Migration, remittances and household labour allocation: an empirical analysis from panel data

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Abstract

This paper analyses the effect of remittance income on the hours of work in remittance-receiving households using panel data from Nepal Living Standard Surveys (NLSS). This study applies a number of econometric models to explain the impact of remittance income on the hours of work in different sectors (e.g., farm, self-employment, off-farm and hired labour) taking into account various methodological issues (endogeneity and selection bias) for migration decision and remittances. This paper first uses a Zero Inflated Poisson model to examine the factors motivating migration, and then applies random effects and instrumental variable Tobit models for estimating the impact of remittances on the household work hours both for different sectors and separately for working age men and women. Evidence shows that rural people with larger family size and higher per capita income without remittances have higher probability to go migration out. Remittances decrease work hours in a number sectors, but increase work hours of hired labour. Remittance income seems to a substitute of non-labour income. No significant effects on off-farm and self-employment activities were observed in the sample households. In contrast, non-labour income appears to be positive with work hours of household members. Moreover, demographic characteristics seem to be influential for the allocation of household work hours, implying that higher family size leads to higher work hours, and a larger number of children (<6 years) leads to a reduction of work hours of females and but not for males. Educated people are also more likely to increase their work hours.

Keywords: migration, remittances, endogeneity, labour supply, Nepal

JEL Classification codes: F22, O15, R23

1. Introduction

The flows of international remittances have tremendously increased during the last decade exceeding all spending on development aid (Salimano, 2003). These remittances have received considerable attention from many policy makers and development strategists in particular with regard to its impact on the economy of developing countries. The data show that officially reported flows of remittances to developing countries have been approximately 20 percent higher than official development assistance (ODA). In 2005, the total remittance received by all developing countries was US$ 188 billion-twice the amount of official assistance to developing countries[1]. Remittance accounts the second most source of external funding in developing countries, following by Foreign Direct Investment (Adams and Page, 2005). The data further reveal that remittances have been increasing on average by 15 percent annually in developing countries since 2000. Therefore, the impact of remittances on receiving countries is of great significance.

Remittance income is also rapidly growing in Nepal with an increase in the rate of migration for foreign employment. It has now become a major part of the economy and an important source of livelihoods for many people living in rural areas (Thieme, 2004). The trend of migration from rural to urban areas and abroad has intensified during the last decade due to the Maoist insurgency beginning from 1996, which cost the lives of over 15,000 people[2]. Massive flows of rural and semi-urban people, escaping the internal conflict and seeking better opportunities, left for foreign countries to support their families in the home country. According to DLEP (2007), the number of Nepalese people, migrating overseas for employment increased by 12.5 percent in the fiscal year of 2006/07. International labour migration is a widespread livelihood strategy in many parts of rural Nepal (Thieme and Wyss, 2005). As a result, international remittances have exceeded the combined share of tourism, foreign aid and export in national income. An understanding of the impact of remittance on the economy and other markets will be critical for policy implications in Nepal.

It is widely recognized that international remittance can be more stable than other external flows, and can play a vital role in the economic development of low income countries. They are also considered as an alternative source of non-farm income that could enhance welfare and reduce

[1] This inflow of remittance includes only from formal channels such as banks and international remittance transfer agencies (i.e. Western Union Money Transfers and Money gram International). Remittances through informal channels could add at least 50 percent to the globally recorded flows (WB, 2006).

[2] Maoist insurgency had begun in February 1996 with an aim to establish communist state in Nepal, and accorded peace deal with government in May 2006.

poverty levels in many low-income countries. Adams and Page (2005) state that international migration and remittance can significantly reduce the level, depth, and severity of poverty in the developing world . For instance, in Nepal, despite the stagnation in agricultural and industrial sectors during the last decade due to political instability and civil wars, the poverty level has declined from 42 percent in 1996 to 31.1 percent in 2004, primarily due to the sharp increase in international remittances (CBS, 2004). In addition, international remittances have also resulted in an improvement in the balance of payments up to US$138.4615 million and foreign currency reserves up to US$1.2 billion (WB, 2005). At present, Nepal ranks among the top 20 remittance recipient countries in terms of the percentage share of Gross National Income (IMF, 2007).

Remittance income can affect the receiving country's economy in many spheres both at the macro and micro levels. At the macro level, the flow of remittances can influence the determination of inflation, exchange, and interest rates, as well as growth rate of the country. At the micro level, an increase in the flow of remittances can contribute to reducing liquidity constraints of the household, which often prevail in most developing countries, particularly in rural areas. Relaxation of such liquidity constraints can facilitate the commercialization and modernization of agriculture through the adoption of capital intensive technologies and innovation. It is often suggested in the literature that remittance recipient households may increase the consumption of leisure and invest on human capital of their children (Acosta, 2006). In relation to the labour supply decisions of the recipient households, as a source of non-labour income, remittances may ease budget constraints, raise reservation wages, and, through an income effect, reduce the employment likelihood and hours worked by remittance receiving individuals[3]. However, the existence of incomplete labour markets in most developing countries, where there is often presume imperfect substitutability between family and hired labour, may complicate the application of traditional labour economics theory. Such incomplete labour markets can change the composition of household labour supply, because migrants usually come from productive and working age members of the remittance-receiving households. In other words, this can create labour shortage in the rural areas, if migration is affordable to households from all income levels. In this context, members from remittance receiving households may increase their work hours to compensate for or satisfy the labour requirements of their migrant members. For those reasons, the relationship between remittance

[3] This concept is based on the neo-classical model of labour and leisure choice, and is drawn form the popular book (Labour Supply) of Killingworth (1983).

income and the work hours of remittance receiving households is ambiguous in the labour supply models.

Moreover, the effect of remittances on the economy of receiving countries can also be measured directly and indirectly. For example, it can directly promote investment and job creation, and indirectly via its long-term positive effects on economic growth. More specifically, resources provided by remittances can subsequently support consumption, housing, education, and small business formation (IMF, 2005b). Empirical findings on remittances and their impact on receiving households, particularly the allocation decisions of household labour would be helpful to get a better understanding of this nexus.

At the same time, there are a number of controversies on the impact of remittances as a flow of resources in developing countries. The literature explains that as remittance income is mostly used for consumption smoothing, an increase in the flow of remittances could lead to a culture of dependency and possibly idleness (Kapur, 2003). A review of the findings of thirty seven community studies regarding the impact of remittance income were "remarkably unanimous in condemning international migration as a palliative that improves the well-being of particular families, but does not lead to sustained economic growth within sending communities"(Duran and Massey, 1992). It has also been stated that labour migration is neither a short cut to development nor a panacea for the sending countries' economic ills (Ghosh, 1996). However, the impact of remittances and labour migration can not simply be written of an account of a few negative impacts in the receiving country's economy. Its impact may depend on how the receiving household utilizes the flow of remittances received from labour migration. Such enormous amounts of remittances as how flow needs to be managed wisely if they are trying to promote sustainable development (Heilmann, 2006). This study thus intends to shed light on how remittance-receiving households allocate their resources in different household activities, focusing particularly on labour hours allocation. The literature often finds that family members who receive remittances are more likely to engage in self-employment (Funkhouser, 1992).

The empirical evidence on the relationship between remittance income and labour supply decisions of receiving households is a comparatively new area of studies in economics. Stark and Bloom[4] (1985) were the first who felt need to examine the impact of labour migration and raised

[4] The seminal paper of New Economics of Labour Migration (NELM) was pioneered by Stark (1982), where the author had explained a lot of methodological and theoretical ideas before NELM. The author claimed that the outcome was the result of over 12 years intensive research in this area.

several theoretical issues on empirical examination. However, credit goes to Funkhauser (1992) for the first empirical examination between remittance and household labour supply. The author estimated the participation in the wage labour force and self-employment for male and female non-migrants by applying a probit model. His empirical findings show that the relationship of remittances with wage labour force participation is negative, and positive for self-employment. Likewise, another study undertaken by Airola (2005) in Mexico relating weekly hours of the household head to remittance income shows a negative sign for labour hours. More recently, Acosta (2006) has examined the economic effects of international remittance on household spending decisions on human capital, child and adults both male and female labour allocation. The results show a positive impact of remittance on investing in the human capital of children. However, it has negative impact on adult female labour supply, but positive with male labour supply. With respect to the impact of remittances on labour supply, Kim (2007) observed some impact of remittances on labour force participation in Jamaica. The findings show a higher reservation wages of household with remittance income, implying that remittance-receiving households are moving out of labour force, or being less enthusiastic about finding jobs.

In Nepal, the study on the impact of migrants' remittance is increasing with an increase in the volume of remittances in the GDP. However, most of studies are descriptive in nature (for example: Chhetry, 1999; Sheddon et Al., 2000; Kumar, 2003, etc.), where their focus is primarily on socio-economic composition, particularly dealing with the condition and the process of migration, the flow of remittance income and problems faced by migrant workers both in the country of origin and abroad. Recently, Lokshin et al. (2007) have analysed the impact of remittance income in relation to poverty reduction using data from the Nepal Living Standard Surveys (NLSSs). Their econometric results are quite precise and address both problems of endogeneity and selection bias, which are often problematic in the estimation of regression models with migration and remittances. They find a strong impact of migration and remittances on the living conditions of households with a migrant member. Based on my knowledge, none of the research has raised the issue of the impact of migration and remittances on receiving households' labour allocation in the specific context of Nepal. This study, thus, attempts to fill this gap by providing the impact of migration and remittances on the labour allocation of receiving households' members in different sectors such as farm, off-farm, and self-employment activities. Because,

remittances are considered as an input into household decision-making, they can affect the labour supply, self employment and other part as well (Funkhauser, 1995).

This study thus intends to add literature on how remittance receiving households allocate their time in various activities such as farm, off-farm, self employment, and hired labour using panel data from the NLSS conducted in 1995/96 and 2003/04. The study intends to examine which effect (i.e. traditional labour economies theory through an income effect or incomplete factor markets) is stronger in the allocation of household labour in remittance receiving household in Nepal through the application of a number of econometric models.

The rest of the study is structured as follows. An overview of migration and remittances in Nepal is given in Section 2, this mainly focuses on the historical development of remittances and the status of remittance flows in Nepal. Section 3 provides the theoretical framework dealing with the farm household model developed by Singh et al.(1986) and further extended by de Janvry et al.(1992) under missing and incomplete factor markets. Description and sources of data are provided in Section 4 with some descriptive statistics focusing on the limitations of data. Section 5 presents the econometric models used for the analysis of data, particularly the Zero Inflated Poisson model, the labour supply equation and the Tobit model. Empirical evidence from the various equations are given in Section 6, while Section 7 provides the discussion of results in relation to the theory. Concluding remarks of the study are given in Section 8.

2. Migration and remittances in Nepal

Nepal has more than 200 years of history of international labour migration, over which Nepalese have sought work abroad to improve their livelihoods. The literature shows that in the early nineteenth century, the first Nepalese men, especially people from hilly regions, migrated to Lahore (in today's Pakistan) to join the army of the Sikh ruler, Ranjit Singh (Thieme and Wyss, 2005), and this trend has given the nickname "*Lahure*[5]" for all those employed in foreign armies. Nevertheless, the history of modern Nepal came only after Gurkha[6] rulers conquered the previous small tiny states and created the present united Nepal, then after the establishment of united Nepal,

[5] Initially the nickname of "*Lahure*" became after going to Lahore, Pakistan(one who goes to Lahore) to join in the Sikh ruler, Ranjit Singh army, but now "*Lahure*" is commonly used to those persons who are going abroad for work both in civilian or in government jobs like British and Indian Gurkha regiments.

[6] Nepal was divided into several tiny states (called as 22 and 24 states) and Gurkha was one of them. Gurkha ruler (ancestor of the present king of Nepal) started to expand the territories conquering all small states during the 18th century and established a modern Nepal. So Gurkha is also used sometimes as synonymous to Nepal because the Gurkha rulers created a modern Nepal.

the rulers tried to increase the size of country through invading Tibet and nearby the present Indian Territory. During the process of expanding and strengthening the country, the Gurkhas had wars with the British India Company, popularly known as Anglo-Nepal war of 1814 to 1816. During that war, the British India rulers were impressed with brevity and skill of Nepalese soldiers, and then the treaty of 1816 empowered to the British ruler to set up three Gurkha regiments in their army (Seddon et al., 2001). Since then, Gurkha regiments have been part of the regular British and Indian armies even after independence of India from Britain. The British army remains the most reliable source of remittances in Nepal, and Gurkha regiments provide lucrative jobs for many young Nepalese.

Apart from joining Gurkha regiments, Nepalese workers also went to work in tea plantation, construction, coal mining and land reclamation in the different regions of India such as Assam, Bengal, Darjeeling, Garhwal and Kumaon (Hoffmann, 2001). This migration process occurred due to an existence of feudal systems in Nepal, where labour exploitation was extremely high during that period. So, oppressed people went to nearby area of Nepal for better livelihoods, which came to be known at present as Indian Nepalese. Presently there are a large number of Nepali origin people settled permanently in Darjeeling, Assam, Meghalaya, and Sikkim of east India and Uttarakhand and Simala states of North West India, and Bhutan. In addition, the trend of seeking job opportunities in other countries has further increased in Nepal due to poor employment opportunities and low wage rates within the country. Migration to Gulf countries and South-East Asian countries intensified after political change in 1990 when the government provided the travel documents and passports more easily than had the previous autocratic regime. The flow of migrants has increased rapidly during past decade due to political conflict and civil wars that have limited the employment opportunities in the country.

The data from the 2001 Population census show that 3.3 percent (762,181) of the total population was absent from Nepal, the majority of them were male (89 percent). Of these, more than 77.6 percent are living in the South Asian region, especially in India, while the Middle east has the second most largest population of living outside Nepal (14.5 percent), followed by East and South-East Asia (4.5 percent), where a significant number of Nepalese are living in Hong Kong Special Region of China under the legal provisions known as ID holders for which applies to those

people born during their parent's service in Hong Kong as part of the Gurkha army at the time of British rule (before 1997) [7]. Other Nepalese are in the rest of the world.

Several studies suggest that the number of Nepalese living abroad is approximately 1.5 percent higher than official data (see, Kollmair et al., 2006), because of the exclusion of large number of illegal immigrants in the surveys. The report from NLSS II (CBS, 2004) shows that 4.6 percent of total sample population is abroad, which is higher than in the population census 2001. In addition, the reports from individual case studies show 4.7 percent of total population abroad in Nepal (Kollmair et al., 2006). This could be due to increasing number of migrant workers in Nepal, where the official data show the flow of migrant workers is increased by an average 10 percent annually during last decade.

The flow of international remittances to Nepal has consistently increased from US$3 million in 1993 to US$ 1211 million in 2005, but the sharp increase in remittance inflows started only in 2001(IMF 2006). Moreover, there is wide spread speculation that remittance inflow from the informal sector is much higher (50 percent) than the flow from the formal sector. Remittance inflow from India mostly comes from the informal sector due to small amounts of money and the inaccessibility of money transfer services in most rural areas of Nepal.

3. Theoretical framework

The theoretical framework for this study draws from the insights of the New Economics of Labour Migration (Stark and Bloom, 1985) plus a couple of other studies (Stark, 1982; Vijvergberg, 1992; Hoddinott, 1994). These theoretical approaches assume that migration decisions are made jointly by the migrant and by non-migrants, particularly the remaining members in the households. Stark (1982), one of the pioneers in this area, mentioned migration decisions in farm households as a strategy to overcome constraints on production and investment activities as a result of missing or incomplete credit and insurance markets in rural areas. This part outlines the theoretical framework drawn upon to investigate the effect of migration and remittances on household labour allocation in different sectors such as on-farm, off-farm and self-employment, using agricultural household models developed by Singh et al. (1986). The central theme of the model is to illustrate the linkages between migration and household labour composition.

[7] This provision was made between Chinese and British governments to provide permanent resident permits to those Nepalese who were born in Hong Kong during the time of British rule. At that time, British Gurkha regiments were established in Hong Kong. Gurkha armies used to bring their families in Hong Kong during their service period and gave birth their children.

To concentrate on the role of migration and remittances in household labour supply responses, we assume that migration decision are taken by the migrant and some group of non-migrant members as an implicit contractual arrangement between the two parties who shares both costs and returns, meaning that migrants send remittances to non-migrant members in the country of origin[8]. To capture this logic in a standard utility maximization problem, we assume that both migrants and non-migrants household members jointly choose their consumption (C_t^i), where t is time periods and i refers non-migrants (nm) and migrants (m), and their respective time endowment (T_t^i) between on-farm work (F_t^i), market work (X_t^i), and leisure (L_t^i). The time endowment of migrant is divided between wage labour (N_t^i) and leisure. Time allocated to market work by non-migrant members yields the wage income. Moreover, the production decisions of the farm household may also depend on a number of other factors such as $\left(w_D, w_{Ab}, \overline{A}, Y_t\right)$, where w_D is domestic wage rates, w_{Ab} is the wage rates of the migrant's working destination or country, $\overline{A}$ is household initial endowment such as land assumed to be fixed, and Y is non-labour income such as pensions, allowances and other interest rates. The household maximizes its utility at period t choosing from $\{C_t, F_t, X_t, N_{t,} H_t, Y_t, R\}$, where H_t is hired labour hours and R is level of remittances. Under these specifications, the maximization problem of household can be set as follows:

$$(1) \qquad \underset{\{C_t, F_t, X_t, N_{t,} H_t, Y_t, R\}}{Max} \quad U^{nm}\{C_t^{nm}, L_t^{nm}, \mathrm{K}\} + U^{m}\{C_t^{m}, L_t^{m}, \mathrm{K}\}$$

Subject to the following constraints:

$$(2) \qquad C_t^{nm} = f(F_t^{nm} + H_t, Y_t, \overline{A}) + w_D X_t^{nm} - w_D H_t + R$$

$$(3) \qquad C_t^{m} = w_{Ab} N_t^{m} - R$$

where U^{nm} and U^{m} are utility functions of non-migrant and migrant members respectively, which are assumed to be non-separable, monotonically increasing and strictly concave. The term K represents individual and household specific characteristics. Household total income is the sum of agricultural products, family wage income, minus cost of hired labour, plus non-labour income, and remittances. Remittances (R) are assumed to be a function of wage rates of migrant's working destination, the number of migrants from the particular household and other individual and household specific characteristics. The output of consumption goods is normalized with price

[8] Implicit contractual arrangement is regarded as part of a longer-term agreement between prospective migrant and non-migrant family members, where costs and benefits are to be shared (Hoddinott, 1992). The data from the Nepal Living Standard Surveys on remittances support this assumption that more than 93 percent of remittance-receiving individuals were the family members of migrants.

unity and set equal to farm output. In addition to budget constraints, household also faces time constraints which are as follows:

(4) $T_t^{nm} = L_t^{nm} + F_t^{nm} + X_t^{nm}$

(5) $T_t^{m} = L_t^{m} + N_t^{m}$

The equation (1) can be maximized subject to budget and time constraints (2 to 5) by usual first order conditions. This simple maximization solution yields the structural demand function for leisure.

(6) $L_t^{i*} = L_t\left\{w_D, \Lambda^*(.), Y, \overline{A}, R, \mathrm{K}\right\}$

Equation (6) tells that the demand for leisure is the function of domestic wages, shadow income(Λ^*), non-labour income, level of remittances, household's initial endowment (i.e. $\overline{A}$) and other individual and household specific characteristics (K), where shadow income is determined by:

(7) $\Lambda^* = \Lambda\left\{w_D, \overline{A}, Y, R(.)\right\}$

Labour supply equations for households' on-farm, off-farm and hired labour can be derived by the same way as in equation (6), which are as follows:

(8) $F_t^{nm*} = F_t\left\{w_D, \Lambda^*(.), Y, \overline{A}, \mathrm{K}, R(.)\right\}$

(9) $X_t^{nm*} = X_t\left\{w_D, \Lambda^*(.), Y, \overline{A}, \mathrm{K}, R(.)\right\}$

(10) $H_t^{*} = H_t\left\{w_D, \Lambda^*(.), Y, \overline{A}, \mathrm{K}, R(.)\right\}$

The labour supply response of non-migrant's work hours with the level of remittances will be analysed under the assumption of missing factor markets. It is often suggested in the literature that households indeed in many resources poor economies may face missing markets for some goods, resulting in a mixture of tradables and non-tradables at the household level (Taylor and Adlemen, 2003). The presumption of missing factor markets is that production decisions of farm households are affected by the consumption decisions. Under this property, the theory assumes that farmers are often constrained by liquidity, and family labour is not perfect substitute to hired labour, which would have allowed us to apply non-separable household model, where wage and farm income are considered as endogenous. The relationship between remittances (R) and wages (w_{Ab}) is determined by the shadow income (Λ^*) and optimal level of remittances (R^*). In order to understand this explanation, we can analyse the comparative static by differentiating F_t^{nm*}, X_t^{nm*} and H_t^* with respect to wage rates of abroad (w_{Ab}).

(11) $$\frac{\partial F}{\partial w_{Ab}} = \left\{ \frac{\partial F}{\partial \Lambda^*} \frac{\partial \Lambda^*}{\partial R} + \frac{\partial F}{\partial R} \right\} \frac{\partial R}{\partial w_{Ab}}$$

(12) $$\frac{\partial X}{\partial w_{Ab}} = \left\{ \frac{\partial X}{\partial \Lambda^*} \frac{\partial \Lambda^*}{\partial R} + \frac{\partial X}{\partial R} \right\} \frac{\partial R}{\partial w_{Ab}}$$

Under the assumption of missing factor markets, ambiguities grow with the number of endogenous variables in the model (ibid). For instance, if the household is liquidity-constrained, remittances ease the budget constraints, then we assume that $\frac{\partial \Lambda^*}{\partial R} > 0$. An increase in the level of remittances encourages households to invest more in on-farm that will increase the marginal product of farm labour (F), suggesting that the relationship between F and Λ^* would be $\frac{\partial F}{\partial \Lambda^*} > 0$, if family labour is imperfect substitute to hired labour. As we know $\frac{\partial R}{\partial w_{Ab}} > 0$ (i.e. an increase in migrant's wage will increase remittances), in this case, the relationship between on-farm and remittances would be positive $\left\{ i.e. \ \frac{\partial F}{\partial R} > 0 \right\}$, if new technologies are more labour-intensive. Households may hire labour to compensate labour loss due to migration that leads to positive relationship between remittances and hired labour $\left\{ i.e. \ \frac{\partial H}{\partial R} > 0 \right\}$, even though the labour market is only functioning partially.

Likewise, in the case of off-farm (12), remittances loosen the liquidity constraint and increase the marginal product of labour on-farm, then $\frac{\partial X}{\partial \Lambda^*} < 0$. If we assume that family labour is perfect substitute to hired labour, then, $\frac{\partial X}{\partial R} < 0$, meaning that an increase in remittances will decrease off-farm work hours. If family labour is not perfect substitute to hired labour due to missing labour markets, non-migrant members may reallocate their labour hours back to farm to compensate their labour loss due to migration, particularly in the case of more investment in farm sector through easing liquidity constraints by remittance income.

In spite of the missing factor markets, if we assume perfect markets (i.e., perfect neoclassical markets), the agricultural household model becomes separable (or recursive), implying that production decisions are independent of consumption decisions. Perfect factor markets are assumed to be zero transaction costs that indicates well functioning of labour and credit markets.

Under this scenario, all markets exist for the household and all prices are determined exogenously and there is hence no role for unobserved shadow prices and incomes. Remittances lift the household budget constraint and increase households' utilities by buying more leisure. Households can hire labour in order to compensate labour loss due to migration.

As we discussed above, migration decisions are made by the migrant and other non-migrant household members. If we substitute equations (8 to 10) into utility function (1), then we can obtain household's indirect utility function characterizing the household's decision of whether or not to send a migrant.

(13) $M^* = V\{w_D, w_{Ab}, R\} - V\{w_D\}$

where $M = 1$ if $M^* > 0$ and $M = 0$ if $M^* \leq 0$,

this model implies that migration process occurs, if the indirect utility of liquidity-constrained household with a migrant member is greater than without migrant member. It can also be possible that household takes migration decision to come out from poverty trap, meaning that burden of credit is more critical than the labour loss due to migration.

Given the theoretical structure of the model of labour supply and welfare, the expected signs between labour supply and remittances could be negative, if remittance income substitutes to other non-labour income of households that reduces the pool of family and hired labour work hours. On the other hand, the relationship could be reversed, if remittances relax the credit constraints that induce investment on farm sectors or self-employment activities, which increases household labour and hired labour hours. Moreover, the conventional model suggests that work hours of labour will increase with the off-farm wage, if leisure is normal good. Due to the intrinsic endogeneity and selectivity involved in decisions surrounding migration, the potential of reverse causality as hours worked may influence emigrants' decision to send remittances home.

4. Data

The data used for the analysis of the impact of remittance on household work hour's allocation is from the Nepal Living Standard Survey (NLSS) carried out by the Central Bureau of Statistics, Government of Nepal with financial and technical assistance from the World Bank. The NLSS was conducted in 1995/96 and 2003/04 consisting the detailed information of income and expenditure on both food and non-food items, demographic composition, wages both in kind and in cash, and transfer of remittances.

NLSS's have wide level of data set providing the information of demographic characteristics, household activities both farm and off-farm, education and literacy, employment status both farm and off-farm, wage rates and remittances covering administrative and ecological zones. For the purpose of this study, information includes the time allocation of household members in farm, off-farm and self-employed, remittance income and other socio-economic characteristics.

The survey includes the detailed information on remittance receiving households both from rural and urban, as well as internal and external migration including their amount and the frequency. Information also includes remittance received in both cash and kind, and different remittance sending channels (i.e. financial institutions, *Hundi*[9], person, and others).

The study on the household labour allocation behaviour will depend on the information related to remittance-receiving households, implying that the analysis will cover only those households who reported receiving remittance in the previous year. So, the analysis will exclude those households, which did not receive any remittances eventhough they had a migrant member in the family due to either recent departure abroad for work, or due to the migrant being unable to send money by other reasons. It could also be possible that households did not report their remittance income because of afraid of taxes.

The data from the NLSS conducted in 1996/97 and 2003/04 show that more than 23 percent and 30 percent of the total 3373 and 3912 sampled households were received remittances from internal or external sources respectively. In the panel data, out of 962 sample households, 21.5 percent households received remittances in 1996/97, and this figure increased by 33.47 percent in 2003/04. The average amount of remittance also increased by NRs. 15,160 to NRs. 34,698 from 1995/96 to 2003/04 with an increment of the share of remittances in total household income (26.6 percent to 35.4 percent). Per capita remittance income has also significantly increased by NRs. 625 in 1995/96 to NRs. 2100 in 2003/04. Individual profiles of the migrants using data from NLSS II show that about 97 percent aged between 15-44 years are male, while only 51 percent of recipients are males. The survey report further shows that remittance flows are very high in rural areas than

[9] *Hundi* refers to financial instruments evolved on the Indian sub-continent used in trade and credit transactions. They were used: (i)as remittance instruments(to transfer funds from one place to another); (ii) as credit instruments(to borrow money); and (ii) for trade transactions(as bills of exchange) [Source: http://www.rbi.org.in/currency/museum/m-hundi.html]. This system is common in Nepal especially among illegal immigrants, who do not have legal documents to send remittances to the country of origin. According to Wikipedia, *Hundi* is an informal value transfer system based on performance and honour of a huge network of money brokers which are primarily located in the Middle East, Africa and Asia.

urban areas. According to NLSSs, 72.6 percent and 75.1 percent of remittance receiving households are from rural areas in 1995/96 and 2003/04 respectively.

Descriptive statistics used for the analysis of the impact of remittance income on the allocation of work hours of remittance receiving households are given in Table 1. Remittance income is measured as the total income received by sample households both from internal and abroad, where other income (or non-labour income) includes pensions, allowances and dividends. Work hours are the aggregate time spent by each household in different activities such as on-farm, off-farm and self employment activities, and hired labour. Land is total farm size either owned, or rented or sharecropped by the household and measured in hectare, and value of the livestock is the total value of livestock owned by households during the survey. Farm size and value of the livestock are often included in labour supply model, assuming that such variables could have effect on household labour allocation. Moreover, the number of children below 6 years and senior population may also matter for the time allocation of households.

The data further reveal that out of total remittance receiving households, about 28.5 percent and 36 percent of households in NLSS I and II are headed by female respectively, but this figure is quite low in the total samples of both remittance receiving and non-receiving households (12.68 percent in 1995/96 and 18.92 percent in 2003/04).

The panel data show some change in the work hours allocation in different sectors, indicating a shift from farm sector to off-farm sectors among the remittance-receiving households. There is also a slight change in average family size from 6.27 to 5.64. The data show some positive changes in remittance income and non-labour income over the last 7 years of the first NLSS. However, farm size decreased over the panel sample.

5. Econometric specification

Econometric model for this analysis is assumed that the household decision for migration is purely based on the objective of utility maximization. Decision to migrate is often done by both migrant and family members by sharing costs and returns as an implicit contractual arrangement between two parties. In other words, patterns of remittances could be better to explain as an intertemporal contractual arrangement between migrant and other family than as the result of purely altruistic considerations as explained by Stark and Bloom (1985) in their seminal paper of “The New Economics of Labour Migration”. Remittances in this context may not be a plausible

assumption to consider as random sample. It can be better to model as the outcome of a joint utility maximization made by the prospective migrant and other non-migrant household members (Hoddinott, 1994). It is also reasonable to assume that households decide migration and remittances jointly with other income activities as a part of their livelihood strategies (Stark and Bloom,1985). In other words, migration decisions, remittances, and other household activities like expenditure, labour allocation, and school attendance are usually made simultaneously (McKenzie and Sasin, 2007). Such complicated relations have raised a number of methodological issues relating to the application of econometric models, particularly identification issues in the context of standard OLS techniques in the presence of simultaneity that can manifest themselves in the problem of endogeneity in the labour supply model.

Furthermore, sample selection bias and omitted variables are common problems in migration and remittance analyses, which can affect the labour supply model. For instance, there are fundamental differences between migrants and non-migrants, and selection of only migrants can result in a bias sample. This gives rise to the problem of selection bias[10]. This sample selection of migration may be a problem of omitted variable bias, arising from the exclusion of both observable and unobservable characteristics of non-migrants in the model.

The instrumental variable (IV) technique is the most common way to address the problem of endogeneity between labour hours, remittances and migration. In addition, the literature also suggests that the model use of panel data can significantly reduce those biases arising from omitted variables (including unobservable individual and household characteristics), selection biases, endogeneity, and can control for household level unobserved effects. The labour supply equation we estimate attempts to take into account the endogeneity problem using panel data from NLSSs conducted in 1995/96 and 2003/04.

Due to the presence of pervasive endogeneity in the migration decision, there is a need to address this problem in the model. The general approach to address such problem is to find good instruments for remittances[11]. Previous studies usually used probit model for binary variable of migration in order to find inverse Mill's ratio, which is considered as instrument of migration. Then the equations on household work hours estimate two-stage least squares using inverse Mill's ratio of migration as instrument for remittance equation. However, this study applies count regression

[10] McKenzie and Sasin (2007) have given an example of healthier, educated and wealthier household regarding this issue. They point out as positive selection if such households might be more likely to migrate and as negative selection, if less likely to migrate.

[11] Migration is also a function of households and other socio-economic characteristics, and written as $M_{it} = \delta_0 + X_{it}\delta_1 + \pi_{it} + \omega_i$. The functional form reflects that the number of migrants from a household should always be a non-negative integer.

model, because about 6 percent of sample households have more than one migrant member in the family. Count regression model has several advantages over other specification (Taylor et al., 2003). We estimate first zero inflated Poisson (ZIP) model due to the high incidence of zero counts in the panel data set in order to find the best instruments for remittances (for equation iii), and predicted value of migrants also includes in the model to control endogeneity. Nevertheless, the estimation of inverse Mill's ratio in the presence of higher number of zero count is likely to be biased. Zero-inflated Poisson regression models introduced by Lambert (1992) are a useful class of models for excessive count data that account for the zeros by the non-migrant households. The density function is:

$$g(m) = \begin{cases} f_1(0) + (1 - f_1(0))\, f_2(0), & if \quad m = 0, \\ (1 - f_1(0))\, f_2(0), & if \quad m > 0. \end{cases}$$

Where, $f_1(0)$ is a logit model and $f_2(0)$ can be either a Poisson or a negative binomial density (Cameron and Trivedi, 2005),.

The number of migrants in the household is the dependent variable for ZIP model with a set of exogenous variables that induce to migrate. These exogenous variables are assumed to be correlated with migration and not to be correlated with error terms. As explained before, the migration equation for this analysis is:

(i) $M_{it} = \delta_0 + X_{it}\delta_1 + \upsilon_i$

Where X_{it} is the vector of exogenous variables such as percentage of migrants from the district, per capita household income without remittances and migrant belonging rural or urban (dummy). In addition, the model has included a number of demographic variables, specifically family size, the dependent ratio (i.e. number of dependent divided by adult members), age and sex (1=female) of the household head. It is often assumed that family size and other democratic characteristics do matter in the presence of incomplete factor markets in most developing countries like Nepal. The education level of the household head has also included in the model as a proxy for educational status of the household, implying that higher educated household can have effect on migration decision. After estimation of Zero Inflated Poisson model, variables which are significant in the ZIP model (equation i), are used as instruments for remittance equation (iii), when applying two-stage least squares regression for equation (ii).

The functional form of labour supply equations which is the main interest of this analysis is expressed as follows:

(ii) $H_{it} = \beta_0 + Z_{it}\beta_1 + \beta_2 R_{it} + \eta_{it} + \varepsilon_i$

Where, H_{it} is a measure of labour hours, Z_{it} is the vector of household characteristics, R_{it} is the level of remittances received by the household, and η_{it} and ε_i are respectively the household specific and aggregate error terms. As discussed above, level of remittances received by households is

considered as endogenous, because migration and remittances are endogenously determined together with other income sources. To control the problem of endogeneity, the equation of remittance income is instrumented by a set of exogenous variables, which are supposed to be correlated with remittances, but not to be correlated with labour hours of the household. The equation for remittances is:

(iii) $R_{it} = \alpha_0 + X_{it}\alpha_1 + \alpha_2 M_{it} + \eta'_{it} + \varepsilon'_i$

Where X_{it} is the vector of exogenous variables such as percentage of migrants from the district, the number of migrants from the household, working region of migrant and region belonging to migrants in the country of origin. M_{it} is the number of migrants from the household.

The dependent variables in the regression model (equation ii) are the total hours of household's work on farm, off-farm and self employment activities, and total work hours of hired labour with a set of exogenous variables, specifically remittance income, household size, farm size, non-labour income, value of livestock, off-farm wages, dependent ratio, number of children (< 6 years) and the number of elderly members of the household (65+ years) in the households, and the sex of household head.

A growing body of evidence suggests that the labour supply response of individual members may not necessarily give the same response at aggregate levels within the same household, perhaps due to differences in responses among the genders, or the regions or the volumes of remittance. For example, Rodriguez and Tiongson (2001) estimated Probit models for the participation of labour force in Manila, and they obtained higher probabilities (about double) of reducing work by women than men among the households with migrant members. The further application of labour supply responses by gender in remittance-receiving households will give more insight to understand the relationship between remittance income and the hours of work. The study also estimates labour supply models of remittance-receiving households by gender based on the demographic characteristics.

The labour supply model[12] for the analysis follows as:

(iv) $L_i^* = \gamma_0 + \gamma_1 R + \gamma_2 Z_i + \omega_i$

where $\omega_i \sim$N $(0, \sigma^2)$ and L_i = max (0, L_i^*), and L measures the individual work hours of remittance receiving households with sample i (i=1,……n). R is the per capita remittance income of the household, and Z is the set of exogenous variables, particularly demographic characteristics of the individual and average non-labour income. The dependent variable L= L^*, if = $L^* \geq 0$, and L=0, if $L^* < 0$, implying that work hours of some individuals are reported as zero. Use of the OLS method

[12] The theoretical idea for this model is mainly drawn from the papers of Amuedo-Dorantes and Pozo (2006), and Acosta (2006).

for this model will give biased and inconsistent estimates of the impact of remittances on the household work hours.

The Tobit model, which can address the problem of the partially discrete and particularly continuous nature(i.e. censored) of dependent variable, would be a better choice against OLS. In addition, Tobit model with instrumental variables for remittances will give unbiased and consistent estimates with taking into account the presences of a number of zeros in the dependent variable (i.e. censored at zero). The model, thus, uses Amemiya Generalized Least Square (AGLS) as described by Amuedo-Dorantes and Pozo (2006) with endogenous regressors. The instruments for remittances are the same as before used in equation (ii) and (iii) for migration decision, where the dependent variable is the zero inflated continuous variables, measuring the work hours of individual members of remittance receiving households.

6. Empirical results

6.1 Migration decision of the household

As discussed earlier regarding migration and remittances as joint decisions of migrants and non-migrant family members, it is plausible to examine the variables of household and other social characteristics that may induce to send remittances. Table 3 displays econometric results of the factors that encourage to take migration decision. In order to estimate these parameters, various count models such as the Poisson regression model (PRM), the Negative Binomial Regression Model (NBRM), the Zero Inflated Poisson (ZIP), and the Zero Inflated Negative Binomial (ZINB) were applied and tested using Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC)[13] for the selection of best model in our analysis. The estimated parameters found consistent in all most all models with some exceptions, but the estimated parameters applying ZIP model seem more compatible with the theory than other count models for our interest. Several tests were also done for the selection of preferable model to the analysis of migration decisions. For this, the result of Likelihood Ratio (LR) test of $\alpha = 0$ for the NBRM against the PRM shows this to be insignificant, favouring to the PRM over the NBRM. Likewise, the result of the Vuong test ($z = 3.70, p < 0.0001$) for the ZIP model against the PRM is significant at 99 percent confidence level, suggesting that the ZIP model is preferred to the PRM. We also estimated random effect models for the PRM and the NBRM and tested panel data against pooled data in order to control

[13] All these being equal, the model with the smaller AIC and BIC is considered as a better fitting model. For detail, see Long and Freese, 2001.

unobserved effects in panel data. The result of LR test of α ($\chi^2_{(1)}$=0.00 with $P_{value} = 1.00$) suggests that panel estimators are not significantly different from pooled estimators, which allows to use pooled estimators for the analysis of migration decision made by household members applying the Zero Inflated Poisson (ZIP) model to explore the variables that encourage to migrate.

The parameters estimated in the ZIP model can be interpreted as the probability of expected number of migrants from the household, like the significant and positive sign of family size imply that an increase in the number of family member will on average increase the probability of migrating by 7 percent. Likewise, residence in the district with the higher migration rate also encourages migration, perhaps due to social and economic impact in the society (i.e. network effects). The sex of the household head is significant and positive, implying that female head households are more likely to have sent migrants out. This is the line with the observations that female-headed households increased by 19.27 percent of the total sample households by 39.77 percent of remittance-receiving households. In addition, the rural dummy shows that people from rural areas are more likely to migrate in compared with urban inhabitants. The intuition may be that this is due to fewer off-farm employment opportunities and possible lower wages in rural areas in comparison to urban areas. The significant and positive sign of the age of household head also indicate a high percentage of migrants are relatively young and that this may lead them to work more for senior family members who remain at home. Per capita income of household production also shows a positive relation to migration, suggesting that household income from own businesses, like income from farm sector and other non-farm sectors, does affect migration decisions, but the magnitude of coefficient is relatively low. The education level of household head has no effect on migration decisions. The dependence ratio of the household also does not show any impact on migration decision.

6.2 Time allocations of remittance receiving households

Table 4 gives estimates for the impact of remittances on household labour allocation, particularly on farm, off-farm, self-employment activities, as well as hired labour. The econometric results presented in the table are all use the same explanatory variables. Remittance income, the main focus of interest in this study, is considered as endogenous. As discussed above, remittance income depends on the number of migrants in the households. So, the presumption that migrant families are systematically different from non-migrants in observable (wealth) and non-observable

(ability and income shocks) characteristics complicates the identification of the effect of remittances using standard Ordinary Least Square (OLS) (Acosta, 2006). The instrumental variables method (IV) is the most common way to control the problem of endogeneity. Instrument variables[14] for remittance income include the number of migrants from the household, percentage rate of migration from the district, family size, sex of female head household (dummy), dependent ratio (number of dependent divided by adult family members), per capita income of household products, and region (rural or urban). The econometric models used two years of panel data (1996 and 2004) of 962 households. Out of which, only 529 households (207 from 1996 and 322 from 2004) received remittances. This result is thus based on the panel data of 529 observations.

The coefficient of remittances in the equation for total household labour supply is significant at 10 percent level with a negative sign, supporting the contention that remittance income is a substitute of non-labour income (e.g. pensions, allowances etc.). It implies that the level of remittances is more likely to decrease total work hours of remittance receiving households. This result is also supported by the coefficients of farm work hours of household, suggesting that remittance income decreases the hours of work on farm sector of remittance receiving households, which is similar to the result of Acosta (2006) for adult female labour supply in El Salvador. Remittances also decrease off-farm work hours as well as self-work hours, but the coefficients are not significantly different from zero, which is contrary to the results of Amuedo-Dorantes and Pozo (2006), and Funkhouser (1992). However, the coefficient of hired labours shows that remittance-receiving households are more likely to increase work hours of hired labour. This result is to some extent in favour of the view that factor markets are incomplete and that remittances relax liquidity constraint so that household can hire more labour in the case of inadequate family labour.

The result of the relationship between household work hours and non-labour income does not support the hypothesis of the traditional labour supply model except hired labour hours, where higher non-labour income is more likely to reduce the work hours of household, if leisure is normal good. But it may be possible for liquidity-constrained households that non-labour income increases the opportunity for self-employment because it lifts household budget constraint, particularly in the presence of missing credit markets, as viewed by Funkhouser (1992) . However, the coefficients of non-labour income for all models are not statistically significant.

[14] Instrumental variables are the same variables, which were significant with positive sign in Zero-Inflated Poisson (ZIP) model. The intuition to include these variables as instruments for remittance equation is that such variables can induce to migrate.

The estimated coefficients of farm size measured in hectares give rise to mixed results in different equations. As usual, farm size increases the hours of work on farm sector. In addition, farm size has also positive effect on self employment activities and hired labour hours, perhaps due to the fact that Nepal is an agrarian country where the agricultural sector is the primary means of livelihood for the majority of people and the main sector for self employment activities. On the other hand, farm size does not show any effect on the aggregate and off-farm work hours at least in these models. However, the value of livestock is significant in all equations except the farm sector. The results show that higher livestock value is more likely to increase the hours of work on off-farm and hired labour, and decrease farm and self employment. This result is a bit surprising for developing countries like Nepal, where livestock and farms are often considered as complementary goods for farm households.

Demographic variables give almost the same results for household work hours showing that higher family size is more likely to lead higher hours of work, while a higher number of children under six years and above 65 years is more likely to reduce hours of work in different activities. Moreover, a higher dependency ratio also reduces total work hours of the household, and increases the hours of hired labour. Female-headed households have relatively high working hours than households headed by their male counterparts, but this effect is not significantly different from zero. The result shows that family member has significant role in the labour market in Nepal.

Finally, the coefficient of off-farm wages shows an *a priori* result that higher wage in the off-farm sector is more likely to increase the total work hours as well as off farm work hours of the sample households. Contrary to this, higher off-farm wage rates draw the labour hours away from the farm sector and self-employment activities, possibly due to higher attractiveness of the off-farm sectors, but most of the coefficients are not significantly different from zero except that for off-farm work hours. The result also shows that higher off-farm wage reduces farm labour hours. This is perhaps due to higher opportunity cost in the off-farm sector than farm sector.

6.3 Instrumental variable Tobit estimation results

The results of the instrumental variable Tobit (IV-Tobit) models for men and women, and pooled of both are given in Table 5. The models use the same explanatory variables for all equations in order to explore gender differences in hours worked, taking remittance income as endogenous. The results of a Wald test for exogeneity are significant, implying that remittances are

indeed endogenous. Most of the explanatory significant variables both for men and women show the same effects with previous models. For instance, the results do not show significant differences of the hours of work between men and women with per capita remittance income and non-labour per capita income, implying that increase in remittance income is more likely to reduce work hours for both men and women, which is consistent with the results of aggregate household work hours in different sectors (in Table 4). However, per capita non labour income increases the labour hours of both men and women, but the coefficients of both remittances and non labour income are very small in magnitude. Moreover, the level of education also increases the hours of work for both, showing that higher educated people are more likely to increase the hours of work than relatively lower educated people. The coefficient of age shows a positive for men, implying higher work hours with higher age. However, education and age do not show any significant effect for female work hours. The number of children below six years reduces the hours of work for men but not for women, but the coefficients are not significant any required level. In addition, the coefficients of ethnicity[15] do not show any significant effects either for males or females. The result is also the same for the coefficients of senior citizens (>65 years). The coefficient of the rural dummy shows that individuals from rural areas are likely to work more than urban individuals. In addition, larger family size is likely to reduce the individual work hours. The coefficients for a female headed household are negative for women, but not significant for men.

The result of pooled men and women shows the same effect as in men and women, indicating consistency and robustness in our models. For instance, remittance income is more likely to reduce work hours of remittance-receiving household members. In general, rural people work more than urban people and higher family size reduces the individual work hours of remittance-receiving households.

7. Discussion of the results

A number of examinations related to migration and remittances with the hours of work in their receiving households tested using NLSS panel data. The study tried to capture the methodological issues related to migration decisions and the impact of remittances on household

[15] The variable ethnicity measures the so-called caste groups in Hindu religion. Caste Systems are traditional and hereditary systems of social classification that evolved due to the enormous diversity in India and Nepal. The systems divides into four major castes from highest to lowest like Brahmin (i.e. Vedic priest), Kshetriyas (warriors and rulers), Vaishyas (merchants), and Shudras (artisans).

work hours, and a number of econometric models such as the Zero-Inflated Poisson model for migration decisions, random effect instrumental variables for household aggregate work hours in different sectors (i.e., farm, off-farm, self employment, and hired labour) and the Instrumental Variables Tobit (IV-Tobit) for the labour supply of working age men and women as well as pooled of men and women were used to explore the impact of remittances on the labour supply decision in remittance-receiving households.

The results from the different models especially that for the impact of remittances on the hours of work in recipient households are consistent with remittances, as remittances decrease both aggregate and individual hours of work in remittance-receiving households, implying that leisure is a normal good. In other words, the income effect appears to be dominant in our data, where an increase in remittances decreases the hours of work. The result also shows that higher remittance income increases the hours of work of hired labour by relaxing the liquidity constraint, indicating an existence of partly missing credit markets in Nepal, rural areas in particular. From a development prospective, remittances create a positive externalities in neighbouring families or villages by hiring more labour, as pointed out by Acosta (2006). In contrast to this, the results on non-labour income are surprising both at the aggregate and individual levels, showing that non labour income increases household work hours. Nevertheless, these coefficients are not statistically significant. Further investigation may be needed to understand this relation.

Consistent with the hypothesis, demographic characteristics such as family size, have shown the result as expected that larger family size leads to higher work hours in all sectors, but reduces individual work hours. However, the number of children under six years does not show significant effects in household work hours, but family members over 65 years normally reduce work hours for women and increase for men with some exceptions. The possible explanation is that the adult female members have to spend more time taking care of their children and senior citizens that reduces to the hours of work on farm and off-farm sectors, which is also consistent with the result of dependency ratio.

Farm size and livestock, which are key characteristics of rural settings, have given rise to mixed results, implying that higher farm size leads to higher work hours on farm sector, self employment activities and hired labour, but not in off-farm sectors. However, the result of the value of livestock, which shows a positive relation with off-farm work hours and negative with farm work hours, is counter-intuitive. More investigation is needed to justify this result.

To summarize the discussion of these results, the study has examined whether remittances decrease the hours of work in all sectors, through operation of the income effect. Family members appear as major sources of labour supply, especially in rural settings.

8. Conclusions

Remittances are becoming a stable source of income for many people living in developing countries. Policy-makers in Nepal have sought to explore the opportunities in developed and middle-income countries, especially in South East Asia and the Gulf countries to absorb their surplus labour to improve living standards. This policy is popular to some extent due to increasing impact of migration and remittances on the living conditions of the remittance-receiving households in Nepal. Due to enormous effects of remittances on receiving countries both at the macro and the micro levels, it is obviously a matter of interest for economists.

The study attempts to explain the impact of remittance income on the hours of work in remittance receiving households both individual as well as sectoral levels in Nepal using panel data from the Nepal Living Standard Surveys conducted in 1995/96 and 2003/04. This study estimates first a Zero Inflated Poisson (ZIP) model in order to find out the factors that motivate to migrate and then examine econometric models of household work hours in various sectors (such as on-farm, off-farm, self-employment activities, hired labour and the aggregate of all) with remittance income and other explanatory variables to measure the effects of labour hours allocation in remittance receiving households. The level of remittance income is assumed to be an endogenous variable because of multiple effects of migration and remittances on living standards and human capital outcomes. We apply the instrumental variables method to control the endogeneity problem in the model. Econometric models for working age men and women (16-65 years) are also estimated to examine the effect of remittances on work hours of recipient households in the country of origin applying an IV-Tobit model.

The result of the ZIP model shows several factors as motivating migration from Nepal. For instance, people from rural areas and the district with higher percentage of migration rate have higher probabilities of migration. Households with larger family size and income per capita without remittances for migration have also a higher probability to migrate. Female-headed households are more likely to have sent migrants out. Large number of children and higher level of education in

the household reduce the probability of migration. This finding supports the view that multiple factors affect for migration decisions.

The empirical analysis of the impact of remittances on the allocation of labour hours in different sectors implies that remittance income increases the consumption of leisure in almost all sectors, the exception being that of hired labour in remittance-receiving households. It does not have any significant effect in the hours of work on off-farm and self-employment activities, implying that remittance income appears to be a substitute for non-labour income in the sample households. However, the evidence in relation to non-labour income is inconsistent with the traditional theory of labour economics, suggesting that leisure is not a normal good. The evidence of hiring labour with remittances suggests that remittance income relaxes the budget constraint and then raises the hours of hired labour to meet the labour demand in the migrant's household. by contrast, households with higher non-labour income prefer to work themselves rather than to hire labour.

Econometric results of the impact of remittances on the labour supply of men and women aged between 16-65 years in remittance-receiving households show that remittances increase the hours of leisure of individual members. However, individuals having higher non-labour income are more likely to increase their hours of work.

Further studies should focus on the impact of remittances on different income level of households residing in different ecological zones. Information on migrant characteristics could be useful to obtain better insights on the impact of remittance and returns to scale in migration.

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Table 1: Descriptive statistics of remittance receiving households

Variables	NLSS 1995/96		NLSS 2003/04	
	Mean	Std. Dev.	Mean	Std. Dev.
Remittance income[16]	20801.21	93425.28	34798.26	70567.58
Non labour income	6375.22	27346.98	31032.62	131702
Total household(HH) size	6.27	2.99	5.64	3.02
Child<15	2.57	1.85	1.95	1.79
Old pop>65	0.26	0.52	0.30	0.56
Total work hours/HH	433123.3	1011436	573625.9	11086047
Total work hours on farm/HH	211900.7	457120.3	7487.54	58940.5
Total work hours on off-farm/HH	128498.1	409962.5	557881.3	1080031
Total work hours on self employment activities/HH	92724.48	306663.7	8257.03	13341.21
Land in hectares	10.61	16.74	0.71	1.19
Livestock value	12080.15	13164.82	35227.48	33411.08
Education level of HH head (no. of years)	1.94	3.62	1.82	3.55
No. of migrants from HH	1.24	0.55	1.29	0.60
Female HH head (%)	28.5		36.02	
No. of HH received remittances	207		322	
Total observations	962		962	

[16] All income sources both remittances and non-labour are given in Nepalese currency (i.e. Rupees), where US$1=63.9 Nepalese Rupees.

Table 2: Descriptive statistics of non-migrant households

Variables	NLSS 1995/96		NLSS 2003/04	
	Mean	Std. Dev.	Mean	Std. Dev.
Remittance income	-	-	-	-
Non labour income[17]	19985.03	286230.7	84417.89	483987.5
Total household(HH) size	5.92	2.63	5.78	2.54
Child<15	2.51	1.76	2.1	1.72
Old pop>65	0.25	0.52	0.30	0.57
Total work hours/HH	420800.3	941358.8	754517.8	152940
Total work hours on farm/HH	197745.2	423899.6	6046.98	31428.19
Total work hours on off-farm/HH	126573.9	349393.7	737526.3	1518645
Total work hours on self employment activities/HH	96481.11	294612.7	10944.52	17504.34
Land in hectares	9.56	19.99	0.73	1.03
Livestock value	10937.77	12505.21	31912.03	34733.79
Female household head (%)	8.34	-	10.31	-
Education level of household head (no. of years)	2.80	4.19	3.42	4.49
No. of HHs without any migrant	755		640	
Total observations	962		962	

[17] All income sources both remittances and non-labour are given in Nepalese currency (i.e. Rupees), where US$1=63.9 NRs.)

Table 3: The effects of migration using ZIP model

Explanatory variables	Coefficients	Std. Err.
Family size	0.07***	0.018
Percentage of migration of the district	0.04***	0.013
Per capita household income without remittances	0.001***	0.002
Dependent ratio	0.10	0.068
Age of household head	.001***	0.003
Education level of household head	-0.02***	0.012
Sex of household head (dummy)	0.42***	0.129
Rural or urban (dummy)	0.74***	0.190
Constant	-2.548***	0.303
Vuong test(ZIP vs. PRM)	3.70***	
AIC	2716.093	
BIC	2793.963	
Number of observations	1924	

*** significant at 1% level

Table 4: Regressions results of household labour hours using random effects instrumental variable

Explanatory variables	**Household work hours**				
	Total	Farm	Off-farm	Self-employment activities	Hired labour
Remittance income	-8.24*	-2.45*	-5.40	-0.39	0.003*
	(4.68)	(1.36)	(3.79)	(0.76)	(0.001)
Land per hectare	6439.82	7251.19***	-4575.32	3749.20***	14.74***
	(4684.55)	(1361.37)	(3795.68)	(763.83)	(1.78)
Non labour income	1.24	0.31	0.93	0.001	-0.0003
	(1.02)	(0.29)	(0.83)	(0.16)	(0.0003)
Livestock value	5.95***	-0.89	7.25***	-0.42**	0.004***
	(1.96)	(0.57)	(1.59)	(0.32)	(0.0007)
Family size (including migrants)	150603.9***	25552.44***	103358.7***	19666.8***	25.93**
	(26661.86)	(7748.17)	(21602.9)	(4347.33)	(10.15)
Children <6 yrs	-29749.53	-9926.87	-4801.36	-14956.35	-64.93*
	(66079.05)	(19203.15)	(53540.89)	(10774.49)	(25.17)
Senior citizen>65yrs	-331068.4***	-70899.13**	-248716.1***	-11462.96	9.71
	(102045.5)	(29655.31)	(82682.87)	(16638.98)	(38.87)
Dependent ratio	-255225.5***	-43653.41*	-197410.3***	-14174.79	12.96
	(86336.64)	(25.90.18)	(69954.7)	(14077.58)	(32.88)
Female household head (dummy)	230077.7	41014.15	189266.5	-84.03	118.93*
	(179662.7)	(52211.54)	(145572.6)	(29294.81)	(68.44)
Off-farm wage rate	1530.79	-184.79	1873.88**	-121.88	-0.39
	(1075.79)	(312.63)	(871.67)	(175.41)	(0.41)
Constant	-121010.2	32281.68	-115334.7	-37900.46	-56.69
	(167283.7)	(48614.1)	(135542.5)	(27276.36)	(63.72)
No. of observations	529	529	529	529	529

Standard errors in parentheses.

***, **, * 1%, 5% and 10% significance level respectively.

Table 5: Instrumental variable Tobit estimation of total household work hours by gender

Explanatory variables	Men	Women	Pooled(both)
Per capita remittance income	-0.002**	-0.001**	-0.002***
	(0.007)	(0.0006)	(0.0006)
Per capita non labour income (excluding	0.003**	0.0005*	0.0005***
remittance income)	(0.001)	(0.0003)	(0.0002)
Age of individual	0.46***	-0.10	-0.20***
	(0.09)	(0.093)	(0.07)
Education level of the individual	2.29***	0.28	1.38***
	(0.44)	(0.42)	(0.33)
Ethnicity of Individual	0.13	0.02	0.05
	(0.10)	(0.11)	(0.09)
Number of children <6 years in	-0.21	0.01	1.72
household	(1.13)	(1.16)	(1.12)
Number of old person > 65 years in	-3.42	-4.40*	-4.48**
household	(3.05)	(2.53)	(1.12)
Household size	-0.63	-2.04	-2.06***
	(0.80)	(0.65)	(0.49)
Rural or urban	3.80	19.38***	13.88***
	(6.04)	(6.05)	(4.83)
Female head household	-1.63	15.26***	15.31***
	(7.08)	(5.69)	(4.58)
Constant	10.01	33.51***	22.40***
	(7.16)	(6.58)	(5.48)
Wald $\chi^2(10)$	83.36 ($P_{< 0.000}$)	46.97 ($P_{< 0.000}$)	49.83($P_{< 0.000}$)
Wald test for exogeneity $(/\alpha = 0) : \chi^2(1)$	5.18 ($P_{< 0.022}$)	3.36($P_{< 0.066}$)	10.99($P_{< 0.000}$)
No. of individuals(16-65 years)	644	890	1534

Source: NLSSs

***, **, * 1%, 5% and 10% significance level respectively.