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Determinants of Rural-urban Migration in Bangladesh at Community and Household Levels: A Multi-Model Analysis

Md. Zakir Hossain[1]* and Mohammad Mahmood Riad[2]

Abstract: It is well documented that migration contributes a lot to the socioeconomic transformation of both global and national economies. This study aims to identify the determinants of rural-urban migration at both household and community levels resorting to some well-recognized and widely used models to ascertain the common predictors and to test whether predictors vary with the methodological variation. This study has used the relevant portion of the data set generated by the project "Rural-urban Migration and its Implications for Food Security in Bangladesh" under National Food Policy Capacity Strengthening Programme (NFPCSP) of the Government of Bangladesh with the technical support of FAO. This study has resorted to classical regression model, multiple logistic regression model, Poisson regression model for analyzing the data. This study discovers that community level income, female wages rate, distance from the educational institutions, distance from the commercial areas, distance from bus/rail station, and community level proportion of international migrant-sending households are the significant determinants of rural-urban migration at community level. The study identified that total land of the household, age of household head, location of residence according to the east-west divide, debt status of the households, sex of the household head, dependency ratio and family size are the common predictors of rural-urban migration at household level determined by both logistic and Poisson regression models. It is also evidenced from the findings that for variation in analytical technique, the predictors vary as well.

Keywords: Rural-urban Migration, Determinants of Migration, Classical Regression Model, Logistic Regression Model, Odds Ratio, Poisson Regression Model.

Introduction

It is well established that people adopted migration as a strategy for availing themselves of broader opportunities for improved life and livelihood. It is proven that migration functions all together as cause and effect of socioeconomic progress at both national and international level. History reveals that civilizations were found to incept basing on the privileges for life and livelihood provided by the nature, and people started flowing towards those civilizations from remote and nearby places through migration. The same event repeats at present days and will continue in the upcoming days. The causes of international migration and its consequences is well documented. The internal migration, particularly rural to urban, also played an important role on the livelihood of migrants, their families and communities as a whole.

* Corresponding Author
[1] Professor, Department of Statistics, Shahjalal University of Science & Technology, Sylhet, Bangladesh. Email: mzhossain.bds@gmail.com
[2] Professor, Department of Basic Science, Patuakhali Science and Technology University, Barisal, Bangladesh. Email: mmr.pstu@gmail.com

From long ago, the researchers have attempted to extract some uniformly applicable norms for migration patterns for all countries at all eras and establish that migration by age are more or less similar for both developed and developing countries, and adult males are found more prone to migration (Hossain, 2000; Yadava, 1988). Several empirical studies have been conducted at home and abroad on different aspects of migration focusing the differentials and determinants considering the attributes like characteristics of the migrants, rate of migration, nature of migration, and causes of migration including push-pull factors (Afsar, 2000; Agasty and Patra, 2013; Deshingker, 2006; De Hann, 2000; Hossain *et al*., 2013; 2017; Islam, 2003; Islam and Siddiqui, 2010; Sloan and Mahinchai, 2010; Sridhar *et al.*, 2010; Tong and Piotrowski, 2011). A selectivity rather than randomness with respect to age, gender, marital status, educational attainment, occupation along with some household characteristics such as ownership of land, amount of adult male members is found to connect with migration behaviors. It is established that the determinants of migration differ amongst different countries and even within a country depending on the social, economic, and demographic characteristics (Hossain *et al.*, 2013).

In the context of Egypt, Zohry (2005) has documented that migration is strongly influenced by poverty, economic complications and inappropriate socioeconomic policies and argued that internal migration plays a vital role in sustaining the livelihoods of lots of families in rural Egypt. After analysis of the district level rural-urban migration rates of India by using 2001 Census data, Mitra and Murayama (2008) found that though people from relatively poor and backward states had greater tendency to migrate internally, the mobility of male population was also seen to be prominent in the relatively advanced states like Maharashtra and Gujarat. The major determinant factor for male migration was identified as prospects of better job opportunities and migration of females were mostly influenced by migration of males. In a study, Agasty and Patra (2013) investigated the characteristics, determinants and destinations of rural-urban migrants using the data collected from a district from Delhi and found that mainly poor and economically disadvantaged families participated in migration due to their poor economic condition including landholdings. Sridhar *et al.* (2010) examined whether push or pull factors influence in migration decision using the data collected from Bangalore and found that pre-migration occupation, past income, age, education, gender and other socio-economic characteristics of the migrants were the determinants of migration. Mahapatro (2009) has investigated the migration dynamics in India by using the NSS data (2007/08) and found that migration is dominated by poorer communities and inter-state migration rate for male was found to increase because of enhanced regional inequalities and ecological forces. Taralekar *et al.* (2012) studied the patterns of interstate and international migration among regional zones of India along with reasons for migration by using census data of 1991 and 2001, and found the highest interstate migrants amounting to 11% in the seven-sister states of northeast India. The study documented that work opportunity and business were the main causes for interstate migration in Western zone, while education was the major cause for interstate migration in the Southern zone of India. Sloan and Mahinchai (2010) has documented that gender, age and years of schooling, family size are the significant determinants of migration decisions for Thailand, and found that migration selectivity differs significantly by destinations. In a study, Tong and Piotrowski (2011) investigated the factors affecting migration selectivity by using a

large longitudinal dataset of China Health and Nutrition Study and explored that health, education and age have effects on migration across the life span and in different migration streams (temporary vs. permanent and rural vs. urban origin).

It is documented that the rural-urban migration in Bangladesh has shown an increasing trend (Hossain *et al.*, 2017), mostly due to the opportunity to work in the informal sectors including garments industries (Afsar, 2003). It is also documented that approximately 40% of rural households of Bangladesh send adult members to seek work in towns (Hossain *et al.*, 2017; Skeldon, 2005). The possible reasons behind the migration is that the work opportunity in rural areas are not sufficient for year-round employment that encourages the rural people to migrate to city. In addition, the recurrent natural disasters of coastal districts pushed the people to the nearby towns due to lack of year-round employment opportunity (Afsar and Baker, 1999). A number of empirical micro-level studies in Bangladesh covers a wide range of issues on social protection and livelihood strategy (Abrar and Seeley, 2009; Siddique and Sikder, 2009). Using the data collected from Comilla district of Bangladesh, Hossain (2000) explored that the rate of migration varied according to the individual characteristics of the migrants like age, marital status, education and pre-migration occupation. Islam and Siddiqui (2010) identified age, education, pre-migration occupation, pre-migration income, family type as significant determinants of migration using the data of Bogra paurashava of Bangladesh. In another study, Al-Amin (2010) explored the factors behind the internal migration and migrant's livelihood features in Dhaka city of Bangladesh and showed that occupational, educational and climatic factors dominate the migration. Siddqui (2010) documented that climate change as one of the major determinants of migration in Bangladesh.

The most of the studies in Bangladesh are destination based, for which the causes and consequences of migration at individual or household or community level at origin is to some extent ignored. It is worth mentioning that studies dealt with community level determinants is not found in the context of Bangladesh though a very few studies are found on the factors of migration at household level. The coverage of most of the existing studies are found limited for national-level representation and used descriptive statistics to draw conclusions. This study designed to discover these knowledge gaps. Therefore, the objective of the research is to find out the determinants of internal rural-urban migration at both community and household levels by employing different types of regression models using a nation-wide primary data collected from the place of origin.

Data and Methods

The data of this study is extracted from the data collected in the project "Rural-Urban Migration and its Implication for food security in Bangladesh" sponsored by FAO and NFPCSP funded by GoB, USAID, European Union (Hossain *et al*., 2013). This study has mainly utilized the data collected under origin-based household-level survey and community survey. Under the research project, the relevant data have been collected from 1500 migrant households (cases) and 750 non-migrant households (control group) under origin-based household-level survey. In addition, the required data has been collected from 60 communities (primary sample units of Bangladesh Bureau of Statistics that were considered as clusters in the survey) under community

survey. Separate interview schedule has been implemented to conduct community and household level surveys. At household level, the survey collected all the relevant information on migration, household members, profile of households including, landholdings, assets, production, income, consumption, food security, food intake. At the community level, the survey gathered the information on proximity to bus/rail stations and service centers, gross migration, natural disaster, cropping pattern, irrigation, tilling technology, investment facility of the community etc. The study utilized most of the information in identifying the determinants of migration. The study considered the migrant households as those households who have sent migrant(s) during the period 2001-2011.

Analytical Techniques

The study has used different types of models, viz., classical multiple regression model, binary multiple logistic regression model and Poisson regression model for identifying the determinants of rural-urban migration both at community and household levels. Among the models, classical multiple regression model was used to explore the community level determinants. On the other hand, binary multiple logistic regression model and Poisson regression model were used to explore the predictors at household level. A brief overview of the binary multiple logistic regression model and Poisson regression model is given below.

Multiple Logistic Regression Model

The logistic regression model is extensively used when the dependent variable is dichotomous or polychotomous to identify risk factors associated with the model in addition to predict the probability of the event. The simple logistic regression model can be expressed as $\log_e[\frac{\pi(X_i)}{1-\pi(X_i)}] = \beta_0 + \beta_1 X_i$ where the quantity $\pi(\mathrm{X_i}) = \mathrm{E}(\mathrm{y_i} = 1 \mid \mathrm{X_i}) = \frac{e^{\beta_0 + \beta_1 X_i}}{1 + e^{\beta_0 + \beta_1 X_i}}$.

If one consider a collection of k covariates denoted by the vector $X^{/}=(X_1, X_2, \ldots, X_k)$ then the multiple logistic regression model can be expressed as

$$\log_e[\frac{\pi(X_i)}{1-\pi(X_i)}] = \beta_0 + \beta_1 X_{1i} + \beta_2 \mathrm{X_{2i}} + \text{- - - - -} + \beta_k \mathrm{X_{ki}} \quad \ldots\ldots\ldots\ldots \quad (1)$$

Poisson Regression

Poisson regression is a special kind of generalized linear model that is used to model the count response variable. It provides the idea about which explanatory variables have a statistically significant effect on the response variable.

Suppose the response variable Y follows Poisson distribution with mean λV. Then

$$Ln[E(Y)] = Ln(\lambda V) = Ln(\lambda) + Ln(V) = (\beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots. + \beta_k X_{ki}) + Ln(V)$$

Therefore, the model can be expressed as:

$$Ln(\lambda) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots. + \beta_k X_{ki} \ldots\ldots \quad (2)$$

The models expressed through equation (1) and (2) are analogous, except the dependent term. The dependent term of logistic regression describes the logarithm of odds of the event,

while dependent term of Poisson regression describes logarithm of rate of occurrence (mean of the distribution) of the event.

Results and Discussions

It is well documented that the process of human migration is not a random choice and so it does suffer from selectivity problem. This study attempted to find out the determinants of internal rural-urban migration both at community and household levels resorting to different recognized models. It is worth mentioning that this study considered villages as community. The results and discussions in relation to the community level and household level determinants have been described in the subsequent sections.

Determinants of Rural-Urban Migration at Community Level

This section has attempted to identify the factors affecting the rural-urban migration at the community level, based on the data obtained from the sampled 60 rural clusters (PSUs/villages) all over Bangladesh. Based on the village level data from northern India, Yadava (1988) examined some relevant hypotheses of migration for a particular region and found prior migrants of the community, per capita income of the community, educational level of the community, sex-ratio, distance to the main road as prominent factors. This study has added some new hypothesis related to migration that has not considered in the previous literature in order to identify the predictors of migration at community level in rural areas of Bangladesh.

Model specification, explanatory variables and hypotheses

The classical multiple regression model of migration rate at community level on different explanatory variables can be expressed as

$$Y_i = \beta_0 + \sum_{i=1}^{10} \beta_j X_{ji} + \varepsilon_i \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where, Y_i is the migration rate of the ith community, which is estimated as:

$$Y_i = \frac{Number\ of\ migrants\ from\ ith\ community}{Total\ population\ of\ the\ ith\ community}\ X\ 100$$

The independent variable X_{1i}, per capita income of the i*th* community is computed as:

$$X_{1i} = \frac{Total\ income\ from\ all\ sources\ of\ ith\ community}{Total\ population\ of\ the\ ith\ community}\ X\ 100$$

The independent variable X_{2i} is the average wage of female labour force in the community at the survey point. The distance variables X_{3i}, X_{5i}, X_{6i} and X_{7i} are the geographical distance (in kilometer) to Dhaka city, Bus/train station, Commercial/industrial area and College from the i*th* community, respectively. The explanatory variable X_{4i} is the proportion of international migrants sending households in the community is computed as:

$$X_{4i} = \frac{Total\ number\ of\ international\ migrant\ households\ of\ ith\ community}{Total\ number\ of\ Households\ of\ the\ ith\ community} X\ 100$$

The variables X_{8i} = Number of Crops (More than 2 crops = 0, 1-2 crops=1) and X_{10i} = Natural Disaster (No=0, Yes=1) are dummy variables. The educational level of the community, X_{9i} is computed as:

$$X_{9i} = \frac{Total\ numberof\ persons\ attained\ 12\ years\ of\ schooling\ of\ ith\ community}{Total\ number\ of\ population\ of\ the\ ith\ community} X\ 100$$

Following the relevant literature of migration, the hypotheses regarding the community level migration are illustrated below:

1. The first hypothesis is that *the per capita income of the community is negatively related to the migration rate from the corresponding community*. People usually migrate for wage differentials, low income, unemployment etc. from rural Bangladesh. If they get better employment opportunities, high-income facilities in rural areas, their propensity of migration to urban areas decreases consequently.

2. In rural areas, female labour opportunity in economic activities is restricted due to some social and religious barriers. In addition, their wages are much lower than the males and consequently they attempt to migrate to opportunity-based urban areas for better livelihood. The second hypothesis is that *migration rate is negatively associated with the female labour wages in rural areas*.

3. In Bangladesh, all activities including employment, education, housing, medication etc. are capital-city (Dhaka) oriented. As a result, *migration rate is expected to rise with the increase in the distance of Dhaka from a particular rural area.* The above-mentioned statement is the third hypothesis of this study.

4. Communities with high percentages of international migrant sending households are in stable or better position in social and economic perspectives. For this reason, people from those communities have fewer tendency to migrate internally for their livelihood. In this regards, our fourth hypothesis states that *the proportion of international migrants sending household is negatively related to the internal migration rate for economic reason*.

5. In Bangladesh, a community may consider to be developed if it is near to the high way or bus station or railway station or any industrial area. The communication from a particular community with better transport facility becomes easier, and people from that community have fewer tendency to migrate rather than they prefer commuting to the urban or commercial areas. Therefore, the fifth and the sixth hypothesis are that *the rate of migration from a community is positively associated with its distances from the nearest bus or railway station and from commercial or industrial areas.*

6. Student migration is caused by the unavailability of education facilities in rural origin. The seventh hypothesis is that *the migration rate is positively associated with the distance from college or higher education institutions.*

7. People from the community with one or two crops are expected to migrate more than that of three or more crops. It might be because of the fact that people from those communities remain workless for a long period every year. Therefore, eighth hypothesis is that *the migration rate is positively associated with the mono-crop cultivation communities*.

8. People having higher education do not have sufficient job opportunity in the rural origin. Therefore, they have a tendency to migrate to urban areas for better job opportunities. Here comes the ninth hypothesis as, *educational level of the community (at least 12 years of schooling) is positively associated with migration rate*.

9. In Bangladesh, natural disasters such as flood, river erosion etc. are common phenomena. People from these affected regions usually migrate for their survival. Therefore, the last hypothesis is *migration rate is positively related to natural disaster affected regions*.

Findings of the Regression Model for Community Level Determinants

The values of the estimated parameters, corresponding standard errors and confidence intervals of the classical multiple regression model (3) are shown in Table 1. The table also demonstrates the significance level of the estimated coefficients and collinearity statistics among the predictor variables. The validity of the regression model has duly been confirmed through examining the traditional assumptions. The model explains about 76% of the total variation of the dependent variable (migration rate) and the value of the F-statistic indicates that the model is well fitted.

The findings indicate the coefficients of the variables X_1 (per capita income of the community), X_2 (average wage of female labour force), X_4 (proportion of international migrant households in community), X_5 (distance to bus/train station), X_6 (distance to commercial area) and X_7 (distance to college) are significant predictors of migration rate from a community. Among the significant predictors, the significance level was found marginal ($p<0.010$) for per capita income of the community only. The negative sign of the coefficient of the variable X_1 (per capita income of the community) confirms the hypothesis that the propensity to migrate is lower for the villages having greater per capita income of the village population. This implies that people usually migrate from rural areas for better income and livelihood. If they are satisfied with their income at the origin, they would not bother migrating to the urban areas and migration rate will be decreases. However, the quantitative explanation of the coefficient is that one unit increase in per capita community income causes 1.31% decrease in the rate of migration and vice-versa.

The negative sign of the coefficients associated with the variable X_2 satisfies the hypothesis that migration rate decreases significantly with the increase in female labor wage in rural areas. Specifically speaking, one unit increase in female labor-wage results in 0.018 point decrease in migration rate. It is understandable that many social and religious barriers restrict the women to be involved with economic employment in countries like Bangladesh that is the worst in rural areas. If the women are capable of earning income with equivalence to the male

counterparts, the internal migration rate tends to decrease. The negative sign of the variable X_3 seems to satisfy the fourth hypothesis of negative association between proportion of international migrant households and internal migration rate. Villages with higher proportion of international migrant households were found economically well off. Therefore, they have less tendency to migrate internally for better income though they tend to migrate for other purposes like better and higher studies.

Table 1: Estimated coefficients with necessary statistics of multiple regression model

Independent Variables	Regression Coefficients †	95% Confidence Interval		Collinearity Statistics	
				Tolerance	VIF
Logarithm of per capita income of community	-1.310* (0.771)	-2.860	0.240	0.692	1.446
Wage of female labor force	-0.018*** (0.005)	-0.029	-0.007	0.533	1.878
Distance to capital city (Dhaka)	0.003 (0.002)	-0.001	0.007	0.674	1.483
Proportion of international migrant households in community	-0.050** (0.022)	-0.095	-0.005	0.832	1.202
Distance to bus/train station	-0.019** (0.009)	-0.037	-0.001	0.644	1.553
Distance of commercial/ industrial area	-0.031** (0.015)	-0.061	0.000	0.700	1.428
Distance to college or higher education institutes	0.329*** (0.052)	0.225	0.433	0.741	1.350
Cropping pattern (1-2 Crop =1, 3 or more crop=0)	0.428 (0.488)	-0.552	1.409	0.869	1.151
Education level of community (at least 12 years of schooling)	0.021 (0.037)	-0.053	0.096	0.931	1.074
Natural disaster (Yes=1, No=0)	0.219 (0.492)	-0.769	1.207	0.936	1.068
Constant	20.717*** (7.605)	5.434	36.00		
R^2 and Adjusted R^2	0.798 and 0.757				
F Statistic	19.407***				
Mean of the Residual	0.000				
Durbin-Watson Statistic	2.26				
Test of Heteroskedasticity (H_o: Homoskedastic)	χ^2 =60.0 (p= 0.4392)				

Note: † Figures within parenthesis indicate the Standard Error; ***ρ<0.01 **ρ<0.05 and *ρ<0.10

The negative sign of the coefficient of the variable X_5 (distance to train station) and X_6 (distance to commercial area) indicate that the hypothesis concerning distances have positive association with the migration rate has been rejected. The communities with lower distance to the bus/railway station and commercial areas were considered as developed and people from those communities were expected to have less tendency to migrate rather commuting. It seems that the relationship between internal rural-urban migration and distance tends to change over time and space as well as the changing socioeconomic condition in Bangladesh. The intuitive explanation is that the nearer the urban destinations from the rural origins, the more tendencies the people of rural communities show to settle down in urban communities to avail themselves of the better amenities in terms of better education and social safety because of their higher economic ability. The positive sign of the coefficients of the variable X_7 significantly satisfy the assumed hypothesis of positive association between migration rate and distance to college or higher education institutes. A large portion of migrants was found to migrate for better study facilities due to the unavailability of quality educational institute in rural areas. To accomplish the need of higher education, the students show more tendency to migrate to the urban areas when the distance of higher education institutes is longer.

The overall findings indicate that the migration from rural communities are influenced by a number of factors such as per capita income of the community, wage of female labour force, proportion of international migrant households in community, distance to bus/train station, distance to commercial/industrial area and distance to college or higher education institutes. Therefore, attention should be given to address these factors to avoid the ill consequences of migration at the place of destinations including rapid urbanization.

Determinants of Rural-urban Migration at Household Level

It is undoubtedly evident from several studies that the decision of migration is largely influenced by the household's characteristics rather than the migrant's characteristics. Thus, it is essential to study the household characteristics to have an in-depth knowledge about the selectivity of migration process. The migration literature suggests that the factors of migration vary from country to country and regional variation was observed sometimes even within the country. The variation of migration intensity depends on the social, economic, demographic and cultural factors of the concerned population. The characteristics of the migrant households like economic and food security situation may improve due to remittances from the migrant member(s), and therefore it is not wise to consider all the individual/household characteristics to isolate the factors differentiating between migrant and non-migrant households based on present condition. To avoid this limitation, this study considered variables like region of residence of the household, total amount of land operated by the household, household size, migration network, dependency ratio, debt status, wealth index, rice-purchasing status at the household level, along with age, sex, education and occupation of the household head and these characteristics do not change within a short span of time. The study has applied the logistic regression model and Poisson regression model to determine the household level predictors of rural-urban migration. The logistic regression model is considered an appropriate technique since the dependent variable, type of household, has two categories: non-migrant households and migrant households. On the other hand, the Poisson regression model is employed to predict the

determinants of migration considering the dependent variable is in count form (number of migrants at the household level).

Very naturally, a question arises why two different models have been applied to sort out the same thing. The rationale behind using two models are to examine whether the determinants vary because of choice of models as well as to identify the common determinants those can be regarded as vital ones to explain the migration selectivity at household level.

Findings from Logistic Regression Model

In this model, the dependent variable is type of the household, which is dichotomized as non-migrant or migrant. The estimated regression coefficients along with the standard errors, value of Wald statistics with significance level (p-value) and odds ratio for each of categories of covariates is shown in Table 2. Based on different goodness of fit statistics including the value of Chi-square, pseudo R^2 and Hosmer and Lemeshow chi-square with its significance level (p-value=0.681), it can be concluded that the estimated binary logistic regression model was significantly well fitted to the observed data. The findings indicate that educational level of the household head, occupation of the household head, total operative land of the household, NGO membership of the household, region of residence according to the east-west divide, debt status, gender of the household head, dependency ratio, household size, and age of household head have had significant effect on rural-urban migration. On the other hand, housing condition, religion, migration network, rice purchasing status and wealth index were found insignificant effect on rural-urban migration decision at household level. The findings are discussed separately for each of the covariates for a better understanding in terms of odds ratio.

Education of the household head

The findings from the estimated logistic regression model indicates that education of the household head have had significant positive impact on migration decision which is consistent with the other studies (Hossain, 2011, Rahman *et al.,* 1996). The value of odds ratio indicate that the likelihood of rural-urban migration is increased gradually with the increase of the level of education of the household heads. The risk of rural-urban migration for the members was found 41% higher for the households whose heads attained primary education in comparison to the households with illiterate heads. The increased likelihood for rural-urban migration for the household members with educated household heads are due to the fact that educated heads have definite vision for their members like higher education, employment, better living etc. and rural-urban migration plays a dominant part for accomplishing their vision.

Occupation of the household heads

It is found from the results of the logistic regression model analysis that occupation of the household head has had significant impact upon migration decision. The households except farming occupation are found to more likely to send internal migrants to urban areas in comparison to the households whose heads were engaged in farming occupation. The likelihood of rural-urban migration was found 2.98 times higher for the family members whose households' heads occupation was service in comparison to the households whose occupation was farmer.

Total operative land of the households

Household landholdings have been found to be a key determinant of rural-out migration in most of the studies (Hossain 2001, Hossain *et al.* 2013, Farooq *et al* 2005, Agasty and Patra, 2013). It has been a healthy debate in literature on whether migrants are mostly from rich land-owning families or from poor land-owning families. Some studies have documented a U type relationship between landholdings and out-migration. The findings of this study reveals that households having (11-49) decimal of land have 7.2% more likelihood of sending internal migrants, although not significant, than the landless/functionally landless households. It is interesting to note that the risk of sending internal rural-urban migration decreases with the increase in landholdings in the study households. This might be because of that the rich land-holding households send international migrants instead of internal rural-urban migrants. As a whole, the tendency of internal rural-urban migration is found higher for the members belonging to landless or small land-owning households. It may be explained by the fact that landholding might not meet up their needs and they migrate to urban areas for better existence.

Debt status

The findings of the logistic regression model reveal that debt status of the households has had significant impact on internal rural-urban migration. The households borrowing debt from individuals or institutions on different conditions restricts them to send migrants to urban areas. The households without any debt were 1.5 times more likely to send rural-urban migrants than that of the households having any sort of debt.

Region of residence

The region of the households in terms of east-west divide was found to have significant impact on migration decision. This study reveals that households located in the west region of Bangladesh were 34% more likely to send internal rural-urban migrants than the households of the east region. It is to be mentioned that the annual average income for the households of the east region is found significantly higher than that of the households of the west region (Hossain *et al.*, 2013), reveals that the east region are economically well-off than the west region. It is well documented that the eastern regional households used to send remarkably high amount of international migrants that western regional households. On the other hand, *monga* (yearly cyclical phenomenon of poverty and hunger) plays a partial or semi-partial role in the migration decision of the people from the west region.

NGO membership of the household

The findings indicate that NGO membership have had a marginal significant impact on internal rural-urban migration decision. The estimated odds ratio of logistic regression model indicates that the households without any connectivity with NGOs were 1.25 times more likely to send internal rural-urban migrants than the households with NGO membership. It may be due to fact that the households associated with NGO be able to manage their livelihood in rural areas through interventions (training on IGA, loan facility) from NGOs.

Gender of the household head

The gender of the household head have had significant impact on internal rural-urban migration decision according to the study findings. Male-headed households are found to have 54.7% less likelihood of sending internal rural-urban migrants than those of the female-headed

households. In the context of Bangladesh, males are more prone to migration and female becomes the household head in the absence of male members of the households. For this reason, the likelihood of migration becomes higher in the female-headed households.

Table 2: Estimated coefficients, odds ratio and test statistics of logistic regression model

Covariates	Coefficient (B)	Std. Error	Wald Statistic	P-value	Odds Ratio
Educational level of the household head					
No education		*Reference category*			1.000
Primary	0.346	0.149	5.414	0.020	1.414
Secondary	0.591	0.194	9.315	0.002	1.806
SSC/HSC	0.635	0.212	8.959	0.003	1.887
Higher	0.522	0.350	2.222	0.136	1.686
Occupation of the household head					
Farmer		*Reference category*			1.000
Laborer	0.276	0.164	2.825	0.093	1.318
Service	1.092	0.242	20.436	0.000	2.980
Others	0.348	0.224	2.415	0.120	1.417
Total operative land of the household					
0-10		*Reference category*			1.000
11-49	0.070	0.162	0.185	0.667	1.072
50-99	-0.444	0.202	4.814	0.028	0.642
100 & above	-0.319	0.200	2.540	0.111	0.727
NGO Membership					
Yes		*Reference category*			1.000
No	0.224	0.137	2.663	0.103	1.251
Region of residence according to the east-west divide					
East		*Reference category*			1.000
West	0.294	0.123	5.719	0.017	1.341
Housing condition					
Poor		*Reference category*			1.000
Good	0.178	0.141	1.596	0.206	1.195
Religion					
Muslim		*Reference category*			1.000
Non-Muslim	-0.201	0.198	1.027	0.311	0.818
Migration network					
No		*Reference category*			1.000
Yes	21.316	1365.734	0.000	0.988	1.809E9
Debt status					
Yes		*Reference category*			1.000
No	0.414	0.134	9.515	0.002	1.512
Rice purchasing status					
No		*Reference category*			1.000
Yes	0.056	0.158	0.125	0.723	1.057
Gender of the household head					
Female		*Reference category*			1.000
Male	-0.792	0.306	6.687	0.010	0.453
Dependency ratio	-0.009	0.001	61.391	0.000	0.991
Wealth index	-0.004	0.005	0.848	0.357	0.996
Family size	0.370	0.039	91.547	0.000	1.448
Age of household head	0.025	0.005	22.660	0.000	1.025
Constant	-2.806	0.463	36.773	0.000	0.060

Note: -2 log likelihood=1718.68; χ^2=1144.08; Cox & Snell R^2 =0.398; Nagelkerke R^2=0.553; Hosmer and Lemeshow χ^2= 5.695; p-value=0.681

Dependency ratio, Family size and Age of household head

In the estimated logistic regression model, dependency ratio, wealth index, family size and age of household head has considered as continuous variable. The findings indicate that dependency ratio had statistically significant impact on internal rural-urban migration and a slightly negative trend of the odds ratios of migration has been observed with the increase of the household dependency ratio. It is found that the family size had significant positive impact on the internal rural-urban migration decision. The likelihood of migration was found 1.45 times greater for one unit increase in family size. The findings concerning family size was found consistent with several studies that family size has positive association with migration decision (Sekhar 1993; Hossain 2001). Age of household head was found to have significant positive impact on rural-urban migration decision-making process as the odds of sending migrants is 1.025 times greater for one-unit increase in the age of the household head.

Housing condition, Religion, Migration network, Rice purchasing status and Wealth index

The findings indicate that housing condition, religion, migration network, rice purchasing status and wealth index have had insignificant effect on internal rural-urban migration decision. However, the findings indicate that households with good housing condition have had more propensity to migrate than that of poor housing condition. The non-Muslim households had less tendency to migrate than that of Muslims. The households having previous migration network have had more propensity to migrate than that of households with no migration network. Those households who used to buy rice for their daily needs have had more risks of sending rural-urban migrants than those of the households who do not buy rice. A decreasing trend in the risk of rural-urban migration has been observed with the increase of the wealth index of the households.

Findings from Poisson Regression Model

The migration at household level has also been predicted by Poisson regression model. Poisson regression model is an appropriate tool when the dependent variable is in count form. Here the dependent variable, number of migrants, is in count form, which allows Poisson regression model to explore the predictors. Table 3 shows the results of Poisson regression model. The concerned test statistics along with deviance goodness of fit and Pearson goodness of fit confirmed the adequacy of the model for identifying the determinants of migration.

The findings show that cultivable land of the household, age of the household head, region of residence according to the east-west divide, debt status of the households, sex of the household head, migration network, dependency ratio and family size have had significant impact on the number of migrants at household level. That is, these factors are the household-level determinants of internal rural-urban migration in Bangladesh. The findings of Poisson regression model are discussed for each of the covariates for a better understanding.

Total operative land of the households

Landholdings have been an influential component of rural-urban migration decision in Bangladesh. The findings of this study indicate that if the total operative land increases by one unit, the difference in the logs of expected counts would likely to be decreased by 0.00038 units,

holding other variables constant in the model that coincide with the findings of Logistic regression model described in the previous section.

Education of the household head

Education of the household head is found to be the key determinant of rural-urban migration addressed by several literatures (Hossain 2011; Rahman *et al.* 1996). The result from the Poisson regression model, though insignificant, reveals that if the year of schooling of the household heads increases by one unit, the difference in the logs of expected counts would likely to be increased by 0.005 units, which also coincides with the findings of Logistic regression model.

Occupation of the household head

For the computational requirements of Poisson regression, four dummy variables were generated for the occupation of household heads. Occupation of household head are found to have positive impact, though insignificant, on migrant sending decision. The results indicate that the difference in the logs of expected counts is likely to be 0.056 unit higher for the farmer headed households compared to the household heads having occupation other than farming (labourer, service and others). On the other hand, the difference in the logs of expected counts is expected to be 0.051 unit higher for the labourer headed households compared to the household heads involved with farming, service and others. In addition, the difference in the logs of expected counts is likely to be 0.076 unit higher for the service-headed households in comparison to the household heads whose professions are farming, labourer and other.

Age of the household head

The findings of the Poisson regression model indicate that age of the household head have had significant positive impact on the number of rural-urban migrants from a household. The finding reveals that one-unit increase in age of the household heads resulted in the difference in the logs of expected counts to be increased by 0.007 units.

Region of the households

The estimated Poisson regression coefficients regarding the region of the households indicate that the difference in the logs of expected counts is likely to be 0.08 units lower for the households located in the west region compared to the households located in the east region.

Debt status of the households

The debt status of the households was found to have significant negative impact in migrant sending decision. The result indicates that the difference in the logs of expected counts is likely to be substandard by 0.097 units for the households borrowing debt from individuals or institutions compared to the households with no involvement with debts.

Housing condition, Rice purchasing status, Religion, NGO membership and Wealth index

Housing condition, rice-purchasing status, religion and NGO membership of the households were found to have negative but insignificant impact on the number of migrants. The results indicate that the difference in the logs of expected counts is likely to be substandard by

0.04 units for the households having good quality houses in comparison with the poor quality households. In addition, the difference in the logs of expected counts is likely to be lower by 0.02 units for those households who did not purchase rice compared to the households who purchased rice in the past year. Non-Muslim households have lower chance of sending rural-urban migrants as the difference in the logs of expected counts is likely to be substandard by 0.008 units for the non-Muslim households than their Muslim counterpart. Involvement with the NGO's may also restrict the households to send rural-urban migrants as the results indicate that the difference in the logs of expected counts is likely to be lower by 0.03 units for the NGO member households in comparison with the non-member households. Although the estimated coefficient of wealth index (score of the household durables) is found insignificant; however, one-unit increase in score of the household durables resulted in 0.001 unit decrease in the logs of expected counts.

Table 3: Estimated regression coefficients with related test statistics of Poisson regression model

Independent Variables	**Coefficient**	**Std. Error**	**P-value**
Total operational land of the household	-0.0004	0.0002	0.009
Occupation of household head (Farming=1)	0.0559	0.0722	0.439
Occupation of household head (Labourer=1)	0.0509	0.0752	0.498
Occupation of household head (Service=1)	0.0764	0.0920	0.406
Occupation of household head (Other=1)	0	(Omitted)	
Education of household head (Years of schooling)	0.0049	0.0058	0.393
Age of household head	0.0075	0.0020	0.000
Region of residence (East=0, West=1)	-0.0833	0.0455	0.067
Debt status of household (No=0, Yes=1)	-0.0978	0.0502	0.051
Housing condition (poor quality=0, Good quality=1)	-0.0395	0.0540	0.465
Status of rice purchasing (purchase=0, not purchase=1)	-0.0202	0.0537	0.706
Religion (Muslim=0, Non-Muslims=1)	-0.0086	0.0706	0.903
NGO membership of household (No=0, Yes=1)	-0.0266	0.0529	0.615
Wealth index of household (score of household durables)	-0.0013	0.0016	0.418
Gender of household head (Male=0, Female=1)	0.2850	0.0937	0.002
Migration network (No=0, Yes=1)	2.8819	0.1444	0.000
Dependency ratio	-0.0019	0.0005	0.000
Family size	0.1023	0.0101	0.000
Constant	-3.6054	0.2530	0.000
Number of observations	2255		
LR χ^2 (17) and P-value	1569.76 (P-value=0.00)		
Pseudo R^2	0.2758		
Value of Log-likelihood	-2061.4275		
Deviance goodness-of-fit and P-value	χ^2=775.3261(P-value=1.0000, d.f.=2240)		
Pearson goodness-of-fit and P-value	χ^2=2014.271 (P-value=0.9997, d.f.=2240)		

Migration network

The migration network was found to have highly significant positive impact on rural-urban migration decision. The results indicate that the difference in the logs of expected counts is likely to be increased by 2.88 units for the households having migration network than those of the households having no network for migration.

Dependency ratio and family size

Both dependency ratio and family size were found to have significant impact, although reverse, in case of rural-urban migration decision. If the dependency ratio increases by one unit, the differences in the logs of expected counts is likely to be to be decreased by 0.002 units, holding other variables constant in the model. On the other hand, if the family size increases by one unit, the differences in the logs of expected counts is likely to be to be increased by 0.102 units.

Household headship

Household headship plays a significant role in the causation of migration, both internal and international. The coefficient for the variable household headship is found 0.28 implying that if the household headship changes from male to female, the differences in the log of expected counts is likely to be increased by 0.28 units holding other variables constant.

Conclusion

The results derived from the community level analysis discover that community level income, female wages rate, distance from the educational institutions, distance from the commercial areas, distance from bus/rail station, and community level proportion of international migrant-sending households are the significant determinants of rural-urban migration. The direction of association between rural-urban migration and distance from commercial area and bus/rail station does not support the hypotheses, that is, the findings does not corroborate the previously done similar studies. The intuitive and plausible explanation of the present finding lies in that the nearer the urban destinations from the rural origins, the more tendencies of the people of rural communities with higher economic ability show to settle down in urban communities to avail themselves of the better amenities in terms of better education and social safety. The other findings are very intuitive and support the relevant findings by previous studies.

The analysis on identifying household level determinants finds out that most of the significant predictors of rural-urban migration determined by both logistic and Poisson regression models are common. These common predictors are identified as total operative land of the household, age of household head, region of residence according to the east-west divide, debt status of the households, sex of the household head, dependency ratio and family size. In addition to these predictors, education of the household head, occupation of the household head and NGO membership of the household have been identified as significant predictors by logistic regression model; while migration network has been identified as significant predictor by Poisson regression model. The predictors of rural-urban migration were found to vary according to the variation in analytical techniques as well. Therefore, the study explores that selection of analytical techniques is a crucial issue to identify the determinants of rural-urban migration.

The researchers would be benefitted from the study to choose the accurate models and techniques to investigate the determinants of migration. Since there is no effective way to stop the rural-urban migration flow, the opportunities and challenges resulted from this process deserve well-planned management system for optimum outcomes. The findings of the study may help the policy-makers and social scientists in this respect as it gives an overview of the

determinants of internal rural-urban migration at both community and household level. The study recommends undertaking a rural development programme to create opportunities for the poor people and to upgrade the teaching-learning environment of the higher secondary educational institutions in order to avoid the untoward flow of rural-urban migration.

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