Economic Opportunity and Youth Migration: Evidence from Nepal

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Abstract

Youth migration has become a defining feature of Nepal's demography, characterized by both mass emigration and significant internal migration. This research explores whether heterogeneity in economic opportunities across districts in Nepal plays a role in migration patterns in Nepal. The magnitude of migration is measured by calculating district-level net migration rates between 2011 and 2021 for the 20–30 age group (in 2021) using the Life Table Survival Ratio (LTSR) method. The impact of district-level per capita income on the net migration rate is then estimated using Two-Stage Least Squares, with the land productivity index serving as an instrument for per capita income. The land productivity index is derived for each district using principal component analysis of land productivity for major cereal and cash crops. The finding reveals that regions with better economic opportunities gain the youth population, while those with fewer opportunities lose them. This result underscores the importance of generating economic opportunities to address youth migration trends.

Keywords: Economic opportunity, Youth Migration, Life Table survival ratio method, Neoclassical macro-migration theory, Land productivity index

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Introduction

Nepal is undergoing a major demographic transition characterized by extensive internal and international migration. In 2021, over 2.1 million individuals were

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absent from Nepal, and one in four households had at least one member living abroad. Alongside international migration, internal migration within Nepal is also significant, with people moving from rural areas to urban centers. Between the 2011 and 2021 censuses, 34 out of Nepal's 77 districts experienced a population decline (National Statistics Office, 2023).

Youth migration is a significant component of these demographic changes. The history of youth migration in Nepal dates back to the nineteenth century, when Nepali youth began serving in foreign security forces, a trend that continues today. After the liberalization of migration policies in the 1990s, the outflow of Nepali youth seeking employment abroad increased dramatically. Youth migration has multidimensional consequences for society. On one hand, it is a natural process during a country's economic development, with urban growth typically drawing youth from agriculture-based rural areas to industry-based urban centers (Lewis, 1954). Youth migration contributes to urban growth, supports the economy through remittances, and strengthens human capital through educational migration. However, it also brings a range of social, cultural, economic, and psychological challenges. Brain drain remains a widely debated issue, and the high suicide rates among Nepali migrant workers are a serious concern (Atteraya, Ebrahim, & Gnawali, 2021). The growing population concentration in Nepal's major cities has created significant urban management challenges.

To maximize the benefits of migration while mitigating its negative impacts, a well-designed policy framework to guide migration patterns is essential. Understanding the key drivers of youth migration is therefore critical for effective demographic, urban, and regional planning. This research aims to provide evidence that regional disparities in economic opportunity are the major factor behind emerging youth migration trends in Nepal. In essence, youth population loss or gain in different parts of the country is primarily determined by the economic opportunities available in those regions.

Review of Literature

Migration is a widely discussed phenomenon in human society, and as such, there is a substantial body of both theoretical and empirical literature on the topic. In the realm of migration theories, Lee's (1966) pull-and-push factor theory is considered a foundational framework for understanding migration, categorizing the factors influencing migration into two main groups: push and pull factors. Push factors are the negative aspects of the origin, and pull factors are the positive aspects of the destination. Other migration theories can be analyzed

within this framework by examining how each theory defines these factors and their interactions.

Faist (2000) classified migration theories into micro-level, meso-level, and macro-level frameworks, which were adopted and extended by Hagen-Zanker (2008) and Wadood et al. (2021). Micro-level theories focus on migration decisions from an individual's perspective, considering factors such as expectations, objectives, and constraints. Meso-level theories, on the other hand, interpret migration as the outcome of decisions made by collective social units, such as families, social networks, and communities. Macro-level theories explain migration as a result of broader macroeconomic forces, including labor market demand and supply, wage levels, and other economic factors.

Micro-level Theory

The neoclassical micro migration theory views migration as a rational decision made by individuals seeking to optimize their outcomes. Sjaastad (1962) and Todaro (1969) suggested that an individual will only choose to migrate if the anticipated income gain at the destination exceeds the costs of migration. Becker (1964) argued that migration is a kind of investment in human capital, especially when an individual moves to a destination where returns to his/her human capital are higher than in the origin. In contrast to the economic factors, Ravenstein (1889) introduced demographic elements such as gender, age, and distance which influence an individual's migration decisions.

Meso-level Theory

New economics of labor migration (NELM) arose in the late 1980s and early 1990s as a critique and extension of traditional migration theories, particularly the neoclassical approach. NELM offers a broader perspective by highlighting the role of households, rather than individuals, in migration decision-making. It frames migration as a strategy to manage risks and enhance household welfare. Stark and Bloom (1985) were instrumental in establishing this framework, illustrating how households leverage migration to diversify income and reduce vulnerability. Stark and Taylor (1991) introduced the idea of relative deprivation, demonstrating that social and economic comparisons within communities often shape migration decisions. Massey et al. (1990) proposed that migrants use their social connections, such as family and friends, to ease migration, forming networks that assist newcomers in the host country. This theory highlighted the importance of established migrant networks in providing information and

support to new migrants, often resulting in chain migration, where the success of one migrant inspires others from the same community to follow.

Macro-level Theory

Neoclassical macro-migration theory extended the idea of neoclassical micro-migration theory. Harris and Todaro (1970) postulated that migration is primarily driven by economic factors, particularly wage differentials and employment opportunities between regions. The theory suggested that labor migrates from low-wage, labor-abundant areas to high-wage, labor-scarce regions, aiming to achieve an equilibrium that reduces wage disparities. This perspective aligns with the model of economic development given by Lewis (1954), which highlights the presence of surplus labor in agricultural sectors and its movement to industrial sectors with higher productivity and wages.

Empirical evidence exists for most of the theoretical frameworks of migration discussed above. Kennan and Walker (2011) developed an econometric model to understand optimal migration decisions, with a focus on expected income as the primary economic factor influencing migration. The study found that income prospects significantly influence migration decisions. It concluded that the relationship between income and migration is driven by both geographical wage disparities and individuals' tendency to relocate in search of better locational matches when income outcomes in their current location are unfavorable. Narayan and Smyth (2008) examined the long-run and short-run determinants of migration from Fiji to the United States between 1972 and 2001. In the long run, the research identified income level differences as a significant driver of migration. In the short run, key determinants included the cost of moving, lagged migration, political instability, the availability of medical care, etc. These studies provide evidence supporting the neo-classical theory of migration.

On the other hand, Constant and Douglas (2002) tested the validation of neoclassical migration theory and the new economics of labor migration. Neoclassical economics suggested that people moved abroad permanently to maximize lifetime earnings, while the new economics theory argued they migrated temporarily to overcome market deficiencies at home. The paper predicted how various factors influenced the likelihood of return migration and tested these predictions using data from the German socio-economic panel. The results offered some support for both models and suggested that migrants had diverse motivations.

Lorincz and Nemeth (2022) highlighted that, in addition to economic and infrastructural factors, social connections significantly influenced migration

patterns through the resources provided by social networks, known as social capital. Indicators for social capital were developed using archived online social network data representing 40% of Hungary's adult population, combined with official migration data from 175 subregions. The analysis found that bridging social capital facilitated migration between subregions. Palloni et. al. (2001) employed a multistate hazard model to test the network hypothesis within social capital theory. The findings indicated that social network effects remained robust even after controlling human capital, shared household characteristics, and unobserved conditions.

Literature in the Context of Nepal

Thapa and Conway (1983) explored the effect of economic, demographic, social, and government policy determinants of interdistrict internal migration in Nepal. They concluded that migration is conditioned by changes in the society's economic structure, as well as by government investment and redistribution policies. The study used net migration estimates from the 1961 and 1971 censuses. Likewise, KC (2004) found that people with resources are more likely to seek foreign employment, while those who lack resources engage in internal migration. A correlation analysis showed that poverty in the regions is associated with net out-migration. Similarly, Shrestha (2020) conducted a randomized field experiment in which individuals considering labor migration from Nepal were provided with comprehensive information regarding their intended destination's wages and mortality rates. The findings indicated that the provision of such information significantly influenced their anticipated income and perception of mortality risk, thereby leading to a change in their actual decision regarding migration.

Massey et. al. (2010) investigated the link between environmental changes and out-migration using data from Nepal. Environmental change was measured through declining land cover, longer times required to gather organic inputs, increasing population density, and perceived declines in agricultural productivity. The findings indicated that environmental change was more strongly associated with short-distance migration than long-distance migration. After controlling for other social and economic factors, the study showed that local moves were predicted by perceived declines in productivity, land-cover degradation, and increased time spent gathering firewood.

Several studies on migration have viewed it as influenced by individuals' subjective conditions, while others have analyzed it as a phenomenon driven by the society's socio-economic structures. However, most literature on migration in the

Nepali context agrees that socio-economic factors, such as poverty and economic opportunities, play a significant role in shaping migration patterns in Nepal.

Thapa and Conway (1983) used district-level census data to identify the drivers of net migration in Nepal, but the fundamental characteristics of migration patterns have changed over the past 40 years. Furthermore, the patterns and determinants of youth migration are likely to differ from those of other age groups. There is limited literature on the regional youth migration patterns in Nepal and the role of disparities in economic opportunities therein, particularly using recent data. Therefore, this research aims to address this gap.

Model Specification

This study employs the neoclassical macro-migration framework, which explains migration as a result of disparities in economic opportunities across regions. Areas offering better economic prospects tend to attract more people, while those with limited opportunities often see population decline.

However, when analyzing migration dynamics of Nepal, it is important to account for other historical factors that have influenced migration patterns. In Nepal, migration from the Hilly region to the Terai has a long history, driven not only by economic factors but also by the relative ease of settling in the Terai's terrain (Gartaula & Niehof, 2013). Such migration from the Hills to the Terai often concentrates around junctions along the East-West Highway, which connects to various hilly districts. This is because transportation nodes act as hubs for trade to and from the regions they connect, attracting people and fostering the development of market centers (Pokharel, Bertolini, Brommelstroet, & Acharya, 2021).

With all these considerations, the regression model used in this research is as follows:

$$NMR_i = \beta_0 + \beta_1 \cdot LNPCI_i + \beta_2 \cdot IS\_TERAI_i + \beta_3 \cdot IS\_JUNCTION_i + \varepsilon_i \quad \text{……. (1)}$$

Where, i = 1, 2, 3, …,75: Districts of Nepal

NMR_i = Net migration rate of ith district between census year 2011 and 2021 for population in Nepal aged between 20 to 30 years in 2021.

$LNPCI_i$ = Natural log of per capita income in dollar ppp for i^{th} district in 2011.

IS_TERAI_i = Dummy variable which takes 1 if the district lies in the Terai ecological region of Nepal. Else it takes 0.

$IS\_JUNCTION_i$ = Dummy variable which takes 1 if the district lies at an important junction on the East-West highway connecting the hilly region of Nepal.

$\beta_0, \beta_1, \beta_2$ and β_3 are regression parameters to be estimated and ε_i is the stochastic error term.

Here, $LNPCI_i$ represents the economic opportunity in a given district of Nepal. Although data from two censuses is used to calculate the net migration rate, the final dataset used for estimation is cross-sectional, as there is only one net migration value per district. Therefore, the model is initially estimated using Ordinary Least Squares (OLS). However, using per capita income as an independent variable introduces endogeneity concerns, as it may be influenced by various factors such as geography and historical context. To address this issue, the model is re-estimated using Two-Stage Least Squares (2SLS), with the land productivity index ($PROD\_INDEX$) of each district used as an instrument for $LNPCI_i$. The estimation procedure for the $LNPCI_i$ is discussed in a later section.

To use an instrument for $LNPCI_i$, we require an exogenous variable, meaning it is not directly related to the net migration rate, that explains variation in Per Capita Income. Its influence on migration should occur only indirectly, through its effect on income. Agricultural land productivity meets this criterion. Since agriculture is a major contributor to Nepal's GDP, land productivity significantly affects Per Capita Income. At the same time, it is unlikely that agricultural productivity directly influences migration decisions, apart from its economic effects.

In this research, the agricultural productivity of land in each district is measured using a Land Productivity Index (PROD_INDEX), constructed through principal component analysis. This index is based on the productivity (in kilograms per hectare) of six major crops grown in Nepal: three cereal crops (paddy, maize, and wheat) and three cash crops (oilseeds, potato, and sugarcane).

To mitigate potential endogeneity, historical data are used, as current land productivity can be influenced by economic conditions such as access to fertilizer, improved seeds, or farmers' income. Specifically, land productivity data from three fiscal years (1999/2000, 2000/2001, and 2001/2002) is averaged to smooth out short-term fluctuations. Since this data predates the period under study, it is less likely to be influenced by recent economic or demographic changes, making the index more plausibly exogenous and reflective of underlying land fertility.

One key factor affecting land productivity is whether a district is located in the Terai, which generally has more fertile land than the Hilly region. However, this regional variation is controlled for in the model, allowing the PROD_INDEX to serve as an exogenous variable and a valid instrument for Per Capita Income.

Source of Data

For this research, district-level data is collected from various secondary sources which are as listed in Table 1.

Table 1: Source of data

Variable	Variable Description	Source
NMR	Net Migration Rate calculated from age specific population for Census 2011 and 2021 expressed as percentage.	National Population and Housing Census 2011 report (Central Bureau of Statistics, 2012) and National Population and Housing Census 2021 report (National Statistics Office, 2023).
LNPCI	Natural log of per capita income in dollar ppp for 2011.	Nepal Human Development Report 2014 (Government of Nepal, 2014).
IS_TERAI	Dummy variable which takes 1 if the district lies in the Terai ecological region of Nepal. Else it takes 0.	District classification from Nepal Human Development Report 2014 (Government of Nepal, 2014). A list of districts classified as Terai is provided in Annex 1.
IS_JUNCTION	Dummy variable which takes 1 if the district lies at an important junction on the East-West highway connecting the hilly region of Nepal. Else it takes 0.	Schematic diagram of the strategic road network of Nepal for year 2011/2012 (Department of Roads, 2012). A list of districts classified as junction points is provided in Annex 2
Land Productivity of Paddy, Maize, Wheat, Oilseed, Potato and Sugarcane in kg per hector for Fiscal Year 1999/2000, 2000/2001 and 2001/2002.		Statistical Information on Nepalese Agriculture (Ministry of Agricultural Development, 2013)
PROD_INDEX	Land Productivity Index	Calculated from Principal Component Analysis of Land Productivity of Paddy, Maize, Wheat, Oilseed, Potato and Sugarcane.
Life Expectancy for 2011		Population Situation Analysis of Nepal report (United Nations, 2017)
Life Table		Model life table for the South Asian region from the United Nations Population Division website (United Nations, 2023)

Life expectancy data is used to choose an appropriate Life Table, which serves as the basis for calculating the survival ratio. This ratio is then utilized to determine net migration and the net migration rate. Net migration is calculated separately for males and females, as life expectancy and Life Tables differ by gender. Finally, the net migration values for males and females are combined to obtain the total net migration for the district.

Similarly, census data often exhibits age heaping or digit preference bias, which can introduce noise when calculating the net migration rate. To address this, population-by-age data for each census is smoothed using a moving average technique with a centered three-year window. The resulting smoothed series is then scaled to ensure that the total population remains consistent before and after smoothing.

Before 2015, Nepal was divided into 75 administrative districts. In 2015, the number increased to 77 when Nawalparasi and Rukum districts were each split into two separate districts. Due to data limitations, this study uses the 75-district administrative structure. For post-2015 data, the necessary aggregations were performed to consolidate data for Nawalparasi and Rukum.

Life Table Survival Ratio Method

This research has estimated migration using the Life Table Survival Ratio (LTSR) method, which is especially useful in contexts where records of vital events—such as births, deaths, and migration—are incomplete, but age-wise population data for the same region over two time periods is available and is more reliable. Nepal presents a fitting case for the application of this method, as it lacks comprehensive vital registration data but has relatively reliable census data. The United Nations Department of Economic and Social Affairs (1970) has published a manual detailing the measurement of migration using LTSR method. Similarly, Mistri (2015) applied the LTSR method on India's 2001 and 2011 census data to analyze inter-state migration. This study follows the same approach.

A life table assumes a hypothetical cohort of 100,000 live births and estimates how many individuals from this cohort are expected to survive to a given age. The survival ratio represents the proportion of individuals from the first census expected to be alive at the time of the second census.

Consider a cohort of 100,000 live births as assumed in standard life table. Assume the first census occurs when this cohort is x years old, and we anticipate that L_x individuals from the cohort are still alive at that time. Next, suppose a

second census is conducted **n** years after the first. At this point, the cohort will be **x+n** years old and we expect L_{x+n} individuals to still be alive. Therefore, the survival ratio for the cohort, whose age was **x** during the first census, can be calculated as:

$$S_x = \frac{L_{x+n}}{L_x} \dots\dots\dots\dots\dots (2)$$

This represents the theoretical fraction of a given aged cohort from the first census expected to be alive during the second census, based solely on mortality probabilities and assuming no migration. However, when the census counts the population, the actual numbers may differ. If there were P_x individuals aged x during the first census and P_{x+n} individuals aged $x+n$ during the second census, the net migration for the cohort between these two censuses can be calculated as follows:

Forward Survival Method: $\quad Net\_M_{1,x} = P_{x+n} - S_x \cdot P_x \dots\dots\dots(3)$

Backward Survival Method: $\quad Net\_M_{2,x} = (\frac{1}{S_x}) \cdot P_{x+n} - P_x \dots\dots\dots(4)$

Average Net Migration: $\quad Net\_Migration_x = \frac{(Net\_M_{1,x} + Net\_M_{2,x})}{2} \dots\dots(5)$

Here, positive $Net\_Migration_x$ gives number of net in-migration while negative $Net\_Migration_x$ gives number of net out-migration. The value of $Net\_Migration_x$ need to be normalized to make it comparable across the different census units. So, we can calculate Net Migration Rate (NMR_x) expressed in percentage as:

$$NMR_x = \frac{Net\_Migration_x}{P_x} \times 100\% \quad \dots\dots\dots\dots (6)$$

Net Migration Rate needs to be calculated for a specific set of age groups X, then we can calculate it as follows:

$$NMR_X = \frac{\sum_X Net\_Migration_x}{\sum_X P_x} \times 100\% \qquad x \in X \dots\dots\dots (7)$$

It is important to note that this method of calculating the net migration rate does not differentiate between internal and international migration. Therefore, the net migration rate derived using this approach represents the aggregate net migration rate for the population, encompassing both internal and international migration.

Choice of Cohort

This research examines net migration from 2011 to 2021, focusing on the population aged 20 to 30 years in 2021 (corresponding to ages 10 to 20 years in 2011). This study is a macro-level analysis of migration; therefore, micro- and meso-level factors are beyond its scope. However, at the macro level, Figure 1 clearly shows that the 20–30 age group (in 2021) represents the most mobile segment of Nepal's population. Hence, this cohort is selected for the analysis.

Results and Discussion

Descriptive Statistics

The statistical properties of the variables used in the model are shown in Table 2. The data highlights contrasting trends in youth migration in Nepal.

Table 2: Statistical properties of variables

	Variables				
	NMR	**LNPCI**	**IS_TERAI**	**IS_JUNCTION**	**PROD_INDEX**
Number of Observations	75	75	75	75	75
Mean	-22.078	6.919	0.267	0.173	0
Median	-27.354	6.914	0	0	-0.087
Standard Deviation	17.251	0.351	0.445	0.381	1.749
Minimum Value	-51.631	6.188	0	0	-2.915
Maximum Value	33.166	8.060	1	1	5.616
Skewness	0.709	0.528	1.055	1.726	0.604
Kurtosis	3.209	4.038	2.114	3.979	3.217

Source: Authors' calculations

The net migration rate ranges from a maximum of 33.166% in Bhaktapur to a minimum of -51.631% in Ramechhap. This indicates that, for the 10 to 20 age group in 2011, more than half had left Ramechhap by 2021. Additionally, the mean net migration rate is -22.078%, suggesting a net out-migration of youth from the country. However, this is a simple average, not a weighted one. The lowest LNPCI value is 6.188 in Bajhang, while the highest is 8.060 in Manang. This is notable because Manang maintains the highest per capita income despite being a challenging mountainous district. This success is attributed to its renowned trekking routes, the lucrative yarshagumba trade, and extensive apple farming. Furthermore, the mean of the dummy variable IS_TERAI is 0.267, indicating that 26.7% of Nepal's districts are classified as Terai. Similarly, the mean of IS_JUNCTION is 0.173, showing that 17.3% of districts are located at junctions of the East-West Highway connecting to hilly areas. Similarly, the correlation matrix among the variables is as shown in Table 3.

Table 3: Correlation matrix among the variables

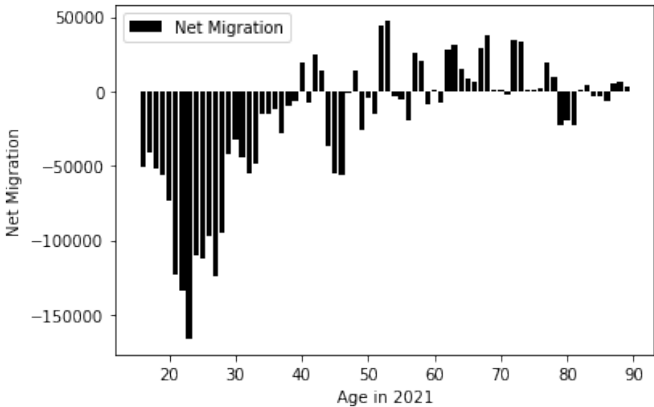| Variables	NMR	LNPCI	IS_TERAI	IS_JUNCTION	PROD_NDEX
NMR	1				
LNPCI	0.451	1			
IS_TERAI	0.435	0.021	1		
IS_JUNCTION	0.36	0.018	0.68	1	
PROD_INDEX	0.438	0.346	0.553	0.324	1

Source: Authors' calculation

The correlation matrix reveals that none of the variable pairs have a correlation close to one, suggesting that multicollinearity is not a concern. The positive correlation between the NMR and other variables indicates the likelihood of positive regression coefficients in the model. The correlation between IS_TERAI and IS_JUNCTION is 0.68, which is expected since the East-West Highway predominantly runs through the Terai region.

Empirical results

Net migration of population of Nepal between 2011 and 2021 by age is shown in Figure 1. In it, we can see that there is high out-migration from Nepal tentatively among the individuals between the age (in 2021) of 20 and 30 years which suggests the relevance of this research. Calculated value of net migration shows that among the age group of 20 to 30 years (in 2021), 16.18% of the cohort has migrated out from the country between 2011 and 2021. Similarly, net migration by age of few selected districts of Nepal is presented in Annex 4.

Figure 1: Net Migration of Nepal 2011-2021 by age

Source: Authors' calculation

The regression results for the Ordinary Least Squares (OLS) and Two-Stage Least Squares (2SLS) estimations are presented in Table 4.

Table 4: Regression result

	Ordinary Least Square NMR	Two-Stage Least Square NMR
LNPCI	21.68***	29.78***
	(4.546)	(11.17)
IS_TERAI	13.42***	13.32***
	(4.889)	(4.864)
IS_JUNCTION	5.303	5.25
	(5.711)	(5.680)
Constant	-176.6***	-232.57***
	(31.49)	(77.28)
Observations	75	75
R-squared	0.392	0.365
Adj R-squared	0.366	
Prob> F-statistics	0.000	

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' estimation

In the OLS regression, the coefficients for LNPCI and IS_TERAI are positive and statistically significant at the 1% level. This indicates that both a district's per capita income and its location in the Terai region are positively associated with the net migration rate of the youth population. In other words, the flow of youth migration is towards the district with higher per capita income, and the trend of migrating toward the Terai region remains significant.

On the other hand, the coefficient for IS_JUNCTION is positive but not statistically significant. The positive sign aligns with expectations, as populations migrating from the hills often settle near junction points along the East-West Highway. However, many junctions lack population centers directly at the junctions, with settlements often located slightly farther away, sometimes extending into neighboring districts. This may explain the statistical insignificance of the IS_JUNCTION coefficient.

A more robust estimation method that addresses potential endogeneity is two-stage least squares (2SLS). When LN_PCI is instrumented with the PROD_

INDEX, the sign and significance of the coefficients remain unchanged. The coefficients are sufficiently stable. This indicates that a 1% increase in a district's per capita income leads to a 0.2978 percentage-point increase in the net migration rate toward that district. Similarly, if a district is located in the Terai region, its net migration rate towards it increases by 13.32 percentage points compared to districts outside the Terai. This result is consistent with Nepal's historical migration patterns, as documented by Gartaula and Niehof (2013).

Table 5: Instrumented mediation test

VARIABLES	(1) LNPCI	(2) NMR	(3) NMR	(4) NMR
LNPCI		21.68***		20.10***
		(4.546)		(4.985)
PROD_INDEX	0.0979***		2.915**	0.947
	(0.0263)		(1.216)	(1.206)
IS_TERAI	-0.225*	13.42***	6.611	11.14*
	(0.133)	(4.889)	(6.161)	(5.701)
IS_JUNCTION	0.0493	5.303	6.724	5.732
	(0.137)	(5.711)	(6.335)	(5.753)
Constant	6.971***	-176.6***	-25.01***	-165.1***
	(0.0468)	(31.49)	(2.165)	(34.80)
Observations	75	75	75	75
R-squared	0.164	0.392	0.257	0.397
Adj. R-squared	0.129	0.367	0.226	0.363
Prob > F-statistics	0.005	0.00	0.00	0.00

Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$
Source: Authors' estimation

The Instrumented Mediation Test result is given at Table 5. In the first-stage regression of the instrumented mediation test, LNPCI is regressed on PROD_INDEX. The coefficient of PROD_INDEX is statistically significant, indicating that it explains variation in LNPCI. The Prob > F-statistic is 0.005, confirming that the first-stage regression is significant. Thus, we reject the null hypothesis of a weak instrument and accept that the instrument is strong.

In the second and third regressions, NMR is used as the dependent variable, with LNPCI and PROD_INDEX as independent variables, respectively. In both cases, the coefficients of the respective independent variables are significant, indicating that LNPCI and PROD_INDEX individually explain variation in NMR.

In the fourth regression, in which NMR is the dependent variable and both LNPCI and PROD_INDEX are included simultaneously as independent variables, the coefficient of LNPCI remains statistically significant at the

1% level. In contrast, the coefficient of PROD_INDEX becomes statistically insignificant. This change in the significance of PROD_INDEX in the presence of LNPCI suggests that PROD_INDEX does not have a direct effect on NMR but instead influences it indirectly through LNPCI. Therefore, PROD_INDEX is an appropriate instrument for LNPCI in estimating NMR.

Discussion

Our result aligns with the neoclassical macro-migration theory, which suggests that regions offering better economic opportunities attract people from areas with fewer such opportunities. (Harris & Todaro, 1970). In Nepal's context, the positive relationship between net migration rate and per capita income indicates that districts with higher per capita income tend to attract a larger share of the young population. This result is consistent with the findings of Thapa and Conway (1983).

The Net Migration Rate by districts of Nepal is depicted on the map in Annex 3. It highlights that youth population growth is concentrated in key urban centers, including Kathmandu Valley, Chitwan, Kaski, and Rupandehi districts. Conversely, while other Terai districts are experiencing a decline in their youth population, the rate of decline is slower than the national average. In contrast, most hilly and mountainous regions are losing their young population at a faster rate than the national average, with notable examples being Manang and Mustang. Interestingly, Manang is losing its youth population at a slower rate than the national average, while Mustang is experiencing a net gain in its youth population, which may be partially attributed to their high per capita income. Additionally, Dolpa exhibits a positive net migration rate, potentially due to its small population size and unique geographic location. Overall, with a few exceptions in mountainous districts (requiring further research to identify the underlying causes), the general trend in Nepal shows hilly districts losing their youth population faster than the national average, urban centers gaining youth population, and the Terai region losing youth population but at a slower rate than the national average.

This study contributes to the macro-migration theory and broader migration literature by providing empirical evidence from Nepal that supports the notion of economic opportunity as a key driver of internal youth migration. By analyzing district-level net migration rates in relation to per capita income, the study reinforces the relevance of neoclassical migration frameworks in a developing country with significant spatial disparities. Furthermore, the detailed mapping of migration patterns offers important insights into regional dynamics—

highlighting the concentration of youth in economically vibrant urban centers and the depopulation of remote hilly and mountainous areas. These findings are crucial for policymakers, as they underscore the need for targeted regional development strategies to address demographic imbalances, ensure equitable access to opportunities, and manage urbanization pressures effectively.

Conclusion

Based on the graphical presentation, maps, and regression results, it is evident that districts with higher per capita income tend to attract youth migration or at least experience a lower outflow of young people. This pattern aligns with the neoclassical macro-migration theory, which suggests that migration is largely motivated by the search for better economic opportunities. These finding carries important policy implications for Nepal. A key factor behind the large-scale out-migration of young people is the limited availability of economic opportunities within the country. Likewise, many rural areas in Nepal are experiencing a noticeable decline in population, mostly due to weak local economic conditions. Promoting economic development in these regions is therefore essential for effective demographic, urban, and regional planning.

Way Forward

This study examines macro-level determinants, specifically, economic opportunities, that influence youth migration in Nepal, using district-level aggregate data. While this approach provides important insights into structural and regional economic factors driving migration, it does not account for the meso- and micro-level dynamics, such as household characteristics, social networks, personal motivations, and community-level influences.

To build upon the findings of this research, future studies should incorporate household-level survey data to explore these finer-grained determinants. Such an approach would enable a more comprehensive understanding of youth migration by capturing the interplay among individual aspirations, family conditions, and community contexts. Integrating micro- and meso-level analyses with macroeconomic insights can enhance the explanatory power of migration models and better inform policy interventions to manage migration and create economic opportunities for youth within the country.

Similarly, if appropriate data can be extracted at the municipal level, our current analysis can be extended to a more granular scale. This would not only improve the precision of macro-level findings but also help uncover intra-district

disparities in economic opportunity and migration patterns, thereby enabling more targeted and effective policy responses.

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Annexes

Annex 1: List of districts classified as Terai for IS_TERAI dummy variable

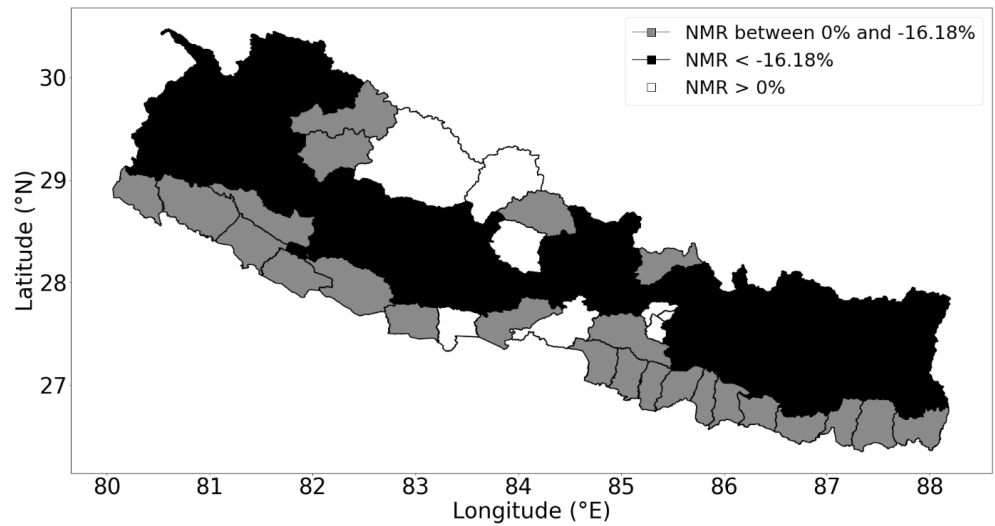| |
|---|
| Jhapa, Morang, Sunsari, Saptari, Siraha, Dhanusa, Mahottari, Sarlahi, Rautahat, Bara, Parsa, Chitwan, Nawalparasi, Rupandehi, Kapilbastu, Dang, Banke, Bardiya, Kailali, Kanchanpur |

Source: National Human Development Report 2014

Annex 2: List of districts classified as important junction point on East West Mahendra highway for Is_Junction dummy variable

Kanchanpur, Kailali, Banke, Dang, Kapilvastu, Rupandehi, Chitwan, Makwanpur, Mahottari, Siraha, Saptari, Sunsari, Jhapa

Source: Schematic Diagram of Strategic Road Network 2011/2012 and authors' analysis

Annex 3: Pattern of Youth Migration across Nepal

*Source***:** Authors' calculation
*Note***:** -16.18% is National Net Migration Rate of Nepal for cohort under study.