

Impact of International Migration on Labor Supply in Nepal

Lokendra Phadera



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Abstract

This paper analyzes the differential impact of migration on labor supply of the left-behind household members in Nepal, where international migration for employment, predominantly a male phenomenon, increased substantially between 2001 and 2011. Using the Nepal Living Standard Survey data, the paper extends the analysis by incorporating the impacts on the extensive and intensive margins. The study also answer the question: if they are not wage-employed, in what activities are the remaining household members engaging instead? The paper finds that, in response to out-migration of some family members,

women realign their priorities and reallocate their time from market employment to self-employment and home production, possibly filling in the roles vacated by the migrants. In contrast, the income effect dominates the impact of migration on the left-behind men; that is, men value their leisure more because of the remittances from abroad and decrease their overall supply of labor. Additionally, the research finds significant heterogeneity in the supply of labor by age, skill, and household head status among the left-behind women, pointing toward intrahousehold bargaining.

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Lokendra Phadera †

Poverty and Equity Group, World Bank

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†E-mail: lphadera@worldbank.org

1 Introduction

One-fifth of the 30% poverty reduction in Nepal occurring between 1995 and 2004 is attributed to work-related international migration and remittances sent home (Lokshin et al., 2010). More than two million prime-age (mostly male) Nepalese are working outside the country and the inflow of remittances accounts for 30% of the country's GDP (Ministry of Finance, 2014). Decrease in labor stock and substantial income from abroad are likely to have profound effects on the labor market and, yet, the impacts of the migration on the non-income dimensions in Nepal remain relatively unexplored. The paper addresses this issue by documenting the differential impact of international migration on labor supply of the left-behind family members.

Traditionally, the literature on the household-level impacts of migration has focused on income and consumption of the left-behind families. There is a general consensus among this literature that temporary out-migration for employment helps increase income and reduce poverty (Adams and Page, 2005, summarize the results of micro-level analysis in several countries).¹ However, a relatively new strand of the literature focusing on the non-consumption dimension of left-behind family members' well-being provides more mixed evidence. These new studies suggest that male migration decreases non-migrating women's labor market participation and increases their labor supply in farming and unpaid family work (Lokshin and Glinskaya, 2009, in Nepal; Binzel and Assaad, 2011, in the Arab Republic of Egypt; Mu and van de Walle, 2011, in China; Mendola and Carletto, 2012, in Albania). Similarly, migration has a negative effect on the left-behind elderly parents' health (Antman, 2010) and on children's educational attainment (Antman, 2011; McKenzie and Rapoport, 2011). So, how beneficial is international migration for the left-behind members? Murard (2016) provides a more complete theoretical framework incorporating both household consumption and labor supply. Using data from Mexico, the paper finds that temporary migration for employment leads to both increase in consumption expenditure and farm labor of household members staying behind. The consumption gains, however, are too large to be purely explained by the endogenous increase in non-migrants' labor supply.

¹Remittances help smooth consumption (Yang and Choi, 2007), provide mutual insurance (Stark and Lucas, 1988), relax credit constraints (Yang, 2008) and alleviate liquidity constraints (Taylor et al., 2003) allowing non-migrating members to engage in higher remunerative activities. At the same time, other community members may benefit from positive spillovers: Amuedo-Dorantes et al. (2010) find that children in communities with more migrants have greater school attendance and McKenzie and Rapoport (2007) find that migration reduces inequality in sending communities in the long run.

This paper contributes to the growing literature of migration's impacts of non-income based outcomes and, in particular, this is among the first papers to investigate the impact of international migration on time allocation and leisure consumption by gender in Nepal. To my knowledge, [Lokshin and Glinskaya \(2009\)](#) is the only other study that explores this topic in the Nepalese setting. However, they limit their analysis to women's labor supply for wage-employment and exclusively on the extensive margin. Using the 2003/04 round of Nepal Living Standard Survey (NLSS II) data, [Lokshin and Glinskaya \(2009\)](#) find that men's migration from Nepal has discouraging effect on women's labor force participation. In contrast, this paper uses the 2010/11 round of NLSS, when work-related international migration was at record high, and incorporates both extensive and intensive margins by gender. This is especially important given the traditional roles of rearing children and household chores women assume within the household and society, the left-behind women are expected to be affected differently than men. One of the most salient features of the employment related emigration in Nepal is that it is predominantly a male phenomenon. With males migrating abroad, the authority over household decision making may shift to women. However, the shift may be accompanied by extra responsibilities requiring extra hours of work or it might compel women to give up their jobs to assume the new roles. An additional important distinction between the papers is the timing of the surveys: while the NLSS II was implemented during a critical phase of the Maoist insurgency in the country, the NLSS III data were collected well after the end of the civil conflict.

The primary identification strategy of the paper relies on an instrumental variable (IV) approach using a popular instrument in migration literature, that is, historical migration networks. Specifically, using the 2001 Nepal Census, I compute the percentage of international migrants from a village as an instrument for migration in 2010/11. A decade lagged migration shares are unlikely to affect local economic conditions and hence, labor supply decisions. Furthermore, I use GDP growth between 2001 and 2011 of the most popular destination countries interacted with the local level decade lagged migration shares as an additional instrument and the results are robust.

The analysis has four major findings. First, solely on the extensive margin, having international migrants in the family discourages the left-behind members from participating in wage-employment. This is true for both male and female members. However, female members significantly increase participation in self-employment, almost entirely through subsistence farming. Whereas, having

migrants in the household does not affect male members' decisions to participate in self-employment. Second, both self-employed and wage-employed adults decrease their weekly hours of labor supply. Third, while women staying behind significantly increase labor time in household activities, I observe no such impact among men. Fourth, when analyzing the aggregate time allocation (wage work + self-employment + household activities), I find 0 effect of migration on women's overall labor supply and significantly negative effect on men's. Therefore, women staying behind realign their priorities and reallocate their time from wage-employment to farm and household activities, while men value their leisure more because of the remittances from abroad and decrease their overall supply of labor.

These are reasonable findings in a country with the traditional household norms and social culture that is likely to see women as subordinate to men. In order to understand the intra-household bargaining channel for labor allocation decisions further, I limit the sample to staying behind women members only and observe that unlike other women in the family, household heads are less likely to participate in wage-employment and do not increase participation in self-employment either. On top of already having greater say in family decision making, household heads are the likeliest recipients of transfers from abroad, which in turn, may further increase bargaining power.

This paper contributes to the existing literature in the following ways. First, it complements [Lokshin and Glinskaya \(2009\)](#) by extending the analysis of women's wage-employment on both extensive and intensive margins. Second, the paper also includes males' labor supply to investigate the presence of differential impact between men and women in Nepal. The most important contribution of the paper is that it analyzes the time allocation of left-behind members beyond their time in self-employment and market work. That is, it answers the question of if they are not employed, what do members of migrant-sending households do instead? This is an important question that the literature, including the studies in other country settings, has mostly ignored. Furthermore, by adding the total time spent in the market, self-employment and household activities, the paper investigates whether migration and remittances increase the consumption of leisure as the microeconomic theory predicts. The answer may have important implications towards the effect on an individual's welfare gains, which have been rarely explored in previous studies. By dissecting the analysis in these multiple ways, this study provides one of the most complete pictures of migration's impact on labor supply of the remaining family members.

The results presented in the paper have important policy implications. They highlight the need

for tailored policy initiatives targeting specific subpopulations. Male-dominated migration pushes females to give up wage-employment and increase labor supply in their own farms. Labor markets in rural Nepal tend to be incomplete and not fully integrated due to information asymmetry, lack of mobility, and lack of strong institutional implementations. Policy initiatives should be focused on these aspects to improve the rural wage labor markets thus allowing households to hire workers to replace those who migrate.

The rest of the paper is organized as follows. Section 2 provides background of out-bound migration from Nepal, a brief scenario of the current labor market in Nepal, and the motivation for the paper. Section 3 describes the data set used for the analysis, while the empirical strategy and identification are discussed in section 4. The findings of the analysis are presented in section 5 and section 6 concludes the paper.

2 Background and Motivation

2.1 Emigration from and Remittances to Nepal

With 25.2% of its population earning less than US\$ 1.25 per day ([World Bank, 2014b](#)), Nepal is one of the least-economically-developed nations in the world. However, with recent international labor treaties, Nepal has been experiencing large outflows of migrants and hence, remittance inflows from abroad. Figure (1) presents the historical international migration trend from Nepal. Close to 2 million Nepalese, 7.3% of the population, were living abroad during the census in 2011. This is a substantial increase compared to earlier decades. Only 3.2% (0.76 million), and 3.4% (0.66 million) of the population was living abroad in 2001 and 1991 respectively. The rise in numbers of Nepalese living abroad in the last decade is mainly due to low skilled employment related migration. The Foreign Employment Act of 2007 - which was designed to provide security, protect the welfare of migrants, provide migrants with education and training before leaving the country, and monitor the businesses that facilitate migration processes - along with the bilateral labor treaties that Nepal signed² have facilitated the migration process. The end of the Maoist insurgency, during which mobility within the country was severely restrained and government offices were destroyed, making

²Nepal signed major international labor treaties in last decade, with Qatar (2005), the United Arab Emirates and the Republic of Korea (2007), Bahrain (2008), Japan (2009), and Malaysia (started process in 2007), with the aim to protect migrants and facilitate the migration process.

it difficult to obtain travel documents, also helped improve conditions to migrate internationally.

Figure (A.1) shows migration trends to the top five destination countries for labor employment.³ Malaysia, Qatar, and the United Arab Emirates, countries Nepal signed treaties with, are among the most favored destinations for work. India, not shown in the figure, is the largest recipient country of Nepalese workers. Due to the open border the two countries share, it is difficult to track migrants and most workers migrating to India do not report to the Department of Foreign Employment, which keeps the records. Additionally, many workers migrating to countries other than India travel through India, so labor-related migration might be significantly higher than is officially reported. With these outflows of workers, it is not surprising that remittances have become major financial flows to Nepal.

Remittance income has become a major factor in the economic development of Nepal. According to the [Ministry of Finance \(2014\)](#), Nepalese households received 430 billion and 560 billion rupees, accounting for 25.7% and 29.1% of the GDP in fiscal years 2012-13 and 2013-14, respectively. About 32% of Nepalese households received remittances in 2004 ([World Bank, 2006](#)). At the country level, remittances have helped sustain the balance of payments, covering 169.5% of imports and are equivalent to 82.9% of the foreign reserves in 2013 ([World Bank, 2014a](#)). This trend is likely to continue in the near future, as the growth in outflows of migrant workers is on the rise. Migrant outflows grew by 16% between 2012 and 2013 ([World Bank, 2014a](#)). Remittances sent through unofficial channels could be as large. Thus, resource inflows from abroad are becoming an increasingly larger share of household budgets to a growing number of families in Nepal.

2.2 Employment

International migration and paid-employment are male-dominated phenomena in Nepal. The labor migration trend by gender is presented in Figure (A.2).³ Among labor-related migrants, only 6.0% (about 23,000), 6.2% (about 28,000) and 5.6% (about 30,000) of migrants were female in 2011, 2012 and 2013, respectively. In my sample, 15.6% of migrants are female.³ Similarly,

³ Workers going abroad are required to obtain labor-permits from the Department of Foreign Employment. Migrants can apply on their own or can apply through foreign-employment recruiting agencies. The numbers reported in Figure (A.1) are those who opted to apply through the recruiting agencies and were issued the permit. Many of the females migrating abroad from Nepal tend to migrate along with their male household members and not necessarily for employment purposes. Therefore, NLSS, which asks if the household has members abroad, is likely to have a higher percentage of female migrants in the sample than reported here.

there is variation in labor market participation across gender. Among working age (18 - 60 years) males, 49.8% of them reported to be paid employees and 70.9% of them reported participating in self-employment, mostly subsistence farming. Among females, only 23.1% reported to be paid employees while 66.3% of them reported participating in self-employment. This is not surprising given the strong social and traditional family norms in Nepal, which discourage women from participating in paid-work, and where women mostly engage in taking care of children and household chores (CEDAW, 2003). However, with males migrating abroad, the authority over household consumption and investment might shift to female members. Women might become more involved in making decisions on labor market participation as well. Besides continuing to care for children and engaging in household chores, women in Nepal often take up men's roles in family farming and enterprises when male members are abroad (Nandini, 1999). Similarly, women play key roles in deciding the use of remittances and running bazaar economics when husbands are away (Brown and Conneil, 1993). The male-dominated international migration in Nepal may affect non-migrant male and female members in the household differently.

3 Data and Descriptive Analysis

For this study I use the 2010-2011 round of the Nepal Living Standard Survey (NLSS III) as the primary data source. It is a nationally representative survey of households and communities that is conducted by the Central Bureau of Statistics (CBS) Nepal, with assistance from the World Bank. It was administered between February 2010 and February 2011. It has a panel component of 1,128 households. Half of the households were followed from the first round and the other half from the second round. The cross-sectional sample has 5,988 households, which were selected in three stages.⁴ The survey collected detailed information on multiple topics related to household welfare. The survey provides rich information on household consumption, sociodemographic composition of households, health and education attainment of the members, labor market outcomes of the household members, and the source of a wide range of household incomes. It contains detailed information on time-allocation for wage-employment and household production of every household member. Households were also asked to provide information on remittances received by the house-

⁴For detailed description of the sample design and the methodology, see <http://cbs.gov.np/>

holds in the previous 12 months and identified the age, gender, educational attainment, and the destination country of the remittance sender.

This study uses 7,108 NLSS III households from both the cross-section and panel components that have complete information on the variables used in the analysis. Among the households in the sample, 33.1% (2,212) reported having at least a member abroad in 2010-11. Characteristics of migrants are reported in table (A.1). Migrants tend to be young (mean age of 28), dominated by males (84.4%) and mostly composed of the daughters/sons of the household head. They tend to have achieved some grade level of education, 53.7% have completed between grades 1 and 10, while 20.3% have completed grade 10 (School Leaving Certificate) and intermediate level (high school). India and the Middle East seem to be the favored destinations for most of the migrants, 44.4% and 24.7%, respectively. Although remittances coming from abroad tend to be relatively large, there are very little difference in total and non-wage household incomes (Figure 2); households with a migrant have slightly higher total and non-wage incomes.

A total of 16,879 working age adults (ages 18-60) are used for the analysis. For the analysis of time allocation in household activities, 4,985 boys and 5,195 girls (both ages 6-17) are added in the sample. Adults from households with and without migrants differ on demographics, household composition, their labor market outcomes, and communities where they reside. Table 1 reports the descriptive statistics of the 16,879 adults used in the analysis. Adults from migrating families, both male and female, are less likely to be employed in wage-employment but are more likely to be involved in self-employment activities compared to the adults from non-migrating families. Consistent with the theory (for the bottom 70% of the households), adults decrease wage-employment with household non-wage income (Figure 3). Migration seems to have a disincentive effect on wage-employment; adults from migrating families are less likely to have wage-work over all the non-wage household income distribution.⁵

Adults from migrating families are older by a year and have achieved a year less education than those in households with no migrants. When comparing only female members, females from families with a migrant are more likely to be married and head the household when compared to females from families with no migrants. This is the opposite when comparing male members. Adults from

⁵These results are suggestive, they do not account for the fact that the adult most likely to be the wage earner in the family might be more likely to migrate, leaving adults who are intrinsically less likely to have wage employment behind.

families with at least one member abroad have larger household size and are more likely to come from a family with a female head. Most of the agriculture in Nepal is subsistence farming, so households own small amounts of land. Migrating families tend to own more land compared to non-migrating families. At the community level, migrant-sending families live areas with slightly lower unemployment rates and literacy rates and higher poverty rates.

4 Empirical Specification and Identification Strategy

The goal of the analysis is to evaluate the impact of migration on the labor market outcomes of the left-behind household members. The simplest strategy is to estimate the following equation.

$$y_{ij} = \beta_0 + \beta_1 M_j + \mathbf{X}'_{ij} \boldsymbol{\beta}_2 + \epsilon_{ij} \quad (1)$$

where $y_{i,j}$ is an outcome variable of individual i in household j . It is either employment status, or total hours spent in paid work, household production or other household activities. \mathbf{X}_{ij} is a vector of controls - individual and household characteristics that influence individual i 's productivity and local labor market conditions. M_j is an endogenous binary variable that takes the value of 1 if household j has at least one migrant - 0 otherwise, and ϵ_{ij} is the unobserved error term.

4.1 Identification

The decisions to migrate and work are selective processes which depend on observed and unobserved household and individual characteristics such as asset level, taste for work, human capital level, opportunities at home and abroad etc. Cross-sectional analysis of migration's effect on labor supply cannot identify a causal relationship because of the endogeneity of migration and household labor supply. Unobserved household and individual characteristics that influence labor supply are likely to influence the decision to migrate as well. Similarly, households may endogenize labor supply decisions and hence, earned income while making migration decisions. Thus, estimated effects of migration on labor supply will be biased using the OLS strategy. To address the potential endogeneity bias, this paper exploits a very popular instrument in the literature: the local historical migrant network serves as an instrumental variable (IV) for the current migration decision. Specifically,

using the 2001 Nepal Census I compute the percentage of international migrants from a Village Development Committee (VDC)⁶ as an instrument for migration in 2010-2011 as in (3). Following is the equation for migration decisions.

$$M_{ijc} = \alpha_0 + \mathbf{X}'_{ijc} \boldsymbol{\alpha}_1 + \alpha_2 Z_{ijc} + \nu_{ijc} \quad (2)$$

where $M_{i,j}$ is an identifier that individual i lives in household j with or without a migrant, \mathbf{X}_{ijc} is a vector of controls as defined in equation (1). Z_{ijc} , defined in (3), is an exogenous instrumental variable that must satisfy as good as randomly assigned, the first stage, and the exclusion criteria conditions. The 2001 migration decisions are likely to be random to the 2011 labor supply and migration decisions as migrants from a community in 2001 would not have anticipated the community's labor market conditions in 2011, which satisfies as good as randomly assigned condition. However, migration networks provide information about the economic opportunities at the destination, potential costs, and might reveal migrations' impact on their family's wellbeings to the community, which might influence other community members' migration decisions (first stage). Similarly, as long as a decade lagged unobserved community characteristics do not influence individual's labor supply in 2011, the 2001 community level migration shares are unlikely to feature in the 2011 labor supply equations. Hence, the instrument is likely to affect the outcome only through the endogenous variable, satisfying the exclusion criteria condition. Following is the instrument.

$$IV_1 = \frac{MIG_{2001,c}}{POP_{2001,c}} \quad (3)$$

where $MIG_{2001,c}$ is the total number of people living abroad in 2001 from a VDC c and $POP_{2001,c}$ is the population of the VDC c in 2001. It is important to note that the IV estimates are likely to be greater than the OLS estimates as the instrumental variable approach identifies the causal impact of treatment on outcome only on the compliers; that is, IV can recover only the local treatment effect (LATE) (Angrist, 1991).⁷

⁶Village Development Committee (VDC) is the lowest level of administrative unit. Similar to a municipality, it is responsible for the proper use and distribution of state funds and local level service delivery. Depending on the size, it may represent a single community or multiple communities. It is divided into 9 subdivisions called wards and currently there are 3,276 VDCs in Nepal.

⁷ OLS assumes treatment to have homogeneous effect. It estimates an average slope, which, in reality, might not be true as there are likely to be heterogeneous responses to the treatment. Let y be a potential outcome, d be a

The historical migrant networks are extensively used in the literature to estimate current levels of migration. Migrant networks, which are ties between migrants, former migrants, and non-migrants at the origin through bonds of kinship, friendship, and shared community origins, might be the most important mechanism for international migration (Massey, 1988). Sociologists and anthropologists have been studying the role of networks on migration for a long-time (Tilly and Brown, 1967; Mitchell, 1969; Choldin, 1973; Hugo, 1981) and economists have also found that networks play an important role in migration decisions (Hägerstrand, 1957; Greenwood, 1969; McKenzie and Rapoport, 2007; Woodruff and Zenteno, 2007; Foged and Peri, 2013). This is because migrant networks reduce the potential hazards at both the destination and the origin and decrease the cost of relocation (Massey, 1988; McKenzie and Rapoport, 2007).

Historically, international migration networks are region specific in Nepal. For example, most of the people joining the Indian and British armies in the 1930’s (and up to the present day) were Gorkhas from the Pokhara region when the recruitment started. Similarly, people from the southern plains migrated after the beginning of the extensive cultivation of tea in northern India (Seddon et al., 2001). People from Far-Western villages in Nepal tend to migrate to the same destination in India as their co-villagers (Thieme, 2006). Figure (A.3) shows the top 10 origin districts for labor-employment migration at present. These top districts, which are located mostly in South-Eastern Terai, account for 36.5% of the total labor-related migration from Nepal between 2008 and 2014.

In order to investigate the role of past community level migration on current levels of migration in the community, I calculate the shares of migrants in 2001 and 2011 to a particular destination country from a VDC using the 2001 and 2011 Nepal Censuses. Then, for each destination country, I regress the share of migrants to the destination from a VDC in 2011 on the share of migrants from

potential treatment and z be an instrument, then under the assumptions of independence, exclusion and monotonicity IV is a LATE. Independence assumption states that difference in outcome (y) and difference in treatment (d) between $z_i = 0$ and $z_i = 1$ should capture the causal effect of the instrument on outcome and treatment. This is satisfied when as good as randomly assigned condition in IV is fulfilled. The exclusion assumption, $y(d_i, z_i = 0) = y(d_i, z_i = 1)$ for $d_i = 0, 1$, is the same as the exclusion criteria condition in IV. Whereas, the monotonicity assumption states that the instrument, if it has any effect, should affect everyone in the same direction i.e. $d_{1i} \geq d_{0i}$ or $d_{1i} \leq d_{0i}$. Given these assumptions, $IV = LATE = \frac{E(y_i|z_i=1) - E(y_i|z_i=0)}{E(d_i|z_i=1) - E(d_i|z_i=0)} = E(y_{1i} - y_{0i} | d_{1i} > d_{0i})$. Notice that the denominator is just the shares of compliers i.e. the percentage of the sample that participate in the treatment only because of the instrument. So, when there is treatment effect heterogeneity, IV estimates the causal effect of treatment on outcome only among compliers. In our case, compliers are those who decide to migrate due to the higher share of migrants in the community in the past. Since all three assumptions are likely to be satisfied, the estimated IVs in the paper are LATEs. Contrarily, under the homogeneity assumption or perfect compliance, the denominator would be 1 and hence, $LATE = IV = ITT$ (intention to treatment effect), which is what OLS assumes. Since the share of compliance is always less than or equal to 1, the LATE is always greater than the ITT.

the same VDC to the same destination in 2001.⁸ Estimated correlations for the top four destination countries are presented in Figure (4). There is a strong correlation between historical and current level migration shares. Coefficients are either closer to 1 or greater than 1 and are highly significant.⁹ Additionally, I regress the number of migrants from a VDC to a particular destination country in 2011 on shares of migrants from the VDC that went to the same destination in 2001. Estimations are presented in Table (2). Again, the 2011 migration levels are highly correlated with the 2001 destination specific propensity scores to migrate.

A potential complication with the instrument is that, although lagged by a decade, lagged unobserved VDC characteristics can influence labor supply decisions. Historically, migrant sending communities might be systematically different to those less migrant sending communities on economic and labor market characteristics. High historical migration might be linked to bad economic conditions at the origin or remittances might have improved the local economic conditions over time. Depending on these conditions, IV estimates might be biased downward or upward. To address this problem, I control for a host of community level economic characteristics such as poverty rate, illiteracy rate, unemployment, and inequality within a VDC.¹⁰ Even so, I cannot claim with certainty that the instrument captures no unobserved VDC characteristics that triggered the past migration and influenced the present labor supply. However, the identification is at least as valid as those used in previous studies. Furthermore, I create an additional instrument, average GDP growth between 2001 and 2011 of the top 8 destination countries in 2011 and interact it with the share of migrants to those destinations from a VDC in 2001 as in (4).

$$IV_2 = \frac{\sum_{i=1}^8 MIG_{2001,i,c}}{POP_{2001,c}} \times GDP\ Growth_{01-11} \quad (4)$$

where $MIG_{2001,i,c}$ is international migrants in 2001 from a VDC c to destination i and $POP_{2001,c}$ is the population of a VDC c in 2001. The top eight destination countries in 2011 are India, Malaysia, Saudi Arabia, Qatar, Kuwait, the United Arab Emirates, the United Kingdom, and the United States. $GDP\ Growth_{01-11}$ is the average GDP growth of the top 8 countries between 2001 and 2011.

⁸ For detailed calculations of shares of migrants and regression equations see the notes of the figures and tables.

⁹ These results hold for other destination countries as well.

¹⁰ It is more appropriate to control the community level characteristics at the baseline, but due to the data limitation I use the 2011 community conditions as the controls.

Since the GDP growth of the destination countries is exogenous to the local labor market conditions the interacted term is likely to be exogenous as well. I report results from both IV_1 and IV_2 in the main specification. Despite the binary endogenous variable, I use the linear 2SLS estimation strategy as suggested by Angrist and Pischke (2009). Because of the binary endogenous variable, the conditional expectation function (CEF) associated with the first-stage might be nonlinear. One can use a nonlinear first-stage and use the predicted probabilities as an instrument in a garden-variety 2SLS as suggested by Angrist and Pischke (2009) and Wooldridge (2010) to avoid “forbidden regression” in the second step. However, this requires making distributional assumption of the first-stage CEF. In contrast, with the linear 2SLS, one need not worry whether the first-stage is linear (Angrist and Pischke, 2009).¹¹

5 Results

A linear estimation of equation (2) using IV_1 (equation 3), and IV_2 (equation 4), are presented in Table (A.2) columns (1) and (2) respectively. Coefficients on both the instruments are highly correlated with the household’s migration decisions. Adults in VDCs with higher proportions of migrants in 2001 were more likely to live in a household with at least one international migrant in 2011. Interestingly, there is a positive relationship between local unemployment rate and illiteracy rate. The negative correlation between the migrant outflows and the local market conditions results in downward biased OLS estimates of the impact on the labor market outcomes (Foged and Peri, 2013).

The OLS estimates of specification (1) are presented in columns (3) and (4), the 2SLS using IV_1 are presented in columns (5) and (6) and IV_2 are presented in columns (7) and (8) of table (A.2). The dependent variables are weekly hours supplied for wage-employment and self-employment. I use all the adults, both employed and non-employed in wage and self-employment. Since 0 hours are observed for non-employees, there is no problem of sample selection. The estimated effects are a combination of intensive and extensive margins. Columns (3), (5) and (7) are estimated wage labor supply equations while (4), (6) and (8) are self-employment labor supply equations.

Overall, the estimates of β_2 s, coefficients on X’s in equation (1), are comparable across the

¹¹With a linear estimation, one would be worried about predicted probabilities from the first-stage not being within 0 and 1. Assuredly, all the predicted values in the estimated models are within the range.

estimation strategies. $\hat{\beta}_2$'s direction corresponds well with the economic intuitions. Individual characteristics, age, and household head status strongly determine the level of labor supply for both the wage and self-employment. It is not surprising that women, in Nepal, are less likely to work outside their homes, and the supply of wage-hours increases with years of schooling. Similarly, household characteristics, and land ownership decrease wage-hours and increases time spent in self-employment. Owning a home and being from a higher social caste, Brahman/Chhetri, discourage adults from working.

The coefficient of interest, $\hat{\beta}_1$, which is the coefficient on migration decision in equation (1) is statistically significant across all the econometric techniques used for time spent in wage employment. While comparable with each other, IV estimates are significantly greater in magnitude than the OLS estimate. As discussed earlier, OLS suffers from selection bias and the negative correlation between the local market conditions and the migration flows is likely to bias the effects downward. Furthermore, the 2SLS can recover the impact only on the compliers i.e. local average treatment effect (LATE), which is always less than the intention to treat effect (ITT).⁷ Both the instruments are reasonably strong, with a high correlation between the endogenous variable and the instruments. F -statistics of the first stage are always above 60, which are greater than the threshold value of 10 researchers usually consider below which one might run into the problem of weak instrument (Stock and Yogo, 2005).

Results from the IV regressions suggest that having a migrant in the household discourages the left-behind members from working in wage-employment. Adults from migrant-families decrease their weekly hours of labor supply for wage-employment by about 8 hours when compared to the adults from the non-migrant households. This is a decrease of almost one official work day. The direction of the effect is consistent with the prediction of the theoretical model. The income transfers through remittances increase the reservation wages and since most of the home production is subsistence farming, members' time-inputs are likely to be substitutes, both of which reduce non-migrating household members' hours of work in market employment. Contrary to the prediction of the theoretical model, migration has a negative effect on self-employment. However, both the IV results are small in magnitude and statistically not different from 0. As discussed earlier, these IV results are combinations of intensive and extensive margins. Separating these effects provides better insight into the economic behavior of the left-behind members and may assist better in policy

design.

I apply the following strategy to separate out these effects. I use a binary employment status, 1 for employed - 0 otherwise, as the dependent variable instead of hours supplied to estimate the impact on extensive margins. To examine the impact on intensive margins, I analyze the hours supplied for a particular employment by limiting the sample to those who are engaged in that employment. That is, depending on the left-hand side outcome variable, the analyzed sample is conditioned on being employed in that particular sector.

Tables (3) and (4) reports 2SLS estimates of the impact of migration on wage employment and self-employment outcomes, respectively, by sex using IV_1 as the instrument. Panel A of the tables shows the impacts on extensive margins while panel B shows the effects on intensive margins. Again, the instrument is reasonably strong with all F -statistics from the first stage above the threshold value of 10 except for the hours supplied for non-agricultural wage employment, which is at 7.1. Both male and female adults from the migrant sending families have smaller involvement in wage-employment, both on extensive and intensive margins when compared to adults from families without migrants. Meanwhile, migration has greater negative effect on left-behind men's propensity to participate in market employment than women's, 31.1% vs 20.5%, (Table 3, Panel A). However, among working adults, left-behind women supply fewer hours in wage-employment than the left-behind men (Table 3, Panel B), which could be a result of Nepali women, if employed outside their homes, having mostly part-time jobs. At the same time, having migrants in the family affects left-behind women's self-employment decisions on both extensive and intensive margins, but not men's. Compared to women from households without migrants, women in households with migrants are 28.0% more likely to be engaged in self-employment, mostly working in their own farms. However, among those employed, women decrease weekly hours worked by 13 hours (Table 4). Overall, migration has negative effect on all the left-behind household adults' involvement in wage-employment but it is only women who increase their involvement in self-employment. In a country with traditional household norms and social culture, where women tend to be subordinate to men, it is not surprising that only women redistribute their time allocation in response to sending some family members abroad.

Table (5) presents the 2SLS estimates of the impacts of migration on the time spent in household production and other activities by the left-behind adults and children using IV_1 as the instrument.¹²

¹²Fetching water, collecting firewood and dung, taking care of animals, making mats, knitting, weaving, tailoring

Sending some members abroad has 0 effect on time allocation in household activities of left-behind male adults and boys. Women and girls, on the contrary, significantly decreased their weekly hours, 7.8% and 4.1% respectively, in less productive activities and increase their weekly hours in more productive activities more than proportionally, 8.2% and 5.5% respectively.

When a household sends some of its members abroad, there are several pathways through which non-migrating member's labor supply is affected. First, the income transfers through remittances increase the valuation of leisure of left-behind members making leisure more appealing. Second, because of the decrease in the household's stock of labor hours, left-behind members might overburden themselves by adding the role vacated by the migrants onto their own workload. Third, households might realign their priorities and redistribute the remaining stock of labor time once they send members abroad. In order to distinguish the latter two pathways, I add weekly hours supplied by the left-behind household members across all activities. The results are presented in table (A.3). The second scenario is true neither for the left-behind women nor men. As a matter of fact, non-migrating male members increase their weekly leisure consumption by 18 hours by cutting their involvement in all forms of employment (wage + self-employment). This fits well with the first scenario rather than the latter two. To isolate the first path, of impacts through income transfers, one has to model migrants' decision to send back remittances, which requires a new identification strategy and potentially a new instrument. Due to limitations in the data, I believe the analysis is beyond this papers' scope. Meanwhile, the aggregate effect is statistically 0 for the left-behind women members, which corresponds well with the third scenario. In Nepal, while left-behind males increase their leisure consumption in response to sending members abroad, women realign their priorities and assume the roles in home production and self-employment - roles likely to have been vacated by the migrants.

The differential impacts between the left-behind male and female members are most likely to be a result of differential bargaining power male and female members have within a household. Bargaining heterogeneity, however, is not limited to gender differences. Even within a gender group, members might have different levels of bargaining, creating heterogeneous responses to migration

and processing preserved food are classified as household production activities. Whereas, minor house repair, cooking food, cleaning, laundry, dishes, babysitting, and taking care of the elderly are categorized as other household activities. They are classified as such because the CBS takes into account only the time spent on the former activities while calculating unemployment. Males and females are ages between 18 and 60 while boys and girls are ages between 6 and 17.

within the group. Among female members, older females and household heads are likely to have a higher level of bargaining than other female members in the family. Table (A.4) presents 2SLS results of the impact of migration on total labor supply by women’s age (Panel A) and women’s household head status (Panel B). Consistent with the hypothesis, older women from migrant-household supply substantially less overall labor hours (16) mostly by reducing their hours in wage and self employment (13). In contrast, migration has no effect on younger women. At the same time, when a household sends its members abroad, it negatively affects overall labor supply of women who are head of the household but has no effect on other female members’ labor supply (Table A.4, Panel B). It is plausible that depending on each member’s bargaining power within a household, the decision to send members abroad has differential impacts on each left-behind members’ labor supply decision.

5.1 Heterogeneous Effects

As with the sex of the left-behind members, households’ migration decisions are likely to affect different groups within the household differently. I divide the sample by skill level, age, and the household head status to analyze the potential treatment effect heterogeneity. Table (6) presents the 2SLS estimates by skill level. Adults with school leaving certificate (SLC) or more are defined as high skilled.¹³ It is only the low skilled left-behind members that are affected by the migration. There is statistically zero effect on labor supply of high skilled adults. While less likely to participate in market jobs, low skilled adults are more likely to be involved in self employment activities. At the same time, low skilled adults, if employed, supply fewer weekly hours for both wage-employment and self-employment. The differential impact by skill level is reasonable as high skilled workers are likely to be already involved in more formal and permanent jobs that have higher opportunity costs of switching.

Tables (7), and (8) present the effect of migration on labor supply from the 2SLS estimation using IV_1 as an instrument by age and household head status respectively. Adults with ages between 18 to 40 are defined as young adults. Irrespective of age, migration affects the left-behind members

¹³All the students whether in private or public schools that follow the Nepali education system, have to take the school leaving certificate (SLC) exam at the end of tenth grade. All schools in the country follow the system with very few exceptions, which follow the Indian or American system. It is mandatory that students pass the exam to continue their studies further within the country and qualify for most of the government and private jobs.

similarly, both younger and older adults decrease their participation in wage employment while increasing participation in self-employment. Likewise, both types of adults have similar responses in their intensive margins - lower weekly labor supply (Table 7).

Although outmigration of some family members has similar effect on the intensive margins for wage-work and own work, there is a significantly different effect on the participation rate by household head status. The left-behind household heads are 41.4% less likely to participate in paid work compared to 23.1% of the other household members. Concurrently, outmigration of family members does not affect the household head's decision to participate in self-employment activities but significantly increases other members' involvement, 29.8% (Table 8). This corresponds well with the intuition that the household heads are likely to have higher bargaining power within the household and are likely to receive remittances sent by the migrants, which in turn, may further increase their bargaining power.

6 Discussion and Conclusions

In this paper I use a unique source of nationally representative data during the period that Nepal experienced a boom in outmigration. The data set contains detailed information on time allocation of every individual in the household, which allows me to extend the analysis further and answer the question that previous studies on the topic could not answer in Nepal. Using the NLSS III data set, this paper explores the impact of migration on labor supply of the left-behind household members both on extensive and intensive margins for wage-employment, self-employment, and household activities. The paper also provides an answer to the question, what are the remaining members in the households engaged in instead of work employment?

I find that having international migrants in the family discourage members staying behind from participation in wage-employment. This is true for both male and female members. However, female members increase participation in self-employment, almost entirely through subsistence farming. The paper also finds that both self-employed and wage-employed adults decrease weekly hours of labor supply and only women in the migrant-sending household increase time in household activities. Findings presented in the paper suggest that male-dominated migration forces women to realign priorities and reallocate time from market-work to farming and household activities. In contrast,

because of the income transfers, men now value their leisure more and decrease their overall labor supply. These are reasonable findings in a country where the traditional household norms and social culture see women as subordinate to men.

The question of the impact of outmigration on the well-being of the left-behind members is of importance for Nepal, which already has high levels of outmigration and the trend for outmigration is on the rise. The neoclassical micro theory identifies wage and employment opportunity differentials between the place of origin and the place of destination as the main cause of migration. Therefore, women switching from the formal labor market to self-employment should speed-up the process of equalization of wages and opportunities between the two places (Lokshin and Glinskaya, 2009). However, with the opening of new destinations, economic incentives abroad, and increasingly simpler migration processes, outmigration from Nepal will not decline anytime soon. International migration for labor-employment from Nepal, however, is risky.¹⁴ Many Nepali emigrant laborers find themselves working in hazardous conditions, work long hours, face delays in getting paid, and some even lose their lives (Kaphle, 2014). It is imperative that Nepal put in place a broad set of policies that protect the welfare of migrants, many of which are breadwinners in their families, and safeguard the wellbeing of the left-behind members.¹⁵

The results presented in the paper may play an important role in designing some of these policies, especially in protecting the wellbeing of the remaining household members. They highlight the need for tailored policy initiatives that target specific subpopulations. Male-dominated outmigration pushes left-behind women to withdraw from wage-employment and increase the labor supply in their own farms. Policy initiatives should be focused on improving the rural wage labor markets, which would allow households to hire workers to replace those who migrate. Additionally, these policies may help in insuring households against the negative migrant-related shocks if they can encourage the left-behind members to remain in formal wage-employment, which may have higher returns than self-employment.

¹⁴International migration from Nepal, especially for labor, is costly and requires extensive planning ahead. It requires obtaining passport and visa, purchasing ticket and saving up or borrowing for the associated costs. Similarly, most of the international work-related migration involves migration brokers who charge high fees for their services and there are contractual agreements in place between migrants and the hiring agency ahead of migration and reversing the decision once made can be very costly (Bhattarai, 2005).

¹⁵See McKenzie and Yang (2015) for reviews of different policies about migration.

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7 Tables and Figures

Figure 1: International Migration Trend from Nepal

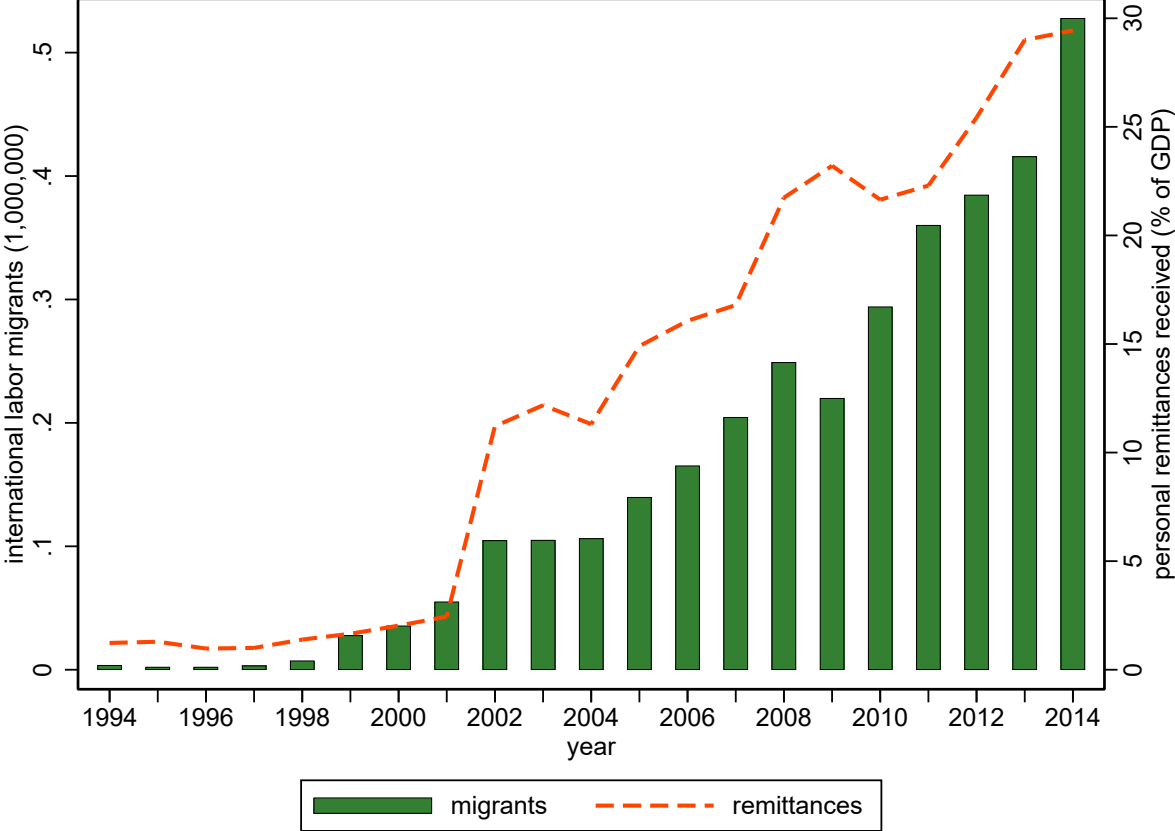


Figure 2: Household Income- Kernel Density

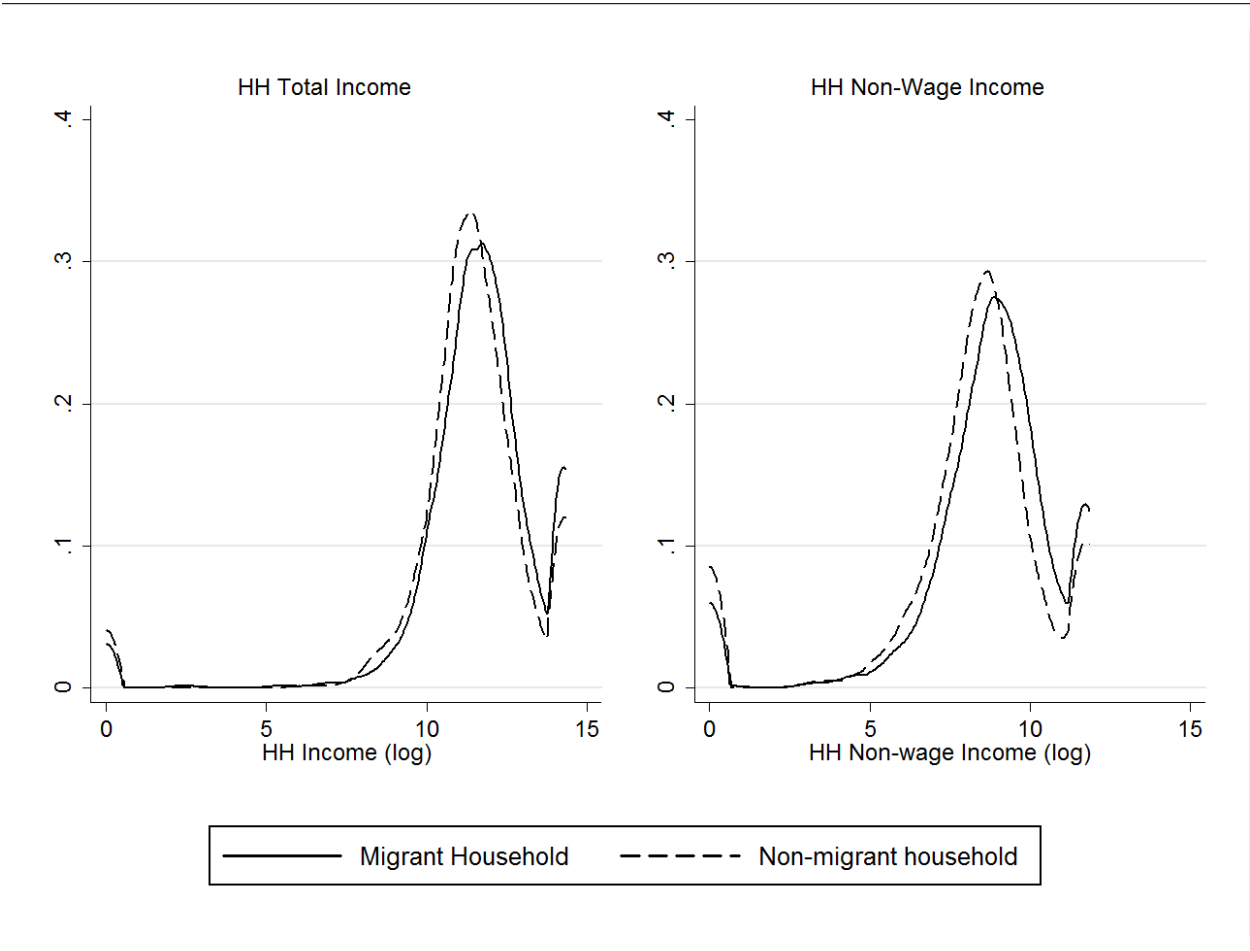
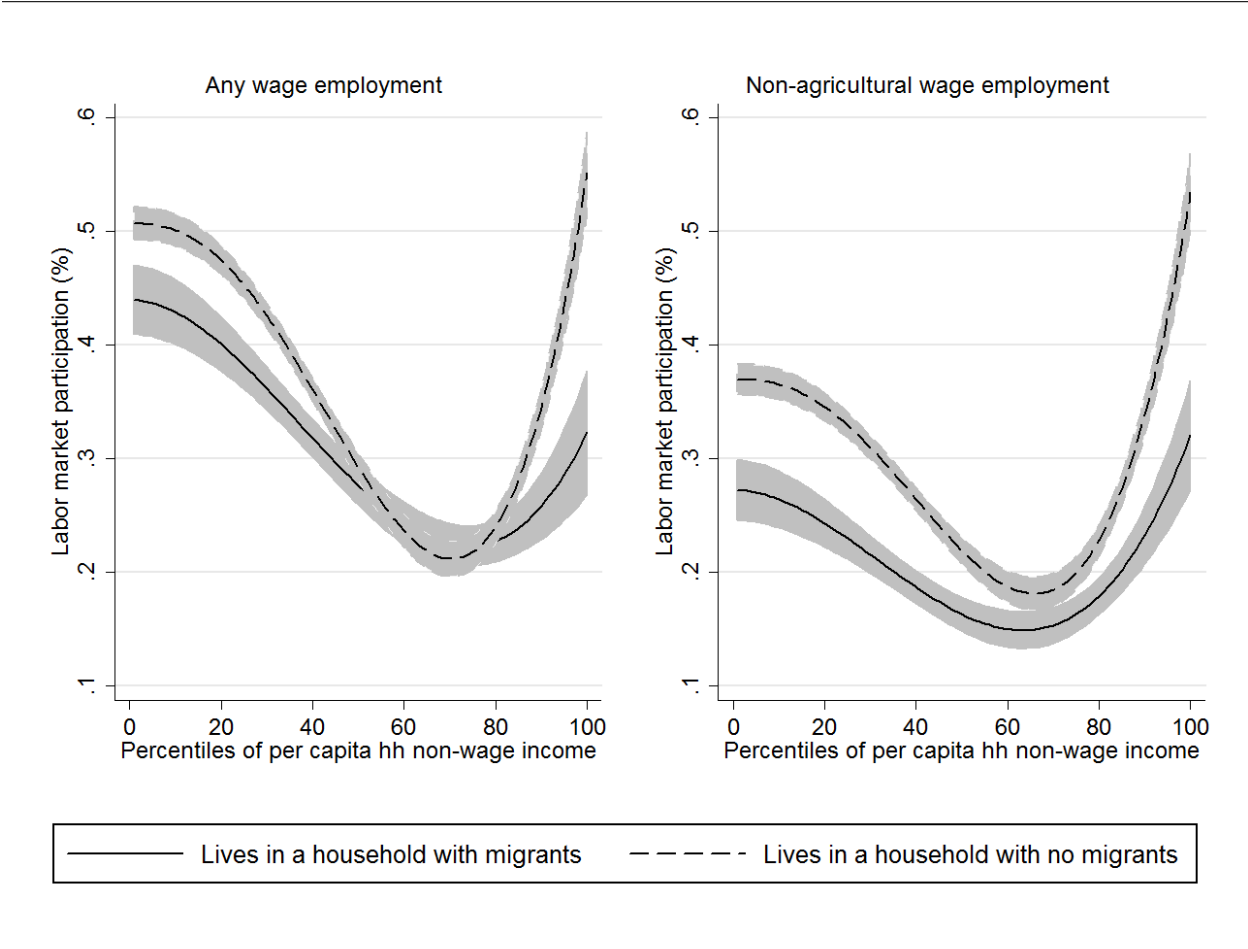
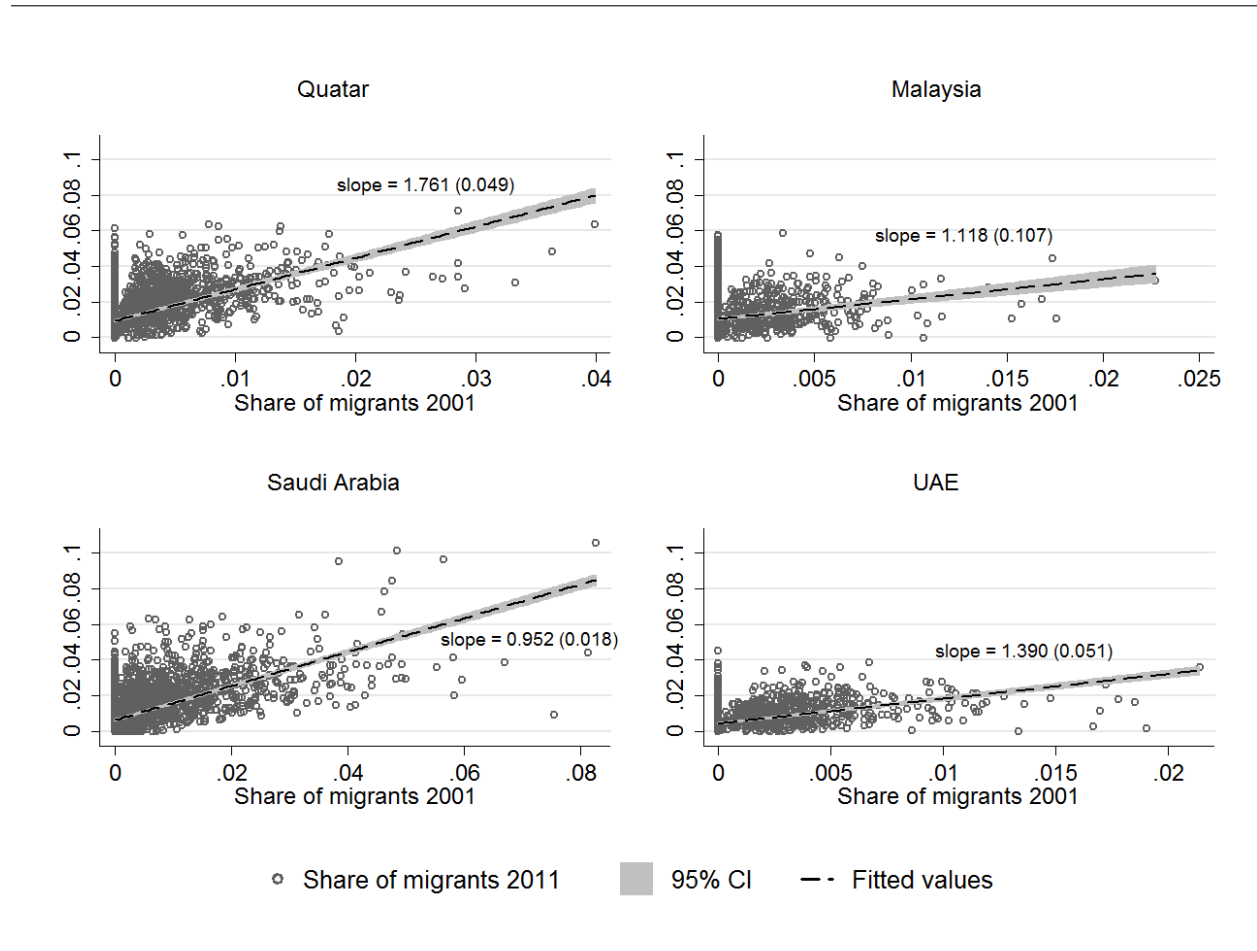


Figure 3: Rate of Labor Market Participation - All Adults



Note: Sample is limited to working-age (18 to 60) population. Figures are created using fractional polynomial regression. Non-wage income is monthly per-capita.

Figure 4: Correlation Between 2001 and 2011 Proportions of Migrants by Major Destination Countries.



Data Source: 2001 and 2011 Nepal Census. Linear fit is $Y_{j,d,11} = \alpha_0 + \alpha_1 Y_{j,d,01}$, where $Y_{j,d,11}$, and $Y_{j,d,01}$ are share of migrants to destination d from VDC j in 2011 and 2001 respectively. Share of migrants is calculated as $Y_{j,d,t} = \frac{M_{j,d,t}}{POP_{j,t}}$, where $M_{j,d,t}$ is number of migrants from VDC j to destination d in year t . $POP_{j,t}$ is the population of VDC j in year t .

Table 1: Descriptive Statistics

	All Adults		Female		Male	
	Nonmigrant (Mean)	Migrant-Nonmigrant (Difference)	Nonmigrant (Mean)	Migrant-Nonmigrant (Difference)	Nonmigrant (Mean)	Migrant-Nonmigrant (Difference)
Wage employment	0.370	-0.079 ***	0.239	-0.021 **	0.517	-0.084 ***
Self employment	0.670	0.044 ***	0.644	0.055 ***	0.699	0.044 ***
<i>Individual Characteristics</i>						
Age	35.699	0.915 ***	35.046	0.454 *	36.436	2.337 ***
Years of education	5.303	-0.912 ***	4.025	-0.495 ***	6.744	-0.686 ***
Married	0.793	0.005	0.798	0.040 ***	0.786	-0.067 ***
Household head	0.340	0.010	0.113	0.154 ***	0.596	-0.085 ***
<i>Household Characteristics</i>						
Female household head	0.131	0.163 ***	0.170	0.201 ***	0.087	0.059 ***
Household size (AE)	5.217	0.251 ***	5.175	0.139 **	5.265	0.502 ***
Share of children 0-7	0.122	0.020 ***	0.125	0.028 ***	0.118	0.002
Share of children 8-15	0.186	-0.005	0.189	0.006	0.184	-0.028 ***
Share of female adult	0.310	0.048 ***	0.341	0.038 ***	0.274	0.041 ***
Share of male adult	0.286	-0.073 ***	0.243	-0.080 ***	0.334	-0.024 ***
Share of elderly	0.055	0.010 ***	0.060	0.008 ***	0.049	0.009 ***
Landless household	0.298	-0.092 ***	0.285	-0.083 ***	0.313	-0.099 ***
Own less than 1 acres	0.316	0.011	0.319	0.019 *	0.313	-0.008
Own 1-2 acres	0.184	0.024 ***	0.192	0.021 **	0.174	0.024 **
Own 2-5 acres	0.152	0.057 ***	0.154	0.047 ***	0.150	0.075 ***
Own 5 or more acres	0.049	0.000	0.049	-0.004	0.050	0.009
Own a house	0.854	0.072 ***	0.868	0.057 ***	0.839	0.091 ***
<i>VDC and Region Characteristics</i>						
Unemployment rate	0.083	-0.005 ***	0.082	-0.005 ***	0.084	-0.005 **
Illiteracy rate	0.395	0.039 ***	0.400	0.039 ***	0.389	0.036 ***
VDC inequality (Gini)	0.469	0.001	0.471	0.002	0.466	-0.002
District poverty rate	0.212	0.011 ***	0.215	0.011 ***	0.209	0.008 **
Rural	0.615	0.105 ***	0.629	0.101 ***	0.599	0.100 ***
Observations		16879		9597		7282

Note: *** (**) (*) indicates significance at the 1% (5%) (10%) level. Sample is working age (18 to 60) adults.

Table 2: Migration Network: Dependent Variable - Number of Migrants in 2011 (1,000)

	All VDCs in Nepal		NLSS VDCs	
	(1)	(2)	(3)	(4)
Share of migrants 2001	3.758*** (0.101)	3.779*** (0.101)	6.606*** (0.676)	6.714*** (0.678)
Constant	0.013*** (0.001)	0.001 (0.001)	0.037*** (0.006)	-0.005*** (0.002)
District Fixed Effect		Yes		Yes
Observations	100880	100880	11648	11648
R^2	0.145	0.161	0.060	0.097

Data Source: 2001 and 2011 Nepal Census. Standard errors in parentheses.* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors are clustered at VDC level. Estimated model is $M_{j,d,11} = \beta_0 + \beta_1 Y_{j,d,01}$, where $M_{j,d,11}$ is number of migrants, in 1,000, to destination country d from a VDC j in 2011. $Y_{j,d,01}$ is share of migrants to destination d from a VDC j in 2001. Share of migrants is calculated as $Y_{i,d,t} = \frac{M_{j,d,t}}{POP_{j,t}}$, where $M_{j,d,t}$ is number of migrants from VDC j to destination d in year t . $POP_{j,t}$ is the population of VDC j in year t .

Table 3: 2SLS Estimation of Labor Supply by Gender- Wage Employment

	Female			Male		
	(1) Any Wage Emp.	(2) Agri.	(3) Non-Agri.	(4) Any Wage Emp.	(5) Agri.	(6) Non-Agri.
<i>Panel A: Labor market participation</i>						
Household with migrant	-0.205* (0.104)	-0.049 (0.083)	-0.221** (0.088)	-0.311* (0.175)	0.027 (0.114)	-0.371** (0.185)
Observations	9597	9597	9597	7282	7282	7282
Wald χ^2	1236.455	576.071	1744.580	941.219	476.251	858.504
F-test 1stage	70.938	70.938	70.938	41.195	41.195	41.195
<i>Panel B: Hours supplied</i>						
Household with migrant	-15.219** (6.826)	7.292 (6.134)	-26.255* (13.613)	-13.564* (7.066)	2.955 (4.996)	-13.505* (7.730)
Observations	2222	1069	1264	3623	773	3189
Wald χ^2	2004.359	205.487	920.637	1538.916	314.929	1475.447
F-test 1stage	18.791	16.894	7.140	37.343	20.071	31.814
Controls						
Individual characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes
VDC characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Region Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes

Note: 2SLS estimates are reported in the table. Share of international migrants in a VDC in 2001 is used as an instrument for the estimations. Sample is working age (18 to 60) adults and standard errors are clustered at VDC level. Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Individual controls are age age^2 , years of education, marital status, and household head identifier. Household controls are female HH head, share of male and female adults, share of elderly, share of children, amount of land-owned, house ownership and social caste. Similarly VDC level controls are, unemployment rate, poverty rate, illiteracy rate, inequality (Gini), and urban/rural location. Regions are Kathmandu, other urban areas, Western hills, Eastern hills, Western Terai, and Eastern Terai. Sample in Panel B is conditioned on being employed in that particular sector. Log of hourly wages is added as an extra individual control.

Table 4: 2SLS Estimation of Labor Supply by Sex- Self Employment

	Female			Male		
	(1) Any Self Emp.	(2) Agri.	(3) Non-Agri.	(4) Any Self Emp.	(5) Agri.	(6) Non-Agri.
<i>Panel A: Labor market participation</i>						
Household with migrant	0.280*** (0.089)	0.308*** (0.113)	-0.098 (0.087)	0.141 (0.120)	0.205 (0.148)	-0.179 (0.166)
Observations	9597	9597	9597	7282	7282	7282
Wald χ^2	8883.913	15715.418	703.258	7294.166	18469.293	841.418
F-test 1stage	70.938	70.938	70.938	41.195	41.195	41.195
<i>Panel B: Hours supplied</i>						
Household with migrant	-13.030*** (4.559)	-6.460* (3.787)	-24.345 (16.457)	-10.252 (6.781)	-5.819 (4.098)	4.337 (15.669)
Observations	6358	5550	1557	5160	4006	2109
Wald χ^2	525.033	434.614	504.186	2193.401	662.555	863.127
F-test 1stage	61.724	58.076	10.609	42.797	35.274	11.702
Controls						
Individual characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes
VDC characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Region Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes

Note: 2SLS estimates are reported in the table. Share of international migrants in a VDC in 2001 is used as an instrument for the estimations. Sample is working age (18 to 60) adults and standard errors are clustered at VDC level. Standard errors in parentheses. $p < 0.1$, $** p < 0.05$, $*** p < 0.01$. Individual controls are age age^2 , years of education, marital status, and household head identifier. Household controls are female HH head, share of male and female adults, share of elderly, share of children, amount of land-owned, house ownership and social caste. Similarly VDC level controls are, unemployment rate, poverty rate, illiteracy rate, inequality (Gini), and urban/rural location. Regions are Kathmandu, other urban areas, Western hills, Eastern hills, Western Terai, and Eastern Terai. Sample in Panel B is conditioned on being employed in that particular sector.

Table 5: 2SLS Estimation of Labor Supply for Household Activities

	Household production				Other household activities			
	(1) Adult-Male	(2) Adult-Female	(3) Boys	(4) Girls	(5) Adult-Male	(6) Adult-Female	(7) Boys	(8) Girls
Household with migrant	1.034 (4.456)	8.184** (3.810)	2.006 (2.326)	5.541** (2.354)	-2.409 (2.361)	-7.776** (3.218)	0.366 (0.970)	-4.107* (2.151)
Observations	7282	9597	4985	5195	7282	9597	4985	5195
Wald χ^2	1805.517	3126.243	755.167	1678.898	1055.533	1854.033	583.091	1950.024
F-test 1stage	41.195	70.938	55.647	47.598	41.195	70.938	55.647	47.598
Coefficient 1stage	1.611***	1.913***	1.976***	1.815***	1.611***	1.913***	1.976***	1.815***
Controls								
Individual characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VDC characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Fetching water, collecting firewood and dung, taking care of animals, making mats, knitting, weaving, tailoring and processing preserved food are classified as household production activities. Whereas, minor house repair, cooking food, cleaning, laundry dishes, babysitting and taking care of elderly are categorized as other household activities. 2SLS estimates are reported in the table. Share of international migrants in a VDC in 2001 is used as an instrument for the estimations. Male and female samples are working age, 18 to 60, adults while boys and girls samples are restricted to ages between 6 and 17. Standard errors are clustered at VDC level. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Individual controls are age age², years of education, marital status, and household head identifier. Household controls are female HH head, share of male and female adults, share of elderly, share of children, amount of land-owned, house ownership and social caste. Similarly VDC level controls are, unemployment rate, poverty rate, illiteracy rate, inequality (Gini), and urban/rural location. Regions are Kathmandu, other urban areas, Western hills, Eastern hills, Western Terai, and Eastern Terai. Coefficient 1stage is the estimated coefficient on the exogenous instrument in the first-stage.

Table 6: 2SLS Estimation of Labor Supply by Skill Level

	Wage Employment		Self Employment	
	(1) Low Skilled	(2) High Skilled	(3) Low Skilled	(4) High Skilled
<i>Panel A: Labor market participation</i>				
Household with migrant	-0.205** (0.098)	-0.486 (0.305)	0.199*** (0.069)	0.324 (0.346)
Observations	14054	2825	14054	2825
Wald χ^2	3577.578	997.890	3864.717	2175.469
F-test 1stage	68.765	8.179	68.765	8.179
Coefficient 1stage	1.925***	1.460***	1.925***	1.460***
<i>Panel B: Hours supply</i>				
Household with migrant	-15.028*** (5.754)	1.032 (11.830)	-13.064*** (4.454)	5.048 (14.563)
Observations	4714	1131	10319	1199
Wald χ^2	2170.635	505.787	1130.111	1815.099
F-test 1stage	33.235	7.061	63.906	6.082
Coefficient 1stage	1.820***	1.665***	1.921***	1.503**
Controls				
Individual characteristics	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes
VDC characteristics	Yes	Yes	Yes	Yes
Region Fixed Effect	Yes	Yes	Yes	Yes

Note: High skilled adults are defined as adults with 11 years or more of education. Sample in Panel B is conditioned on being employed in that particular sector. Log of hourly wage is added as an extra individual control for column (1) and (2). 2SLS estimates are reported in the table. Instrument used for 2SLS is share of international migrants in a VDC in 2001 (IV1). Sample is working age (18 to 60) adults and standard errors are clustered at VDC level. Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Individual controls are age age^2 , years of education, gender, household head identifier, and marital status. Household controls are female HH head, share of male and female adults, share of elderly, share of children, amount of land-owned, house ownership and social caste. Similarly VDC level controls are, unemployment rate, poverty rate, illiteracy rate, inequality (Gini), and urban/rural location. Regions are Kathmandu, other urban areas, Western hills, Eastern hills, Western Terai, and Eastern Terai. Coefficient 1stage is the estimated coefficient on the exogenous instrument in the first-stage.

Table 7: 2SLS Estimation of Labor Supply by Age

	Wage Employment		Self Employment	
	(1) Young Adults	(2) Old Adult	(3) Young Adults	(4) Old Adults
<i>Panel A: Labor market participation</i>				
Household with migrant	-0.292*** (0.113)	-0.260** (0.122)	0.252** (0.103)	0.236*** (0.085)
Observations	10861	6018	10861	6018
Wald χ^2	2028.588	1552.717	15778.586	3651.974
F-test 1stage	58.207	50.061	58.207	50.061
Coefficient 1stage	1.836***	1.937***	1.836***	1.937***
<i>Panel B: Hours supply</i>				
Household with migrant	-13.546* (7.380)	-13.516** (5.618)	-8.632* (5.037)	-14.457** (5.925)
Observations	3913	1932	6901	4617
Wald χ^2	2379.303	1482.415	2401.545	545.837
F-test 1stage	31.766	24.765	52.713	43.511
Coefficient 1stage	1.645***	2.078***	1.804***	1.957***
Controls				
Individual characteristics	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes
VDC characteristics	Yes	Yes	Yes	Yes
Region Fixed Effect	Yes	Yes	Yes	Yes

Note: Young adults are ages between 18 and 40 while old adults are ages between 41 and 60. Sample in Panel B is conditioned on being employed in that particular sector. Log of hourly wage is added as an extra individual control for column (1) and (2). 2SLS estimates are reported in the table. Instrument used for 2SLS is share of international migrants in a VDC in 2001 (IV1). Sample is working age (18 to 60) adults and standard errors are clustered at VDC level. Standard errors in parentheses.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Individual controls are age age^2 , years of education, gender, household head identifier, and marital status. Household controls are female HH head, share of male and female adults, share of elderly, share of children, amount of land-owned, house ownership and social caste. Similarly VDC level controls are, unemployment rate, poverty rate, illiteracy rate, inequality (Gini), and urban/rural location. Regions are Kathmandu, other urban areas, Western hills, Eastern hills, Western Terai, and Eastern Terai. Coefficient 1stage is the estimated coefficient on the exogenous instrument in the first-stage.

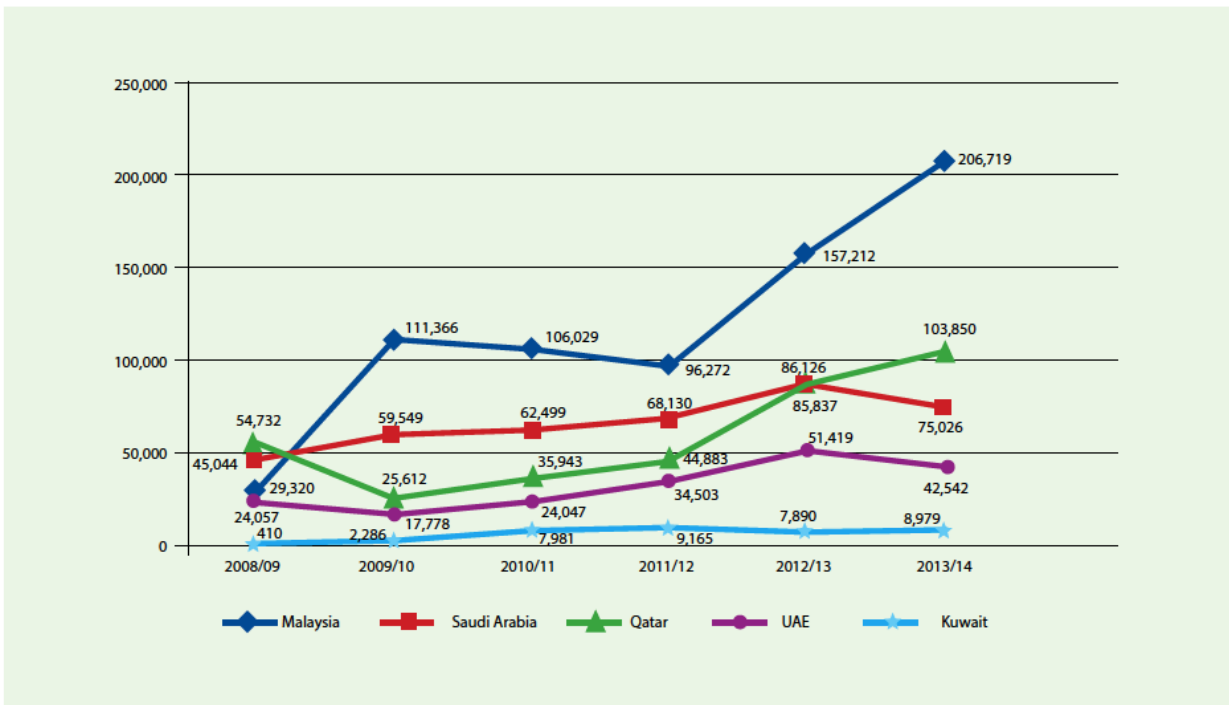
Table 8: 2SLS Estimates of Labor Supply by Household Head Status

	Wage Employment		Self Employment	
	(1) Household Head	(2) Other Members	(3) Household Head	(4) Other Members
<i>Panel A: Labor market participation</i>				
Household with migrant	-0.414*** (0.147)	-0.231** (0.100)	0.125 (0.098)	0.298*** (0.091)
Observations	5791	11088	5791	11088
Wald χ^2	906.861	1882.340	6353.722	8786.879
<i>F</i> -test 1stage	53.309	62.508	53.309	62.508
Coefficient 1stage	1.633***	2.030***	1.633***	2.030***
<i>Panel B: Hours supply</i>				
Household with migrant	-17.642** (7.434)	-11.559* (6.610)	-11.369* (6.662)	-10.493** (4.285)
Observations	2772	3073	4450	7068
Wald χ^2	2009.570	2551.071	943.402	1107.469
<i>F</i> -test 1stage	24.419	30.862	50.477	57.718
Coefficient 1stage	1.515***	2.032***	1.647***	2.036***
Controls				
Individual characteristics	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes
VDC characteristics	Yes	Yes	Yes	Yes
Region Fixed Effect	Yes	Yes	Yes	Yes

Note: 2SLS estimates are reported in the table. Instrument used for 2SLS is share of international migrants in a VDC in 2001 (IV1). Sample is working age (18 to 60) adults and standard errors are clustered at VDC level. Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Individual controls are age age², years of education, gender, household head identifier, and marital status. Household controls are female HH head, share of male and female adults, share of elderly, share of children, amount of land-owned, house ownership and social caste. Similarly VDC level controls are, unemployment rate, poverty rate, illiteracy rate, inequality (Gini), and urban/rural location. Regions are Kathmandu, other urban areas, Western hills, Eastern hills, Western Terai, and Eastern Terai. Coefficient 1stage is the estimated coefficient on the exogenous instrument in the first-stage. Sample in Panel B is conditioned on being employed in that particular sector. Log of hourly wage is added as an extra individual control for column (1) and (2).

A Appendix

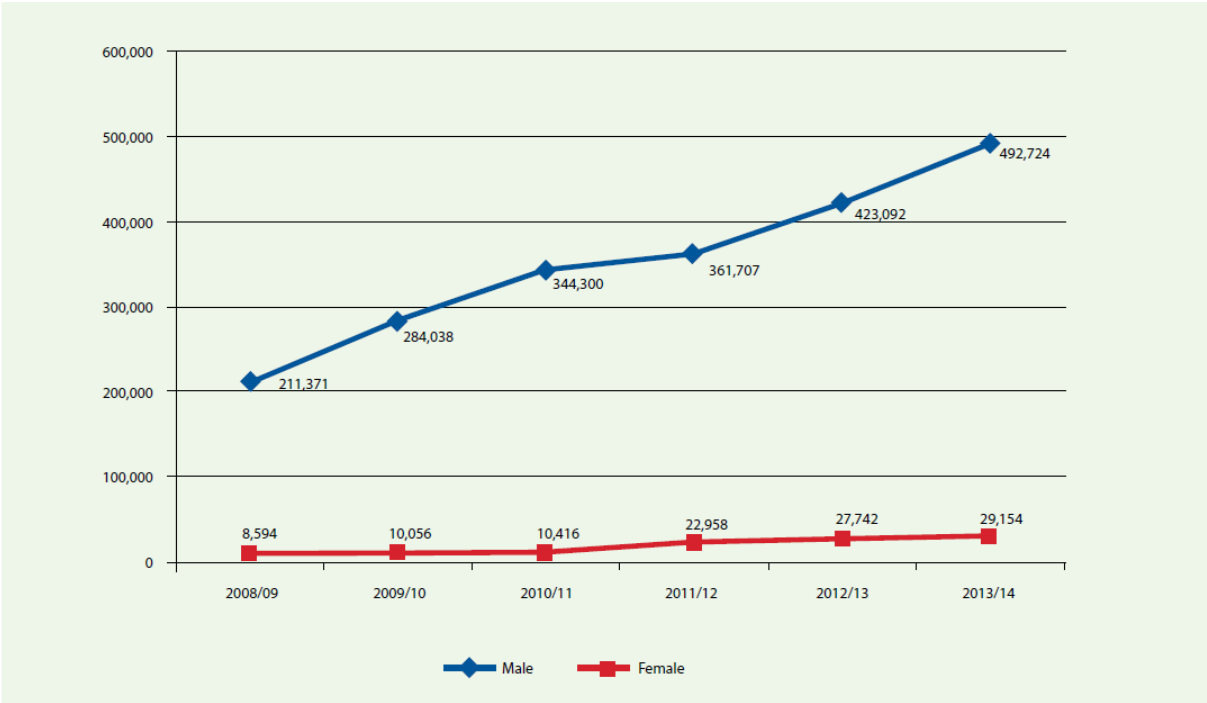
Figure A.1: Migration Trend for Labor-Employment to Top 5 Destination Countries



Source: Department of Foreign Employment.

Note: Migrants for labor-employment to foreign countries are required to obtain labor permits from the Department of Foreign Employment. Migrants can apply on their own or through a recruitment agency. Number reported in the figures are total labor permits issued to migrants who apply through the services of recruitment agencies.

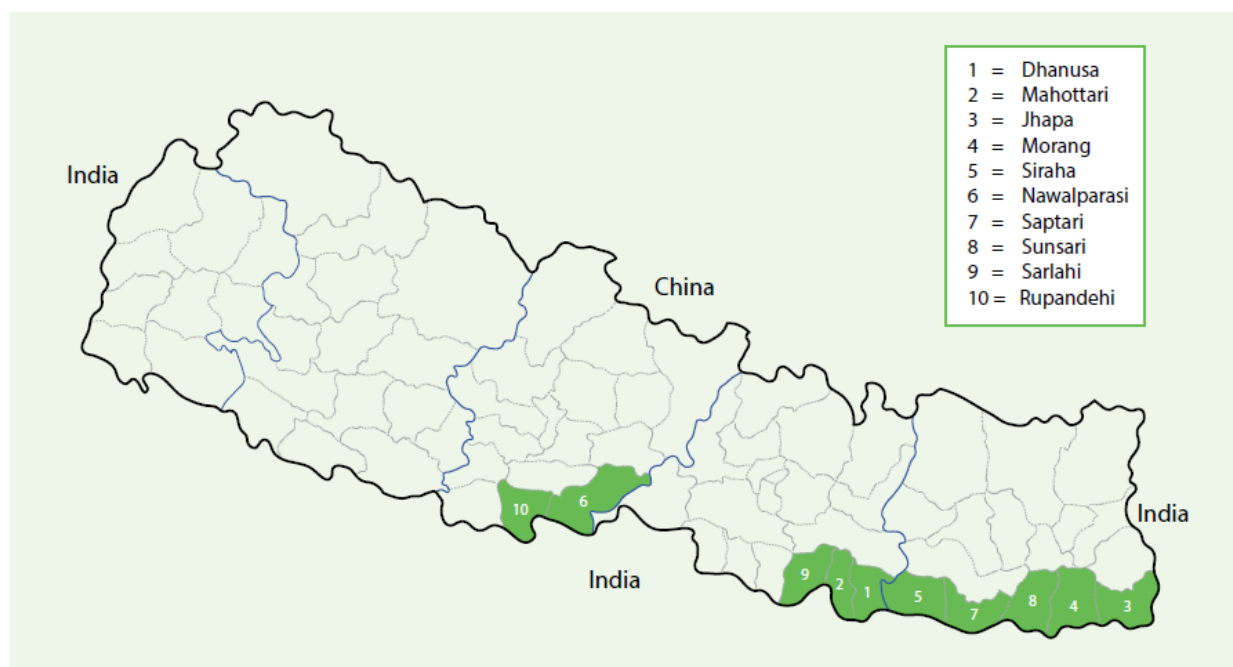
Figure A.2: Migration Trend by gender of Migrants



Source: Department of Foreign Employment.

Note: Source is [Department of Foreign Employment \(2014\)](#). Migrants for labor-employment to foreign countries are required to obtain labor permits from the Department of Foreign Employment. Migrants can apply on their own or through a recruitment agency. Number reported in the figures are total labor permits issued to migrants who apply through the services of recruitment agencies.

Figure A.3: Top-Ten Districts of Origin for Labor Employment Migration



Source for Base Map: Survey Department, Ministry of Land Reform and Management

Note: Source is [Department of Foreign Employment \(2014\)](#). Migrants for labor-employment to foreign countries are required to obtain labor permits from the Department of Foreign Employment. Migrants can apply on their own or through a recruitment agency. Number reported in the figures are total labor permits issued to migrants who apply through the services of recruitment agencies. These top ten districts account for 36.5% of the all labor-permits issued between 2008 and 2014.

Table A.1: Characteristics of Migrants

	Mean	Standard Deviation
Age	28.109	11.370
Male	0.844	0.363
Relation to HH head (Son/Daughter)	0.546	0.498
<i>Education level</i>		
Illiterate	0.172	0.377
1 to 10 grade	0.537	0.499
SLC/Intermediate	0.205	0.404
College or more	0.086	0.280
<i>Migration to</i>		
India	0.440	0.496
Malaysia	0.095	0.294
Middle east	0.247	0.432
Households with migrant	2212 (31.1%)	
Total households in the sample	7108	

Table A.2: Migration and Labor Supply - Full Model

	Migration (First-Stage)			OLS			IV1			IV2		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)				
Migrant network 2001 (IV1)	2.088*** (0.253)											
Migrant network 2001 * GDP growth (IV2)		1.042*** (0.132)										
Household with migrant												
Age	-0.0250*** (0.00240)	-0.0250*** (0.00240)	-1.604*** (0.282)	-0.833* (0.426)	-8.106*** (2.521)	-0.542 (3.422)	-7.625*** (2.438)	-0.717 (3.495)				
Age squared	0.000335*** (2.95e-05)	0.000334*** (2.95e-05)	0.152*** (0.119)	1.279*** (0.110)	0.988*** (0.139)	1.286*** (0.137)	1.000*** (0.137)	1.282*** (0.139)				
Sex: Female	0.134*** (0.00809)	0.134*** (0.00812)	-0.0158*** (0.00159)	-0.0148*** (0.00141)	-0.0136*** (0.00182)	-0.0149*** (0.00177)	-0.0137*** (0.00180)	-0.0148*** (0.00181)				
Years of education	-1.93e-05 (0.00162)	4.40e-05 (0.00162)	0.180*** (0.0459)	-0.0878 (0.0642)	0.180*** (0.0458)	-0.0878 (0.0644)	0.180*** (0.0457)	-0.0878 (0.0642)				
Married	-0.000824 (0.0112)	-0.00157 (0.0112)	-0.0914 (0.390)	4.051*** (0.384)	-0.114 (0.415)	4.052*** (0.383)	-0.112 (0.413)	4.051*** (0.383)				
HH head	0.0865*** (0.00944)	0.0863*** (0.00944)	1.835*** (0.430)	1.658*** (0.381)	2.422*** (0.489)	1.632*** (0.474)	2.379*** (0.486)	1.648*** (0.487)				
Share of children 0 to 6	0.141*** (0.0443)	0.143*** (0.0443)	-1.010 (1.190)	0.460 (1.220)	-0.0579 (1.278)	0.417 (1.320)	-0.128 (1.264)	0.443 (1.319)				
Share of children 7 to 15	-0.0341 (0.0309)	-0.0337 (0.0309)	-0.284 (1.061)	0.838 (1.100)	-0.472 (1.090)	0.846 (1.102)	-0.458 (1.086)	0.841 (1.104)				
Land own (Acres)	0.00676** (0.00279)	0.00669** (0.00279)	-0.519*** (0.0909)	0.346*** (0.0770)	-0.476*** (0.0911)	0.344*** (0.0819)	-0.479*** (0.0909)	0.345*** (0.0822)				
Owns a house	0.0878*** (0.0163)	0.0838*** (0.0166)	-3.403*** (0.520)	-2.119** (0.928)	-2.844*** (0.589)	-2.144** (1.001)	-2.885*** (0.579)	-2.129** (0.999)				
Social caste: Brahmin/Chhetri	-0.0334** (0.0160)	-0.0345** (0.0160)	-0.876** (0.424)	-1.352** (0.639)	-1.050** (0.414)	-1.344** (0.635)	-1.037** (0.416)	-1.348** (0.636)				
Unemployment rate (VDC)	0.133 (0.103)	0.143 (0.105)	1.932 (3.197)	-26.93*** (3.688)	2.574 (3.214)	-26.96*** (3.722)	2.526 (3.210)	-26.94*** (3.724)				
Illiteracy rate (VDC)	0.201*** (0.0556)	0.196*** (0.0555)	1.525 (1.444)	-5.073** (2.034)	2.410 (1.537)	-5.113** (2.068)	2.344 (1.527)	-5.089** (2.065)				
Inequality: Income Gini (VDC)	-0.114** (0.0542)	-0.126** (0.0550)	-1.409 (1.515)	2.480 (1.934)	-2.099 (1.534)	2.511 (1.947)	-2.048 (1.530)	2.492 (1.958)				
Poverty rate (District)	-0.168** (0.0837)	-0.200** (0.0849)	-4.378** (2.066)	-2.990 (2.659)	-5.422** (2.121)	-2.943 (2.747)	-5.345** (2.109)	-2.972 (2.750)				
Constant	0.405*** (0.0637)	0.431*** (0.0636)	-1.005 (2.482)	1.396 (2.514)	2.159 (2.875)	1.254 (2.936)	1.925 (2.846)	1.339 (3.011)				
Observations	16,879	16,879	16,879	16,879	16,879	16,879	16,879	16,879				
R ²	0.087	0.086	0.157	0.099	0.132	0.099	0.136	0.099				
Wald χ^2					1996	1038	2014	1037				
F-test Istage					68.21	68.21	62.58	62.58				
Region Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes				

Note: Standard errors clustered at VDC level. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Sample is working age (18 to 60) adults. Columns (1) and (2) are first stage for IV1 and IV2 respectively. Columns (3), (5), and (7) are hours in wage employment while Columns (4), (6), and (8) are hours in self employment.

Table A.3: 2SLS Estimation of Labor Supply by Gender- Full Model

	Female			Male		
	(1) Total Hours	(2) Work Hours (Wage + Self)	(3) Total Household Activity Hours	(4) Total Hours	(5) Work Hours (Wage + Self)	(6) Total Household Activity Hours
Household with migrant	-5.702 (6.312)	-4.538 (3.552)	-1.164 (4.960)	-17.65** (8.652)	-18.34** (7.142)	0.689 (5.980)
Observations	9,597	9,597	9,597	7,282	7,282	7,282
Wald χ^2	2436	960.9	2287	1528	1085	1127
F-test 1stage	74.90	74.90	74.90	35.55	35.55	35.55
Controls						
Individual characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes
VDC characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Region Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes

Note: 2SLS estimates are reported in the table. Instrument used for 2SLS is share of international migrants in a VDC in 2001 (IV1). Sample is working age (18 to 60) adults and standard errors are clustered at VDC level. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Individual controls are age², years of education, household head identifier, and marital status. Household controls are share of children, amount of land-owned, house ownership and social caste. Similarly VDC level controls are, unemployment rate, poverty rate, illiteracy rate, and inequality (Gini).

Table A.4: 2SLS Estimation of Labor Supply by Women's Age and Household Head Status- Full Model

	(1)	(2)	(3)	(4)	(5)	(6)
	Total Hours	Work Hours (Wage + Self)	Total Household Activity Hours	Total Hours	Work Hours (Wage + Self)	Total Household Activity Hours
<i>Panel A</i>						
					Young	
Household with migrant	-16.17** (7.662)	-12.73*** (4.652)	-3.440 (5.720)	-0.0365 (7.072)	0.293 (4.345)	-0.330 (5.395)
Observations	3,144	3,144	3,144	6,453	6,453	6,453
Wald χ^2	776.8	360.9	885.7	2287	958.8	2627
F-test 1stage	60.28	60.28	60.28	62.12	62.12	62.12
<i>Panel B</i>						
		HH Head			Other Members	
Household with migrant	-12.86 (9.121)	-12.72** (5.703)	-0.146 (6.672)	-3.036 (6.589)	-1.939 (3.970)	-1.097 (5.135)
Observations	1,593	1,593	1,593	8,004	8,004	8,004
Wald χ^2	428.1	204.5	1042	2298	921.2	2163
F-test 1stage	31.33	31.33	31.33	62.19	62.19	62.19
Controls						
Individual characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes
VDC characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Region Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes

Note: Young adults are ages between 18 and 40 while old adults are ages between 41 and 60. 2SLS estimates are reported in the table. Instrument used for 2SLS is share of international migrants in a VDC in 2001 (IV1). Sample is working age (18 to 60) adults and standard errors are clustered at VDC level. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Individual controls are age age², years of education, household head identifier, and marital status. Household controls are share of children, amount of land-owned, house ownership and social caste. Similarly VDC level controls are, unemployment rate, poverty rate, illiteracy rate, and inequality (Gini).