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The Effect of Male Migration for Work on Employment Patterns of Females in Nepal

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Abstract

This paper assesses the impact of work-related migration by males on the labor market behavior of females in Nepal. Using data from the 2004 Nepal household survey, the authors apply the Instrumental Variable Full Information Maximum Likelihood method to account for unobserved factors that could simultaneously affect males' decision to migrate and females' decision to participate in the labor market. The results indicate that male migration for work has a negative impact on the level of market work participation by the women left behind. The authors find evidence of substantial heterogeneity (based both on observable and unobservable characteristics) in the impact of male migration. The findings highlight the important gender dimension of the impact of predominantly male worker migration on the wellbeing of sending households. The authors argue that strategies for economic development in Nepal should take into account such gender aspects of the migration dynamics.

This paper—a product of the Poverty Team, Development Research Group—is part of a larger effort in the department to study migration and remittances. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at mlokshin@worldbank.org.

The Effect of Male Migration for Work on Employment Patterns of Females in Nepal

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1. Introduction

A sharp increase in the number of work migrants and in the amount of remittances they send to their countries of origin has fueled the recent debate on the costs and benefits of international migration for the sending communities (United Nations 2002). Remittances are considered to be one of the main factors through which migration affects economic growth. Most microeconomic studies of migration and remittances focus on their role in reducing poverty and economic inequality. At the same time, the impact of remittances and migration on the economic behavior of household members 'left behind' has received relatively little attention among economists (Kanaiaupuni 2000).

Most research on this issue comes from sociological and demographic literature which indicates that the time women spend working on home farms is increasing, due, at least in part, to the migration of males (Deere and Leon 1987, Crummet 1987). Among the few economists that focus on the labor market outcomes of members of households that have sent migrants, Itzigsohn (1995) assesses the effect of migrant remittances on income and labor market participation of members of low-income urban households in the Caribbean Basin. Rodriguez and Tiongson (2001) analyze the effect migrants have on the labor force participation of non-migrants in the Philippines. Sadiqi and Ennaji (2004) study the impact of male migration from Morocco to Europe on the women left behind. Amuedo-Dorantes and Pozo (2006) investigate how migration and migrant remittances affect the employment status and hours of work of individuals living in the sending households in Mexico. The relation between remittances, labor supply, and school attendance in El Salvador is examined by Acosta (2006). Cabegin (2006) examines the effect of overseas work-related migration on the market participation and labor supply behavior of migrants' spouses left behind in the Philippines. Kim (2007) studies the impact of remittances on labor supply in Jamaica. The common finding of all these studies is that migration and remittances result in a decline in the labor force participation of household members left behind, in particular, of females.

The objective of this paper is to examine the extent to which male migration affects the labor force participation of prime age women in Nepal. This question is of

interest for a country where one out of every ten prime age males is currently working overseas and remittances reached 17 percent of GDP in 2004 (World Bank 2005).

Work migration in Nepal, while predominantly a male phenomenon, takes place within a social framework. It affects families, households and communities, brings changes in the gender division of labor and increases the women's workload. Male work migrants are gone for months and sometimes for years at a time, leaving women to assume the day-to-day productive responsibilities at home. When their husbands migrate, wives not only continue to rear the children and take care of the usual household chores, but often also fill in for the absent husbands in working on the family plots or enterprises. Female heads of agricultural households have a particularly hard time when male labor is not available for such tasks as plowing which is taboo for women in certain areas of Nepal (Nandini 1999).

Another effect of male worker migration is that the well-being of sending households becomes increasingly dependent on women raising their status and strengthening their position in household decision-making. Women can find themselves playing key roles as entrepreneurs in investing or divesting remittance incomes or running bazaar economies based on the sale of remittances in kind (Brown and Connell 1993). At the same time, social and traditional family norms, as well as the structure of the Nepali labor market which has limited employment opportunities for women, reinforce husbands' objections to wives working away from home. With their husbands absent, wives find it easier to work at home in order to maintain respectability in the eyes of neighbors and relatives.

A husband's migration can have a mixed effect on gender relations between his wife and other members of the sending household. If a man leaves his wife in an extended household and sends remittances to his parents, the mother and father-in-law dominate family affairs. Several sociological studies have shown (e.g., Sharma 1986) that the role of the daughter-in-law in Nepal requires subservient behavior and the performance of arduous tasks. The absence of a husband may represent the loss of a possible ally for his wife, someone to speak on her behalf should her in-laws mistreat her or become too demanding. On the other hand, depending on circumstances and on

whether the husband sends his remittances to his parents or his wife, the reverse can also occur.

A 28-year old woman from Shyauli Bazaar in Gorkha district looks after her household and farm. Her husband is working in Dubai and sends his earnings to her. Though she lives in an extended family with her two children, grandmother, and father and mother-in-law, these days she is also the acting head of her household. Her grandmother and mother-in-law are not well, so she has taken charge of all household and farm responsibilities. Her father-in-law helps with the household chores but leaves most of the decision-making to her. Though her family and productive demands are many, she has become involved in community groups and is the treasurer of one savings and credit program (World Bank 2006).

In this paper, we develop a theoretical model in which a household decides to send a male migrant to work and whether the female participates in market activities. This model motivates our empirical strategy. Using data from the 2004 nationally representative survey of Nepali households, we applied the Full Information Maximum Likelihood method to estimate the effect of migration of men on market work participation (MWP) by the women left behind. The method took into account unobserved household characteristics that could simultaneously affect migration and MWP decisions. Our results indicate that male migration has a negative impact on the level of MWP by the women left behind.

The current paper contributes to the existing literature on the effects of migration and remittances in three important ways. First, to the best of our knowledge, this analysis is the first attempt to estimate the impact of remittances and migration on the labor market behavior of household members of sending households in Nepal. Second, in this literature, we used a new methodology—an econometric technique that controls for various forms of endogeneity and selection biases arising in our model. Finally, our results highlight the important gender dimension of the predominantly male worker migration on the well-being of sending households.

The rest of the paper is organized as follows: Section 2 describes data and defines the main constructed variables, Section 3 presents the descriptive results, and Section 4

discusses the theoretical model and the estimation methodology. Our main findings are presented in Section 5. Section 6 concludes.

2. Data

The analysis in this paper is based on the data from the 2004 Round of the Nepal Living Standard Survey (NLSS-II). The NLSS is a nationally-representative survey of households and communities. NLSS-II was conducted between April 2003 and April 2004 by the Nepal Central Bureau of Statistics with assistance from the World Bank. The sample frame of NLSS-II was designed using a two-stage method based on the 2001 Census[1]. For our analysis, we selected a sub-sample of 3,528 households with prime-age females, and our sample contains information on 5,426 females 18 to 60 years of age. We used data from the First (1996) Round of NLSS and the Nepal Census of 2001 for descriptive results and to construct the lagged indicators at ward and district levels.

The NLSS collects data on household consumption of a wide range of food and non-food items, detailed information about the socio-demographic composition of the interviewed households, labor status of the household members, members' health and educational achievements, and information on various sources of household income including income in-kind and individual wages. In a special section of the questionnaire, respondents reported the amounts of remittance their households received during the month of the survey, and provided information on the age and destination of the migration of the donors. This information was used to identify households with migrants[2]. Our analysis focuses on the labor market behavior of women 18 to 60 years of age. We define a woman to be participating in the labor market if she is involved in wage-earning activities.

[1] For detailed description of sample frame and survey methodology, see World Bank 2005 (this citation is missing in the References section at the end).
[2] Lokshin, Bonch-Osmolovskiy and Glinskaya (2007) discuss the possible biases from misclassification of households receiving remittances and households with migrants; they show that for Nepal these biases are relatively small.

3. Migration and Female Labor Force Participation in Nepal

Work-related migration has become a major factor affecting the economic development of Nepal during the last two decades. In 2004, close to a million Nepali migrants were working in India, countries of the Arab Gulf, South Asia, Western Europe, and North America. According to official sources, the amount of remittances received by Nepali households from abroad reached $1 billion, overflowing foreign exchange reserves and affecting the exchange rate and inflation. The amount of remittances coming through unofficial channels could be at least as large.

Thirty-two percent of households in Nepal had working migrants and received remittances in 2004 (World Bank 2005). An average amount of remittances received by households during the year prior to the survey amounted to about NPR 24,000, or 16 percent of mean household yearly consumption. Almost all (97 percent) of Nepali migrants are males, age 15 to 44, and the majority of migrants are either husbands or sons of household members receiving the remittances[3]. Most of the migrants come from rural areas. Only 13 percent of households based in the capital city of Katmandu have working migrants; the proportion of such households in rural areas of Nepal is twice as high. The propensity to migrate is higher among members of large households[4]. The proportion of households with migrants is the lowest among households of Newar and Janajati castes. On average, the amount of remittances received by households in Katmandu and other urban areas is double the amount received by rural households in Nepal.

The formal sector in Nepal accounts for less than 8 percent of total female employment. Over 70 percent of women workers are self-employed or confined to low-wage activities in the informal sector. In the urban areas, women are employed in a range of cottage industries such as carpet-weaving, textiles and handicrafts, as well as in occupations like vending, petty trade, brewing, and vegetable selling (UNDP 2004). In rural Nepal, women often work as hired agricultural labor or manual labor in construction

[3] The Nepal Foreign Employment Act of 1985 placed some restrictions on foreign work migration by women. It limited the overseas travel of single women and women under 35 years of age. The Act prohibits the foreign employment of women without special permission from the Government (Sanghera and Kapur 2000).

[4] All variables constructed using the household size for households with migrants are adjusted for the presence of would-be-migrants.

and forestry enterprises (Koolwal 2007). Women in Nepal lag far behind men in literacy rates and educational attainments: the gap between male and female literacy rates is about 28 percentage points and males receive almost twice as many years of schooling as females (World Bank 2005).

Figure 1 shows the age-gender pyramid for the Nepali population with superimposed proportions of individuals participating in the labor market. The pyramid shows that for ages 15 to 35, the number of females substantially exceeds the number of males. While multiple forces could be at play, work-related migration of males is clearly one of the strongest factors that influence this distribution. On average, 55 percent of adult males and 19 percent of females were engaged in market wage-earning activities in 2004. The largest proportion of workers was among respondents 20 to 35 years of age, with 58 percent being male and 22 percent female. Participation in market work by both genders declined with age.

The levels of market work participation (MWP) by prime-age females were different depending on whether the households they lived in had migrant members and received remittances or not. Figure 2 shows the estimated distribution of MWP by percentiles of per capita expenditure, net of women's market wages and by women's levels of education. On average, only 13 percent of women from households with migrants participated in the labor market compared with 21 percent of women who lived in households with no migrants. The gap in the level of MWP between these two groups was widening for households from the top percentiles of expenditure distribution. The right panel of Figure 2 shows the female rates of MWP by years of education. Better-educated women had a higher propensity to work. For all educational categories, except the highest, women from non-migrant households participated in the labor market at higher rates. MWP was least for women with only one to seven years of schooling.

4. Theoretical Framework and Empirical Strategy

In Nepal, work-related migration by a household member has to be planned ahead. Before migration takes place, multiple arrangements need to be made. For example, if traveling abroad, a migrant has to obtain an international passport, apply for a visa and

purchase a ticket. Thus, the decision to migrate for work and the actual event of migration taking place are separated in time. Once the decision is made, reversing it can often be costly for the household. The costs could come from fees to the migration broker, travel costs, a fixed contractual agreement between the migrant and the hiring agency, etc. (Bhattarai 2005). Therefore, usually, the worker has to migrate as planned, stay in the host country, and work. The decision taken by the household regarding migration, as well as the decision about the labor force participation of its members, can be modeled in a two-period optimization framework.

Consider a unitary model of a household composed of two spouses, with a utility function $U(C, L_m, L_f, \boldsymbol{X})$, where L_m and L_f are the leisure time of the husband and the wife respectively, and $\boldsymbol{X}$ is a vector of household characteristics. The household consumption C consists of goods purchased on the market and produced at home. The time available to spouses could be allocated to leisure, market work of a husband h_m^m at wage rate w_m, market work of a wife h_f^m at wage rate w_f, and the time spent on home production h_m^d and h_f^d. The technology of home production is described by a continuous, twice-differentiable function $f(h_m^d, h_f^d)$ such that $f_{1,2}^{'} > 0$, and $f_{1,2}^{''} < 0$.

Let us assume, because of specialization, the husband is more productive in the labor market and the wife has higher productivity at home. Assume also that the husband can migrate and earn wage rate $w_m^* > w_m$. Under these assumptions, the husband always works in the market $h_m^m > 0,\ h_m^d \geq 0$ (either in the native or host country), while the wife allocates her time between leisure, home production and market work ($h_f^m \geq 0,\ h_f^d > 0$)[5]. Let z define a set of regional factors affecting the costs of migration $P(z)$ ($P_z^{'} < 0$).

In time period 1, the household decides whether the husband should migrate or not. The household compares his utilities with and without migration, conditional on the expected distribution of wages in period 2 (the actual wages in period 2 are unknown in period 1). The expected values of indirect utility functions in period 2 could be expressed as:

[5] Nepali men migrate both within the country and abroad in search of work. To keep things simple, from now on, we will refer to the destination of migration as a host country or abroad.

$$\begin{aligned} &Migration: \quad E(V^1) = E(V^1(w_m^*, w_f, X, I - P(z))) \\ &No\,migration: \; E(V^0) = E(V^0(w_m, w_f, X, I)) \end{aligned} \tag{1}$$

where superscript 1 corresponds to a regime in which the husband migrates and 0 to a regime where the husband stays at home. The household sends the migrant if $E(V^1)>E(V^0)$.

In period 2, the household observes the realized labor market outcomes: the migrant, who is by now in the host country, informs the household about his wages, and conditions on the local market become known. With this information, the household decides about the market participation of the wife. The household optimization process can be expressed as utility maximization in two regimes, with and without migration:

Husband stays home	Husband migrates
$MaxU(C, L_m, L_f, X)_{\{C, L_m, L_f, h_m^m, h_f^m, h_m^d, h_f^d\}}$	$MaxU(C, \bar{L}_m, L_f, X)_{\{C, L_f, h_f^m, h_f^d\}}$
$s.t.\ C \le w_m h_m^m + w_f h_f^m + f(h_m^d, h_f^d) + I$	$s.t.\ C \le w_m^* \bar{h}_m^m + w_f h_f^m + f(0, h_f^d) + I$
$h_m^m + h_m^d + L_m = 1;\ \ h_f^m + h_f^d + L_f = 1$	$h_f^m + h_f^d + L_f = 1$

(2)

Assuming that market wage is determined by an exogenous return *r* on the human capital characteristics, such that $w = rf(X)$, we can derive, using Roy's Identity, demand functions for the hours the woman supplies on the labor market in both regimes:

$$H_s = H_s(X_h, X_w, X, I),\ s = 0,1 \tag{3}$$

In each regime, the utility optimization problem has interior and corner solutions for the wife's market hours. At the corner solution, the wife supplies zero hours on the market and spends her time on home production and leisure. At the interior solution, the wife allocates her time for market work, home production and leisure.

Standard test-table hypotheses can be derived from the comparative static of (1-2). The model predicts that a reduction in the cost of migration, *P*, and higher expected returns from migration, w_m^*, increase the probability of the household choosing to send the migrant. In both regimes, the market hours of the wife are a decreasing function of the household's non-labor income (which might include remittances); the effect of the wife's wages on market hours is undefined. The effect of the husband's migration on the wife's labor market behavior is determined by the interaction of income effects and the effect of the changes in the wife's productivity at home caused by the migration of her husband.

Higher wages received by the husband in the host country, which are transferred to his household in the form of remittances, induce his wife to consume more leisure. If the inputs of spouses in home production are complements ($f_{12}^{"} > 0$), the migration of the husband ($h_h^d = 0$) would decrease his wife's productivity at home[6]. In that case, the total effect of migration on female MWP would be ambiguous: while some women would enter the labor market and women who worked before their husbands migrated would work more hours, others would just enjoy more leisure. If, however, the inputs of the husband and wife are substitutes ($f_{12}^{"} < 0$), which is probably more likely in Nepal where a large share of household production is concentrated on work in subsistence agriculture (Kniesner 1976, Leeds and Allmen 2004), the migration of the husband would make the wife's work at home more valuable and she would reduce her time on the market (Paris, Singh, Luis, and Hossain 2005). Some women would withdraw completely from market work. In that case, we would expect to observe lower levels of MWP among women living in sending households.

Empirical specification

Our theoretical model motivates the empirical estimation strategy. Let the market wage of a husband, w_h, and a wife, w_w, be determined as a linear combination of their productive characteristics. From (1), the reduced linearized form of the latent differential of indirect utility functions for migration and no-migration is:

$$D_i^* = [V_{1i} - V_{0i}] = [\gamma_1 Z_i - \gamma_0 Z_i + \mu_{1i} - \mu_{0i}] = \gamma Z_i + \mu_i \quad (4)$$

where γ is a vector of parameters, μ_i is an error term such that $\mu_i \mid Z_i \sim N(0,1)$, and vector Z_i includes variables on the productive characteristics of a husband and a wife, household characteristics, characteristics of the local labor market, and the variables determining cost of migration. Then the observed migration status of a husband M_i in period 1 can be expressed as[7]:

[6] We assume that hiring perfect substitutes for the labor of family members who migrate might be very costly to households (Pfeiffer and Taylor 2007).

[7] The existence of the regime switching point ($D^*=0$) follows from Brouwer's fixed-point theorem, given the boundedness conditions, as long as D^* is continuous (e.g., Border 1985).

$$M_i = 1[D_i^* \geq 0] = 1(\gamma Z_i + \mu_i \geq 0) \quad (5)$$

where 1[.] is an indicator function. From (3), the number of hours a wife supplies on the market could be expressed in a linearized form as:

$$H_{ij} = \beta_j X_{iw} + \nu_{ij};\ j = 0,1 \quad (6)$$

where β_j is a regime-specific vector of parameters, X_i is a vector of individual characteristics of a wife, household characteristics, and characteristics of locality, and ν_{ij} are the regime-specific error terms, such that $E(\nu_{ij} \mid X_i, M_i) \neq 0$. Let the W_{ij} be the observed market work status of a wife in period 2, such that:

$$W_{ij} = 1[H_{ij} \geq 0] = 1(\beta_j X_{iw} + \nu_{ij} \geq 0);\ j = 0,1 \quad (7)$$

We assume that the error terms $(\mu_i, \nu_{i0}, \nu_{i1})$ in (4) and (6) are jointly normally distributed with a zero-mean vector and covariance matrix:

$$\Sigma = \begin{pmatrix} 1 & \rho_{\mu 0} & \rho_{\mu 1} \\ & 1 & \rho_{10} \\ & & 1 \end{pmatrix}, \quad (8)$$

where $\rho_{\mu 0,1}$ are the correlations between μ and ν_0, and ν_1, and ρ_{01} is a correlation between ν_0 and ν_1. Since W_{i1} and W_{i0} are never observed simultaneously, the joint distribution of (ν_{i0}, ν_{i1}) is not identified and, consequently, ρ_{10} cannot be estimated. Then, the log-likelihood function for the simultaneous system of equations (5 and 7) is:

$$\begin{aligned} Ln(\Im) = & \sum_{M_j \neq 0, W_j \neq 0} \ln\left\{\Phi_2(x_j\beta_1, z_j\gamma, \rho_{\mu 1})\right\} + \sum_{M_j \neq 0, W_j = 0} \ln\left\{\Phi_2(-x_j\beta_1, z_j\gamma, -\rho_{\mu 1})\right\} + \\ & \sum_{M_j = 0, W_j \neq 0} \ln\left\{\Phi_2(x_j\beta_2, -z_j\gamma, -\rho_{\mu 0})\right\} + \sum_{M_j = 0, W_j = 0} \ln\left\{\Phi_2(-x_j\beta_2, -z_j\gamma, \rho_{\mu 0})\right\} \end{aligned} \quad (9)$$

where Φ_2 is the cumulative function of a bivariate normal distribution.

This switching probit model (e.g., Carrasco 2001, Cappellari 2002) can be used to generate the counterfactual probabilities for women in different regimes of migration and market work participation. We define the impact of migration on the level of women's MWP as a treatment effect, following the methodological framework developed by Aakvik, Heckman, and Vytlacil (2000). Then, the effect of migration on working women in sending households can be interpreted as the effect of treatment on the treated (ATT):

$$ATT(x) = \Pr[W_1 = 1 \mid M = 1, X = x] - \Pr[W_0 = 1 \mid M = 1, X = x]$$
$$= \frac{\Phi_2[x\beta_1, z\gamma, \rho_{\mu 1}] - \Phi_2[x'\beta_2, z\gamma, \rho_{\mu 0}]}{\Phi_2[z\gamma]} \quad , \quad (10)$$

where *x'* indicates that the household characteristics are adjusted for the presence of would-be-migrants in the counterfactual scenario of no migration. The ATT is the difference between the predicted probability of MWP for a woman currently residing in a household with a migrant and the probability for that woman working had the household decided not to send a migrant.

The effect of male migration on the probability of working by a woman randomly selected from the population can be expressed as the average treatment effect (ATE):

$$ATE(x) = \Pr[W = 1 \mid X = x] - \Pr[W = 0 \mid X = x] = \Phi[x\beta_1] - \Phi[x\beta_2] \quad (11)$$

The effect of male migration on female MWP can vary for households with different observed (X) and unobserved (μ) characteristics. To account for the unobserved heterogeneity we estimated the Marginal Treatment Effect (MTE) – the framework introduced by Bjorklund and Moffit (1987) and developed by Heckman and Vytlacil (1999, 2000, 2001, and 2005). The MTE identifies the effect of male migration on households induced to change the working status of their females because of migration. The MTE can be expressed as:

$$MTE(x, \mu) = \Pr[W_1 = 1 \mid X = x, \mu = \bar{\mu}] - \Pr[W_0 = 1 \mid X = x, \mu = \bar{\mu}]$$
$$= \Phi\left[\frac{x\beta_1 + \rho_{\mu 1}\mu}{\sqrt{1-\rho_{\mu 1}^2}}\right] - \Phi\left[\frac{x\beta_2 + \rho_{\mu 0}\mu}{\sqrt{1-\rho_{\mu 0}^2}}\right] \quad (12)$$

The schematic diagram of the switching probit model of male migration and female market work participation is shown in Figure 3.

Identification strategy

The system of equations (5) and (7) is identified by non-linearities even if variables in ***X*** and ***Z*** overlap completely. To improve the efficiency and computational stability of the estimates, we imposed stronger identification restrictions on the model by including variables that, we believe, influence the household's migration decision but have no

direct impact on the MWP decision. Causal effects of migration could be identified by a variation in the instrumental variables since the effect of this variation is entirely channeled through the household's migration decision. We used information from the 2001 Nepal Census Data (Central Bureau of Statistics 2003) to construct two instrumental variables: the proportion of internal and abroad migrants in a ward (village) in 2001. We argued that the women's decisions to participate in market work in 2004 should not be directly affected by the extent of migration networks in 2001, after controlling for the then current conditions on the local labor market. Studies of the Nepali labor market indicate that female and male labor markets are segmented and the rates of female paid employment are only marginally affected by changes in labor market conditions for males (Acharya 2003, Bhatt and Bhattarai 2006).

The proportion of migrants in a ward in 2001 could be interpreted as a proxy for the ward-level networks that help future migrants to migrate (e.g., Carringon, Detragiache, and Vishwanath 1996; Munshi 2003). When in the host country, Nepali migrants develop extensive social and information networks that link them with relatives and friends in the home country (Yamanaka 2000). Such networks lower the cost of migration for the population of a ward. Indeed, in Nepal, migrants tend to follow their co-villagers and migrate to the same destinations (Thieme 2006). They also are likely to fill a similar niche in the labor market. The identification strategies that use migrant networks as instruments for migration decisions were applied by Woodraff and Zenteno (2001) and McKenzie and Rapoport (2005) in studies of migration in Mexico.

Explanatory variables

Our theoretical model guided us on selecting the explanatory variables for the empirical specification. Conceptually, these variables can be grouped into four categories. The first group of variables contains those characteristics of a woman that determine her market productivity: her age (experience) and educational level dummies. The second group includes variables that could affect the home productivity of household members. Among such variables are household demographic composition and the size of the land plot owned by the household. The third group includes variables describing ethnicity, religion and household non-wage income. The household non-wage income is a sum of all

government and private transfers--such as pensions, scholarships and stipends--that could be considered exogenous to the household migration or labor force participation decisions. Finally, a set of variables describing the regional and ward characteristics includes variables reflecting labor market conditions in a ward.

The descriptive statistics for the main explanatory variables used in our analysis are reported in Table 1. The characteristics of women living in migrant sending and non-sending households are similar. Among the differences, women residing in non-sending households seem to be better educated. Migrant sending households are, on average, smaller, have a higher share of adult males (adjusted for the number of current migrants), possess larger land plots, and have higher non-wage incomes. The comparison of characteristics of women who participate in the labor market with non-working women demonstrates that working women are better educated, less likely to be married, and reside in smaller households and in households with a smaller proportion of adult women. Brahmin, Chhetri and Newar households are less likely to have their women working on the market compared with other castes. Land ownership has a strong negative effect on the probability of women participating in the labor market: women living in landless households are almost three times as likely to work for wages compared with women from households with less than one hectare of land. The gap between these women and the number of working women belonging to households that own larger land plots is even greater. Women living in Katmandu and other urban areas of Nepal are more likely to work for wages than women from rural Nepal.

5. Results

The results of the joint estimation of equations (5) and (7) are shown in Table 2[8]. The coefficients on the main explanatory variables affecting household migration and

[8] According to the likelihood-ratio test criterion, the specification that assumes an independence of the error terms in equations 5 and 7 (Table A1 in Appendix) is rejected in favor of the SPFIML estimation. The results of estimation of equations 5 and 7, under assumption of independence of the error terms between these two systems, are shown in Appendix.

The Wald tests show that the estimated $\rho_{\mu 0}$ is statistically significant with ($\chi^2(1)=4.03$) and $\rho_{\mu 0}$ is statistically significant with ($\chi^2(1)=3.88$); two ρ's are jointly significant. The Wald test also rejects the hypothesis that $Cov[\mu, v_1 - v_0] = 0$.

woman's market work participation decisions correspond well with the predictions of our theoretical model. Households in wards with a higher proportion of migrants in 2001 were more likely to send their male members to work.

Overall, the observed household characteristics, in particular geographical and ward characteristics, play a more important role in determining the level of MWP by women in non-migrant sending households compared with women residing in migrant sending households. While a household's human and productive capital have a strong effect on women's MWP in households without migrants, these factors become less important for households that have sent migrants--where remittances contribute a significant share to the household budget.

The level of MWP increases with age for women living in both sending and non-sending households. Married women and women with 11 or more years of education are more likely to work for wages. Household non-wage income negatively affects the likelihood of market employment of women from non-sending households. The effect of non-wage income on MWP of women living in sending households is insignificant. Household composition seems to affect the MWP of women in non-sending households. Relative to other ethnic groups, Dalit and Muslim households have a higher probability of their women working. These results are consistent with the findings of other studies which demonstrate that women from Indo-Aryan communities that follow Hinduism and are disposed toward patriarchy are less likely to work for pay. At the same time, primary Buddhists, Tibeto-Burman and Muslim communities offer much greater social and economic mobility to their women (Raghuram 2001, Koolwal 2007). Households with large land plots are less likely to have their female members working outside the home, regardless of whether male household members migrate or not. This can be attributed to the economies of scale in agricultural home production which increase women's productivity when they work on larger land plots. Compared with women living in Katmandu, women residing in other urban areas of Nepal and in Rural Western Terai have a lower propensity to participate in market work.

Finally, certain local conditions are significantly correlated with levels of female MWP. Women from non-migrant sending households, living in wards with a high proportion of illiteracy, are significantly less likely to work on the market compared with

women in wards with better-educated populations. Higher shares of wage- and self-employed in wards have a positive impact on MWP by women from households with no migrants in these wards. The effects of local labor market conditions on the MWP of women residing in migrant sending households are insignificant.

To ascertain the validity of our instruments, we conducted a range of diagnostic tests. The Sargan's test (Sargan 1958) did not reject ($Prob> \chi^2(1)=0.353$) the null hypothesis that the excluded instruments are uncorrelated with the error terms and correctly excluded from the estimated equation. We investigated the potential problem of having weak instruments by adopting the test by Stock and Yogo (2005). We calculated the value of Cragg-Donald (CD) Wald **F** statistic by regressing a woman's MWP on a set of her characteristics, an instrumental variable, and an endogenous dummy for having a migrant from the household. The hypothesis of weak instruments was rejected with the CD **F** statistic of 20.39, and the critical values of Stock-Yogo test of 19.93 for 10 percent size of the Wald test.

Simulations

We simulated the impact of male migration on women's MWP according to (10). Women living in migrant sending households had 5.4 percentage points (bootstrap standard error of 1.3)[9] or about 40 percent lower probability of participating in market work compared with the counterfactual scenario of women living in non-sending households–this is the ATT effect. The specification where the migration dummy was included directly into the MWP equation (the un-instrumented probit estimates shown in Table A2 in the Appendix) resulted in ATT of –5.6 percentage points (bootstrap standard error of 1.8). The magnitude of these effects is similar to those found by Kim (2007) in Jamaica. At the same time, the effect of male work-related migration on the MWP of a woman randomly selected from the population (ATE) was positive and statistically not different from zero. In comparison, the raw difference in rates of MWP was –8.4 (standard error of 1.1)

[9] The simulated probabilities are generated for each household by integrating over the estimated heterogeneity distribution and averaging the probabilities across the sample. The standard errors of the predicted probabilities are calculated by bootstrapping.

$(\text{Prob}(W_1 \mid M = 1) - \text{Prob}(W_0 \mid M = 0) = -8.4))$, suggesting that controlling for selection appeared to be important in these data.

We can also simulate the heterogeneity of the effect of male migration on female MWP by observable characteristics. These simulations are shown in the first column of Table 3. The largest negative impact of male migration is registered for women 25 to 35 years of age whose level of MWP would increase by 6.9 percentage points if male migrants were to stay at home. The detrimental effect of male migration on female MWP increases with the number of years of a woman's education. The rate of MWP by women with 11 or more years of schooling is 15.4 percentage points lower than it would be in the counterfactual scenario. The work patterns of women residing in Katmandu and other urban areas of Nepal, as well as those of women living in landless households, are affected by male migration to a greater degree than those of women living in households with large land-holdings and in rural areas. We can speculate that such differences could be explained by the differences in the technology of home production. In households with large land plots, women might be able to substitute, to some extent, the inputs of now migrant male labor by hired labor, thus lowering the impact of male migration on their productivity at home. The home production of landless households is likely to be related to child rearing and tending for elderly household members--activities for which finding a paid substitute is difficult.

The heterogeneity of the effect of migration by unobservable characteristics can be investigated using the MTE framework. Figure 4 plots the MTE against the normalized values of unobservables (μ) at the population means for X's according to (12). The estimate of MTE is monotonically decreasing in μ, indicating that households that are more likely to send one of their male members to work are also more likely to withdraw their female members from the labor market. The fact that the MTE is not flat confirms the presence of unobserved heterogeneity in the impact of migration on women's MWP.

The estimated correlations of error terms in (4) and (6) demonstrate the perverse selection on unobservables: for households sending migrants, unobservables that positively affect the probability of sending a migrant for work have a negative impact on the probability of a woman to participate in the labor market ($Corr(\mu, v_1) = -0.290$). At

the same time, for households with no migrants, the unobservables promoting migration are positively correlated with woman's employment ($Corr(\mu, v_0) = 0.256$). Thus, higher values of μ are correlated with lower value of v_1 and with higher values of v_0, so that the impact of migration on labor force participation of women is lower for the households with high μ (who are more likely to have a working migrant).

There are several qualifications to and possible caveats in our results. First, our results are obtained using the 2004 cross-sectional data. Without panel data we have no instruments to control for possible household- or community-level endogeneity. In this sense, our estimations of the impact of work-related migration are valid only to the extent that unobserved family and community characteristics are captured by the variables included in our empirical specification. Second, while the majority of women in our sample are wives of migrants, some are daughters and other relatives of migrants. The effect of male migration might be different depending on whether the migrants are husbands, fathers, brothers or some other relative of the women in the sending households. Our analysis fails to capture this heterogeneity. Finally, we focus only on the direct impact of male migration for work on the labor market behavior of women in sending households. At the same time, male migration for work may also affect the aggregate labor market conditions in the sending communities. Accounting for the general equilibrium consequences of work-related migration might reduce its estimated impact on the MWP of females left behind.

6. Conclusions

This paper examines the extent to which male migration for work affects labor force participation by prime age females in Nepal. The theoretical model developed in this paper predicts that male migration for work might have two main effects on the MWP of the women in the sending households. First, the increase in household income due to remittances from the migrants might lead to a reduction in the rates of MWP by the women. Second, depending on the properties of the home production function, male migration can increase or decrease women's productivity at home, thus having an ambiguous effect on their MWP. The overall effect of male migration on women's MWP

depends on the interaction of these factors. We tested this relationship using data from a nationally-representative household survey for Nepal. We compared the observed rates of MWP of women living in households that had sent migrants with the rates simulated under a counterfactual scenario of no migration. To construct these counterfactuals we estimated a model of household male migration and female MWP decisions, identifying observed and unobserved differences in the returns to characteristics based on migration status.

The results of our simulations show that the migration of male household members reduces women's rates of MWP by 5.4 percentage points. The effect of male migration is strongest for women 25 to 35 years of age and for women with 11 or more years of education. The income effect of remittances from migrants and the substitutability of male and female time inputs in home production might explain the stronger impact of male migration on the MWP of women residing in landless households and in urban areas of Nepal. The MWP of women living in households with large landholdings is affected by male migration to a lesser degree, suggesting that in such households, males and females might complement each other in home production. We find evidence of substantial heterogeneity (based both on observable and unobservable characteristics) in the impact of male migration.

Work-related migration is already high in Nepal and will most likely continue rising in response to the economic incentives offered by neighboring countries. Our findings highlight the gender dimension of the impact of predominantly male work migration on the wellbeing of sending households. The effect of male migration on the work pattern of women left behind has important implications for the latter's overall social status and might influence the outcomes of other household members, particularly children. Hence, strategies for economic development in Nepal should take into account such gender aspects of the migration dynamics.

References

Aakvik, A., Heckman, J., and E. Vytlacil. 2000. Treatment Effect for Discrete Outcomes when Responses to Treatment Vary Among Observationally Identical Persons: An Application to Norwegian Vocational Rehabilitation Programs. NBER Technical Paper #262. NBER, Cambridge, MA.

Acharya, M. 2003. Efforts at Promotion of Women in Nepal. Report. Tanka Prasad Acharya Foundation, Kathmandu, Nepal.

Acosta, P. 2006. Labor Supply, School Attendance, and Remittances from International Migration: the Case of El Salvador. World Bank Policy Research Paper #3903. World Bank.

Amuedo-Dorantes, C., and S. Pozo. 2006. "Migration, Remittances, and Male and Female Employment Patterns." American Economic Review Vol. 96(2): 222-226.

Basmann, R. 1960. "On Finite Sample Distributions of Generalized Classical Linear Identifiability Test Statistics." Journal of the American Statistical Association Vol. 55(292): 650-59.

Bhatt, S. and E. Bhattarai. (2006. "WTO Membership and Nepalese Women." South Asian Journal Vol. 13. (Web issue: /www.southasianmedia.net/magazine).

Bhattarai, P. 2005. Migration of Nepalese Youth for Foreign Employment: Problems and Prospects. Report. Youth Action, Katmandu, Nepal.

Bjorklund, A. and R. Moffitt. 1987. "The Estimation of Wage Gains and Welfare Gains in Self-Selection Models." Review of Economics and Statistics Vol. 69: 42-49.

Border, K. 1985. Fixed Point Theorems with Applications to Economics and Game Theory. Cambridge, United Kingdom: Cambridge UP

Brown, R., and J. Connell.1993. "The Global Flea Market: Migration, Remittances and the Informal Economy in Tonga." Development and Change Vol. 24:611-647.

Cabegin, E. 2006. The Effect of Filipino Overseas Migration on the Non-Migrant Spouse's Market Participation and Labor Supply Behavior. IZA Discussion Paper Series #2240. IZA, Bonn, Germany.

Carrasco, R. 2001. "Binary Choice with Binary Endogenous Regressors in Panel Data: Estimating the Effect of Fertility on Female Labor Participation." Journal of Business & Economic Statistics Vol. 19(4): 385-394.

Cappellari, L. 2002 "Do the "Working Poor' Stay Poor? An Analysis of Low Pay Transitions in Italy." Oxford Bulletin of Economics and Statistics Vol. 64(2): 87-110.

Carrington, W., Detragiache, E., and T. Vishwanath. 1996. "Migration with Endogenous Moving Costs." American Economic Review Vol. 86: 909–930.

Central Bureau of Statistics. 2003. Population Census 2001: National Report. Central Bureau of Statistics, Katmandu, Nepal.

Crummet, M. 1987. "Rural Women and Migration in Latin America." Rural Women and State Policy: Feminists Perspectives on Latin America Agricultural Development. Ed. C. Deere and M. Leon de Leal. Bolder, CO: Westview Press.

Deere, C., and M. Leon de Leal. 1987. Rural Women and State Policy: Feminists Perspectives on Latin America Agricultural Development. Bolder, CO: Westview Press.

Itzigsohn, J. 1995. “Migrant Remittances, Labor Markets, and Household Strategies: A Comparative Analysis of Low-Income Household Strategies in the Caribbean Basin.” Social Forces Vol. 74(2): 633-655.

Heckman, J. and E. Vytlacil. 1999. “Local Instrumental Variable and Latent Variable Models for Identifying and Bounding Treatment Effects.” Proceedings of the National Academy of Sciences. Vol. 96: 4730-4734.

Heckman, J. and E. Vytlacil. 2000. “Local Instrumental Variables.” Nonlinear Statistical Modeling: Proceedings of the Thirteenth International Symposium in Economic Theory and Econometrics: Essays in Honor of Takeshi Amemiya. Ed. C. Hsiao, K. Morimune and J. Powells. Cambridge University Press. 1-46.

Heckman, J. and E. Vytlacil. 2001. “Policy Relevant Treatment Effects.” American Economic Review Vol. 91(2): 107-111.

Heckman, J. and E. Vytlacil. 2005. “Structural Equations, Treatment, Effects andEconometric Policy Evaluation.” Econometrica Vol. 73(3): 669-738.

Hildebrandt, N. and D. McKenzie. 2004. “The Effects of Migration on Child Health in Mexico.”Economia Vol 6 (1): 257–289.

Kanaiaupuni, S. 2000. Sustaining Families and Communities: Nonmigrant Women and Mexico-U.S Migration Process. Working Paper #2000-13. Center for Demography and Ecology, University of Wisconsin, Madison.

Kim, N. 2007. The Impact of Remittances on Labor Supply: The Case of Jamaica. World Bank Policy Research Paper #4120. World Bank.

Kniesner, T. 1976. "An Indirect Test of Complementarity in a Family Labor Supply Model," Econometrica, Vol. 44(4): 651-69

Koolwal, G. 2007. “Son Preference and Child Labor in Nepal: The Household Impact of Sending Girls to Work.” World Development Vol. 35(5): 881-903.

Leeds, M. and P. von Allmen. (2004). “Spousal Complementarities in Home Production. American Journal of Economics and Sociology, Vol. 63(4): 795-812.

Lokshin, M., Bonch-Osmolovskiy, M. and E. Glinskaya. 2007. Work-related Migration and Poverty Reduction in Nepal. World Bank Policy Research Working Paper #4231. World Bank.

Louhichi, K. 1997. “The Impact of the Emigration of the Husband on the Status of the Wife: The Case of Egypt.” Women and Families: Evolution of the Status of Women as Factor and Consequence of Changes in Family Dynamics. Ed. M. E. Cosio-Zavala. Paris: CICRED. 323-339.

McKenzie, D. and H. Rapoport. 2005. “Migration Networks, Migration Incentives, and Education Inequality in Rural Mexico.” Paper presented at the Inter-American Development Bank conference on Economic Integration, Remittances, and Development.

Munshi, K. 2003. “Networks in the Modern Economy: Mexican Migrants in the U. S. Labor Market.” Quarterly Journal of Economics Vol. 118 (2): 549–599.

Nandini, A. 1999. Engendered Mobilization – the Key to Livelihood Security: IFAD’s Experience in South Asia. Rome: IFAD.

Paris, T., Singh, A., Luis, J. and M. Hossain. 2005. “Labor Outmigration, Livelihood of Rice Farming Households and Women Left Behind: A Case Study in Eastern Uttar Pradesh.” Economic and Political Weekly. June 18

Pfeiffer, L. and E. Taylor. 2007. “Gender and the Impacts of International Migration: Evidence from Rural Mexico.” Women in International Migration. Ed. Morrion, A., Schiff, M. and M. Sjoblom. The World Bank and Palgrave Macmillan.

Rodriguez, E. and E. Tiongson. 2001 “Temporary Migration Overseas and Household Labor Supply: Evidence from Urban Philippines.” International Migration Review Vol. 35(3): 709-725.

Raghuram, P. 2001 "Caste and Gender in the Organization of Paid Domestic Work in India." Work Employment and Society Vol. 15(3): 607-617.

Sadiqi, F. and M. Ennaji. 2004. “The Impact of Male Migration from Morocco to Europe on Women: a Gender Approach.” Finisterra Vol. XXXIX (77): 59-76

Sanghera, J. and R. Kapur. 2000. Trafficking in Nepal: Policy Analysis. The Asia Foundation, Katmandu, Nepal.

Sargan, J. 1958. “The Estimation of Economic Relationships Using Instrumental Variables.” Econometrica Vol. 26: 393-415.

Sharma, K. 1986. “Bondages of Nepalese Women.” Community Development Journal Vol. 21: 62-65.

Stock, J. and M., Yogo. 2005. “Testing for Weak Instruments in Linear IV Regression.” Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg. Ed. D.W.K. Andrews and J.H. Stock. Cambridge: Cambridge University Press. 80–108.

Thieme, S. 2005. *Social Networks and Migration: Far West Nepalese Labor Migrants in Delhi*, LIT Verlag Berlin-Hamburg-Münster

United Nation Development Program. 2004. Nepal Human Development Report 2004: Empowerment and Poverty Reduction. United Nation Development Program, Katmandu, Nepal.

World Bank. 2005 Resilience Amidst Conflict: an Assessment of Poverty in Nepal 1995-96 and 2003-04. Report. South Asia Poverty Reduction and Economic Management, The World Bank

Woodruff, C. and R. Zenteno 2001. *Remittances and micro-enterprises in Mexico*, Mimeo, University of California at San Diego.

Yamanaka, K. 2000. Nepalese Labour Migration to Japan: From global warriors to global workers. Ethnic and Racial Studies Vol. 23(1): 62-93.

Zachariah, K. and I. Rajan. 2001. “Impact of Migration on Kerala's Economy and Society.” International Migration Vol. 39(1): 63-88.

Table 1: Descriptive statistics for the main variables

	Women from households with migrants		Women from households with no migrants		Women working on the market		Women who do not work on the market	
	Mean	Std. Error	Mean	Std. Error	Mean	Std. Error	Mean	Std. Error
Participate in wage work	0.127	*0.008*	0.211	*0.007*				
Live in household with migrants					0.214	*0.412*	0.335	*0.472*
Age	34.542	*12.825*	34.521	*11.799*	34.045	*10.565*	34.637	*12.453*
Married	0.806	*0.010*	0.812	*0.006*	0.782	*0.013*	0.817	*0.006*
Illiterate	0.614	*0.012*	0.612	*0.008*	0.537	*0.016*	0.630	*0.007*
1-4 years of schooling	0.100	*0.007*	0.102	*0.005*	0.109	*0.010*	0.100	*0.005*
5-7 years of schooling	0.099	*0.007*	0.084	*0.005*	0.090	*0.009*	0.089	*0.004*
8-10 years of schooling	0.152	*0.009*	0.135	*0.006*	0.159	*0.012*	0.136	*0.005*
11+ years of schooling	0.035	*0.004*	0.066	*0.004*	0.106	*0.010*	0.045	*0.003*
Household nonwage income	0.609	*4.585*	0.508	*3.065*	0.305	*1.708*	0.593	*3.912*
Household size	5.835	*2.952*	6.267	*3.189*	5.536	*2.537*	6.268	*3.226*
Share of adult men	0.325	*0.003*	0.277	*0.002*	0.282	*0.005*	0.294	*0.002*
Share of elderly	0.320	*0.003*	0.337	*0.002*	0.347	*0.005*	0.328	*0.002*
Share of women	0.152	*0.003*	0.157	*0.003*	0.137	*0.005*	0.160	*0.002*
Share of children 0-6	0.165	*0.004*	0.192	*0.003*	0.199	*0.006*	0.180	*0.003*
Share of children 7-15	0.033	*0.002*	0.036	*0.001*	0.033	*0.003*	0.036	*0.001*
Male headed household	0.643	*0.012*	0.903	*0.005*	0.779	*0.013*	0.831	*0.006*
Brahman/Chhetri	0.355	*0.012*	0.285	*0.007*	0.212	*0.013*	0.329	*0.007*
Dalits	0.084	*0.007*	0.068	*0.004*	0.074	*0.008*	0.072	*0.004*
Newars	0.065	*0.006*	0.150	*0.006*	0.233	*0.013*	0.098	*0.004*
TeraiMC	0.255	*0.011*	0.247	*0.007*	0.210	*0.013*	0.259	*0.007*
Muslims, other	0.241	*0.010*	0.250	*0.007*	0.271	*0.014*	0.242	*0.006*
Hindu household	0.829	*0.009*	0.817	*0.006*	0.808	*0.012*	0.824	*0.006*
Landless households	0.372	*0.012*	0.471	*0.008*	0.694	*0.015*	0.383	*0.007*
Own less than 1 ha of land	0.377	*0.012*	0.314	*0.008*	0.234	*0.013*	0.357	*0.007*
Own 1ha to 2 ha of land	0.159	*0.009*	0.141	*0.006*	0.050	*0.007*	0.169	*0.006*
Own more than 2 ha of land	0.091	*0.007*	0.073	*0.004*	0.022	*0.005*	0.092	*0.004*
Katmandu	0.038	*0.007*	0.144	*0.004*	0.226	*0.005*	0.082	*0.004*
Other urban areas	0.185	*0.009*	0.187	*0.006*	0.221	*0.013*	0.178	*0.006*
Rural Western Hills	0.239	*0.010*	0.150	*0.006*	0.097	*0.009*	0.196	*0.006*
Rural Eastern Hills	0.169	*0.009*	0.193	*0.006*	0.148	*0.011*	0.194	*0.006*
Rural Western Terai	0.117	*0.008*	0.118	*0.005*	0.064	*0.008*	0.130	*0.005*
Rural Eastern Terai	0.250	*0.011*	0.208	*0.007*	0.244	*0.014*	0.216	*0.006*
Percent of migrant population	0.139	*0.004*	0.091	*0.002*	0.091	*0.004*	0.109	*0.002*
Number of observations	1,694		3,732		1,004		4,422	

Table 2: FIML Estimation of the Endogenous Switching Probit Model

	MWP equation. Households					
	with no migrant		*with migrant*		*Migration decision*	
	Coeff.	*Std. Err*	Coeff.	*Std. Err*	Coeff.	*Std. Err*
Age	0.064***	*0.017*	0.110***	*0.031*	-0.042***	*0.013*
Age squared/100	-0.001***	*0.000*	-0.002***	*0.000*	0.001***	*0.000*
Married	-0.090	*0.080*	-0.365***	*0.135*	0.202***	*0.064*
Educational category (reference: Illiterate)						
1-4 years of schooling	0.112	*0.085*	-0.292*	*0.172*	0.004	*0.071*
5-7 years of schooling	0.019	*0.094*	0.077	*0.167*	0.071	*0.075*
8-10 years of schooling	0.076	*0.085*	0.026	*0.163*	0.153**	*0.072*
11+ years of schooling	0.327***	*0.119*	0.818***	*0.263*	0.032	*0.120*
Currently in school	-0.435***	*0.142*	-0.793***	*0.304*	0.032	*0.119*
Household characteristics						
Household non-wage income	-0.052***	*0.014*	-0.014	*0.015*	0.002	*0.005*
Household size	0.007	*0.029*	0.072	*0.083*	-0.082***	*0.022*
Household size squared	-0.000	*0.001*	-0.004	*0.005*	0.002**	*0.001*
Share of adult men	0.109	*0.327*	-0.684	*0.790*	-1.042***	*0.256*
Share of elderly	1.672***	*0.429*	0.753	*1.667*	-4.700***	*0.244*
Share of women	0.466	*0.299*	-0.143	*0.907*	-2.505***	*0.186*
Share of children 0-6	1.088***	*0.265*	-0.001	*0.895*	-2.453***	*0.172*
Share of children 7-15	0.059	*0.169*	0.068	*0.482*	-1.466***	*0.059*
Male-headed household	-0.239**	*0.094*	-0.424	*0.269*	0.685***	*0.067*
Ethnicity (reference:Brahman/Chhetri)						
Dalits	0.223**	*0.108*	0.424**	*0.166*	-0.090	*0.083*
Newars	0.477***	*0.088*	0.497***	*0.184*	-0.259***	*0.085*
TeraiMC	0.402***	*0.080*	0.197	*0.138*	-0.108*	*0.059*
Muslims, other	0.261***	*0.081*	0.361**	*0.141*	-0.122**	*0.062*
Hindu households	0.022	*0.069*	0.253*	*0.133*	-0.106*	*0.058*
Land ownership (reference: Landless households)						
Own less than 1 ha of land	-0.429***	*0.079*	-0.685***	*0.124*	0.024	*0.065*
Own 1 ha to 2 ha of land	-0.832***	*0.111*	-1.114***	*0.195*	0.002	*0.078*
Own more than 2 ha of land	-1.106***	*0.155*	-0.869***	*0.219*	0.196**	*0.093*
Regional Dummies (reference: Kathmandu)						
Other urban areas	-0.135	*0.101*	0.062	*0.357*	0.748***	*0.101*
Rural Western Hills	-0.060	*0.149*	0.487	*0.451*	0.778***	*0.132*
Rural Eastern Hills	0.359***	*0.138*	0.865**	*0.376*	0.579***	*0.129*
Rural Western Terai	0.074	*0.147*	0.669*	*0.406*	0.716***	*0.128*
Rural Eastern Terai	0.498***	*0.148*	0.899**	*0.451*	0.927***	*0.121*
Ward characteristics						
Percent of illiterate	-1.164***	*0.175*	-0.807***	*0.284*	0.182	*0.131*
Percent of wage employment	1.629***	*0.306*	0.431	*0.517*	0.153	*0.241*
Percent of self-employed	0.548**	*0.218*	-0.082	*0.350*	0.416***	*0.149*
Percent of abroad migrants					0.887***	*0.152*
Percent of domestic migrants					0.260	*0.231*
Constant	-2.776***	*0.518*	-2.940***	*0.768*	2.660***	*0.316*
Number of observations	5,426					
Log-likelihood	-4855.13					

Note: * is significant at 10 percent level; ** at 5 percent level; *** at 1 percent level. The standard errors are adjusted for clustering on a ward level.

Table 3: Simulated Effect of Migration on Level of MWP of Women in Migrant Sending Households (by characteristics of women and household characteristics)

	(ATT)	**(ATE)**
Age category		
18-25	-5.303	0.815
25-35	-6.874	-0.767
35-45	-3.548	2.020
45-60	-1.670	1.551
Education category		
Illiterate	-3.915	0.918
1-4 years of schooling	-7.798	-6.307
5-7 years of schooling	-6.120	0.915
8-10 years of schooling	-7.834	-0.995
11+ years of schooling	-15.410	7.834
Regions		
Katmandu	-18.129	-6.942
Other urban areas	-9.405	0.787
Rural Western Hills	-0.898	1.402
Rural Eastern Hills	-6.001	-0.535
Rural Western Terai	-1.684	2.776
Rural Eastern Terai	-5.294	2.053
Ethnicity		
Brahman/Chhetri	-2.787	1.291
Dalit	-1.360	0.724
Newars	-1.706	4.622
TeraiMC	-9.956	-3.072
Muslim, other	-5.876	1.754
Landholding		
Landless households	-9.545	0.554
Own less than 1 ha of land	-3.561	-0.363
Own 1 ha to 2 ha of land	-3.088	-0.345
Own more than 2 ha of land	-1.790	2.967
Total	-5.44	-0.03

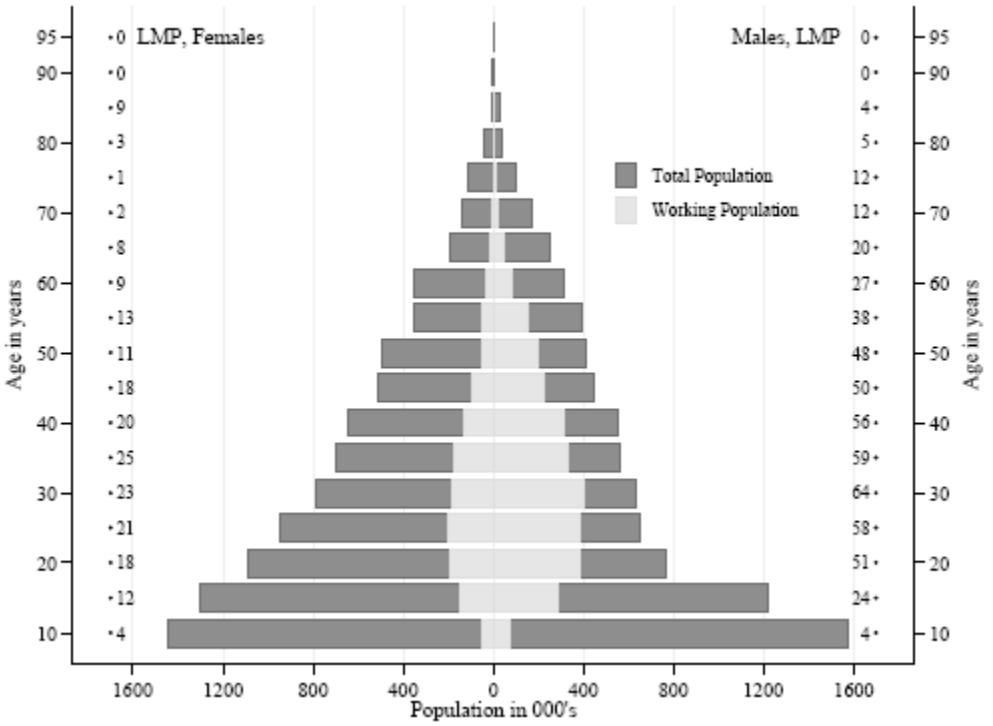

Figure 1: Age-gender Population Pyramid with Superimposed Rates of MWP for Males and Females. Nepal 2004.

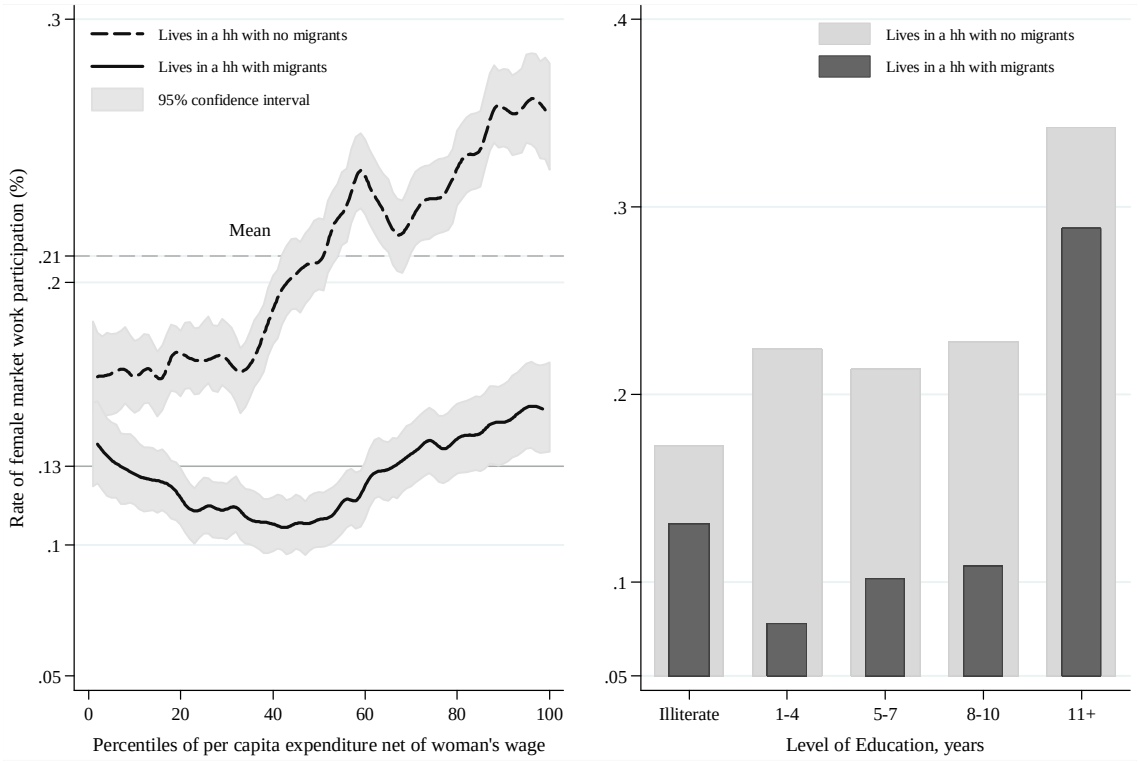

Figure 2: Rates of MWP (by Percentiles of Per Capita Expenditure (Lowess Regression) and Years of Education) by Females in Households With and Without Work Migrants.

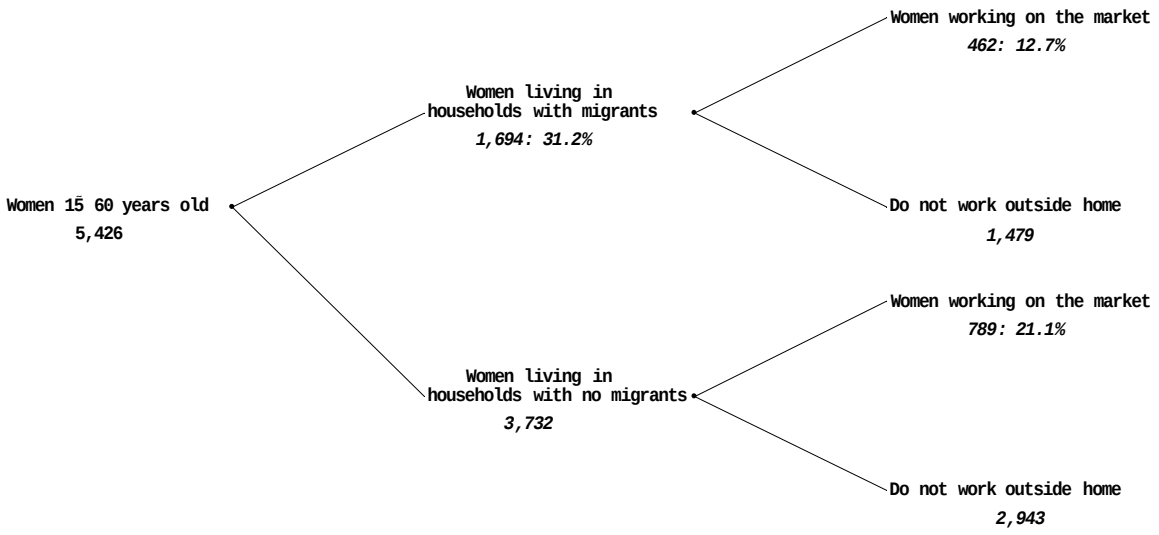

Figure 3: Sample Selection Diagram, number of observations and percent of the sample in corresponding group.

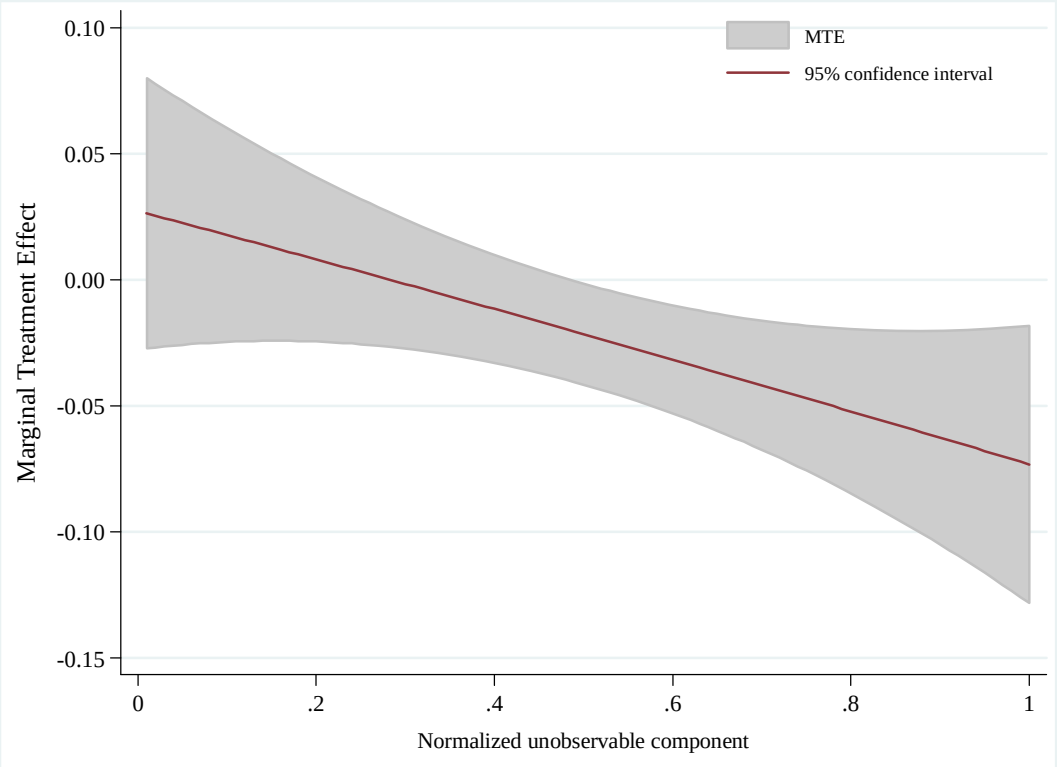

Figure 4: Estimated Marginal Treatment Effect at Population Means

Appendix

Table A1: Estimation of system (5-7) under an assumption of independence of the error terms: three independent probits.

	MWP equation		*MWP equation*		*Migration decision*	
	Coeff.	*Std. Err*	Coeff.	*Std. Err*	Coeff.	*Std. Err*
Age	0.107***	*0.030*	0.058***	*0.017*	-0.042***	*0.013*
Age squared/100	-0.148***	*0.040*	-0.086***	*0.023*	0.054***	*0.017*
Married	-0.352***	*0.127*	-0.057	*0.082*	0.194***	*0.064*
Educational category (reference: Illiterate)						
1-4 years of schooling	-0.292*	*0.172*	0.120	*0.087*	0.010	*0.071*
5-7 years of schooling	0.083	*0.165*	0.037	*0.097*	0.066	*0.075*
8-10 years of schooling	0.040	*0.152*	0.101	*0.087*	0.137*	*0.072*
11+ years of schooling	0.826***	*0.259*	0.347***	*0.121*	0.016	*0.121*
Currently in school	-0.794***	*0.304*	-0.445***	*0.145*	0.022	*0.119*
Household characteristics						
Household non-wage income	-0.013	*0.015*	-0.052***	*0.014*	0.002	*0.005*
Household size	0.065	*0.079*	-0.001	*0.030*	-0.081***	*0.022*
Household size squared	-0.004	*0.005*	-0.000	*0.001*	0.002**	*0.001*
Share of adult men	-0.781	*0.674*	-0.112	*0.321*	-1.062***	*0.256*
Share of elderly	0.360	*0.465*	0.923***	*0.309*	-4.708***	*0.242*
Share of women	-0.334	*0.440*	0.009	*0.234*	-2.518***	*0.186*
Share of children 0-6	-0.193	*0.411*	0.669***	*0.212*	-2.445***	*0.171*
Share of children 7-15	-0.046	*0.109*	-0.253***	*0.087*	-1.471***	*0.059*
Male-headed households	-0.367**	*0.145*	-0.137	*0.087*	0.690***	*0.067*
Ethnicity (reference: Brahman/Chhetri)						
Dalit	0.423**	*0.166*	0.213*	*0.112*	-0.090	*0.083*
Newars	0.476***	*0.170*	0.448***	*0.090*	-0.273***	*0.085*
Terai Casts	0.190	*0.136*	0.397***	*0.082*	-0.107*	*0.059*
Muslim, other	0.351**	*0.138*	0.242***	*0.083*	-0.126**	*0.062*
Hindu households	0.246*	*0.131*	0.006	*0.070*	-0.102*	*0.058*
Land ownership (reference: landless households)						
Own less than 1ha of land	-0.686***	*0.123*	-0.448***	*0.079*	0.018	*0.065*
Own 1 ha to 2 ha of land	-1.117***	*0.193*	-0.867***	*0.110*	-0.001	*0.078*
Own more than 2 ha of land	-0.855***	*0.217*	-1.112***	*0.159*	0.192**	*0.093*
Regional Dummies (reference: Kathmandu)						
Other urban areas	0.130	*0.224*	-0.035	*0.094*	0.735***	*0.101*
Rural Western Hills	0.571**	*0.282*	0.070	*0.142*	0.769***	*0.131*
Rural Eastern Hills	0.922***	*0.283*	0.442***	*0.134*	0.563***	*0.128*
Rural Western Terai	0.740***	*0.275*	0.176	*0.144*	0.694***	*0.127*
Rural Eastern Terai	0.985***	*0.262*	0.661***	*0.126*	0.917***	*0.120*
Ward characteristics						
Percent of illiterate	-0.795***	*0.283*	-1.186***	*0.178*	0.180	*0.131*
Percent of wage employment	0.430	*0.520*	1.705***	*0.309*	0.148	*0.240*
Percent of self-employed	-0.051	*0.328*	0.653***	*0.218*	0.413***	*0.150*
Percent of abroad migrants					0.845***	*0.150*
Percent of domestic migrants					0.224	*0.232*
Constant	-2.844***	*0.686*	-1.986***	*0.425*	2.713***	*0.314*
Number of observations	*1,694*		*3,732*		*5,426*	
Log-likelihood	*-537.69*		*-1,656.50*		*-2,662.73*	

Note: * is significant at 10 percent level; ** at 5 percent level; *** at 1 percent level.

Table A2: Probit estimation of the model of female MWP with uninstrumented dummy for migration status.

	Market Work Participation	
	Coefficient	*Std. Err*
Household with male migrant	-0.251***	*0.056*
Age	0.070***	*0.015*
Age squared/100	-0.100***	*0.020*
Married	-0.148**	*0.068*
Educational category (reference: Illiterate)		
1-4 years of schooling	0.027	*0.076*
5-7 years of schooling	0.048	*0.083*
8-10 years of schooling	0.079	*0.075*
11+ years of schooling	0.396***	*0.108*
Currently in school	-0.493***	*0.129*
Household characteristics		
Household non-wage income	-0.041***	*0.011*
Household size	0.002	*0.026*
Household size squared	-0.000	*0.001*
Share of adult men	-0.234	*0.284*
Share of elderly	0.740***	*0.252*
Share of women	-0.076	*0.202*
Share of children 0-6	0.446**	*0.184*
Share of children 7-15	-0.154**	*0.065*
Male-headed household	-0.184**	*0.073*
Ethnicity (reference: Brahman/Chhetri)		
Dalit	0.274***	*0.092*
Newar	0.453***	*0.078*
TeraiMC	0.323***	*0.069*
Muslim, other	0.271***	*0.070*
Hindu households	0.050	*0.061*
Land ownership (reference: landless households)		
Own less than 1ha of land	-0.520***	*0.066*
Own 1 ha to 2 ha of land	-0.930***	*0.094*
Own more than 2 ha of land	-1.009***	*0.125*
Regional Dummies (reference: Kathmandu)		
Other urban areas	-0.071	*0.084*
Rural Western Hills	0.151	*0.122*
Rural Eastern Hills	0.507***	*0.118*
Rural Western Terai	0.267**	*0.122*
Rural Eastern Terai	0.672***	*0.110*
Ward characteristics		
Percent of illiterate	-1.057***	*0.148*
Percent of wage employment	1.314***	*0.261*
Percent of self-employed	0.424**	*0.179*
Constant	-2.000***	*0.352*
Number of observations	5,426	
Log-likelihood	-2,221.83	

Note: * is significant at 10 percent level; ** at 5 percent level; *** at 1 percent level. The standard errors are adjusted for clustering on a ward level.

Table A3: FIML estimation of the endogenous switching probit model. Instruments included in all equations (no exclusion restrictions).

MWP equation. Households						
	with no migrant		*with migrant*		*Migration decision*	
	Coeff.	*Std. Err*	Coeff.	*Std. Err*	Coeff.	*Std. Err*
Age	0.063***	*0.017*	0.097***	*0.033*	-0.042***	*0.013*
Age squared/100	-0.001***	*0.000*	-0.001***	*0.000*	0.001***	*0.000*
Married	-0.083	*0.083*	-0.310**	*0.136*	0.195***	*0.064*
Educational category (reference: Illiterate)						
1-4 years of schooling	0.114	*0.086*	-0.298*	*0.171*	0.006	*0.071*
5-7 years of schooling	0.026	*0.096*	0.094	*0.164*	0.068	*0.075*
8-10 years of schooling	0.086	*0.087*	0.057	*0.153*	0.148**	*0.072*
11+ years of schooling	0.343***	*0.121*	0.809***	*0.257*	0.024	*0.121*
Currently in school	-0.450***	*0.145*	-0.771**	*0.304*	0.024	*0.119*
Household characteristics						
Household non-wage income	-0.053***	*0.014*	-0.013	*0.015*	0.002	*0.005*
Household size	0.003	*0.030*	0.049	*0.081*	-0.082***	*0.022*
Household size squared	-0.000	*0.001*	-0.004	*0.005*	0.002**	*0.001*
Share of adult men	0.016	*0.344*	-0.887	*0.682*	-1.063***	*0.256*
Share of elderly	1.416***	*0.522*	-0.389	*1.102*	-4.719***	*0.243*
Share of women	0.315	*0.349*	-0.703	*0.621*	-2.519***	*0.185*
Share of children 0-6	0.937***	*0.316*	-0.550	*0.608*	-2.463***	*0.172*
Share of children 7-15	-0.049	*0.199*	-0.264	*0.296*	-1.470***	*0.059*
Male-headed household	-0.207**	*0.103*	-0.247	*0.219*	0.690***	*0.067*
Ethnicity (reference: Brahman/Chhetri)						
Dalit	0.217*	*0.111*	0.383**	*0.167*	-0.092	*0.083*
Newar	0.451***	*0.091*	0.434**	*0.187*	-0.261***	*0.086*
TeraiMC	0.406***	*0.081*	0.167	*0.137*	-0.109*	*0.059*
Muslim, other	0.264***	*0.083*	0.333**	*0.143*	-0.122**	*0.062*
Hindu households	0.014	*0.071*	0.235*	*0.133*	-0.102*	*0.058*
Land ownership (reference: landless households)						
Own less than 1ha of land	-0.432***	*0.080*	-0.670***	*0.128*	0.019	*0.065*
Own 1ha to 2 ha of land	-0.846***	*0.111*	-1.110***	*0.199*	-0.001	*0.078*
Own more than 2 ha of land	-1.103***	*0.157*	-0.820***	*0.233*	0.189**	*0.093*
Regional Dummies (reference: Kathmandu)						
Other urban areas	-0.099	*0.108*	0.246	*0.281*	0.740***	*0.101*
Rural Western Hills	-0.070	*0.158*	0.618*	*0.323*	0.780***	*0.132*
Rural Eastern Hills	0.415***	*0.144*	1.015***	*0.294*	0.577***	*0.129*
Rural Western Terai	0.094	*0.153*	0.851***	*0.303*	0.710***	*0.128*
Rural Eastern Terai	0.556***	*0.157*	1.136***	*0.305*	0.925***	*0.121*
Ward characteristics						
percent of illiterate	-1.260***	*0.183*	-0.748***	*0.290*	0.188	*0.131*
percent of wage employment	1.738***	*0.314*	0.539	*0.517*	0.143	*0.241*
percent of self-employed	0.612***	*0.225*	0.008	*0.336*	0.409***	*0.150*
Percent of abroad migrants	0.383	*0.257*	0.536	*0.342*	0.844***	*0.150*
Percent of domestic migrants	0.632	*0398*	-0.117	*0.525*	0.194	*0.233*
Constant	-2.598***	*0.602*	-2.621***	*0.768*	2.701***	*0.316*
Number of observations	5,426					
Log-likelihood	-4850.94					

Note: * is significant at 10 percent level; ** at 5 percent level; *** at 1 percent level. The standard errors are adjusted for clustering on a ward level.