Impact of Remittance on Educational Outcomes: Empirical Evidence from Nepal

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Abstract

The remittances are the treasure for irrigating Nepal's economy. Because emigration is increasing, per capita remittance is also increasing in Nepal. However, the question is signaling in its utilization for educational attainment. In this context, the study examines the impact of remittance on educational outcomes in Nepal. The study applied autoregressive distributed lag (ARDL) estimations, Granger causality, forecast error variance decomposition (FEVD) technique, and impulse response functions (IRFs), with time-series data spanning from 1981 to 2021. The overall findings revealed that remittance had a positive impact on educational outcomes in Nepal. In the short run, remittance was found to be crucial for secondary schooling; in the long run, remittance had a significant effect on tertiary schooling in Nepal. The FEVD confirmed that remittance might be the inevitable predictor of educational outcomes in Nepal. The Granger causality also found a unidirectional causality from remittance to educational outcomes. The policymakers and stakeholders, therefore, should focus on funneling remittance toward financing education as well as a productive sector to accelerate per capita GDP and on cropping the demographic dividend in the Nepali economy.

Keywords: remittance, emigration, education, ARDL, schooling, Granger causality
JEL classification: C32, F22, F24, I21, I23

Introduction

Inward remittances play a crucial role in Nepal's economy as well as society. In the aftermath of the 1990s political system regime, the government of Nepal grasped opportunities for the benefits of global integration and abroad emigration. Policies have evolved from

attempts at control to a focus on leveraging migration for development, including poverty reduction, gender equality, and human capital development. Remittances thus, have become crucial for government revenue and economic stability, prompting increased attention to migration policies in recent times (Adhikari, 2016).

Nepali men and women, for two centuries, have been leaving their homeland in pursuit of jobs, either to escape the burdens of taxes or exploitation. Labor migration may bring significant economic benefits to the country through remittances, but it is not adequately prioritized nor emphasized by the policymakers (Gurung, 2004). Following the resurgence of democracy, the boarding abroad of workers was considerably cleared up with cheers to the Labor Act of 1985, and the subsequent enactment of the Foreign Employment Act, coupled with the distribution of passports by the District Development Offices, which was accompanied by rising jobs abroad, particularly to the Gulf countries, outside India (Shrestha, 2020).

As the emigration in Nepal has increased, by mid-March of FY 2023, the number of persons who have obtained labour permits to work in foreign countries has reached 55,26,704. Remittance inflows had increased by 25.3 percent to Rs. 794.32 billion by mid-March of FY 2023 (Ministry of Finance [MoF], 2023). National Statistics Office [NSO] (2022) reported that the majority of Nepali, about 62%, are in the range of aged 15-59. Nepal thus can utilize demographic dividend for economic progress and sustainable economy. However, Nepal failed to utilize this demographic capital, focusing on emigrating carrot—remittance, causing Dutch disease. Remittance is the inevitable source of income for the nationals as well as capital account medicine. It is also needed to maintain the adequacy level of foreign reserve in a country (Gajurel, 2022) which should be maintained by personal remittance inflow. However, the channelization of remittance towards productivity, and social and physical capital overhead is not satisfactory as evidenced by different studies including Pant (2011) and Sapkota (2013). However, social overhead capital can cause productivity and output (Danga et al., 2022) that can be ultimately used for public educational financing to enhance educational outcomes in Nepal.

Education outcomes are problematic due to income matters in Nepal (Thapa, 2013; Neupane, 2017). Due to the problem of hands-to-mouth, expensive institutional education, and poor quality of the government education system, Nepal fails to attain educational outcome objectives. Secondary and tertiary enrollment are the backbone of human capital. Thus, educational spending helps human capital development to reduce poverty (Gajurel, 2023), and tertiary education and financing public education can promote economic growth (Dangal & Gajurel, 2019; Dangal & Gajurel, 2022). The research problems, objectives, rationale, and limitations stated below can explore the overall ideas of the study.

Research Problems

Remittance and its dependency in Nepal are continuously rising. Most of the youths are expecting to move to foreign employment, expecting their economic sustainability. As increasing remittance, its utilization in children's education is questionable in the Nepali context. Most of the studies found a positive impact (Bansak et al., 2015; Chaaban, & Mansour, 2012; Forhad & Alam, 2021; Kumar, 2019) and no sufficient evidence (Antman, 2011; McKenzie & Rapoport, 2011; Thapa & Acharya, 2017) to the betterment of educational outcomes by remittance inflow. On the other hand, there was no specific study of time series analysis of remittance impact on educational outcomes in Nepal. This study, therefore, is intended to examine the impact of remittance on education outcomes in Nepal, considering the following research question: Is there any evidence of the impact of remittance on education outcomes in Nepal?

Research Objectives

Remittance is continuously towering in Nepal. The personal financial remit, however, is supposed to be utilized for personal well-being and family welfare, enhancing their capacity as well as competitiveness through the advanced educational outcome. Assuming that remittance can improve educational outcomes, the paper aims to evaluate the impact of remittance on educational outcomes in Nepal.

Rationale

Remittance is the backbone of the Nepalese economy. Its excessive dependency is also questionable at the policymaking level in recent years, debating, therefore, as the proximate cause of Dutch disease. Through this study, the educational outcomes can be studied whether or not remittances are promoted. This study attempts to fill the empirical gaps in the context of Nepal. This study will attempt to fill the gap and make significant contributions to policymakers as well as stakeholders to design policy mechanisms for funneling and diverting resources toward educational outcomes in Nepal.

Limitations

Channelization of the remittance has multifaced effects on the economy. Individuals can benefit from remittance differently. This study used time series data and macro level study to evaluate the overall educational outcomes via remittance. This study excludes the primary-level educational outcomes due to free educational provision in government schools, excepting that if they tend to enroll at the primary level it cannot be a matter of income. This study covers limited interacting and controlling variables and thus results can be limited to generalize the problems addressed by appropriate policy.

Besides the introduction, this paper will be divided into a literature review, materials and methods, results and discussion, and a conclusion and implication.

Literature Review

With increasing emigration, remittances are an important source of capital input in developing countries, and they can serve as both a source of physical and social capital (Chami et al., 2005; Meyer & Shera, 2017; Sinha et al., 2019). Workers' remittance thus, can promote human capital in the short- and long-run (Aslam & Sivarajasingham, 2023). Many studies linked remittance to educational attainment via income, investment, and consumption perspectives. Thus, remittance enhances personal income and then consumption of goods and services including education as well (Glytsos, 2005; Tchantchane et al., 2013, Bansak et al., 2015; Askarov et al., 2020, Mishra et al., 2022). In contrast, a study by Karki Nepal (2016) with Nepal Living Standards Survey (NLSS) data didn't find any evidence that remittance leads to spending on education and can improve the educational outcome in Nepal.

In a panel study of 69 low- and middle-income countries, Zhunio et al. (2021) found that remittance has a paramount role in improving primary and secondary school attainment. Using system GMM with 46 Sub-Saharan African (SSA) countries and a 5-year interval data spanning from 1975 to 2014, Amega (2018) found that remittance can significantly improve educational outcomes. This study revealed that secondary-level enrollment increases as an increase in remittance per capital. Using pseudo-panel and cross-section data Gyimah-Brempong and Asiedu (2015) found that remittances mark a substantial increase in the levels of enrollment for both primary and secondary school children demonstrating the addition of human capital through education. International remittances have an evidenced influence that is way more powerful compared to domestic transfers. Also, there is a chance that remittances to female-headed households raise higher education investments compared to male-headed households.

Bansak et al. (2015) studied using the Nepal Living Standards Survey III of 2010 data and they found that internal remittance due to inward migration has a substantive impact and can propel education outcomes in Nepal. Consistent with these findings, Thapa and Acharya (2017) considered the same set of survey data and found no proper evidence of remittance on investing education compared to remittance non-receiving households. Considering the national-level household survey of Jordan, Mansour et al. (2011) found that remittance inflow can positively influence education attendance, and thus, improve education outcomes more for men than women. The study revealed that the impact of remittance on tertiary schooling is more crucial and significant than secondary education; while there were greater effects of remittance on secondary education in recipient nations (Forhad & Alam, 2021). Employing panel ARDL, Arif et al. (2019) confirmed that remittance has a paramount impact on the development of higher education.

The prior research either focusing panel studies or cross-sectional studies; however, they found positive and negative impacts of remittance on educational outcomes. In the

Nepalese context, almost cross-sectional studies were found but not find sufficient literature on time series analysis of the impact of remittance on educational outcomes. This study attempts to plug these empirical and contextual studies gaps.

Research Materials and Method

Data and Variables of Interest

This study is intended to investigate the impact of remittance on educational outcomes in Nepal. The study covers the 41-year annual data set spanning from 1981 to 2021 AD. Gross enrollment in secondary level and tertiary level were proxied for education outcomes and per capita remittances were proxied for remittance under this study (Aslam & Sivarajasingham, 2023; Komla, 2018). To estimate the impact of remittance on education, dependency ratio, education expenditure, GDP per capita, net migration, and rural population were considered as the endogenous variables. The data were obtained from the World Development Indicator (WDI) of the World Bank data bank and the database of the Nepalese economy by Nepal Rastra Bank (NRB) A detailed description of the variables and their measurement units are illustrated in Table 1.

Table 1

Description of Variables of Interest

Proxies	Descriptions	Measurement	Sources
ln*tertiary*	Higher education gross school enrollment ratio of total enrollment	%	WDI
ln*secondary*	Secondary education gross enrollment ratio of total enrollment	%	WDI
ln*dependency*	The ratio of dependent population (< 15 and ≥ 65) to economically active population aged 15 to 64	ratio	WDI
ln*eduexp*	General government expenditure on education (current, capital, and transfers) is expressed as a percentage of GDP	%	WDI
Ln*gdpp*	GDP per capita is gross domestic product divided by midyear population. Data are in constant 2015 U.S. dollars	US dollar	WDI
ln*migration*	Net migration is the number of immigrants minus the number of emigrants, including citizens and non-citizens	Number	WDI
ln*remit*	Per capita remittance as a ratio of remittance received to population	Rs.	NRB
ln*rpopulation*	Rural population refers to people living in rural areas as defined by national statistical offices	Number	WDI

Note. WDI = World Development Indicator, NRB = Nepal Rastra Bank

The missing data of enrollment were obtained by linear interpolation. For smoothing the data, all the variables are transformed into a logarithmic form. The negative series of net migration can be transformed into a natural logarithmic form by using the following formula (Gajurel et al., 2021).

$$\ln x = \ln\left(x+\sqrt{(x^2+1)}\right)$$

Model Specification and Methods

Remittance is the inevitable source of capital flow in Nepal (Ministry of Finance [MOF], 2023). Capital can be mobilized to enhance social development. Education is the building block of the nation and every individual can secure their schooling if they have sufficient resources to finance education. As rising emigration tendency in Nepal, remittance is the major source of personal income. Due to that most of the domestic migrated to secure their children's education as reported by the National Population and Housing Census 2021: National Report (National Statistics Office [NSO, 2022]. Thus, two general model specifications for the study are as follows:

$$\ln secondary_t = f(\ln remit_t, \ln migration_t, \ln gdpp_t, \ln dependency_t, \ln eduexp_t, \ln rpopulation_t) \ldots \quad (1)$$

$$\ln tertiary_t = f(\ln remit_t, \ln migration_t, \ln gdpp_t, \ln dependency_t, \ln eduexp_t, \ln rpopulation_t) \ldots \quad (2)$$

Where, ln*secondary* = log of secondary education enrollment, ln*tertiary* = log of higher education enrollment, ln*remit* = log of per capita remittance, ln*migration* = log of net migration, ln*gdpp* = log of GDP per capita, ln*dependency* = log of dependency ratio, ln*eduexp* = log of government expenditure on education, and ln*rpopulation* = rural population. Enrollment at the primary level was excluded in this mode due to the assumption that primary education is completely free in a government school and it is not a matter of level of income or source of income.

To estimate the short and long-run dynamics of remittance on education, the autoregressive distributed lag (ARDL) bound test and error correction model (ECM), Granger causality, forecast error variance decomposition, and impulse response functions (IRFs) were performed. Before performing these, the unit root test and optimal lag were determined.

Pesaran and Shin (1999) and Pesaran et al. (2001) developed the ARDL model to estimate the short and long-run dynamics. The ARDL bound test is employed to confirm the cointegration between variables of interest. The ARDL (p, q) equations for the anticipated relationship in equations 1 and 2 can be estimated as follows:

$$\Delta\ln secondary_t = \alpha_0 + \beta_1 \ln secondary_{t-1} + \beta_2 \ln remit_{t-1} + \beta_3 \ln migration_{t-1} + \beta_4 \ln gdpp_{t-1} + \beta_5 \ln dependency_{t-1} + \beta_6 \ln eduexp_{t-1} + \beta_7 \ln rpopulation_{t-1} + \sum_{i=1}^{p} \phi_{1i} \Delta\ln secondary_{t-i} + \sum_{i=1}^{q} \phi_{2i} \Delta\ln remit_{t-i} + \sum_{i=1}^{q} \phi_{3i} \Delta\ln migration_{t-i} + \sum_{i=1}^{q} \phi_{4i} \Delta\ln gdpp_{t-i} + \sum_{i=1}^{q} \phi_{5i} \Delta\ln dependency_{t-i} + \sum_{i=1}^{q} \phi_{6i} \Delta\ln eduexp_{t-i} + \sum_{i=1}^{q} \phi_{7i} \Delta\ln rpopulation_{t-i} + \epsilon_t \quad \ldots (3)$$

$$\Delta\ln tertiary_t = \alpha_0 + \beta_1 \ln tertiary_{t-1} + \beta_2 \ln remit_{t-1} + \beta_3 \ln migration_{t-1} + \beta_4 \ln gdpp_{t-1} + \beta_5 \ln dependency_{t-1} + \beta_6 \ln eduexp_{t-1} + \beta_7 \ln rpopulation_{t-1} + \sum_{i=1}^{p} \phi_{1i} \Delta\ln tertiary_{t-i} + \sum_{i=1}^{q} \phi_{2i} \Delta\ln remit_{t-i} + \sum_{i=1}^{q} \phi_{3i} \Delta\ln migration_{t-i} + \sum_{i=1}^{q} \phi_{4i} \Delta\ln gdpp_{t-i} + \sum_{i=1}^{q} \phi_{5i} \Delta\ln dependency_{t-i} + \sum_{i=1}^{q} \phi_{6i} \Delta\ln eduexp_{t-i} + \sum_{i=1}^{q} \phi_{7i} \Delta\ln rpopulation_{t-i} + \epsilon_t \quad \ldots (4)$$

In the paper, equation (3) and (4) were performed. In these equations (3) and (4), long-run coefficients are represented by $\beta_1, \beta_2, \ldots, \beta_7$ and short-run coefficients are indicated by ϕ_{1i}, $\phi_{2i} .., \phi_{7i}$. Similarly, p and q refer to the optimal lags for dependent variable and regressors respectively. For level relationship, the ARDL bound test for cointegration is applied with null hypothesis $\beta_1 = \beta_2 = \ldots. = \beta_7 = 0$, implying no long-run relationship. If it is rejected as indicated by estimated F-statistics lies above the upper bound, the error correction term (ECM) can be performed. The ECM can be estimated as follows:

$$\Delta\ln secondary_t = \sum_{i=1}^{p} \phi_{1i} \Delta\ln secondary_{t-i} + \sum_{i=1}^{q} \phi_{2i} \Delta\ln remit_{t-i} + \sum_{i=1}^{q} \phi_{3i} \Delta\ln migration_{t-i} + \sum_{i=1}^{q} \phi_{4i} \Delta\ln gdpp_{t-i} + \sum_{i=1}^{q} \phi_{5i} \Delta\ln dependency_{t-i} + \sum_{i=1}^{q} \phi_{6i} \Delta\ln eduexp_{t-i} + \sum_{i=1}^{q} \phi_{7i} \Delta\ln rpopulation_{t-i} + \varphi ECT_{t-1} + \epsilon_t \quad \ldots..(5)$$

$$\Delta\ln tertiary_t = \sum_{i=1}^{p} \phi_{1i} \Delta\ln tertiary_{t-i} + \sum_{i=1}^{q} \phi_{2i} \Delta\ln remit_{t-i} + \sum_{i=1}^{q} \phi_{3i} \Delta\ln migration_{t-i} + \sum_{i=1}^{q} \phi_{4i} \Delta\ln gdpp_{t-i} + \sum_{i=1}^{q} \phi_{5i} \Delta\ln dependency_{t-i} + \sum_{i=1}^{q} \phi_{6i} \Delta\ln eduexp_{t-i} + \sum_{i=1}^{q} \phi_{7i} \Delta\ln rpopulation_{t-i} + \varphi ECT_{t-1} + \epsilon_t \quad \ldots..(6)$$

In equation (5) and (6), φ refers to the error correction term, which is expected to be statistically significant with a negative coefficient, demonstrating the speed of converging short-run deviations or shocks into the long-run equilibrium (Pesaran et al., 2001; Gajurel et at., 2021). After ECM, several coefficient diagnostic and stability tests were performed to ensure the robustness of the ARDL estimation.

The lagged error correction term (ECT_{t-1}) shows the long-run causality between the variables of interest. Additionally, to analyze the causal connection of remittance to education in the short-run, a pairwise Granger causality test is employed. With the null hypothesis of X_t does not Granger cause Y_t, the specification can be formed as follows (Granger, 1988; Aslam & Sivarajasingham, 2023):

$$E(Y_{t+i}|J_t, X_t) = E(Y_{t+i}|J_t)$$

Here, J_t, uses all of the available information in the past and present Y_t and X_t, and E refers to the conditional mean of the corresponding conditional distribution of variables.

Finally, forecast error variance decomposition (FEVD) and impulse response functions (IRFs) were employed. FEVD is used to confirm the stronger predictability of the regressors on educational outcomes varying over time. Hill et al. (2018) state that "another way to disentangle the effects of various shocks is to consider the contribution of each type of shock to the forecast error variance (p. 633)." IRFs are applied to examine the response of one variable to an impulse in another variable in a system. It is thus, often known as multiplier analysis (Lütkepohl, 1991). Both FEVD and IRFs are employed in terms of the moving average (MV) process as indicated below (Lütkepohl, 1991).

$$Y_t = \mu_i + \sum_{i=0}^{\infty} \Theta_i w_{t-1}$$

Where, the elements of $w_t = (w_{1t},\ldots\ldots,w_{kt})'$ are not correlated but have unit variance $\sum = I_K$. It is derived by decomposing $\sum_u$ as $\sum_u = PP'$. Here, P is the lower triangular matrix, indicating $\Theta_i = \Phi_i P$ and $W_t = P^{-1}u_t$, here u_t is the error term. Additionally, it can be linked with zero mean VAR (p) system (Lütkepohl, 1991): $Y_t = A_1 Y_{t-1} + \ldots . + A_p Y_{t-p} + u_t$, then Orthogonalized (uncorrelated) impulse responses and FEVD can be estimated.

Results and Discussion

Descriptive Summary of the Study Variables

The nature of the data can be assessed by a statistical summary of variables with mean, median, maximum, minimum, standard deviation, and Jarque-Bera. Table 2 reveals that net migration (ln*migration*) had more deviated from the mean value as indicated by the high value of standard deviation, and the rest of the variables had less degree of variations from the mean. All the series thus, had normally distributed (except ln*eduexp* and ln*migration*) as shown by non-significant JB statistics at a 5 % level of significance.

Table 2

Statistical Summary of the Variables of Interest

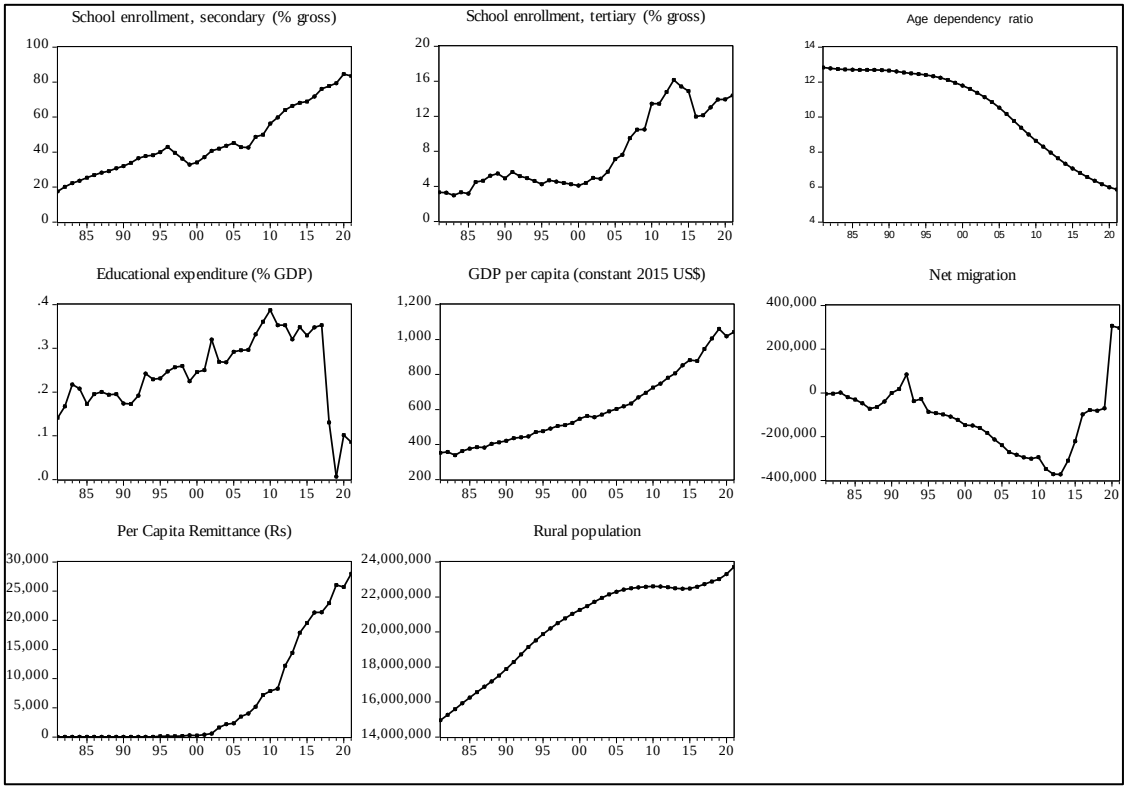
	Mean	Median	Max.	Min.	σ	JB	Prob
ln*tertiary*	1.905	1.65	2.782	1.087	0.549	4.138	0.126
ln*secondary*	3.743	3.708	4.438	2.864	0.409	0.873	0.646
ln*dependency*	2.316	2.452	2.552	1.768	0.264	5.942	0.051
ln*eduexp*	-1.532	-1.403	-0.948	-4.997	0.654	615.814	0.000
ln*gdpp*	6.351	6.321	6.967	5.825	0.343	2.5	0.286
ln*migration*	-9.205	-12.127	13.327	-13.523	7.913	52.049	0.000
ln*remit*	6.32	5.973	10.241	2.326	2.887	4.443	0.108
ln*rpopulation*	16.822	16.882	16.982	16.52	0.138	5.628	0.06

Note. Max = maximum, Min = Minimum, σ = standard deviation, JB = Jarque–Bera, Prob = probability

The trend of the variables of interest is presented in Figure 1.

Figure 1

Trends of Variables of Interest



The gross enrollment in secondary was continuously growing while enrollment in higher levels was trending upward till 2013, thereafter it was sharply declining and then it was

increasing but at a slow pace. The reason behind that is the growing mobility of students for higher education in abroad recent years from Nepal. The data also showed that the age dependency of Nepal is rapidly declining, meaning that the economically active labor forces are rising in Nepal and, therefore, have a demographic dividend in the Nepali economy. Figure 1 also showed that educational expenditure in Nepal was increasing with a fluctuating trend until the year 2010 and it was slightly declining and moving sideways until 2017, thereafter it was sharply declining, and currently has little bit of improvement on it. Nepal's per capita GDP was continuously rising at a more and less equal pace. On the other hand, the net migration of Nepal was in fluctuating trends. It was declining continuously from 1992 to 2013, thereafter it was rapidly jumping till the date. Figure 1 also indicates that per capita remittance was nominal up to about 2000 AD, thereafter it was towering as increasing labor migration abroad from Nepal. Lastly, the rural population of Nepal was also graduating in trends.

Unit Root Tests

Unit root tests are employed to confirm the stationary property of variables of interest. To employ the ARDL framework, it was necessarily employed the unit root tests to ensure the time series has no unit root. Pesaran et al. (2001) also advocated that only stationary series having no more than an order of integration, *I*(1) can apply the ARDL model. Thus, to confirm the stationarity of the series that confirms these series converge to mean value or not, the Augmented Dickey-Fuller test (ADF) and Phillips–Perron test (PP) were employed; and results are presented in Table 3.

Table 3

ADF and PP Unit Root Test Results

Variables	Augmented Dickey-Fuller test (ADF)				Phillips–Perron test (PP)			
	At level		At Δ		At level		At Δ	
	C	C & T	C	C & T	C	C & T	C	C & T
ln*tertiary*	0.630	-3.352*	-2.441	-2.823	-0.660	-1.868	-6.025***	-5.954***
ln*secondary*	-0.873	-2.494	-4.310***	-4.254***	-1.538	-2.629	-4.206***	-4.147**
ln*dependency*	-1.870	-3.725**	-2.257	-1.534	3.147	-1.048	-1.098	-0.495
ln*eduexp*	-3.547	-3.519*	-6.176***	-6.541***	-3.510**	-3.473*	-11.849***	-23.240***
ln*gdpp*	2.597	-2.525	-2.063	-5.728***	3.682	-2.410	-7.138***	-15.056***
ln*migration*	-2.738*	-2.489	-5.590***	-5.944***	-2.695*	-2.516	-7.442***	-7.776***
ln*remit*	-0.337	-2.495	-8.619***	-8.498***	-0.290	-2.389	-8.619***	-8.498***
ln*rpopulation*	-0.693	-3.394*	-1.532	0.3420	-4.624***	-1.508	-1.253	0.7416

Note. C = with constant, C & T = with constant and trend, Δ = first difference; * indicates significant at 10%, **significant at 5%, and *** significant at 1%.

The unit root test confirms that all variables of interest were stationary at a level as well as the first difference. The ln*tertiary* was significant at a 10% level of significance with constant and trend in level data as per ADF tests but it was only stationary at 1% with first

differencing with PP tests. Similarly, both ADF and PP tests confirm that ln*secondary* had no unit root at first difference. The ln*dependency* however was stationary at 5% at the level data with the ADF test. Likewise, ln*eduexp* was stationary at 1% with differencing by both methods and similar results of Table 3 had been shown by lm*migration*, ln*gdpp*, and ln*remit*. Moreover, ln*rpopulation* was stationary at 10% by ADF and at 1% by PP test. Thus, ADF and PP test results (Table 3) reveal that there was a mixed order of integration *I*(0) and *I*(1), and none of them were integrated more than *I*(1). This result is granted evidence to employ and proceed with the ARDL model to estimate the short and long-run relationship.

Optimal Lag order

ARDL model allows the lagged relationship between variables of interest. It is a lagged distributed model; therefore, the optimal lags have to be estimated. The optimal lag is determined with the vector autoregressive (VAR) multivariate procedures. There are various lag length criteria, among them Akaike information criterion (AIC) and Bayesian or Schwarz information criterion (SIC or BIC) are quite popular. The results of lag length VAR estimation are presented in Table 4. The asterisk (*) indicates the optimal lag as the lowest value of each criterion.

Table 4

VAR Lag Length Estimation

Lag	LR	FPE	AIC	SIC	HQ
Model 1: ln*secondary* = *f* (ln*remit*, ln*migration*, ln*gdpp*, ln*dependency*, ln*eduexp*, ln*rpopulation*)					
0	NA	3.98e-09	0.521919	0.823579	0.629247
1	609.4166	8.25e-17	-17.21302	-14.79974	-16.35439
2	170.8889	8.48e-19	-22.06403	-17.53912*	-20.45410
3	73.50714*	2.59e-19*	-24.07928*	-17.44274	-21.71805*
Model 2: ln*tertiary* = *f* (ln*remit*, ln*migration*, ln*gdpp*, ln*dependency*, ln*eduexp*, ln*rpopulation*)					
0	NA	2.73e-08	2.447221	2.748882	2.554550
1	642.8025	1.86e-16	-16.40058	-13.98730	-15.54195
2	165.1331*	2.45e-18	-21.00133	-16.47643*	-19.39141
3	62.70978	1.47e-18*	-22.34175*	-15.70522	-19.98052*

Note. * Indicates lag order selected by the criterion; LR = sequential modified LR test statistic, FPE: Final prediction error, AIC = Akaike information criterion, SIC = Schwarz information criterion, HQ = Hannan-Quinn information criterion

The paper uses two models for estimating the impact of remittance on educational outcomes. For these two models, the lowest value between AIC and BIC was selected as the optimal lag length. The results of both models of lag order indicate that 3-period lag is optimal

for estimating the ARDL models as indicated by the lowest criterion values by AIC (Lütkepohl (1991; Ozcicek & Douglas Mcmillin, 1999). Thus, under the ARDL (p,q) model, the paper used ARDL (3,3) as a 3-period lag for both targeted variables as well as regressors.

Bound Test for Cointegration

With optimal lag length, the bound test for cointegration as proposed by Pesaran et al. (2001) was employed to estimate the long-run cointegration between remittance and educational outcomes. F-statistics is used to test the null hypothesis of no level relationship between variables of interest. The rejection of the null hypothesis reveals that there is a level or long-run relationship. It is confirmed with critical lower and upper bound values. If the *F*-statistic lies above the upper critical boundary, *I*(1), there is long-run cointegration between variables of interest and can run ARDL error correction model.

Table 5

Results of Bounds Test for Cointegration

Model		Statistic	Value
$F_{lnsecondary}$ | ln*remit*, ln*migration*, lng*dpp*, ln*dependency*, ln*eduexp*, ln*rpopulation* [ARDL(1, 2, 0, 1, 3, 0, 1)]		*F*-statistic	6.0913
		k	6
$F_{lntertiary}$ | ln*remit*, ln*migration*, lng*dpp*, ln*dependency*, ln*eduexp*, ln*rpopulation* [ARDL(1, 1, 0, 3, 0, 0, 0)]		*F*-statistic	4.6683
		k	6
Critical Value for Significance		*I*(0)	*I*(1)
	10%	2.12	3.23
	5%	2.45	3.61
	2.5%	2.75	3.99
	1%	3.15	4.43

Note. *I*(0) = lower bound, *I*(1) = upper bound.

In first model, ln*secondary* was regressed with ln*remit*, ln*migration*, lng*dpp*, ln*dependency*, ln*eduexp*, and ln*rpopulation* with optimal lag 3 and *F*-statistic of the automatically selected model, ARDL(1, 2, 0, 1, 3, 0, 1), is 6.0913, laying above the critical value of upper bound at 1% level (i.e., 4.43), confirming that there was a long-run cointegration between remittance and secondary level educational outcome. Similarly, in Model 2, ln*tertiary* was regressed with ln*remit*, ln*migration*, lng*dpp*, ln*dependency*, ln*eduexp*, and ln*rpopulation* with optimal lag 3 and *F*-statistic of the automatically selected model, ARDL(1, 1, 0, 3, 0, 0, 0), is 4.6683, laying above the critical value of upper bound at 1% level (i.e., 4.43), confirming that there was also long-run cointegration between remittance and higher level educational outcome.

Long-run and Short-run Relationship between Remittance and Educational Outcomes

ARDL model is used to estimate the short and long-run dynamics. Two models were used to estimate such dynamics. Model 1 shows the long-run relationship between remittance and educational outcomes regarding secondary-level gross enrollment and Model 2 specifies the long-run relationship between remittance and educational outcomes regarding higher/tertiary education enrollment. It is assumed that growing remittance and migration in Nepal (as shown in Figure 1) ultimately improve the secondary and higher-level education outcomes in Nepal.

The negative and statistically significant coefficient of *ECT*(-1) as indicated in Panel B of Table 6 implies that there was long-run causality between remittance and educational outcome. Educational outcomes are boosted by the momentous inflow of funds over a long period due to growing financial stability among households which in turn strengthens the investment in education. Panel A of Table 6 illustrated the long-run estimation as two models. Each model has ln*secondary* and ln*tertiary* respectively as dependent variables.

The results of Model 1 reveal that there was only one variable, ln*gdpp*, that positively influenced the ln*secondary* as consistent with the reviewed literatures. All other variables except it had no significant association with ln*secondary*. It indicates that when GDP per capita increases the gross enrollment in the secondary level will be promoted. The reason behind that the increment in GDP per capita through foreign remit typically expands household consumption and investment expenditure, thus, education can be affordable and accessible which makes education outcomes effective. It is also pushed by the demonstrative effects of migrant families.

The remittance, net migration, educational expenditure, rural population, and dependency ratio do not significantly influence the educational outcome at the school level in Nepal. Public education at the secondary level is more or less free in Nepal. Most of the migrated families belong to rural areas and therefore, secondary schooling may not be improved. However, after migration, their families migrated to urban for primary schooling, which is not considered in the model. These circumstances may cause to insignificant effect of remittance on secondary education in the long run. On the contrary, all regressors except ln*eduexp* (due to less effectiveness in public higher schooling arrangements) affected the ln*tertiary* significantly (Model 2). It confirms that higher education is promoted by remittance in the long run in Nepal.

Table 6

ARDL Short-run and Long-run Estimations with Results of Diagnostic and Stability Tests

Variable	Model 1: ln*secondary* ARDL(1, 2, 0, 1, 3, 0, 1)			Model 2: ln*tertiary* ARDL(1, 1, 0, 3, 0, 0, 0)		
Panel A: Level relationship						
	Coefficient	*t*-Statistic	Prob.	Coefficient	*t*-Statistic	Prob.
Ln*remit*	-0.126860	-1.590961	0.1253	0.209913*	1.800419	0.0834
ln*migration*	0.005485	1.066724	0.2972	0.015063*	1.828678	0.0789
Ln*gdpp*	5.610347*	2.004525	0.0569	-8.429965**	-2.467823	0.0205
lndependency	4.238066	1.401981	0.1743	-6.708928**	-2.244523	0.0335
lneduexp	0.045949	0.968571	0.3428	0.000255	0.002794	0.9978
ln*rpopulation*	-5.140147	-1.465628	0.1563	7.319111*	1.807819	0.0822
Panel B: Short run						
C	12.45378***	7.297576	0.0000	-18.18091***	-6.347021	0.0000
Δln*remit*	0.023143*	1.835570	0.0794	0.020255	0.754383	0.4574
Δln*remit*(-1)	0.062574***	4.646511	0.0001			
Δln*gdpp*	0.927480***	3.446061	0.0022	1.024825*	1.707308	0.0997
Δln*gdpp*(-1)	…	…	…	2.708428***	4.203397	0.0003
Δln*gdpp*(-2)	…	…	…	2.922379***	4.540047	0.0001
Δln*dependency*	-9.931883**	-2.148469	0.0424	…	…	…
Δln*dependency*(-1)	17.82117**	2.206213	0.0376	…	…	…
Δln*dependency*(-2)	-21.32334***	-4.514488	0.0002	…	…	…
Δln*rpopulation*	10.75436***	4.127143	0.0004	…	…	…
ECT(-1)	-0.280850***	-7.332298	0.0000	-0.336769***	-6.341858	0.0000
	R^2 = 0.687738, Adj. R^2 = 0.601597, DW = 1.978472, *F*-statistic = 7.983848***			R^2 = 0.586165, Adj. R^2 = 0.521503, DW = 2.345650, *F*-statistic = 9.065093***		

Panel C: Diagnostic and stability tests	Model 1		Model 2	
	Test statistic	P-value	Test statistic	P-value
Heteroskedasticity Test: Breusch-Pagan-Godfrey [*F*(14,23) *F*(11,26)]	0.284803	0.9909	1.048986	0.4356
Breusch-Godfrey Serial Correlation LM Test [*F*(2,21), *F*(2,24)]	0.313575	0.7342	1.045547	0.3670
Jarque-Bera	7.51067**	0.0234	1.39811	0.4971
CUSUM	Stable			Stable
CUSUM of Square	Stable			Stable

Model 2 indicates that remittance positively influenced higher education enrollment at a 10% level of significance, consisting of reviewed studies under the study. An increase in remittance may help families with funds to pay for heavy educational needs such as tuition, textbooks, and educational tools which, in turn, create equal access and opportunity to higher education. Similarly, ln*migration* and ln*rpopulation* had a positive with ln*tertiary* at 10% level of significance. On the flip side, ln*gdpp* and ln*dependency* negatively affected the ln*tertiary* at 5% level of significance. It indicates that an increase in GDP per capita does not sufficiently attract the higher-level educational attainment in Nepal. It is quite surprising that higher education is not attractive even if there is an increase in GDP per capita. Additionally, if remittance increases while the dependent population is up, it will adversely affect the higher level of enrollment in Nepal.

In the short run, there was a positive significant impact of current and lagged ln*remit* on ln*secondary* as indicated by Model 1. Conversely, there was no significant relationship between remittance and higher education enrollment as found in Model 2. In the short-run, remittance can support secondary schooling but not higher education which may be insighted the less priorities of remittance in higher education. The growing urban migration, buying properties (land, building), and paying loans may such reasons to have fewer priorities in higher education. ln*gdpp* and ln*rpopulation* were also statistically significant and had a positive impact on ln*secondary*. However, ln*dependency* and its lag value except 1 period lag had a negative impact on Lnsecondary. As Model 1, ln*gdpp* and its lag value positively influenced the ln*tertiary*. Both of the models had negative with less than one statistically significant *ECT*(-1), providing evidence that any shocks or disequilibrium in the short run can converse back in the long run in 3.56 years and 2.97 years respectively.

The estimated ARDL model was statistically robust and fitted. Both models were free from heteroskedasticity and serial correlation as indicated by Panel C of Table 6. The models were stable at a 5% level of significance as shown by CUSUM and CUSUM of square. The residuals were normally distributed in Model 2 but not in Model 1. However, all other criteria of stability and diagnosis were well-fitted. Overall *F*-statistic of both models were significant, supporting the models were fitted and can explained by regressors on target variables—ln*secondary* and ln*tertiary*. R^2 of both models also explained the more than 50% variations in the educational outcomes by remittance.

Granger Causality

Pairwise Granger causality test estimates the *F*-statistics for a causal connection between variables of interest. Table 7 illustrates the result of the Granger causality test. The null hypothesis of ln*remit* does not Granger cause ln*secondary* was rejected at 1% level of significance implies that remittance caused to secondary enrollment in Nepal. Similarly, ln*remitte* does Granger cause ln*tertiary* at 5% level of significance indicates that there was a

causal connection of remittance to higher education enrollment in Nepal. Thus, the results reveal that there are only unidirectional causal relations between remittance to educational outcomes in Nepal. Remittance is the source of funds and sustainable income for migrated families; therefore, they will set priority on children's schooling due to financial support by emigration. Thus, the remittance can cause consumption and investment in educational outcomes.

Table 7

Pairwise Granger Causality Tests

Null Hypothesis:	Lag	Obs	*F*-Statistic	Prob.
ln*remit* does not Granger cause ln*secondary*	4	37	4.13679	0.0093
ln*secondary* does not Granger cause ln*remit*			0.05626	0.9938
ln*remit* does not Granger cause ln*tertiary*	2	30	4.03172	0.0268
ln*tertiary* does not Granger cause ln*remit*			0.63704	0.5351

Forecast Error Variance Decomposition (FEVD) Analysis

Forecast error variance decomposition of educational outcomes is presented in Table 8. The upper panel of the table shows the result of the forecast error variance decomposition of ln*secondary* or secondary level enrollment and the lower part of ln*tertiary* or higher-level enrollment of Nepal. In 1 period, 100% forecast error variance in ln*secondary* was explained by one innovation or shock. Similarly, it is continuously declining in the long run. In period 5, only 78.95% of the forecast error variance of ln*secondary* accounted for the own shock, and the remaining 11.20% of forecast error variance was explained by ln*remit*, 3.96% was explained by ln*migration*, 2.91% is contributed by ln*dependency*, 1.33% is accounted by ln*rpopulation*, and rest of the nominal percentage was contributed by ln*ggdp* and ln*eduexp*. Finally, in 10th period, 66.51% of the forecast error variance was explained by own shock in ln*secondary*, and 10% forecast error variance was explained by ln*remit*. The FEVD analysis provides a shred of evidence that remittance is the major predicted factor in educational outcomes in Nepal.

On the other hand, the 100 % forecast error variance of ln*tertiary* was explained by its shock in period 1. Then its error variance value is declining. In the 5th period, only 65.85% of forecast error variance in ln*tertiary* accounted for its own shock. At the same time, 14.71% forecast error variance of ln*tertiary* was contributed by shock in ln*remit*, and 4.39% error variance was explained by shock in ln*migration*. Eventually, only 51.77% of forecast error variance accounted for its shock and 19.30% was explained by any shock given to ln*remit* in the 10th period.

Table 8

Forecast Error Variance Decomposition of Educational Outcomes

Period	1	2	3	4	5	6	7	8	9	10
Variance Decomposition of ln*secondary*										
ln*secondary*	100.00	95.83	88.66	83.48	78.95	74.71	72.06	70.36	67.96	66.51
Ln*remit*	0.00	0.92	6.89	10.00	11.20	10.74	9.91	9.95	10.49	10.98
ln*migration*	0.00	0.83	1.60	1.87	3.96	6.36	6.86	6.70	6.39	6.26
Ln*gdpp*	0.00	0.92	0.74	1.05	0.93	1.42	2.19	2.08	2.69	3.14
ln*dependency*	0.00	0.68	1.24	2.04	2.91	3.88	4.66	4.71	4.52	4.48
ln*eduexp*	0.00	0.81	0.60	0.75	0.72	0.65	0.60	0.82	1.56	1.84
ln*rpopulation*	0.00	0.01	0.26	0.81	1.33	2.25	3.71	5.38	6.39	6.79
Variance Decomposition of ln*tertiary*										
ln*tertiary*	100.00	92.70	81.32	71.49	65.85	60.61	57.47	55.13	53.13	51.77
Ln*remit*	0.00	4.95	8.90	12.62	14.71	16.39	17.69	18.65	19.13	19.30
ln*migration*	0.00	0.07	2.06	4.63	4.39	4.11	4.00	3.84	3.68	3.54
Ln*gdpp*	0.00	0.01	1.88	2.65	4.70	6.55	6.99	7.47	8.34	9.17
ln*dependency*	0.00	0.46	2.07	3.62	4.75	5.90	7.13	7.86	8.15	8.33
ln*eduexp*	0.00	1.49	1.79	1.72	1.50	1.67	1.67	1.96	2.64	3.13
ln*rpopulation*	0.00	0.32	1.99	3.27	4.11	4.78	5.05	5.09	4.93	4.75

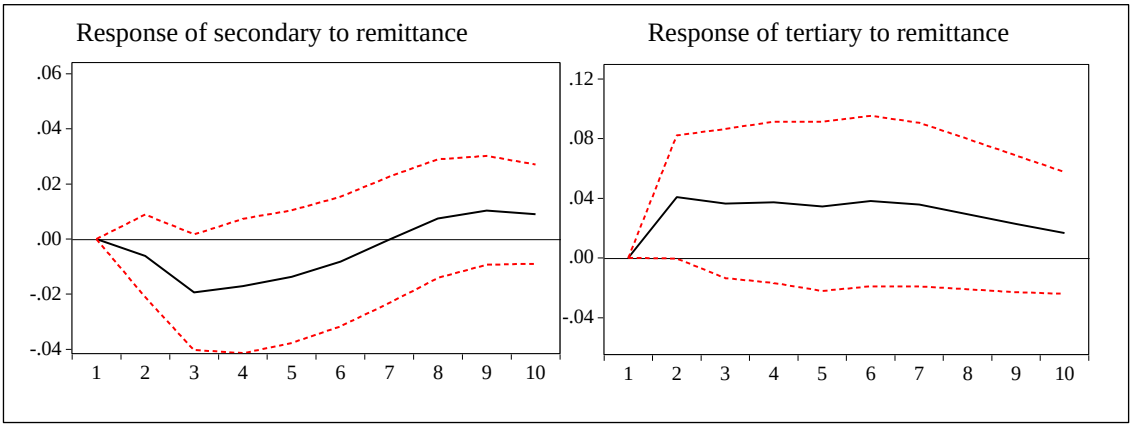
Impulse Response Functions (IRFs) Analysis

Impulse response functions trace out the dynamic effect mechanism of a response to any innovation or shock changes in a variable or system. Figure 2 demonstrates the short-run and long-run responses of educational outcomes when one-unit standard deviation innovation or shock or any changes in remittance. The result indicates that there was a statistically negative response of secondary level enrollment when a one-unit standard deviation shock or change was made in remittance in the short run. However, it will be positive in the long run. It implies that any changes in remittance can be effective, meaning a positive response in the long run.

On the other hand, in contrast with the response of secondary-level enrollment, the response of higher-level enrollment was positive in the short run while any innovation was given to the remittance. However, it will be a less effective but positive response, if a one-unit standard deviation shock was given to the remittance in the long run.

Figure 2

IRFs of Remittance and Education Outcomes



Conclusion and Implication

Employing ARDL, Granger causality, FEVD, and IRFs, the paper investigates the impact of remittance on educational outcomes in Nepal, covering the annual data from 1981 to 2021. The initial overview of the data showed the rising trend of remittance and enrollment at secondary and tertiary levels of education in Nepal. The bound test and *ECT*(-1) confirm that remittance and educational outcomes were cointegrated and long-run associated. Long-run results reveal that remittance was more crucial in tertiary educational outcomes and it was fully supported by IRFs and FEVD results. In the long run, if GDP per capita and dependencyharmed (negative impact) tertiary education, it will be enhanced by per capita remittance. In contrast, per capita GDP merely contributed to secondary schooling in Nepal in the long run which was supported by IRF of secondary schooling to remittance effective after period 3. Conversely, in the short run, the per capita remittance was only effective for secondary schooling. When remittance is funneled towards enhancing per capita GDP, the tertiary education outcome can be improved in the short-run. The Granger causality also confirms that educational outcomes might be caused by remittance.

The overall findings reveal that remittance can promote and cause educational outcomes in different magnitudes and directions; thus, remittance has multifaceted effects on educational attainment in Nepal. The policymaker and stakeholder should carefully examine the utilization of remittance properly and be regulated toward educational attainment. The results do not precisely find evidence of the effectiveness of remittance to education outcomes, which is the source of human capital, accelerating the economic development of the nation. Excessive dependency on remittance may not be ensured the school education as the findings of the study, may be the chance of Dutch disease; therefore, the government should be focused on shifting remittance towards productive channels. For practical policy frameworks and

generalization, the intensive micro-level and comprehensive and interactive macro channels to educational outcomes could be studied in the future.

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