable and the selected explanatory variables. In addition to identifying long-run associations, the technique also provides insights into short-run adjustments among the variables. According to Pesaran et al. (2001), the bounds test employs the Joint F-statistic to test the null hypothesis that no cointegration exists among the variables against the alternative hypothesis that a cointegrating relationship is present. The calculated F-statistic is then compared with the lower bound I(0) and upper bound I(1) critical values to determine the existence of cointegration. The empirical findings of the bounds test are reported in Table 5, while the results of the Error Correction Model are presented in Table 6.

Table 5: Empirical Results of ARDL Bound Test for Cointegration and Long-Run

F-Bound Test				
Test Statistic	**Value**	**Significance**	**I (0)**	**I (1)**
F-statistic	7.1367	10%	2.01	3.1
k	3	5%	2.45	3.63
		2.5%	2.87	4.16
		1%	3.42	4.84

Source: Estimated using EViews 10

The data reported in Table 5 shows the results of ARDL bound test results for cointegration. The value of F-statistic for the bound test is 7.1367 which is greater than the lower bound value of 3.42 and upper bound of 4.84 at a 1 percent level of significance, which justifies that there is a long-run relationship between human development (HDI) with remittance (REMI), education expenses (EDEXP), and health expenses (HEEXP) in Nepal.

Estimation of Long-Run Coefficients

Once the bounds test confirms the presence of a long-run relationship among the selected variables in the study, the ARDL approach proceeds to estimate the long-run coefficients. Equation (2) specifies the long-run model employed in this study. To obtain reliable long-run estimates, the optimal lag length is selected based on the Akaike Information Criterion (AIC). As shown in Table 3, the ARDL (4, 4, 4, 2) specification was chosen as the most appropriate model. The resulting long-run coefficient estimates are presented in Table 6.

Table 6: Estimation of Long -Run Coefficients

Dependent Variable: LnHDI		**Model: ARDL (4,4,4,2).**		
Variables	**Coefficients**	**Std. Error**	**t-statistic**	**Prob.**
LnREMI	0.1950	0.0201	9.7002	0.0000
LnEDEXP	-0.1202	0.1812	-0.6631	0.5222
LnHEEXP	-0.5699	0.1287	-4.4268	0.0013

Source: Calculated using EViews 10

The data reported in Table 6 show the estimated long-run coefficients using ARDL model. The relationship of lnREMI with LnHDI is positive and statistically significant at 1 percent level. However, LnEDEXP is negative and statistically not significant with LnHDI. The LnHEEXP is negative and statistically significant with LnHDI at 1 percent level. When remittance inflow increases by 1 percent, it leads to 0.19 percent increase in human development in the long-run. The findings of our study is similar with the findings of Rajkumar

and Nagarajan (2026); Sanneh (2026); Barket et al. (2026); Ali (2026); Khan (2025); Khan et al. (2024); Ali et al. (2024); Nasrin et al. (2024); Ahmad et al. (2019); Huay et al. (2019); Huay and Bani (2018); Sahoo et al. (2020); Xia et al. (2022); Salas (2014); Tasinda et al. (2021); Cooray et al. (2016); Arshad et al. (2022); and others. The inflow of remittances eases household budget constraints and provides household with additional financial resources to the households for essential expenditures. Spending a portion of remittances on education and health can yield significant long-run returns by improving human capital development.

Error Correction Model: Short Run Dynamics

The results of the Error Correction Model (ECM) are shown in Table 7. The error correction term carries a negative coefficient of -0.1169 and is statistically significant. This finding indicates that any short-run disequilibrium is gradually corrected over time, confirming the presence of a long-run equilibrium relationship among the variables considered in the study.

Table 7: ARDL Error Correction Regression

ECM Regression:			**Case 1:** No Constant and No Trend	
Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Δ(LNHDI(-1))	-0.2694	0.1961	-1.3734	0.1996
Δ(LNHDI(-2))	-0.3255	0.1259	-2.5848	0.0272
Δ(LNHDI(-3))	-0.3397	0.1132	-2.9994	0.0134
Δ(LNREMI)	0.0122	0.0034	3.5089	0.0056
Δ(LNREMI(-1))	-0.0148	0.0033	-4.4601	0.0012
Δ(LNREMI(-2))	-0.0063	0.0044	-1.4237	0.1850
Δ(LNREMI(-3))	-0.0081	0.0036	-2.2088	0.0517
Δ(LNEDEXP)	-0.0270	0.0078	-3.4651	0.0061
Δ(LNEDEXP(-1))	-0.0442	0.0098	-4.4885	0.0012
Δ(LNEDEXP(-2))	-0.0380	0.0112	-3.3894	0.0069
Δ(LNEDEXP(-3))	-0.0228	0.0090	-2.5107	0.0309
Δ(LNHEEXP)	0.0099	0.0125	0.7961	0.4444
Δ(LNHEEXP(-1))	0.0653	0.0174	3.7459	0.0038
Coint Eqⁿ (-1)*	-0.1169	0.0191	-6.0918	0.0001

Source: Calculated using EViews 10

Table 7 presents the results of an Error Correction Model (ECM) regression, which explores the short-run and long-run dynamics between the dependent variable, Human Development Index (LnHDI), and three selected independent variables, including the core independent variable: remittances (LnREMI), and other control variables, namely education expenditure (LnEDEXP), and health expenditure (LnHEEXP). Each variable is expressed in first differences (Δ),

indicating short-run effects. The "Cointegration Equation (-1)" term represents the error correction term, capturing the long-run relationship between the variables.

In the short run, the HDI values are statistically significant at lags 2 and 3. This shows that past HDI values continue to influence recent values, although the coefficients are negative. Remittances (REMI) show mixed effects on human development. The current remittance inflow has a significant positive effect, suggesting that an increase in remittance inflow tends to improve HDI in the short term. However, the first and third lag values have negative and significant effects, which may indicate delayed negative impacts such as increased dependency or inflationary pressure. Education expenditure (EDEXP) shows negative and highly significant coefficients across all lag periods, which is unexpected in this study. This may reflect inefficiencies of government expenditure in the education sector in the short run. In comparison, health expenditure (HEEXP) is mostly insignificant, except at the first lag where it shows a positive and significant effect, suggesting a delayed positive contribution of health expenses to HDI.

The error correction term (cointegration Eqn.) is negative and statistically significant at the 1% level. This confirms a stable long-run relationship between the dependent variable (HDI) and the independent variables. The negative value of the cointegration coefficient (-0.1169) represents the speed at which the system returns to long-run equilibrium. It indicates that nearly 11.69% of the short-term disequilibrium is corrected in each period towards the equilibrium.

The statistical significance of the error correction term also indicates that the model effectively explains both short-term changes and long-term equilibrium relationships. Overall, the ECM results indicate that remittances and health expenditure generally contribute positively to improvements in HDI, whereas education spending appears less effective in the short run. This could be due to a number of challenges the government faces in the education sector. Government spending on school education and the recent SEE results of government schools in Nepal are real examples. Taken together, short-run and long-run findings indicate that remittances, education expenditure, and health expenditure all play a role in shaping human capital development in Nepal.

Residual Diagnostics

Once the empirical model is estimated, residual diagnostic tests are applied to evaluate the model residuals and assess model adequacy. Consequently, LM

Test, Heteroscedasticity, and Normality tests are performed, and their findings are reported in Table 8, Table 9, and Figure 2.

Table 8: Breusch-Godfrey Serial Correlation (LM Test)

F-statistic	1.4820	Prob. F (4,6)	0.3170
Obs*R-squared	13.4188	Prob. Chi-Square (4)	0.0994

Source: Calculated using EViews 10

The Breusch–Godfrey LM test is used to detect serial correlation in the model. As shown in Table 8, the results suggest no evidence of autocorrelation, since the p-value of the F-statistic exceeds the 10 percent significance level.

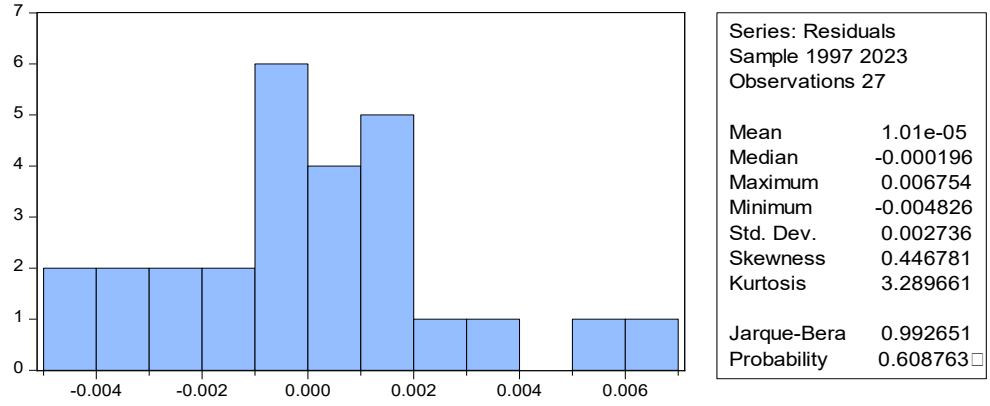
Table 9: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.7448	Prob. F (17,9)	0.1991
Obs*R-squared	20.7147	Prob. Chi-Square (17)	0.2393
Scaled explained SS	3.2626	Prob. Chi-Square (17)	0.9999

Source: Calculated using EViews 10

The Breusch–Pagan–Godfrey test is used to assess whether heteroskedasticity is present in the model. As shown in Table 9, the results suggest that there is no heteroskedasticity problem, since the p-value of the F-statistic is above the 10 percent significance threshold.

Figure 2: Normality Test (Histogram)



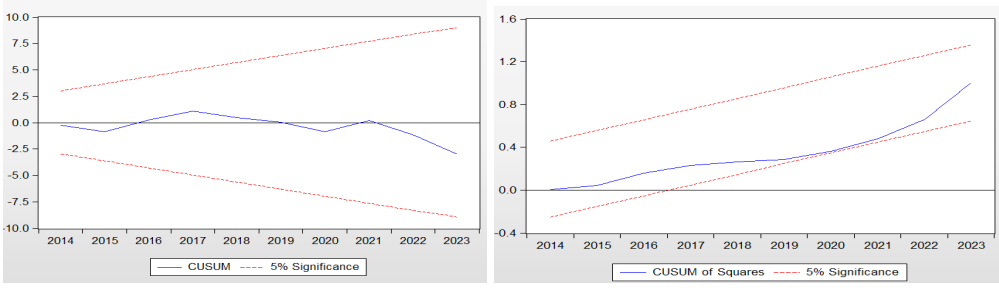
Source: Calculated using EViews 10

Figure 2 shows the normality test for the dataset under study. The probability of the 'J-B test' is more than 10 percent. It shows that the data are normally distributed.

Stability Diagnostics

The stability of the human development model is examined to verify the consistency of both long-run and short-run parameter estimates. The CUSUM and CUSUMSQ tests are applied to detect any structural breaks in the ARDL model over the sample period. Stability is established when the plotted statistics remain within the 5 percent significance-level critical bounds, as indicated by two red boundary lines. The results, presented in Figure 3, confirm that the model is structurally stable.

Figure 3: Plot of Cumulative Sum (CUSUM) and CUSUM of SQ of Recursive Residuals



Source: Calculated using EViews 10

Conclusion

Remittance inflows are a vital source of external finance for developing countries, significantly influencing household incomes and national economic stability. These funds impact various sectors, promoting domestic consumption, investment, and, most prominently, human capital development. This study examined the impact of foreign remittance inflows on human development in Nepal using the Autoregressive Distributed Lag (ARDL) bounds testing approach, employing time-series data spanning 31 years (1993 to 2023). The relationship of lnREMI with LnHDI is positive and statistically not significant at the 1 percent level. However, LnEDEXP is negative and statistically insignificant with LnHDI. However, LnHEEXP is negative and statistically significant with LnHDI at the 1 percent level. When remittance inflow increases by 1 percent, it results in a 0.19 percent increase in human development in the long run. The result of this study aligns with Rajkumar and Nagarajan (2026); Sanneh (2026); Barket et al. (2026); Ali (2026); Khan (2025); Khan et al. (2024); Ali et al. (2024); Nasrin et al. (2024); Ahmad et al. (2019); Huay et al. (2019); Huay and

Bani (2018); Sahoo et al. (2020); Xia et al. (2022); Salas (2014); Tasinda et al. (2021); Cooray et al. (2016); Arshad et al. (2022); and others.

The empirical findings of this study provide undeniable evidence that foreign remittances have a significant and positive impact on human development in Nepal, both in the short run and long run. This emphasizes the critical role of remittance inflows in shaping the country's human resource base by improving living standards, expanding access to resources, and enhancing the capabilities of individuals and households. Over the 31-year period from 1993 to 2023, remittances have consistently contributed to improvements in Nepal's Human Development Index (HDI), confirming their role as a key driver of socio-economic progress.

However, the mixed effects of education and health expenditures on human development signal inefficiencies in the allocation and use of public funds in these sectors. While such spending is crucial for capacity building and productivity, the lack of consistent long-term impact suggests a need to reassess the quality, targeting, and governance of public investment in education and healthcare. Policymakers should focus on strengthening institutional frameworks to ensure that increased expenditures translate into meaningful improvements in service delivery and outcomes. Coordination between remittance-driven household spending and government development priorities should be enhanced to create synergy in building a resilient human capital base.

Given the sustained contribution of remittances, Nepal should adopt policies that facilitate safe, productive, and formal remittance inflows and promote financial literacy among recipients to encourage long-term investments in education, health, and related businesses. At the same time, there should be increased accountability and transparency in public spending in human development sectors to maximize their effectiveness. Incentivizing diaspora engagement in nation-building, alongside reforms to education and healthcare systems, can help create a sustainable ecosystem in which both private (remittance-based) and public investments reinforce one another to advance human development.

Future Research Prospects

Future research could explore the disaggregated impacts of remittances on different dimensions of human development—such as education attainment levels, health outcomes, or income inequality—at both national and regional levels. Likewise, further studies could be explored and compared using first-hand data collected from the provinces of Nepal.

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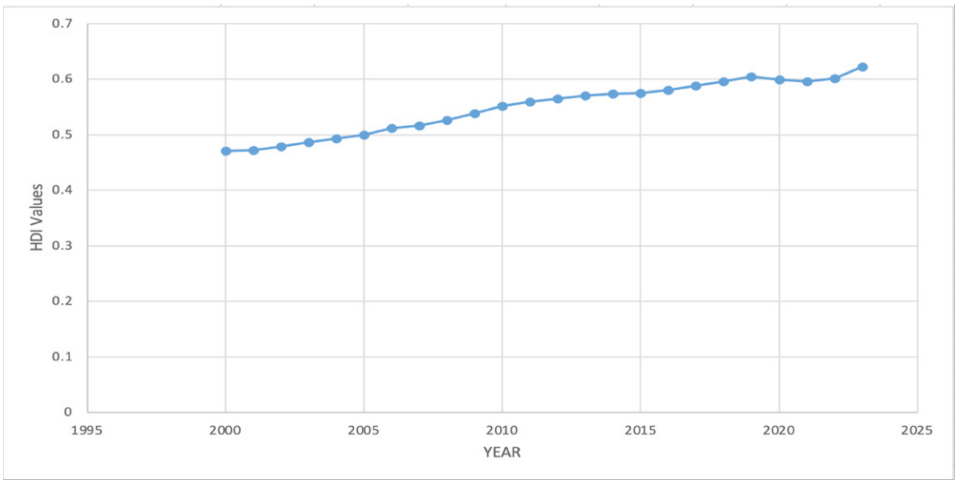
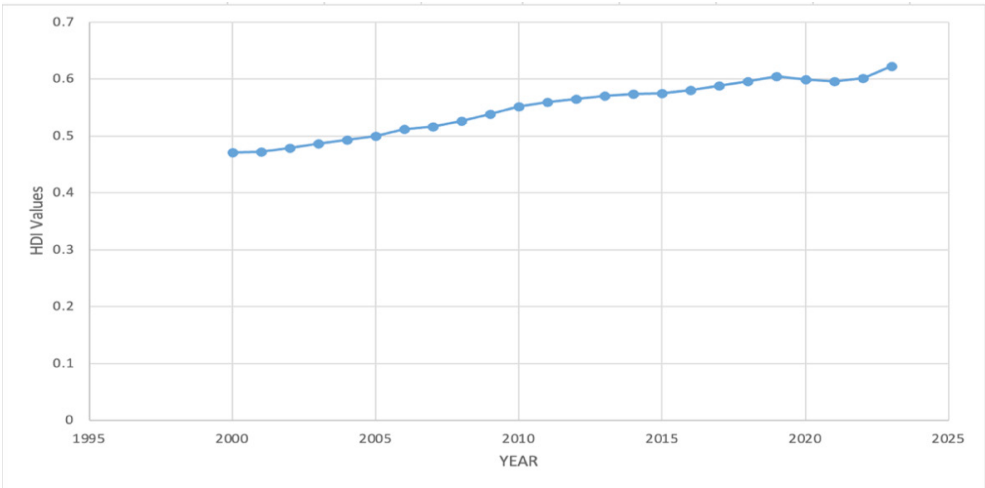
Appendix

Figure A1: Year-wise inflow of Remittances in Nepal (Rs. billion).



Source: NRB (2024)

Figure A2: HDI Values of Nepal (Since 2000 to 2023)



Source: MOF (2024)