

# **RURAL-URBAN MIGRATION IN BANGLADESH: PATTERN AND IMPACT**



*THESIS SUBMITTED FOR THE DEGREE OF*

*Doctor of Philosophy*  
in  
**STATISTICS**

By

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July 2014

## **DECLARATION OF ORIGINALITY**

I declare with sincerity and gratitude that the thesis entitled “**RURAL-URBAN MIGRATION IN BANGLADESH: PATTERN AND IMPACT**” submitted to the Department of Statistics, SHAHJALAL UNIVERSITY OF SCIENCE & TECHNOLOGY, under the supervision of Professor Dr. Md. Zakir Hossain, for the degree of Doctor of Philosophy in Statistics is my own original research work.

I hereby, also affirm that this piece of research has neither in part nor in full been submitted to any other university or institution for the award of any degree at tertiary level.

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## **CERTIFICATION FROM THE SUPERVISOR**

This dissertation entitled “**RURAL-URBAN MIGRATION IN BANGLADESH: PATTERN AND IMPACT**” submitted by **Mr. Mohammad Mahmood Riad** to the Department of Statistics, Shahjalal University of Science & Technology for the degree of **Doctor of Philosophy** in Statistics under my supervision is the outcome of his own research work.

It is to be mentioned that he has fulfilled all the requirements prescribed in the *Ordinance for Graduate Program of SUST* for submitting thesis for **Ph.D degree**. To the best of my knowledge, this work is neither in part nor in full has been submitted to any other University or Institutions for the award of any degree.

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**Dedicated to my beloved Wife**

## ACKNOWLEDGEMENT

All praise goes to **Almighty Allah** who has given me the strength and opportunity to do this research work. This dissertation would not have been possible without the advice and enthusiastic assistance of my reverend supervisor Professor Dr. Md. Zakir Hossain, Department of Statistics, Shahjalal University of Science and Technology. I would like to express my sincere gratitude to him for his encouragement, detailed guidance and critical comments throughout the course of this dissertation.

I am solemnly indebted to the authority of Department of Statistics, Shahjalal University of Science and Technology (SUST) for giving me the opportunity as a Ph. D. research fellow. Special gratitude to Professor Dr. Sabina Islam for allowing me to utilize all the facilities of the Department. Sincere thanks to Professor Dr. Kabir Hossain, Professor Dr. Ahmed Kabir, Professor Md. Ahmed Kabir Chowdhury, Professor Dr. Rahmat Ali and all other teachers of the Department for their continuous inspiration. Supporting staff of the Department deserve a special thanks for their cordial help.

Special acknowledgements go for the authority of the sub-project “Postgraduate Research Enhancement Schemes in Mathematics and Statistics” under Higher Education Quality Enhancement Project (HEQEP) of University Grants Commission of Bangladesh for funding me to do this research work. Thanks are due to Professor Dr. Md Shajedul Karim, SPM of the sub-project for his constant encouragement during the course of the study.

I do recognize the authority of Patuakhali Science and Technology University, for providing me study leave in order to completion of my Ph.D research work.

Special appreciation and thanks are due to the authority of the research project “Rural-Urban Migration and its Implication for food security in Bangladesh” sponsored by FAO and NFPCSP funded by GoB, USAID, European Union for allowing me to use the readymade datasets. I would also like to thank with much appreciation Dr. Jasim Uddin Ahmed, Associate professor of Economics, Md. Mahedi Hasan and Sabbir Tahmidur Rahman for their contributions in different stages of the research.

I gratefully acknowledge the contribution of my parents, beloved wife and my loving son whose sacrifice, belief and inspiration enabled me to complete the research work in due time. I am solely responsible for any errors and omissions, if any.

**Author**

## **ABSTRACT**

It is well-documented that migration in general and rural-urban migration in particular contributes a lot to the socioeconomic transformation of both global and national economies. Keeping this importance into consideration in the context of Bangladesh, this endeavor has chosen the field of migration for research. This study broadly focuses on two issues of internal rural-urban migration and these are pattern and impact. Specifically speaking, this study explores the pattern in terms of flow analysis based on cause, destination and income distribution of the migrant-sending households as well as in terms of some probability model-based analysis. It also identifies the determinants of rural-urban migration at both household and community levels as the impact of these attributes on migration itself on the one hand and on the other hand, it determines the impact of rural-urban migration on income, expenditure and income distribution of the households at origin.

This study has used the relevant portion of the data set generated by the project titled “Rural-urban Migration and its Implications for Food Security in Bangladesh” financed by USAID and EU under NFPCSP program with the technical support of FAO of the UN and FPMU of the Ministry of Food, GoB. This study has resorted to both descriptive and inferential statistical tools and techniques for analyzing the data. The inferential tools include Classical Multiple Regression Model, Poisson Regression Model, Working-Leser Model, Binary Logistic Regression Model, IV Regression Model (based on NELM Hypotheses), Discriminant Analysis and some Probability Models. Categorically speaking, this study has applied Classical Multiple Regression Model, Binary Logistic Regression Model, Poisson Regression Model and Discriminant Analysis to identify the determinants of rural-urban migration; Working-Leser Model, IV Regression Model and Lorenz curve analysis to find out the impact of rural-urban migration on expenditure, income and income distribution; and Working-Leser Model and some Probability Models to analyze the pattern of rural-urban migration.

This study discovers that community level income, female wages rate, distance from the educational institutions, distance from the commercial areas, distance from rail station, and community level proportion of international migrant- sending households are the significant determinants of rural-urban migration at community level. It identifies that education level of the household head, occupation of the household head, total operative land, debt status, sex of the household head, dependency ratio, age of the household head, 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. For example, in the multiple logistic regression model, region is identified as a highly significant predictor while in the Poisson Regression model it is not; conversely, migration network is identified as a highly significant predictor in the Poisson Regression model while it is not in the multiple logistic regression model. In addition, the discriminant function analysis has identified some significant discriminating factors that distinguish between migrant sending and non-migrant households at rural origin. The major discriminators are identified as Years of schooling of the household head, Household size and Age of the household head and apart from this an overall positive discriminating impact of dummy variables is derived from the hierarchical discriminant function analysis. Though these discriminators are not deemed to be the determinants of migration, these can be applied for satisfactorily classifying the rural households into two groups as migrant-sending and non-migrant households. Though the analysis on identifying determinants apparently seems to contradict with the title of the thesis, actually this analysis focuses on the impact of some attributes on rural-urban migration and this is also one kind of impact analysis viewed reversely.

The model-based analysis explores that rural to urban migration exerts negative impact, though insignificant, on on-farm income and significant positive impact on off-farm income. Moreover, the analysis on expenditure pattern by migration status explores that with the increase in per

capita total expenditure, the share of per capita agricultural expenditure significantly decreases for the migrant-sending households. In addition, the share of food expenditure increases significantly with the increase in per capita total expenditure for these households. These findings give the indication that rural to urban migration functions as a route out of agriculture in Bangladesh and a qualitatively positive change takes place through a better and more expensive food-mix for the migrant-sending households in rural origin. The overall finding implies that migration tends to exert negative impact on farm income and positive impact on food security. Furthermore, the Gini-coefficient analysis finds out a positive contribution of this migration to income distribution in the left-behind community of the migrants.

This study has tried to explore some characteristics of rural-urban migration through model-based analysis that are distinct from the typical features of migration pattern, particularly internal rural-urban, as documented by different studies at home and abroad. The findings reveal that proportionately, a declining trend of rural-urban migration flow is found out to Dhaka; while the opposite trend is found towards district and upazilla headquarters. It is also observed that migration flow due to poverty from rural to urban areas shows a declining tendency; whereas the flow due to natural calamities and sociopolitical victimization shows an increasing tendency. The probability model-based analysis discovers that all of the concerned models exhibit better fits for both datasets from Comilla- district survey by Hossain (2000) and nationwide survey (RUM-2012) tending to prove the time-invariant applicability of these models on both small regional sample to large national sample in the context of Bangladesh. The key findings from this analysis reveal that the incidence of single-migrant households is on rise over the time and the rural-urban migration flow from the West tends to be higher than that from the East.

Overall, the study conveys the key messages that along with the individual characteristics of the migrants both household and community level attributes influence the internal rural-urban migration decision in Bangladesh; rural-urban migration contributes significantly to off-farm

income, food security and income distribution at origin; and rural-urban migration pattern has changed in Bangladesh in course of time in terms of destination, cause and demographic feature.

The succinct policy implications from this study reveal that rural-urban migration process deserves to be well-managed and the leverages resulted from this process should be properly utilized. The findings also suggest that more development in district and upazilla headquarters is needed to trim the migration flow rate to Dhaka.

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## Abbreviations & Acronyms

NSS	National Sample Survey
GDP	Gross Domestic Product
SIPP	Survey of Income and Program Participation
UN	United Nations
ILO	International Labour Organization
BBS	Bangladesh Bureau of Statistics
MDG	Millennium Development Goals
HIV	Human Immunodeficiency Virus
YAPS	Young-Adult Panel Study
NELM	New Economics Labour Migration
RDPG	Rural Development Population Growth
NFPCSP	National Food Policy and Capacity Strengthening Program
FPMU	Food Planning and Monitoring Unit
GoB	Government of Bangladesh
FAO	Food and Agriculture Organization
EU	European Union
USAID	United States Agency for International Development
PSU	primary sample units
PPS	Probability Proportional to Size
OLS	Ordinary Least Square
IV	Instrumental Variable
DA	Discriminant Analysis
VIF	Variance Inflation Factor
HH	Household
SSC	Secondary School Certificate
HSC	Higher Secondary Certificate
NGO	Non Government Organization
LR	Likelihood Ratio
2SLS	Two-stage Least Squares
GMM	Generalized Method of Moments
HQ	Headquarter
RUM-2012 (Origin)	Origin-based Rural-urban Migration Household-level Survey-2012

# **CHAPTER I**

## **INTRODUCTION**

### **1.1 Background of the study**

It is historically proven and well-documented that people adopted migration as a strategy for availing themselves of wider opportunities for better life and livelihood. It is also documented that migration functions simultaneously as cause and effect of socioeconomic development, particularly urbanization. This function is spirally done 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 far and nearby places through migration. The same thing happens at present and will continue in the future. In those days, there were rarely found boundaries for the demarcation of nations to distinguish between national and international level. But now-a-days, the demarcation is obvious and it clearly makes national level distinct from international level. In this context, migration is spit into two categories- internal and international. Each category broadly encompasses two types of purpose- economic and noneconomic. This study concerns internal rural-urban migration basically with economic purpose.

The importance of international migration in socioeconomic development in terms of both financial and social remittances is greatly observed and documented in Bangladesh. On the contrary, except the growth of urbanization, the contribution of internal migration in this respect is still obscure. In comparison with the research on international migration, it simply seems that internal migration is under-researched in Bangladesh. Though the level and the change of international migration is recorded over time, it is ironically true that the authentic data on internal migration are very rare in this regard. The record of remittances from internal migration is also unusually poor compared to that of foreign remittances. It can intuitively be said that the level and outcome of internal migration are as important as those of international migration for better

management of labor market as well as overall socioeconomic development. Whereas, in Bangladesh both the researchers and policy-makers have paid little attention to internal migration in contrast to international migration. For finding out policy implications, the study on pattern and impact of internal migration is very essential. Pattern determines substantially what sorts of impacts migration can exert on life and livelihood of the migrants, their left-behind households as well as accompanied family members. Since this study considers the impacts of internal migration on the left-behind households at origin, it excludes impacts on other actors in the process. Moreover, though there are four types of internal migration, this study considers only rural-urban migration because of its massive volume and outcome. The rest three types include rural-rural, urban-urban and urban-rural. Among these three, rural to rural migration is recently on sharp decline indeed; urban to urban migration produces not so considerable outcome for both the ends; and urban to rural migration is all but inconsiderable in Bangladesh now-a-days. Apart from this, the increasing trend of rural to urban migration flow deserves proper and prudent management from policy point of view in order to derive optimal outcome from this move of rural population. More obviously and specifically speaking, rural-urban migration reallocates the surplus, underemployed and the distressed labor force of rural population to urban areas and facilitates other interested sections of this population in availing themselves of better urban amenities. This process creates both positive and negative outcomes in the economy as a whole and the overall result can be optimized through adopting and executing proper policies. This is all why this study has selected rural-urban internal migration for research leaving the other forms aside. In favor of the abovementioned arguments the following paragraphs attempt to give empirical evidences.

In the past twentieth century, the urban population in Bangladesh grew from 0.70 million to 31.07 million, an increase of more than forty-fold (BBS, 2008). In contrast, the population of rural areas increased nearly four-fold (from 28.2 million to 103.1 million). The proportion of people living in urban areas rose from 2.4% in 1901 to 8.8% in 1974 and reached 23.8% in 2001 (BBS, 2008). In comparison with other south Asian countries, the rate of urbanization is high in

Bangladesh: the average annual growth rate of urban population was recorded as 6.5 percent for Bangladesh, 3.4 percent for India and 4.2 percent for both Pakistan and Sri Lanka during 1970 to 1990 (Hugo, 1992). It is observed that rural-urban migration dominates over other processes in bringing about urban population growth and it contributes between three-fifths to two-thirds to this growth (UN, 1993). In Bangladesh, the rate of urbanization increased sharply after independence mainly due to the prevailing unemployment problem and deteriorating law and order situation in rural areas (Chaudhury, 1980). A high rate of migration to the city, 63% between 1982 and 1996, was also estimated by Khun using the data from *Demographic Surveillance System* of ICDDR,B at Matlab (Kuhn, 2000). Using the panel data of 62 villages in Bangladesh, Rahman *et al* (1996) estimated that nearly two-thirds migration occurred from rural to urban areas, while one-in-ten migration for rural-rural and nearly one-quarter movement occurred for international migration. The rural to rural migration is more prevalent in 17 coastal districts where silt deposits in estuaries create small islands or *chars* (Kar and Hossain, 2001).

In Bangladesh, migration from rural to urban areas has shown an increasing trend (Hossain, 2011), first due to the work opportunity to the urban informal sector and more recently to garments manufacturing units (Afsar, 2003). It is also documented that nearly two-fifths of rural households of Bangladesh send adult members to seek work in towns (Hossain, 2011; Skeldon, 2005) and in some areas, over 80% of the household income is derived from outside the villages (Skeldon, 2005; Toufique, 2002). The rural areas have failed to generate year-round employment that encourages migration to city. The recurrent flooding of coastal districts such as in Faridpur, Barisal, Patuakhali, Noakhali, Sirajganj can also ‘push’ people into migration. It is reported that almost two-fifths of rural households of Faridpur and Rajbari districts sent adult members to the nearest towns due to lack of year-round employment (Afsar and Baker, 1999). It is argued that the poorer people adopted migration as safety net for search of supplementary livelihoods and they got deprived of many formal and informal sources of support (Abrar and Seeley, 2009). A number of empirical micro-level studies in Bangladesh covers a wide range of issues on social

protection and livelihood (Abrar and Seeley, 2009; Gardner, 2009; Rashid, 2009; Seeley *et al.*, 2009) with particular emphasis on female migration (Siddique and Sikder, 2009).

Seasonal migration is also a common feature especially in lean season for livelihood strategy of the rural people of Bangladesh. Hossain *et al.* (2003) documented that 19% of households, across all wealth groups, migrate in the lean agricultural season. Based on a survey of 1600 households in Northwest Bangladesh, the study also reports that seasonal migration is an important livelihood strategy for about 25% of chronic poor households. Khandker and Mahmud (2012) have studied the role of seasonal migration by collecting data on *monga*-affected areas of Rangpur region and identified that seasonal migration to be the single most important coping strategy to address food insecurity during *monga* (seasonal hunger) adopted by poor households. Through econometric analysis, they identified the determinants of seasonal migration among which a sharp dip in labour demand and high levels of impoverishment seem to be the major driving forces.

Research about migration is limited in Bangladesh due to, among other reasons, a lack of adequate data from national surveys and population censuses. Only some information about place of birth is available in the census schedule of Bangladesh and it is difficult to study the differentials, determinants and impact of migration using census data (Hossain, 2011). On the other hand, the existing micro-level studies in Bangladesh have a limited scope and scale, which implies they test only a few hypotheses and their poor coverage constrains strong inference. Besides, most of these studies are destination specific and ignored the impact on rural households (Begum, 1999; CUS, 1996; Mortuza, 1992) and there are few studies explaining the causes of migration from villages to Dhaka (Afsar, 2000; Chaudhury and Curlin, 1975; Chaudhury, 1978). There have also been a number of studies looked at the migration behaviour and survival strategies of the poor in Dhaka city only (Begum, 1999; CUS, 1988; 1990; 1996; Huq-Hussain, 1992; Mortuza, 1992).

From the above stated historical, intuitive and empirical evidences it is very clearly understood that rural-urban migration, though a mixed blessing for its actors, plays a great role in the process of socioeconomic transformation of the economy of Bangladesh. This very realization has inspired to undertake the current research on the field of internal rural-urban migration addressing its pattern and impact. In this regard, this study has made a rigorous attempt to update the relevant findings and to explore authentic results with the innovative application of widely used statistical tools and techniques.

## **1.2 Literature Review**

Migration is one of the prioritized topics of research worldwide in different perspectives to explore interesting and remarkable phenomena regarding this issue. Migration, as always, is a complex characteristic of human being and is difficult to present in a certain structure. In recent years, the issue of migration has received special attention in many countries due to its impact. Researchers are using different tools and dimensions for exploring new phenomena regarding migration. As human migration behavior is very complex to explain, rigorous attempts are required for interpreting such complexity. While there is great variation among internal and international migration in terms of individual and household characteristics, this demographic process is expected to increase as days go by. In this situation, literature on migration linked with different issues that influence various dimensions of migration should be reviewed. This section reviews the selected relevant literature that concerns the migration process in different dimensions and different parts of the world under the four broad areas, viz., *Theories and Laws of Migration*, *Determinants and Differentials of Migration*, *Consequence and/or Impact of Migration*, and *pattern of out-migration through probability distribution*.

## Theories and Laws of Migration

A variety of theoretical models has been proposed to explain the behavior of migration. Massey *et al.* (1993) reported that although each model eventually seeks to explain the same thing, they use radically different concepts, assumptions and frames of reference. Ravenstein's Laws (1885; 1889) on population movement is the milestone in the area of migration, particularly to study the trend and volume of migration. His theory states that most migrants travel short distances and with increasing distance the number of migrants decreases; migration occurs in a series of waves or steps and each significant migration stream produces, to a degree, a counter stream; urban dwellers are less migratory than rural dweller and the major cause of migration is economic. After the pioneer work of Ravenstein, two important theories of migration had been explored at the mid of the last century and received much attention by the migration researchers: Opportunity (1940) and intervening opportunity (1960) theory by Stouffer and the Gravity model (1946) by Zipf. Stouffer's (1940) theory claims that the volume of migration between two places is related not so much to distance and population size but to perceived opportunities that exist in those two places and between them. Zipf's inverse distance laws (1949) argue that the volume of migration is inversely proportional to the distance travelled by migrants, and directly proportional to the populations of the source and destinations. After a thorough review of the above theories on migration, Lee (1966) formulated some generalized hypotheses with regard to volume of migration, establishment of stream and counter-stream and the characteristics of migrants. Several studies argued that the gravity type model overestimates migration at short distances and underestimates for long distances, whereas operational definition of opportunity and intervening opportunity has no definite norm. Hossain (2000) tested one of the important hypothesis formulated by Lee (1966) related to volume of out-migration in the context of Bangladesh and found satisfactory result. The hypothesis tested by Hossain (2000) is "the volume of migration varies with the diversity of people", that is, a population, homogeneous in nature with respect to

various socio-economic and other characteristics experience lesser rate of migration than that of great diversity.

A number of studies dealt with the macro theory of neo-classical economics that attempts to explain internal labour migration (Harris and Todaro, 1970; Lewis, 1954; Rains and Fei, 1961; Todaro, 1976). The main insight of the theory is geographic differences between supply of and demand for labour result in wage differentials that actually cause movement of wage labour from the labour surplus region to the labour scarce region as long as the differentials exist. The migration studies dealing with the causes of migration also dominated by the long-standing micro economic model of human capital theory, which connotes that migration is the consequence of a rational and economic decision by an individual to maximize the returns from his/her human capital (which depends on education) over space. The human capital theory is an individualistic theory; sometimes known as rational choice theory, first introduced by Sjasstad (1962) later expanded the framework by Todaro (1969).

The “push-pull” framework of Lee (1966) is inseparable from neo-classical economic theories (Lee, 1966). According to this framework, the push factors functioning at origin and the pull factors at destination, jointly contribute to the migration decision. Some of the well-known push factors are high population density, poverty, lack of socioeconomic opportunities, natural disasters, and socio-political hostility; on the other hand, demand for labour, availability of land, economic opportunities, freedom of religion, political freedom or safety, are regarded as the prominent pull factors. Many researchers worked on the push-pull framework and concluded that push and pull factors are not equally responsible for migration decision. For example, Massey et al. (1987) reported that push factors have become predominant in the present-day. Neo-classical economic theories also ultimately focus almost exclusively on economic disparities between areas of origin and destination.

After challenging some of the assumptions and conclusions of neoclassical theory, a new model of migration viz., "new economics of migration" has been developed (Katz and Stark, 1986; Lauby and Stark, 1988; Stark, 1984; 1991; Stark and Bloom, 1985; Stark and Levhari, 1982; Taylor, 1986). The main insight of this new approach is that migration decisions are made by families or households not by migrants only, that helps not only to maximize expected income, but also to minimize risks and to loosen constraints associated with a variety of market failures, apart from those in the labor market.

According to Marxist perception, migration is seen as an inevitable outcome of capitalism that challenges the individualistic assumption-based neo-classical models like Todaro's hypothesis (Safa, 1982; Chapman and Prothero, 1985; de Haan, 2006; Hossain et al., 2013). Another approach, known as social capital theory is considered as an important framework for understanding migration (Bourdieu and Wacqueant, 1992). This theory exposes the significance of migration network and growth of behind the scene institutions in creating migration.

It is evident from the above discussion that the theory and hypothesis of migration has been changed with the passage of time and with the change of society. In a very recent study Hossain et al. (2013) has given importance on both the theoretical aspects and the empirical applications to better understand the process of migration and its outcome.

#### Determinants and Differentials of Migration

Several empirical studies have been conducted at home and abroad on different aspects of migration highlighting the differentials and determinants (Afsar, 2000; De Hann, 2000; Hossain, 2000; 2011; Islam, 2003; Mehta 1991; Selvaraj and Rao, 1993; Stoeckel *et al.* 1972; Wintle, 1992; Yadava, 1988). A selectivity rather than randomness with respect to age, sex, caste, marital status, education, occupation along with some household characteristics such as landholding, number of adult male members etc. is found to pertain with migration behaviour (Hossain, 2010;

2011; Lee, 1966; Sekhar, 1993; Yadava, 1988). It is reported that the rural development efforts neither could reverse the trend in rural-urban migration nor could it minimize uneven economic opportunities such as off-farm employment and earning (Robert and Smith, 1977). Urzua (1981) reported that school drop-outs prefer to migrate to urban areas in search of job simply because they do not want to take up agriculture as their occupation. On the other hand, access to higher education and training in the urban areas stimulate the rural-urban migration among youths (Odaman, 1989). It is documented that the determinants of migration vary from country to country and even within a country depending on the socio-economic, demographic and cultural factors such as high unemployment rate, low income, wage differentials, high population growth, unequal distribution of land, demand for higher schooling and prior migration patterns (Banerjee, 1986; Bilsborrow *et al.*, 1987; Hossain, 2000; 2011; 2013; Kadioglu, 1994; Nabi, 1992; Sekhar, 1993; Singh, 1986; Yadava, 1988).

The study of migration differentials have played a significant role in identifying the socio-economic and demographic impacts of the population involved in the stream. It is observed that the differentials of migration have generally been studied according to various attributes such as characteristics of the migrants like age, gender, educational qualification, occupation, skills; rate of migration; nature of migration in terms of precariousness of their employment at destination; causes of migration including wage differentials, income differentials; opportunities at destination etc. (Afsar, 2000; Al Amin, 2010; Agasty and Patra, 2013; Bohra and Massey, 2009; Deshingker, 2006; Hossain, 2011; 2013; Haque and Islam, 2012; Islam and Siddiqui, 2010; Posel, 2002; Singh, 1986; Siddiqui, 2010; Sloan and Mahinchai, 2010; Sridhar *et al.*, 2010; Tong and Piotrowski, 2011; Yadava, 1988; Zohry, 2005). From long ago, the researchers have tried to establish some uniformly applicable for migration patterns for all countries at all times and found that migration by age are more or less similar for developed as well as developing countries (Caldwell, 1969; Rogaia, 1997; Singh and Yadava, 1981a; Yadava, 1988). Many researchers also established that adult males are more prone to migrate than other people of the community

(Hossain, 2000; Singh and Yadava, 1981a). Some relevant studies on determinants and differentials of migration carried out using the data from developing countries is reviewed below to have an in-depth understanding of the issue of investigation and to identify the knowledge gap.

In a comprehensive report, Yadava (1987) documented the pattern, trend, volume and determinants of out-migration from rural areas of Northern India using the data collected from Varanasi district of Eastern Uttar Pradesh from three distinct surveys conducted in 1984-85, 1978 (Rural Development and Population Growth – A Sample Survey) and 1969-70 (Demographic Survey of Varanasi 1969-1970). According to the findings of the study, the propensity of migration from rural households was found positively related to education, social and economic status and larger landholdings. The study also critically reviewed and tested the ‘gravity’ and ‘opportunity’ models in the context of rural-urban migration in India. In a study, Singh (1986) examined the patterns of age and sex differentials in rural to urban migration in two states of India. The study found that rural to urban migration is selective of a wide range of age groups and age selectivity differ markedly according to sex. The study also found that men are more migratory than women in West Bengal comparing to Kerala and marriage plays an prominent role for women migration in both of the states. The sex ratio of cities in West Bengal is much higher than that of rural areas as men are not always accompanied by female members at the destination.

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. In addition, the study elaborately described the nature of migration, factors active for migration and place of migration. Poverty, job searching and family influence were identified as the main push factors for out migration, while better opportunity, prior migrants and availability of job were the main pull factors behind

migration. Education of the migrants and their pre-migration occupation was significantly related with the push factors of the migration.

In a review article on migration in South African context, Posel (2002) provided a review of existing literature, available data for the empirical study and highlight the areas for future research. To understand the migration process he suggested to conduct more careful household level study with closer attention to decision making structure of rural households, resource sharing conditions and impact of migration on the development of rural origin. In the context of migration scenario of Egypt, Zohry (2005) proclaimed that migration is strongly influenced by poverty, economic difficulties and improper socioeconomic policies. It is documented that until the mid-1950s, foreigners came to Egypt but Egyptians rarely migrated abroad. The study also mentioned that Egyptian emigration was not only a reflection of the oil boom in the Arab Gulf countries and the need for manpower in neighboring countries, but also of economic problems and high rates of population growth in Egypt. The study concludes that internal migration was a natural response to poverty and the uneven distribution of economic activities and played a major role as a balancing mechanism, as Egyptian migration flows to the Gulf and elsewhere began. The study argued that internal migration still plays a major role in sustaining the livelihoods of many families in rural Egypt (Zohry, 2005).

In a study, Mitra and Murayama (2008) analyzed the district level rural-urban migration rates for males and females separately by using 2001 Census data of India. The study found that although, 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. Prospects of better job opportunities was found to be the major determinant of migration for males and migration of females were mostly influenced by migration of males. The study concluded that social networks played an important role in the context of migration and are prevalent among the short distance migrants but tend to lose their

significance with a rise in the distance between the place of origin and destination. 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. The evidence of this study shows that the rural-urban migrants from Kendrapara district mostly belong to the poor and economically disadvantaged families. The reasons of migration was mostly economic and many of the migrants' families didn't have any farming land for which their income was less and it pushes them to migrate. Most of migrants were found to migrate to Delhi and majority of them were found to be involved in labour selling in new construction sites.

Sridhar et al. (2010) examined whether push (out of rural area) or pull (towards the urban area ) factors of migration influence mostly in migration decision using the data collected from Bangalore. Push factors were found to have greater importance in case of Christians compared to Muslim communities. The study also found that pre-migration occupation, past income, age, education, gender and other socio-economic characteristics of the migrants were the determinants of migration. A remarkable demographic difference emerged when the skilled and unskilled migrants were compared: skilled migrants were found much younger than the unskilled migrants.

Mahapatro (2009) made an attempt to understand the emerging migration patterns in India by using the NSS data (2007/08). The migration trend emerged from this study revealed that male migration showed a declining tendency due to short term employment opportunities in urban areas and steady increase of urban migrants in lower economic class indicated migration is dominated by poorer communities. The rate of inter-state male migration was found to increase because of enhanced regional inequalities and ecological forces. The study recommended to focus on the female migration policies as the pattern of female migration changes from marriage to employment and education reasons over time. Taralekar *et al.* (2012) made an attempt to explore the patterns of interstate and international migration among regional zones of India along

with its reasons for migration by using census data of 1991 and 2001. The study results found that the North Zone of India (Assam, Arunachal Pradesh, Manipur, Tripura, Mizoram, Meghalaya & Nagaland) has highest interstate migrants amounting to 11% of the total population as per 2001 Census data. The work opportunity and business have been found as main causes for interstate migration in Western zone (Goa, Gujarat, Maharashtra and the Union Territories of Daman & Diu and Dadra & Nagar Haveli) while education as the major cause for interstate migration in the Southern zone of India (Andhra Pradesh, Andaman Nicobar, Lakshadweep, Karnataka, Kerala, Tamil Nadu and the Union Territory of Pondicherry). The study has recommended to conduct research at community level for gaining a socio-demographic and composite view of migration.

Sloan and Mahinchai (2010) investigated the increasing flows of internal migrants in developing countries resulted from urbanization. The study has used the data of individual-level and household-level social surveys of the Nang Rong Project conducted in 1994-1995 and 2000-2001 in Thailand. Individual characteristics such as gender, age and years of schooling, and household level characteristics such as family size are significantly and consistently found to be the determinants of migration decisions. Moreover, the study found that migration selectivity differs significantly by migrant destinations. The study recommended that policy makers should also consider different destination choice of migration, as well as the migrants' characteristics, when they try to predict migration patterns and flows. 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. The study revealed that health, education and age have effects on migration across the life span and also in different migration streams (i.e., temporary vs. permanent and rural vs. urban origin). Although skill selectivity was not found to vary between rural-urban or rural-rural streams but it is different between permanent and temporary migration.

Mahmud *et al.* (2011) in their research study analyzed the impact of social sector development on internal migration in Pakistan by using two datasets namely Labour Force Survey of Pakistan (pooled cross sectional data by merging LFS data for the years 2005-06, 2006-07 and 2007-08) and Population Census of 1998. The study looked at the patterns of migration which reveal that among the total migrants who have migrated during the last ten years, about 63% have moved to an urban area and the majority (56%) of these migrants migrated to the provincial or the federal capital. The study indicated that migration was led by the motivation of improving the economic access to urban areas.

Bohra and Massey (2009) examined the hypotheses derived from neoclassical economics of migration, the theory of new economics of migration, social capital theory, and cumulative causation theory of migration using the data from Chitwan district of the south-central region of Nepal. The study identified the predictors of internal and international migration to measure the effect of theoretically specified variables and the results strongly supported the hypotheses derived from the theoretical models. The study result revealed that education and occupational skill increase the probability of internal migration but are unrelated to the international migration and social capital had strong influence on individual mobility. Nanfosso and Akono (2009) evaluated the inter-relationships between wages differentials and migration status for the dwellers of Yaoundé and Douala of Cameroon. This study has used 3585 sample collected from 'Employment and Informal Sector Survey' implemented by the National Institute of Statistics in 2005. The wage differential between migrants and non-migrant is decomposed by using a variant of Oaxaca-Blinder method. The econometric results reveal that individual and employment characteristics determine wage differentials between migrants and non-migrants. However, these wage differentials have found no significant influence on the likeliness to move to urban area.

In a study, Yaro (2007) briefly evaluated the patterns of migration in West Africa referring to the existing literatures. Population mobility in Western Africa is an old-age phenomena as it was

started by the group movements of the larger tribes due to economic, social, security and political reasons. The empty spaces created by migration possessed new challenges for development in rural areas, while remittances and return migration were found to have potentials for enhanced development of sending areas. Phouxay (2010) studied the patterns of migration in Laos using two population census surveys in 1995 and 2005, i.e. a period of dramatic political and socio-economic change. The study examined the relationship between migration and socio-economic change over two decades and the focus was on how the migration pattern is influenced by the regionally differentiated modernization process, socio-economic change, international migration and resettlement, as well as how internal migration is influenced by the opportunities for international migration and by rural development. The empirical findings showed a decrease in migration on district level from 12.6% for the period 1985-1995 to 7.8% for the period 1995-2005. The findings also indicate that rural-rural migration was significantly higher in the earlier period of the study (1985-1995) due to the influence of various kinds of internal resettlements. During the later period (1995-2005) rural-rural migration slowed down, partly because of a curtailment of the resettlement programme. At the same time the urban population has increased from 17% to 27%, due to the continuous increase in urban growth rates in all provinces. Caro *et al.* (2013) carried out a research in Albania in order to predict the causes of increasing flows of internal and international migration over the last twenty years as a result of economic and social changes. Referring to the previous literatures that focused mainly on international migration, this study explored the dynamics between internal and international migration. This research found that financial and social remittances were key ingredients within the Albanian livelihood strategy, and a security system for internal migrants.

Roman *et al.* (2010) conducted a study with an aim to present the current trends in migratory behaviour in Central and Eastern European countries in the context of socio-economic transition and to analyze migration trends in Romania in last two decades by using the data of Romanian National Institute. The main causes that influence migration behavior for the Central and

Eastern Europe countries (Poland, Bulgaria, Czech Republic, Romania) are economical. The reduced level of GDP per capita, an increasing unemployment or low personal or professional developments were also found very important causes of migration for these countries. In case of Romania the study found that population dynamics and migration are negatively related due to the permanent decreasing trend of Romanian population during the last two decades.

In their study, Murillo *et al.* (2011) used the longitudinal datasets from Survey of Income and Program Participation (SIPP) covering from 1996 to 2008 in order to analyze the pattern and propensity of interstate migration in the United States. The study found that higher migration propensity of younger or more educated individuals showed notable differences according to gender, marital status, employment status, and residential status (homeowners and non-homeowners). Life changing events like marriage, divorce, widowhood, children attaining school age etc. are also found to have influence on the migration propensities. The study recommended to conduct future research with special attention to the citizens aged 55-65 as the characteristics, employment rates and wages were found to exhibit considerable differences between origin and destination for this sub-group.

Islam and Siddiqui (2010) identified age, educational qualification, pre-migration occupation, income (before migration), type of family (before migration) as significant determinants of migration by studying the background characteristics of migrants and the effects of socio-demographic characteristics of migrants 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 aspects in Dhaka city of Bangladesh. The study showed the factors that affected the internal migration were mainly occupational, educational and climatic. These factors were analyzed and discussed through the migration theories - neo classical theory, new economics of migration theory and network theory. The classical linear regression models were adopted to

measure the impact of internal migration on migrants' livelihood. In her study, Siddqui (2010) identified climate change as one of the major determinants of migration. This study attempted to trace impact of climate change on human security of affected population and provide evidence of climate change induced migration in Bangladesh through secondary data. Migration is considered as one of the many adaptation strategies for the climate hazardous people.

Hossain (2011) studied the causes and consequences of rural-urban migration in Bangladesh and recommended the strategies for reducing the adverse impacts of undue flow of rural-urban migration. The study adopted household level survey, individual level interview and key informant's interview to collect the desired data and information on the causes and consequences of migration from 30 clusters covering all the divisions of Bangladesh. The study found that migrant sending households had economically better position comparing to their non-migrant counterpart. Regarding selectivity of migrants, the study explored that the majority of the migrants were young, educated and unmarried male member of households. Poverty, job searching and study were found as the main push factors of rural-urban migration, while better opportunity and prior migrants were the main pull factors for migration. About two-fifths of the total migrants have chosen capital city as their destination followed by other divisions and over half of the migrants were found to migrated for temporary employment. The result of logistic regression model indicate that maximum education level, occupation of the household head, landholding, number of adult male members and dependency ratio are the prominent predictors of rural-urban migration at household level. The study suggests some policy implications that include increasing the education facilities in the rural areas; taking proper steps for the refugee migrants to direct them to rural-rural regional migration instead of rural-urban migration; immediate actions are required to decentralize the administration, industrialization, commercialization to minimize the untoward rural-urban migration flow in order to have a sound overall outcome and optimize the rural-urban migration process. In a study, Haque and Islam (2012) examined the relationships between rural to urban migration status and household living

conditions using the data from the Bangladesh Demographic and Health Survey 2007. The results revealed that living condition advantage in urban areas significantly influence rural-urban migrants in addition to migration selectivity by education and occupation.

### Consequence and/or Impact of Migration

Among the empirical studies that dealt with the typology and determinants of migration, the majority were found to focus on consequences of migration (Afsar, 2000; 2003; Brockerhoff, 1994; de Haan, 2000; Farooq *et al.*, 2005; Golgher, 2007; Hossain, 2011; 2013; Islam, 2003; Mahapatro, 2009; Mehta 1991; Selvaraj and Rao, 1993; Stoeckel *et al.* 1972; Wintle, 1992; Yadava, 1988). The literature suggests that the migration produces both positive and negative impacts (Hossain *et al.*, 2013). In a study, Sharma (1992) documented that migration of an individual produces demographic impacts in addition to the social and economic impacts. The demographic impacts include low fertility rate due to the physical separation between husband and wife as a result of which the female partner gets less scope for conception. In another study, Kainth (2009) argued that in addition to the economic factors, some social, political, cultural, environmental, health-related and educational factors influence the internal migration. Therefore, it is important to understand intentions of migration, extent of migration and its effect on the growth of urban population for proper urban planning as well as for undertaking further rural development programmes. The elaboration of some relevant studies is done here for getting a clear picture of dearth of investigation on consequence and impact of rural out-migration.

Brockerhoff (1994) used the data from Demographic and Health Surveys in 17 countries to assess the impact of rural-urban migration of mothers on the survival chances of children under age two in the late 1970s and 1980s. Results of the study showed that, before migration, children of migrant women had similar or slightly higher mortality risks than children of women who remained in the village. In the two-year period surrounding their mother's migration, their

chances of dying increased sharply as a result of accompanying their mothers or being left behind, to levels well above those of rural and urban non-migrant children.

Afsar (2003), examined the patterns and trends of internal migration in Bangladesh along with the profile of migrants, labour markets conditions, key problems faced by migrants by using multiple datasets on the labour force and migration generated by the United Nations (UN), International Labour Organization (ILO) and the Bangladesh Bureau of Statistics (BBS). The study reported that the proportion of lifetime internal migrants increased sharply over time. Consequences of internal migration include sending remittances (in cash & in kind) on regular basis. It is also reported that temporary internal migrants send 40% of their total urban income which varies significantly for married (64%) and unmarried (27%) migrants. The major parts of the remittances were found to be consumed for households' consumption at rural origin.

Farooq *et al.* (2005) examined the impact of internal (rural-urban) migration on migrants and their families at the destination by using probit model for testing the hypothesis: "The poorer the economic opportunities in the rural areas, the greater will be rural-out migration". The study has used the data of Faisalabad city maintained by Excise and Taxation Department of Pakistan. The results revealed that majority of the migrants migrated from rural to urban areas for better employment with regard to enhance the household income and availing urban facilities. Rural-out migration was found to have positive impact on poverty reduction in the urban communities, women empowerment and attitude towards child education. However, the study also concluded that the excess of migrants created pressure on the public institutions in urban areas.

In her study 'Internal Migration, Poverty, and Development in Asia', Deshingkar (2006) claimed that internal migration has greater potential for poverty reduction, meeting the Millennium Development Goals (MDGs) and contributing to economic growth in developing countries than does international migration. Her study recommended that internal migration stems from a

broader base where smaller sums of money are evenly distributed to specific areas and poor families through internal remittances (rather than international remittances, which reach fewer people). Internal migration involves poorer people from poorer regions and has a strong role to play in achieving the MDGs and it is an important driver of growth in many sectors including agriculture, manufacturing, construction, coastal economies, and services.

In a review paper, Lall *et al.* (2006) spotted some light on internal migration policies in developing countries in the light of economic theory as it is not only important to understand migration patterns but also related to the welfare issues of internal migration. The study reviewed the existing literature from theoretical (Dual economy models, Harris Todaro models) and empirical (Binary model) perspective. From some empirical literature, the study concluded that migration had a positive impact on individual and households from the economic sense and remittances from internal migrants had an equalizing impact on village income distribution whereas remittances from international migrants had an unequalizing impact. The study also recommended to use the panel datasets for sufficiently understanding the migration process for future research. Golgher (2007) conducted the study with an objective of selectivity of migration and to check the associations of migration with rural poverty in Brazil using the Human Capital Models framework. The study employed mathematical simulations and found that the influence of social nets, age and wages of low skilled and high skilled workers have impact on selectivity of migration. The study recommended that minimizing the cost of migration, improvement of information exchange and facilitating the migrants at destination would bring positive result for poor migrants.

Zohry (2009) explored the impact of internal versus international migration on development at the micro level through the data collected from two different geographical locations in Egypt. The study concluded that both Egyptian internal and international migrations are deployed to escape from rural poverty and also from poor economic development. In addition, the study

addressed migration as a survival strategy to decrease hazards than to maximize benefits. In contrast, Dungumaro (2009) identified some negative impact of internal female migrants by using the data of origin (Iringa) and destination (Dar es Salaam) in Tanzania. The study found rural-urban migration as the most important pattern of population flow in Tanzania. This study challenged the popular perception of increased income and improved living conditions due to migration as it is found that female migrants escorted HIV virus to their newly born babies and the households were suffered from lack of female assistance at the place of origin.

Ackah and Medvedev (2010) conducted a research on causes and impacts of internal migration in Ghana using 3987 Ghanaian households taken from 8687 households participated in Ghana Living Standards Survey 2005/06. The study found person's age, civil status and educational attainment as prominent determinants of migration. Among the total migrant sending households, 55% were found to have more than one migrant member and 62% were reported to receive remittances from their households members. In a study Meng and Iza (2010) explored the causal relationship between rural-urban migration and urban native workers' labour market outcomes in Chinese cities. The study found modest positive or zero effects on the average employment opportunities and insignificant impact on the earnings of urban workers after controlling the endogeneity problem.

In another study, Arif (2006) explored the impact of internal migration on household well being by utilizing the data collected by Pakistan Socio-economic Survey 2000-01. The result indicated that majority of the internal migrants were found to move to rural-urban and rural-rural direction and male migrants were found to move for economic reasons while female moved mainly for non-economic reasons. The impact of migration on households' well being was measured on three different indicators: per capita consumption, infant mortality and child malnutrition. The study concluded that the migrant households were better off than the non-migrant households although the impact was not significant regarding these indicators.

In an exceptional study, Switek (2011) attempted to explore the association between migration and subjective life satisfaction using the longitudinal datasets of Young-Adult Panel Study (YAPS) and Swedish register information among the young adult migrants. This study has assessed the changes in life satisfaction due to migration by comparing migrants and non-migrants before and after the migration with a critical consideration to the unobservable factors. The result indicated that migration increases the life satisfaction regardless of any reason behind movement but the level of life satisfaction varies for work and non-work migrants.

Hak *et al.* (2011) examined migration at the family level with a focus on the effects of internal and cross-border migration on rural older-age parents who remain in the areas of origin. The analysis of this study was based on quantitative and qualitative data from a survey conducted in 2010 in two communes of Battambang Province, Cambodia. The results of the study indicated that with a large family size households are allowed to send one or two members for internal and international migration. Migrant members were found to contribute in their family welfare at origin through sending remittances depending on their place of residence. Internal migrants although earn less than the international migrants were found educated and made themselves avail for better jobs. However, there was found little difference between the internal and international migrants in terms of keeping contact with their parents at the place origin through phone calls.

Badaoui *et al.* (2013) estimated the impact of inward migration on local labour markets in Thailand by extracting the data from Thai Labour Force Survey between the years 1991 and 2000. The study has used climate as an instrument variable for controlling possible endogeneity of internal migration and concluded that wages of low skilled male workers were highly flexible by the supply of migrant workers. However, the study found no significant effect on the wages of high skilled labourers and female labourers due to internal migration.

In a study, Weerdt (2013) explored the internal migration and risk sharing behaviour of migrants using a panel data collected from north-western part of rural Tanzania. The study found that over half of the original household members had moved internally, while a very few moved internationally. Internal migrants were found to provide unilateral insurance to their remaining household members at their place of origin. This insurance to the household members forced the migrants to sacrifice 2 to 7 percent of their consumption in the long run. In case of Southeastern Nigeria, Ajaero and Onokala (2013) examined the impacts of rural-urban migration on the rural communities by using the data collected by questionnaire surveys and key informant interviews. The study leads to conclude that rural-urban migration contributes significantly towards the development of rural communities through monetary remittances and the involvement of the rural-urban migrants in community development projects. This study revealed that the rural-urban migrants usually send back remittances in the forms of money, food, and clothing and at a definite interval with most of them remitting once a month. In addition, the rural-urban migrants also embark on and execute some developmental projects in their rural communities of origin.

In a very recent study, Hossain *et al.* (2013) made a rigorous attempt to bridge the knowledge gap related to internal migration and its food security outcomes. The study has focused mainly on identifying the selectivity of internal rural-urban migration at individual and household levels, exploring the food security outcomes/impacts of this type of migration, documenting the Asian evidences on food security impacts and thus unearthing the overall rural-urban migration patterns and its implications for food security in Bangladesh with a view to providing policy suggestions. The study has used perception analysis, instrumental variable regression and 3-stage NELM models to study the impact of migration on food security. The results of the 3-stage NELM models indicated that migration has a positive impact on both on-farm and off-farm income. However, literature suggests that migration should have negative impact on the on-farm income and positive impact on off-farm income (Taylor *et al.*, 2003). A rigorous investigation is

essential to verify this proposition using two-stage NELM models excluding the equation for remittances since the impact of this variable was found insignificant in the 3-stage model.

#### Pattern of out-migration through probability distribution

Mathematical models are commonly used in social sciences to characterize the observed phenomenon. Generally two types of models are employed for modeling the social phenomena - structural and empirical. The structural model has the advantage that it may provide further understanding of the underlying social phenomena. Among several approaches, a study of migration through a model has greater importance because it explains the pattern very concisely. It is always a point of interest for the migration researchers to model the distribution of households according to the number of migrants. Throughout the years, migration scholars have developed a number of models in this respect and these models received great attention by stakeholders. In a broad sense, migration from a household can be classified into two types: the first type indicates an adult male ( $\geq 15$  years of age) migrates alone to a place of destination; and the second type deals with an individual person migrates with his wife and children. Regarding both type of migration several authors have proposed models to describe the distribution of households according to the number of migrants (Hossain, 2000; Kushwaha, 1992; Sharma, 1987; Singh, 1990; 1992; Singh and Yadava, 1981; 1985; Yadava, 1988; Yadava *et al.*, 1989; 1994; Yadava and Yadava, 1988).

Yadava (1988) critically reviewed some of the migration models and tested the suitability of these models using the several sets of data collected from Varanasi district of Northern India. Hossain (2000) studied the Zipf's gravity models, single origin and multiple destinations migration models, probability models to describe the distribution of households according to the number of migrants, empirical models to describe the distribution of distance for marriage migration in the context of Bangladesh using the data collected from 10 rural *mauzas* (primary sampling units of Bangladesh Bureau of Statistics) of Comilla district. Hossain (2000) proposed

a probability model with underlying assumptions to describe the distribution of households according to the adult (aged 15 years and above) male migrants and applied the model to the micro-level data collected under Varanasi survey as well as Comilla survey. The proposed model was found very much suitable to describe the distribution of adult male migrants better than the previous models proposed by others. In addition, the study offered a new estimation technique to the model of adult male migrants proposed by Sharma (1985). The study also employed maximum likelihood estimation technique to the models proposed by Yadava (1993) and Singh (1992) for total number of migrants and found better fit. In a comparative study, Yadava and Shukla (2006) have made an attempt to assess the suitability of some previously proposed models on the pattern of rural adult male ( $\geq 15$  years) and total number of out-migration under different assumptions by applying the models to the data collected from northern India. The study found inflated geometric and inflated logarithmic series distributions to describe the pattern of out-migration for adult male migrants suitably.

Pandey and Tiwari (2011) developed an inflated geometric model in order to structure the total number of migrants from a household in remote, semi-urban and growth centre separately. The study has adopted the most widely used method of moments and maximum likelihood for estimating the parameters of the proposed model and the model was further tested by applying it to three different datasets on migrants at household level namely “RDPG – a sample survey (1978)”, “Rural Areas of Comilla Districts, Bangladesh-2000” and “Rewa Survey – 2002”. The estimated risk of migration under this proposed model was found higher for the households from ‘Remote areas’ which typically depicts the real picture of the society. Further, the model was found to fit well for all the abovementioned datasets.

The review of the aforesaid pieces of literature has identified lacuna for this study on three points. First, studies finding out the determinants of internal rural-urban at community level are very rare on a solid statistical footing and the studies identifying these determinants at individual

as well as household level through multi-model analysis for a comparative scenario is almost nonexistent in the literature too. Second, the impact of rural-urban migration on income and expenditure directly related to food security is extremely under-researched with the help of Working-Leser Model in general and particularly in Bangladesh. In this respect, the analysis applying 2-stage regression model with instrument variables is rarely found in overall literature and is absolutely missing in Bangladeshi literature. Third, the application of Working-Leser Model to study the migration flow quantitatively is totally absent in the migration literature and the study of migration pattern resorting to probabilistic models to test the topicality of their application on a country wide representative dataset is also missing in Bangladeshi literature. These knowledge gaps are duly addressed in the present study with appropriately tailored statistical rigor.

### **1.3 Rationale of the Study**

The population movement has a significant implication on regional as well as national planning. The national level data of Bangladesh such as Census data is not sufficient to study the causes and consequences of migration because only some information about place of birth is available in the census schedule. The existing studies in Bangladesh have failed to address causes and consequences of migration at the individual and/or household level. The studies carried out in Bangladesh are mainly destination based, and attention on causes and consequences of migration at individual or household level of a particular origin is ignored. Furthermore, existing studies on migration in Bangladesh have given scanty or no attention to the factors of migration at the micro-levels i.e. at the level of individuals and/or households (Hossain, 2000).

It would be useful to understand the motivation factors in migration decision process and the consequences of migration by analyzing the data from the places of origin in a single study. So, a modest attempt is necessary to conduct a comprehensive study on the causes and consequences of rural-urban migration by using the data collected at the places of origin for formulating a

blueprint of work plan regarding next steps and strategy to be undertaken for balancing the rural-urban migration on an equitable basis.

From one point of view, rural-urban migration imposes havoc on the economy by intensifying the urbanization with bad impacts on environment in urban areas; from another point of view it brings blessings for the migrants and their households along with the communities they left behind and in some cases for the place of destination as well.

Rural-urban migration is a reality in the context of dualistic structure of our economy since a considerable number of socio-economic differences between rural and urban areas in terms of opportunities exist and it has no way out. So agreeing to the reality, the controversy needs a solution in an amicable way and to do that a comprehensive research on the proposed topic encompassing all the stakeholders deserves to be done on an urgent basis to find out the overall consequences of rural-urban migration and to sort out strategic policies to optimize the outcomes. Since every policy decision entails trade-off, the best that can be hoped for is to balance the rural-urban migration process at an optimal level.

#### **1.4 Conceptual Framework of the Study**

This section attempts to give an overall blueprint of the study. Though international migration is mostly talked about for its notable outcomes, particularly remittances, internal rural-urban migration also deserves to be taken into serious consideration by all the stakeholders because of its multidimensional causes and consequences from the perspective of socioeconomic development, especially urbanization. In addition, the dynamism of this migration process needs to be properly understood and explored. Keeping these things in mind, this research effort is tailored. This research has basically discovered two traits of rural-urban migration and these are its pattern and impact. Actually, both pattern and impact are very comprehensive and one research work cannot cover the full. Here comes the scope of this study. Categorically speaking, the pattern is explored basing on who migrate, why they migrate, where they migrate and to what

extent, how the migration dynamism appears, whether some probabilistic models apply to the empirical data and whether these models apply distinctly on regional divide and over time. On the other hand, the impact is analyzed based on causes and consequences of migration. That means, first, the factors of migration in terms of determinants are identified and second, the impact of migration on income and expenditure of the left-behind origin households is explored. The determinants/predictors are identified at both household and community levels. Intuitively, a certain age and income/privilege group people are more exposed to migration; they strive to migrate for some reasons that compel and/or lure them from the origin to the destination; they opt for the destination where their expectations are more perceived to be fulfilled; the migration behavior can change over time; the migration behavior may follow some probabilistic distribution; and the distribution can vary over time and space. Along with the individual characteristics, both household and communal characteristics influence the migration behavior. The major household characteristics that may influence the migration decision are profile of the household head, household composition and size, household socioeconomic condition, and household psychological behavior. The major communal characteristics that may impact the migration behavior are distance from the origin to the destination, the mode of transportations, the social capital of the community, the prior migration history, socioeconomic and political condition, and proximity of the growth-centers. The impact on income is found out on the basis of on-farm and off-farm divide; and the impact on expenditure is studied by share of total expenditure and by share of food expenditure. Household income at origin can be influenced through affecting agricultural product and income due to labor depletion resulted from migration and/or through affecting off-farm income by reshaping remaining labor allocation to off-farm economic activities and remittances. Since income is the underlying cause of expenditure, the expenditure pattern can also change due to migration behavior of the household.

Now comes the data and methodology. The main data for this study are taken from the dataset of a research project under NFPCSP supported by FPMU of GoB and FAO of United Nations and

funded by EU and USAID. In addition, the extracted data for this study have been customized in some cases as per need. Both descriptive and inferential statistical tools and techniques have been applied to analyze the data and to derive the findings. It is notable here that the adopted models are succinctly described in the methodology chapter. To study the pattern of migration and its dynamism, the Working-Leser model and two probabilistic models have been used along with the descriptive analysis. Here, the application of Working-Leser model is an innovative and novel exercise indeed. To identify the determinants of migration, Multiple Classical Regression Model, Count Regression Model of Poisson Distribution, Multiple Logistic Regression Model and Discriminant Analysis have been resorted to and to find out the impact of migration on income and expenditure, 2-stage NELM model with instrumental variables and Working-Leser model have been applied respectively. Thus the study has tried to achieve the objectives and ultimately bridged up the lacunas.

### **1.5 Objectives of the study**

The general objective of the research is to explore the pattern and impact of rural-urban migration in Bangladesh emphasizing on places of origin.

The specific objectives of this study are:

- ❖ to study the flow of rural-urban migration according to causes and destination by applying Working-Leser models.
- ❖ to find out the determinants of internal rural-urban migration at community and household levels by different types of regression models.
- ❖ to identify the impact/consequences of rural-urban migration at the places of origin in different dimensions by applying NELM models and Working-Leser models.
- ❖ to study the pattern of rural-urban migration by applying some probability models in terms of the distribution of households according to the number of migrants.

## **CHAPTER II**

### **METHODOLOGY**

This chapter provides a brief description of the sources of data including extraction procedure and analytical techniques used in the study.

#### **2.1 Data Source and Extraction Procedure**

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). Under this project, the basic data on rural-urban migration and food security status has been collected using separate survey instruments with following techniques:

- (i) Origin-based household-level survey, briefly named as RUM-2012 (Origin)
- (ii) Destination-based tracer survey, briefly named as RUM-2012 (Destination)
- (iii) Focus group discussions
- (iv) Key informant’s interview and
- (v) Community survey.

This study has mainly utilized the data collected under origin-based household-level survey and community survey. A brief overview is given below about the sample design of the desired datasets:

The data have been collected from both migrant-households<sup>1</sup> and non-migrant households (control group) under origin-based household-level survey. On the other hand, the data have been collected from individual migrants and/or household level migrants (corresponding to the

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<sup>1</sup> A household is considered as a migrant household if any of its members (used to share a cooking pot) migrated in 2001 or afterwards and now resides (own home, rental house, government quarters, dormitory/hall/hostel & slums) in urban areas within the country.

surveyed households at origin) under destination-based tracer survey. The community survey has been conducted at the place of origin and collected data from 60 rural clusters. The clusters were considered as the primary sample units (PSUs) defined by the Bangladesh Bureau of Statistics (BBS). With the aim of providing the main indicators in two rural domains according to the East-West divide reported by the World Bank poverty assessment study of Bangladesh (World Bank, 2008), the required sample size has been estimated for the 2 rural domains. Following cluster sampling methodology and recognized sample size determination formula<sup>2</sup> [on the basis of 21% indicator percentage<sup>3</sup> (proportion of internal/domestic remittance receiving households), 95% confidence interval, 0.17×p relative precision and highest response distribution with an assumed design effect 1.5], it is estimated that 750 migrant households are required in each domain.

It is reported that 30 clusters has been covered in each domain and the clusters in each domain have been selected using systematic PPS sampling procedure. Under destination-based tracer survey, the data has been collected from key migrants corresponding to the one-third migrant households surveyed at the origin in each cluster. The estimated units of analysis by different categories are given below.

	# of Domain	# of Total Clusters	Target units of analysis
<b>Origin-based Household Survey</b>			
Rural-urban Migrant Households	2	(30×2)=60	1500
Non-Migrant Households (Control group)	50% of the number of Migrant HHs		750
<b>Destination-based Tracer Survey</b>			
Individual migrant members/households identified by origin survey (Tracer Survey)	Representative of one-third Migrant Households surveyed at origin		500
Non-Migrant Households (Control group)	50% of the number of Migrant HHs		250
<b>Community Survey</b>			
Rural clusters	(30×2)		60

<sup>2</sup>  $n = \frac{p(1-p)Z^2}{(0.17p)^2} \times Deff$  where p is the indicator percentage, Z is the value of normal variate with 95% confidence interval, 0.17p is the relative error margin and Deff is the design effect.

<sup>3</sup> In a World Bank (2008) study, it is documented that about 21% households received domestic remittances, which is used as a proxy of percentage of households possess rural-urban migrants.

### Extraction Procedure:

The main contents of the interview schedule for origin-based household survey were Household Roster, Migration Records and Perceptive Views, Landholdings and Household Assets, Crop Production and Homestead Gardening, Income from Other Sources, Consumption & Expenditure, Food Security Status and Coping Strategies, Food Intake in Last 3 Days. Since the present study mainly deals with the pattern and impact of rural-urban migration, it utilized most of the household level information except food security and food intake components. The present study analyzed the information of 2250 households, of which 1500 are cases (migrant households) and 750 are controls (non-migrant households). The computation procedure of some of the important variables needs to be clarified.

The data on household production and income from selling/consuming of products of separate sectors have been distinctly collected through different modules during the survey time. Income of the households has been broadly classified into on-farm income and off-farm income. The survey questionnaire consists of a module for collecting the data of household's last one year crop production behavior that entailed the details against the land size. The net income from the crop sector has also been collected in that module. Another module included the description of household's livestock and poultry sectors and net income from this sector. A distinct module has been devoted to collecting data on household's last one year's Fish farming, Fishing and Farm Forest activities along with the net income from this very sector. On-farm income aggregates the annual income from Crop Production and/or homestead gardening of the household, livestock and poultry, fish farming, fishing and farm forest. Household's on-farm income reflects the contribution of agriculture and farm based sources on total household income. On the other hand, off-farm income includes the annual income of the household members from non-farm activities (Service, labour selling, business, remittances, gratuity and provident funds etc). The total income of a household is the sum of on-farm annual income and off-farm annual income.

The annual consumption of a household has been computed using four distinct sections. Agricultural expenditure of a household means the total amount spending on seeds/plants, fertilizer/ pesticide, irrigation, wages (sowing, weeding, harvest etc). Expenditure on clothing involves the total amount of money spent on sarees, salowar & kamij, lungee, pant, towel, shirts & panjabi, footwear etc. A considerable amount of money of the households is found to be spent on education, medication, religious and cultural festivals and housing purpose. These are included in the other expenditure section. Food includes the main part of household expenditure and this data have been collected on weekly basis along with rice purchasing status of the households. Multiplying the weekly expenditure with 52 results the annual food expenditure of the households. The aggregate of this agricultural expenditure, clothing expenditure, other expenditure and food expenditure constitute the total annual expenditure of a household.

On the other hand, the interview schedule for community survey consists of the *Proximity to Stations and Service Centers, Gross Migration condition at community level, Natural disaster during last few years, Cropping Pattern and Land under Irrigation, Tilling Technology, Investment facility of the community, Reasons for Food Insecurity, Coping Strategies during Food Insecurity*. The data on the proximity to stations and service centers from a particular community is measured in kilometer. This section also includes the information on time elapsed to go to a particular place from community, nature of transportation and main road. Gross migration condition of a community indicated the number of families migrated as a whole from that particular community. Cropping pattern classifies the communities into one crop land, two crop land and three crop land along with the total percentage of land under irrigation. The dichotomized feature of the land tilling technology indicated whether the surveyed communities are mechanized or non-mechanized. The investment facilities of the community were assessed by some of the proximity and establishment factors. The community questionnaire also collected information on reasons and coping strategies of food insecurity although it is not used in this

study. The present study used the majority of the data collected under community survey except the food security segment to study the determinants of migration at community level. In addition, the data from household and community level survey have sometimes been merged in order to operate different analysis in various levels.

## **2.2 Analytical Tools & Techniques**

The study has used several statistical tools and techniques, both descriptive and inferential. In addition, some probability models are applied to analyze the data. Specifically, the determinants and impact of migration has been studied by using different techniques including Classical Multiple Regression Model, Working-Leser Model, Binary Multiple Logistic Regression Model, Poisson Regression Model, Discriminant Analysis and Instrumental Variable Regression Model. A brief description of some of the above techniques is given below.

### **2.2.1 Working-Leser Model**

This study has resorted to a special type of Multiple Classical Regression Model named Working-Leser Model after its proponents. The model was originally developed by Working (1943). After long twenty years; Leser (1963) proved its better fit than its alternatives. Since then this model has been known as Working-Leser Model in literature. The beauty of this model is that it relates the share of some variable linearly to the log of that variable on the assumption that the summation of all the shares becomes one. The sign of the coefficient of the variable, logarithm of the concerned variable, determines the changing behaviour of the response share variable with the change of the concerned variable. The positivity implies a direct relationship between the two changes and the negativity implies an inverse relationship. More clearly described, if the sign of the coefficient is positive, it means that with the increase in the concerned variable, the value of the response variable increases as well and vice versa. In this model, shares are considered as independent variables. This study has adopted the three-stage

version of the Working-Leser Model and along with the as usual independent variables; this model has considered some interactive, demographic and regional variables. The original three-stage version of Working-Leser Model is:

$$\frac{C_{ij}}{y_i} = \beta_i + \gamma_i (\log y_i) \dots \dots \dots (2.1)$$

where  $C_{ij}/y_i$  is the fraction of the concerned variable for  $j$ th unit of analysis on item  $i$  and  $y_i$  is the concerned variable. Adding up requires that  $\Sigma(C_{ij}/y_i)$  equals 1.

This modified version of the Working-Leser Model in semi-log ratio form along with the interactive, demographic and regional variables is as follows (Adams, Jr., 2006):

$$\frac{C_{ij}}{y_i} = \beta_i + \gamma_i (\log y_i) + \sum \lambda_i (z_i) \dots \dots \dots (2.2)$$

where  $C_{ij}/y_i$  is the fraction of the concerned variable for  $j$ th unit of analysis on item  $i$  and  $y_i$  is the concerned variable. Adding up requires that  $\Sigma(C_{ij}/y_i)$  equals 1. Here  $z_i$  denote household and community characteristic variable. This modified Working-Leser model allows the demographic and regional variables as covariates and has the advantage that the coefficients can be explained in the elasticity form.

### 2.2.2 Multiple Binary Logistic Regression Model

When the dependent variable is dichotomous, logistic regression model is widely used not only to identify risk factors but also to predict the probability of success. The simple linear logistic regression model can be expressed as  $\log_e \left[ \frac{\pi(X_i)}{1 - \pi(X_i)} \right] = \beta_0 + \beta_1 X_i$  where the quantity

$\pi(X_i) = E(y_i = 1 | X_i)$  represent the conditional probability that  $Y=1$  given  $X$  and expressed as

$$\pi(X_i) = \frac{e^{\beta_0 + \beta_1 X_i}}{1 + e^{\beta_0 + \beta_1 X_i}}$$

If one consider a collection of p independent variables denoted by the vector  $X'=(X_1, X_2, \dots, X_p)$  then the multiple logistic regression model is given by the equation as

$$\log_e \left[ \frac{\pi(X_i)}{1 - \pi(X_i)} \right] = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_p X_{pi} \dots\dots(2.3)$$

### 2.2.3 Instrumental Variable Regression

Endogeneity or dual causality is one of the major challenges in econometric analysis. Social sciences are likely to understand the behaviour of people not to run experiments in a laboratory like in natural sciences. Much of the work done in social sciences are biased and misleading if it suffers endogeneity. From the statistical point of view, the endogeneity problem arises when (a) there is an omitted variable that is correlated with some regressors (b) the dependent variable and at least one of the independent variables are determined simultaneously in a system and (c) there is measurement error in at least one of the regressors.

In the presence of endogeneity problem, the OLS assumption  $[E(u|x)=0]$  is violated and as a consequence it results in biased and inconsistent estimates. The best possible way of dealing with the endogeneity problem is the **instrumental variable estimation technique**. The mechanism of instrumental variable estimation includes finding a genuinely exogenous variable (instrument) that is strongly correlated with the potentially endogenous regressor and ensuring that the instrument only influences the dependant variable through the potentially endogenous independent variable.

In a simultaneous equation system, instruments ( $z_i$ ) are variables used to explain a suspected endogenous variable and which are exogenous with respect to the main equation  $cov(z_i ; u_i) = 0$  and  $cov(z_i ; x_i) \neq 0$ . It is usually easy to find the instrument that satisfies one of the conditions but challenging to find one that satisfies both. Some imagination and creativity could come up with a good instrument. Once the instrument(s) are selected, three things need to be checked for

trustworthy instrumental variable regression estimates: validity of the instruments, strength of the instruments and whether the suspected explanatory variable is indeed endogenous. Several tests are available in literature to check the above conditions such as for the validity of instruments (Sargan N\*R-sq test, Hansen J statistic and Basmann test) and for the endogeneity (Wu-Hausman F test, Durbin-Wu-Hausman chi-sq test). If all the criteria are met then it is assumed that a problem with endogeneity would produce a different result in instrumental variable regression estimates compared to the OLS estimates.

This study used the instrumental variable regression in the line of two-stage NELS models, described in Chapter IV, to study the impact of migration on household income. As mentioned earlier, instrumental variable regression is generally used when there exists an endogeneity problem in the main predictor variable; migration is a kind of self-selection and may cause endogeneity problem as reported by Hossain *et al.* (2013). Therefore instrumental variable regression is the best possible way to study the impact of migration on household income.

#### 2.2.4 Poisson Regression

Poisson regression model is used to estimate the effect of selected predictors on response variable (number of migrants) which is essentially count data. A Poisson regression model is similar to an ordinary linear regression model with two differences (i) the errors follow a Poisson and (ii) the natural log of the response variable is a function of the independent variables. Poisson Regression model may be appropriate if it is assumed that the mean and variance of the errors to be equal for each observation. The model can be expressed as:

$$\mu_i = e^{a + X_{1i} b_1 + X_{2i} b_2 + \dots + X_{ki} b_k} \dots\dots\dots(2.4)$$

Where  $\mu_i$  is the mean of the distribution, which is estimated from observed values of the independent variables, a is the constant, bi represents the deviation from mean of the reference category for each group (i=1,2,3.....n). The relationship between the predictor (X) variables

and mean of the distribution ( $\mu$ ) is nonlinear. In this study  $\mu_i$  is the mean number of migrants for a given set of predictor variables. The variables included in the Poisson model are initially screened for statistical differences and to ascertain the direction of relationship between the dependent variable and the predictor variables.

### 2.2.5 Discriminant Analysis

Discriminant Analysis (DA) is a powerful statistical technique used to distinguish between two or more groups or cases. The characteristics used to distinguish among the groups are called 'discriminating variables'. In general, there is no limit on the number of discriminating variables as long as the total number of cases exceeds the number variables by more than two. There are however some limits on the statistical properties which the discriminating variables are allowed to have. For one thing, no variable may be a linear combination of other discriminating variables. Another is two variables which are perfectly correlated cannot be used at the same time.

Discriminant Function Analysis (DA) undertakes the same task as multiple linear regressions by predicting an outcome. However, multiple linear regressions is limited to cases where the dependent variable on the Y axis is an interval variable so that the combination of predictors will, through the regression equation, produce estimated mean population numerical Y values for given values of weighted combinations of X values. But DA is used when the dependent is categorical with the predictor independent variables at interval level. Dummy variables can also be used in DA as in multiple regressions.

#### Specification of Discriminant Analysis Model:

The **Discriminant analysis model** involves linear combinations of the following form:

$$D = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + \dots + b_k X_k \quad \dots\dots\dots(2.5)$$

Where,

$D$  = Discriminant score.

$B$ 's = Discriminant coefficient or weight.

$X$ 's = Predictors or independent variables.

The coefficients, or weights ( $b$ ), are estimated so that the groups differ as much as possible on the values of the discriminant function. This occurs when the ratio of between-group sum of squares to within-group sum of squares for the discriminant scores is at a maximum. The dataset is divided into analysis sample and holdout sample from which analysis sample has been used for estimating discriminant coefficients and holdout sample has been used for validation of the discriminant function.

## **CHAPTER III**

### **DETERMINANTS OF MIGRATION AT COMMUNITY AND HOUSEHOLD LEVEL**

It is well-documented that the process of human migration, either internally or internationally, is not a random choice and so it suffers from selectivity problem. To explore the factors that can contribute to this selectivity, several studies have been conducted in developing as well as developed countries and it was found that migration determinants vary from country to country or even within a country or different dimensions (Hossain, 2011; Yadava, 1987; 1988). High unemployment rate, poor income, high population growth, unequal distribution of land, better schooling facilities, prior migration opportunities etc. were detected as some of the main predictors of migration over the countries throughout years (Banerjee, 1986; Bilsborrow *et al.*, 1987; Hossain, 2010; Kadioglu, 1994; Nabi, 1992; Sekhar, 1993; Singh, 1986; Yadava, 1987; 1988). Although economic factors play a vital role on decision making of migration, other factors like social, cultural and demographic may also contribute in this process. This chapter makes an attempt to find out the determinants of internal rural to urban migration both at household and community level resorting to different recognized models. The first section tries to determine the factors at community level through Multiple Regression Model and the second section tries to identify the determinants at household level with the help of Logistic Regression Model, Poisson Regression model and Discriminant Function Analysis.

#### **3.1 Determinants of Migration at Community Level using Classical Regression Model**

This section has made an attempt to identify the factors affecting the migration at the community level, based on the data obtained from the sampled 60 clusters all over Bangladesh. Based on the village level data from northern India, Yadava (1987) 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 unexplored/ new hypothesis related to migration with particularly defined reference period in order to identify the predictors of migration at community level of rural Bangladesh.

The explanatory variables and hypotheses:

This section presents a description of variables and hypothesis regarding the community level migration.

- ❖ The first hypothesis is that **the per capita income of the community is negatively related to the current 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.
- ❖ In rural areas, female labour opportunity in economic activities is restricted due to some social and religious barriers. In addition, their wages are awfully lower than their male counterparts'. So, they migrate to urban areas for better livelihood. The second hypothesis is that **migration rate is negatively associated with the female labour wages in rural areas**.
- ❖ 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.
- ❖ Communities with high percentages of international migrant sending households are in stable or better position in social economic perspectives. For that 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.**

- ❖ In Bangladesh, community is considered to be developed if it is near to the high way or bus station or railway station or any industrial area. Communicating 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. So the fifth and the sixth hypothesis are that **the rate of migration from a community is positively associated with it's distances from the nearest bus or railway station and from commercial or industrial areas.**
- ❖ 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.**
- ❖ People from the community with one or two crops are expected to migrate more, than the community with three/multi crops. It may be due to the fact that the people from those communities, remain workless for a long period of time every year. Therefore, eighth hypothesis is that **the migration rate is positively associated with the intensiveness of cropping (one or two or multi crops) the people of the community exercise.**
- ❖ People with higher education do not have sufficient job opportunity in the rural origin. So, they have a tendency to migrate to urban areas for better job opportunities. Here comes our ninth hypothesis, **educational level of the community (at least 12 years of schooling) is positively associated with migration rate.**
- ❖ In Bangladesh, natural disasters such as flood, river erosion etc. are common phenomena. People from these affected regions usually migrate for their living convenience. The last hypothesis is **migration rate is positively related to natural disaster affected regions.**

That is:

$Y_i$  = The percentage of migrants from the  $i$ th community during the period 2001-2011 for  $i=1,2,\dots,N$ , where  $N$  denotes the number of community.

$X_{1i}$  = Logarithm of the per capita income of the  $i$ th community.

$X_{2i}$  = Female wage labour of  $i$ th community.

$X_{3i}$  = Distance from Dhaka

$X_{4i}$  = Proportion of international migrants sending households in  $i$ th community

$X_{5i}$  = Distance to Bus/Railway station.

$X_{6i}$  = Distance to Commercial/Industrial area

$X_{7i}$  = Distance to College

$X_{8i}$  = No. of Crops (Mono/Double =1, Otherwise=0)

$X_{9i}$  = The educational level of the community

$X_{10i}$  = Natural Disaster (Yes=1, No=0)

A multiple regression model based on these variables is:

$$Y_i = \alpha_0 + \sum_{j=1}^{10} \alpha_j x_{ji} + \varepsilon_i \dots\dots\dots (3.1)$$

Measurement of the Variables:

The study considered the households as migrant households according to the time period 2001-2011. That means, the households at rural origin that have sent migrant/s during this time period are considered as migrant households. In this study, the percentage of migrants during 2001-2011 to the total population is considered as the dependent variable  $Y_i$  (Migration Rate at Community Level)

That is:

$$Y_i = \frac{\text{Number of migrants from } i\text{th community}}{\text{Total population of the } i\text{th community}} \times 100$$

To measure the independent variable  $X_{1i}$ , per capita income of the  $i$ th community is computed as:

$$X_{1i} = \frac{\text{Total income from all sources of } i\text{th community}}{\text{Total population of the } i\text{th community}} \times 100$$

The independent variable  $X_{2i}$  namely wage of female labour were collected during the survey. The distance variables  $X_{3i}$ ,  $X_{5i}$ ,  $X_{6i}$  and  $X_{7i}$  are the geographical distance (in k.m) to Dhaka, Bus/Train station, Commercial/Industrial area and College from the  $i$ th community respectively. The explanatory variable  $X_{4i}$  namely proportion of international migrants sending households in community is computed as:

$$X_{4i} = \frac{\text{Total number of international migrant households of } i\text{th community}}{\text{Total number of Households of the } i\text{th community}} \times 100$$

The variables  $X_{8i}$  = Number of Crops (1 or 2 Crops=1, 3 or more=0 ) and  $X_{10i}$  = Natural Disaster (Yes=1, No=0) are dummy variables. The educational level of the community that is  $X_{9i}$  is computed as follows:

$$X_{9i} = \frac{\text{Total number of persons attained 12 years of schooling of } i\text{th community}}{\text{Total number of population of the } i\text{th community}} \times 100$$

### Findings

The values of the estimated coefficients along with their standard errors and confidence intervals are shown in Table 3.1. The table also shows the 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 in migration and the F-statistic indicates the goodness of fit of the fitted model.

The estimate of the constant is 20.72 which is significant at 1% level of significance. The table indicates the coefficients of the variables  $X_2$ , wage labor of female and  $X_7$ , distance to college are significant at 1% level while proportion of international migrant households in community, distance to train station and distance to commercial area are significant at 5% level.

**Table 3.1: Estimated regression coefficients with necessary statistics of multiple regression model for identifying the determinants of migration at community level**

Independent Variables	Regression Coefficients <sup>†</sup>	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 Labor of Female	-0.018*** (0.005)	-0.029	-0.007	0.533	1.878
Distance to Dhaka	0.003 (0.002)	-0.001	0.007	0.674	1.483
Proportion of International Migrant HHs in Community	-0.050** (0.022)	-0.095	-0.005	0.832	1.202
Distance to 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	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 <sup>2</sup>	0.798				
Adjusted R <sup>2</sup>	0.757				
F Statistic	19.407***				
Mean of the Residual	0.000				
Durbin-Watson Statistic	2.26				
Test of Heteroskedasticity (H <sub>0</sub> : Homoskedasticity)	$\chi^2=60.0$ (p= 0.4392)				
Note: † Figures within parenthesis indicate the Standard Error *** $\rho < 0.01$ ** $\rho < 0.05$ and * $\rho < 0.10$					

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 decreases. However, the quantitative explanation of the coefficient is that 1 unit increase in per capita community income causes 1.31% decrease in the rate of migration and vice-versa.

The negative sign of the variable  $X_2$ , labor wage of female, satisfies the hypothesis that with the increase in female labor wage in rural areas migration rate decreases significantly. 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 economic employment in countries like Bangladesh which 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  $X_3$ , proportion of international migrant households in community, 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. So they have less tendency to migrate internally for better income though they tend to migrate for other purposes like better and higher studies.

The negative sign of the coefficient of the variable  $X_5$  and  $X_6$ , distance to train station and distance to commercial area, have been found not to accept the hypothesis that distances have positive association with the migration rate. 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. Yadava (1987) also found the positive association between the above mentioned variables with the migration

rate. It is difficult to state any definite conclusion regarding these two hypothesis because of time and space specificity. Over time and space, this relationship between internal rural-urban migration and distance tends to change. This study made these hypothesis based on previous findings of the research. But the finding of this research explores the converse association and in the changed backdrop of socioeconomic condition in Bangladesh over time, this does not seem to be counter-intuitive. The intuitive explanation of the present finding 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  $X_7$ , distance to college significantly satisfy the assumed hypothesis that there remains positive association between migration rate and distance to college or higher education institutes. A large portion of migrants were 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 is longer from the community.

### 3.2 Determinants of Migration at Household Level

It is undoubtedly evident from several studies that the decision of migration is largely influenced by the household's characteristics given the migrant's characteristics. Thus, it is important to study the household characteristics to get an in-depth idea about the selectivity of migration process. According to literature, determinants of migration vary from country to country and even within country. The diversity depends on the socio-economic, demographic and cultural factors.

It is difficult to predict the factors differentiating between migrant and non-migrant households because the socio-economic position of a migrant household may change considerably after receiving remittances from the migrant member(s). It is therefore not justified to compare the present position of migrant households with their non-migrant counterparts. It is expected that the variables like education level of the household head, occupation of the household head, region of household, total amount of land operated by the household, migration network and dependency ratio influence migration decision at the household level and these characteristics do not change within a short span of time. The study has applied the following models to determine the household level predictors of rural-urban migration:

- **Logistic Regression Model:** The logistic regression model is considered an appropriate tool to analyze such data since the dependent variable, type of household, is dichotomized (non-migrant or migrant).
- **Poisson Regression Model:** Poisson regression model is used to identify the determinants of migration at household level considering the dependent variable is in count form (Number of Migrant).
- **Canonical Discriminant Function:** Discriminant analysis is used to find out the discriminating factors between migrant and non-migrant households based on some socio-demographic predictors.

Very naturally, a question arises why this study has applied three different models to do the same thing. There lie three arguments in favor of this. First, to examine whether the determinants vary as a result of different techniques of analysis. Second, to identify the common determinants that can be the vital ones to explain the migration behavior at household level. And third, to verify the relevance of the determinants identified by this study with those identified by other similar studies previously done at home and abroad.

### **3.2.1 Determinants of Migration at Household Level using Logistic Regression Model**

As mentioned earlier, the logistic regression model is considered an appropriate tool to analyze data when the dependent variable is dichotomized. Here our dependent variable, type of the household is dichotomized i.e., non-migrant or migrant. The estimated regression coefficients along with the standard errors, relative risks and the number of cases for the categories of variables studied is shown in Table 3.2. The developed binary logit model was found significantly fitted on the basis of all available tests including Hosmer and Lemeshow (p-value=0.681). The findings indicate that majority of the variables included in the analysis have had significant effect on rural-urban migration. The likelihood of migration for each variables are explained in terms of the odds ratio which is a measure of association that has found in wide use, especially in epidemiology, as it approximates how much more likely (or unlikely) it is for the outcome to be present among those with  $x=1$  than among those with  $x=0$ . The findings are discussed separately for each of the covariates for a better understanding.

#### Education of the household heads

The findings from the logistic regression model indicates that education of the household head have had significant impact in migration decision which is consistent with the other studies (Hossain 2011, Rahman *et al* 1996). The estimate of odds ratio shows that members from the households with primarily educated household head are 1.41 times more likely to migrate than

**Table 3.2: Estimated Relative Risks and associated statistics from Logistic Regression Model for identifying the predictors of migration at household level**

Covariates	B	S.E	Wald	p-value	Exp(B)
<b>Education level of the Household head</b>					
Illiterate	-	-	-	-	<b>1.000</b>
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
<b>Occupation of the Household Head</b>					
Farmer	-	-	-	-	<b>1.000</b>
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
<b>Total Operative land</b>					
0-10	-	-	-	-	<b>1.000</b>
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
<b>NGO Membership</b>					
Yes	-	-	-	-	<b>1.000</b>
No	0.224	0.137	2.663	0.103	1.251
<b>Region</b>					
East	-	-	-	-	<b>1.000</b>
West	0.294	0.123	5.719	0.017	1.341
<b>Housing Condition</b>					
Poor	-	-	-	-	<b>1.000</b>
Good	0.178	0.141	1.596	0.206	1.195
<b>Religion</b>					
Muslim	-	-	-	-	<b>1.000</b>
Non-Muslim	-0.201	0.198	1.027	0.311	0.818
<b>Migration Network</b>					
No	-	-	-	-	<b>1.000</b>
Yes	21.316	1365.734	0.000	0.988	1.809E9
<b>Debt Status</b>					
Yes	-	-	-	-	<b>1.000</b>
No	0.414	0.134	9.515	0.002	1.512
<b>Rice Purchasing Status</b>					
No	-	-	-	-	<b>1.000</b>
Yes	0.056	0.158	0.125	0.723	1.057
<b>Sex of The Household head</b>					
Female	-	-	-	-	<b>1.000</b>
Male	-0.792	0.306	6.687	0.010	0.453
<b>Dependency Ratio</b>	-0.009	0.001	61.391	0.000	0.991
<b>Wealth index</b>	-0.004	0.005	0.848	0.357	0.996
<b>Family Size</b>	0.370	0.039	91.547	0.000	1.448
<b>Age of HH</b>	0.025	0.005	22.660	0.000	1.025
<b>Constant</b>	-2.806	0.463	36.773	0.000	0.060
-2 log likelihood=1718.68; Chi-square=1144.08; Cox & Snell R Square=0.398; Nagelkerke R-Square=0.553; Hosmer and Lemeshow Chi-Square= 5.695; p-value=0.681					

those from the illiterate headed households. Similarly, the odds ratio also reveals that members from the households with household head having Secondary level of education and SSC/HSC level education are respectively 1.81 and 1.89 times more likely to migrate than those from the households having no education. The increased likelihood of rural-urban migration for the migrants whose household head(s) are educated may be due to the fact that educated household heads have definite vision for their members and migration plays the organic part for accomplishing the vision.

#### Occupation of the household heads

Occupation of the household head assess the status of the households to some extent and it was found from the study that occupation have had significant impact on migration decision. The households with laborer, service holder and other occupation household head are 1.32, 2.98 and 1.42 times more likely to send internal migrants than the households with farmer household heads. This might be due to the insufficient availability of off-farm income generating activities and wage differentials in rural areas.

#### Total operative land of the households

Household land holdings 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 *et al.* 2013) throughout countries. It has been a healthy debate in literature on whether migrants are mostly from landlord families or from poor land owner families. The answer varies as it depends very much on the local context of the study. The findings of this study reveals that households having (11-49)decimal of land have 7.2% more risk of sending internal migrants, although not significant, than the landless/functionally landless households. It is interesting to note that the risk of sending internal migration decreases with the increase in landholdings. It is to be mentioned that (50-99) decimal land owner households have 35.8% less risk of sending migrants while households having 100 or above decimal of land have 27.3% less risk of sending migrants

than the landless/functionally landless households. The tendency of migration is higher for the persons from landless or small land owner 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. On the other hand, landlord households make use of their lands and use their potential for greater benefits.

#### NGO membership of the household

The estimated relative risk of logistic regression model indicates that the households having no connection with NGO are 1.25 times more likely to send migrants than the households with NGO membership. It may be due to fact that the households involved with NGO utilize the training facilities and loans received from the NGO to manage their livelihood in rural areas. In a sense they found themselves trapped as they have sometimes been forced to join and taking loans at high interest rates. However, this study has found to have a significant impact of NGO membership on migration decision.

#### Region

The region of the households was found to have significant impact on migration decision. This study reveals that households located in west region are 1.34 times more likely to send migrants than the households from east region. The annual average income for the households from east region is higher than the households from west region (Hossain *et al.* 2013) that means economically they are more stable than the households from west region. 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 west region.

#### Housing condition, Religion and Migration network

Housing condition, Religion, Migration network have had insignificant effect on migration decision. Households with good housing condition have 19.5% more propensity to migrate than

the households with poor housing condition. The non-Muslim households have 18% less tendency to migrate than the Muslim households. The households with previous migration network have more propensity to migrate than the households with no migration network.

#### Debt status

The findings of this study reveal that debt status of the households has had significant impact on migration. The households borrowing debt from individuals or institutions on different conditions which restricts them to send migrants to some extent. The households with no involvement to debt are 1.51 times more likely to send migrants than that of the households involved with debt.

#### Rice purchasing status

Those households who buy rice for their daily needs have 5.7% more risks of sending migrants than those of the households who do not buy rice. It might be due to the fact that on-farm income are not sufficient for meeting their needs and they have to send their household members for migration.

#### Sex of the household head

Sex of the Household head have had significant impact on migration decision according to the study. Male headed households have 54.7% less risk of sending internal migrants than those of the female headed households.

#### Dependency ratio

The logistic regression model indicates that dependency ratio had statistically significant impact on rural-out migration. A negative trend of the risk of out migration has been observed with the increase of the household dependency ratio.

### Wealth index

The result indicates that score sum have had negative but statistically insignificant impact on migration decision.

### Family size

It is evident from several studies that family size has positive association with migration decision (Connell et al. 1976; Sekhar 1993; Hossain 2001; Rahman *et al.* 2013). The findings show that the family size has significant impact on the internal migration decision and the odds of migrating internally is 1.45 times greater for one unit increase in family size. In other words, households with large number of members might have the lavishness to send their family members for migration.

### Age of household head

Age of household head was found to have significant positive impact on migration decision making as the odds of sending migrants is 1.025 times greater for one unit increase in the age of the household head.

### **3.2.2 Determinants of Migration at Household Level using 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 allows Poisson regression model to analyse the data. Table 3.3 shows the results of Poisson regression model. All the statistics along with deviance goodness-of-fit ( $p=1.000$ ) and Pearson goodness-of-fit ( $p=0.9997$ ) assures the adequacy of the model for identifying the determinants of migration.

The findings show that total operative land of the household, region of the households, debt status of the households and dependency ratio have had significant negative impact on the number of migrants. On the other hand age of the household head, sex of the household head, migration network and family size were found to have significant positive impact on migration. The findings of Poisson regression model are discussed elaborately 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 be expected to 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 be expected to be increased by 0.005 units, which also coincides with the findings of Logistic regression model.

**Table 3.3: Estimated regression coefficients with necessary statistics of Poisson regression model for identifying the determinants of household level migration**

<b>Independent Variables</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>P&gt;z</b>
Total operative land of Household	-0.00038	0.00015	0.009
Occupation of HH (Farming)	0.05593	0.07220	0.439
Occupation of HH (Labourer)	0.05093	0.07518	0.498
Occupation of HH (Service)	0.07636	0.09195	0.406
Occupation of HH (Other)	0	(Omitted)	
Education of HH (Years of schooling)	0.00493	0.00577	0.393
Age of Household Head	0.00752	0.00195	0.000
Region (East=0, West=1)	-0.08326	0.04550	0.067
Debt status of Household (Yes=1)	-0.09781	0.05015	0.051
Housing (poor quality=0, Good quality=1)	-0.03945	0.05404	0.465
Rice purchasing status (did not purchase=1)	-0.02023	0.05371	0.706
Religion (Muslim=0, Non-Muslims=1)	-0.00860	0.07063	0.903
NGO Membership of Household (Yes=1)	-0.02659	0.05289	0.615
Score of household durables	-0.00128	0.00158	0.418
Female headed Household (Female=1)	0.28498	0.09371	0.002
Migration Network (Yes=1)	2.88186	0.14438	0.000
Dependency Ratio	-0.00189	0.00049	0.000
Family Size	0.10229	0.01006	0.000
Constant	-3.60539	0.25304	0.000
No. of observations	2255		
LR chi2(17)	1569.76		
Prob > chi2	0.000		
Pseudo R2	0.2758		
Log likelihood	-2061.4275		
*Deviance goodness-of-fit	775.3261		
Prob > chi2(2240)	1.0000		
**Pearson goodness-of-fit	2014.271		
Prob > chi2(2240)	0.9997		

### Occupation of the household head

Occupations of household head have found to have positive impact, although not significant, on migrant sending decision. For the computational requirements of Poisson regression, four dummy variables were created for the occupation of household heads. The results indicate that the difference in the logs of expected counts is expected 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 expected 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

Age of the household heads were found to have significant positive impact on the migration. 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 expected to be 0.08 units lower for the households located in west region compared to the households located 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 expected to be substandard by 0.097 units for the households borrowing debt from individuals or institutions compared to the households having no involvement with debts.

### Housing condition, Rice purchasing status, Religion and NGO membership of the households

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 expected 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 expected to be lower by 0.02 units for those households who did not purchase rice for livelihood 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 expected to be substandard by 0.01 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 expected to be lower by 0.03 units for the NGO member households in comparison with the non-member households.

### Score of the household durables and Migration network

The estimated Poisson regression coefficient regarding score of the household durables is found insignificant and indicates that one unit increase in score of the household durables results in 0.001 unit decrease in the logs of expected counts. On the other hand, migration network was found to have highly significant positive impact in migration decision. The results indicate that the difference in the logs of expected counts is expected to be increased by 2.88 units for the households having migration network than those of the households having no network.

### Dependency ratio and Family size

Both the dependency ratio and family size were found to have significant impact, although reverse, in case of migration decision. If the dependency ratio increases by one unit, the differences in the logs of expected counts 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 to be increased by 0.102 units.

### Household Headship

Household headship plays a significant role in the causation of migration. 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 increases by 0.28 units holding other variables constant.

### **3.2.3 Determinants of Migration at Household Level using Discriminant Analysis**

Discriminant analysis is a powerful statistical technique for examining differences between two or more groups of objects with respect to several variables simultaneously. The emphasis is on deriving a rule that can be used to optimally assign new cases to the labeled classes. This study has tried to differentiate between the non-migrant and migrant sending households. Taking the migration status of the households as grouping variable, this study has differentiated between the groups taking two at a time. That is, a two-group discriminant analysis namely non-migrant vs. migrant sending households has been done.

In running the Discriminant analysis, the study divided the sample into two parts: analysis sample and holdout sample. The analysis sample has been used for estimating discriminant function and holdout sample has been used to evaluate the validation of the derived function. This segment has used the same socio-economic and demographic variables to compute discriminating function between non-migrant households and migrant sending households that are used in Logistic regression and Poisson regression models.

The group means and standard deviations shown in Appendix Table 3.1 provide the idea about the significant differences of the variables under study. If there are no significant group differences, it is not worthwhile proceeding any further with the analysis. The findings of Appendix Table 3.1 suggests that two groups are more widely separated in terms of Landholding of household, Years of Schooling of the household head, Dependency ratio, Asset score, Household size and Age of the household head. Wilk's lambda clarifies the significant differences between the means of the two groups. There are, however, some limits on the statistical properties which the discriminating variables are allowed to have. For one thing, no variable may be a linear combination of the other discriminating variables. Likewise, two variables, which are perfectly correlated, cannot be used at the same time.

Appendix Table 3.2 shows the eigenvalue and significance of the discriminant function between non-migrant and migrant sending households. The maximum number of discriminant functions produced is the number of group minus 1. Since the study has used two groups, namely non-migrant households and internal migrant sending households, so only one function is displayed.

The canonical correlation is the multiple correlations between the predictors and the discriminant function. With only one function it provides an index of overall model fit which is interpreted as being the proportion of variance explained ( $R^2$ ). The size of eigenvalue (0.604) is related to the discriminating power of the function. This value shows that the discrimination of the two groups of variables is present. From Appendix Table 3.2, a canonical correlation of 0.614 suggests the model explains 37.7% of the variation in the grouping variable, i.e. whether a household is non-migrant or sends migrants. Wilk's lambda indicates the significance of the discriminant function and the last column of the above table indicates a highly significant ( $p < 0.000$ ) discriminant function.

#### Canonical Discriminant Function between Non-migrant and Internal Migrant sending households

The following function presents the unstandardized coefficients that are used to develop the discriminant function (equation). It operates just like a linear regression equation. In the case of discriminating between non-migrant and internal migrant sending households, the function is given below:

$$D = (-1.94) + (-0.000016) * Landholding + 0.044 * Year\ of\ schooling + (-0.005) * Dependency\ Ratio + (-0.005) * Asset\ Score + 0.201 * Household\ Size + 0.019 * Age + (-0.287) * Farming + (-0.236) * Labourer + 0.388 * Service + (-0.146) * NGO\ Member + (-0.274) * Male\ Household\ head + 0.165 * Location_{West} + 0.115 * Good\ Housing + (-0.046) * Non - Muslim + 2.028 * Network(Yes) + (-0.327) * Debt\ Status(Yes) + (-0.166) * Rice\ Purchasing\ Status(Didn't\ Purchase)$$

This discriminant function coefficient indicates the partial contribution of each variable to discriminant function controlling for all other variables in the equation. They can be used to assess each independent variable's unique contribution to the discriminant function. In this case we found Years of schooling of the household head, Household size and Age of the household head have stronger contribution to discriminate between the two groups. Since we have dummy variables in this equation, the individual beta weights cannot be used for interpreting dummy variables. Dummy variables were assessed as a group and the discriminant analysis is performed through hierarchical way; first with the dummy variables and then without the dummy variables. The difference in the squared canonical correlation indicates the explanatory effects of the dummy variables in the equation. By performing the discriminant analysis without dummy variables we found the canonical correlation 0.375 and with them it was found 0.614. Thus, it is estimated that the dummy variables explain 23.6% ( $0.614^2 - 0.375^2 = 0.236$ ) of the total explanatory effect.

### Classification Phase

The classification showed in Table 3.4 is simply a table in which the rows are the observed categories of the dependent and the columns are the predicted categories. When prediction is perfect all the cases will lie on the diagonal. The percentage of cases on the diagonal is the percentage of correct classifications.

A renowned validation method is to perform the classification for the two datasets (test sample and retest/holdout sample) separately. Table 3.4 shows the test-retest results and the two results were found consistent. The classification results reveal that 77.2% of respondents were classified correctly into 'non-migrant households' or 'migrant sending households' groups. Non-migrants were classified with slightly better accuracy (89.6%) than internal migrants (71.1%). From the retest sample it is evident that, 76.4% cases are correctly classified which is consistent with the

test sample. Therefore, the estimated discriminating equation could be used to discriminate unknown cases too.

**Table 3.4: Classification of the Cases using Discriminant Function**

<b>Classification Table For Test Sample</b>			
Migration Status of the Households	Predicted Group Membership		Total
	Non-Migrant (%)	Migrant (%)	
Non-Migrant	89.6	10.4	517
Migrant	28.9	71.1	1052
<i>77.2% of Selected Original Grouped Cases Correctly Classified.</i>			
<b>Classification Table For Retest Sample</b>			
Migration Status of The Households	Predicted Group Membership		Total
	Non-Migrant	Migrant (%)	
Non-Migrant	86.5	13.5	229
Migrant	28.4	71.6	457
<i>76.4% original cases are correctly classified</i>			

#### Comparison of findings

This section concludes that most of the significant predictors of migration determined by both the regression models are found to be common. These common predictors are identified as education level of the household head, occupation of the household head, total operative land, debt status, sex of the household head, dependency ratio, age of the household head, and family size. At household level in rural Bangladesh, these predictors play a vital role in making decision for internal rural-urban migration. It is also evidenced from the findings that for variation in analytical technique, the predictors vary as well. For example, in the multiple logistic regression model, region is identified as a highly significant predictor while in the Poisson regression model it is not; conversely, migration network is identified as a highly significant predictor in the Poisson regression model while it is not in the multiple logistic regression model. Finally, many a predictor identified in this study are corroborated by the previously done similar studies at home and abroad. Besides, the discriminant function analysis has identified some significant discriminating factors that distinguish between migrant sending and non-migrant households at rural origin. The major discriminators are identified as Years of schooling of the household head,

Household size and Age of the household head and apart from this an overall positive discriminating impact of dummy variables is derived from the hierarchical discriminant function analysis. Though these discriminators are not deemed to be the determinants of migration, these can be applied for satisfactorily classifying the rural households into two groups as migrant-sending and non-migrant households.

The upshot of this chapter is that at community level, the levels of income and female wages as well as distances from growth-centers and educational facilities are the significant determinants of rural to urban migration; while at household level, a number of very intuitively supported predictors have been identified. From these findings the policy-makers can extract many policy implications as per their interests and targets.

## **CHAPTER IV**

### **IMPACT OF MIGRATION ON HOUSEHOLD INCOME-EXPENDITURE BEHAVIOR**

Migration exerts impacts on life and livelihood in several dimensions. Income and expenditure are two strong dimensions that are interwoven with human life. Income is linked to production and expenditure is linked to consumption and investment. Economic activities center round production and consumption and migration actually influences production and/or consumption in one or another way. Thus migration impacts on income and expenditure through the economic activities of production and/or consumption and vice versa. This chapter makes an effort to uncover the impact of rural-urban migration on income and expenditure at household level in rural origin. The first section deals with the impact on income through 2-stage NELM model; the second section deals with the impact on expenditure through Working-Leser Model; and the third section deals with the impact of migration on income distribution.

#### **4.1 Impact of Migration on On-Farm and Off-Farm Income: 2-Stage NELM Models**

In a recently conducted study, Hossain *et al.*, (2013) investigated the impact of rural-urban migration on food security by applying both two-stage and three-stage NELM econometric models, as these models simultaneously consider migration determinants, remittance behavior and impacts. In the two-stage model, the impact of migration on calorie intake, as a proxy of food security, is explored with the help of instrumental variable (IV) regression model. The results of the two-stage model suggest that migration has a significant positive impact on the per capita calorie intake. On the other hand, two 3-Stage NELM models have been performed by considering two dependent variables viz., on-farm income and off-farm income (except remittance) considering number of migrants and amount of remittances as endogenous variables (Hossain *et al.*, 2013). In fitting the model with IV regression, the study faced a serious problem

to employ two sets of instruments simultaneously for the two endogenous variables (number of migrants and amount of remittances). To overcome the problem, the study estimated the predicted number of migrants using Poisson regression with count form and performed two-stage IV regression considering only the remittance as an endogenous variable. Having developed the models for on-farm and off-farm income with remittance as an endogenous variable and predicted number of migrants along with other covariates as exogenous variables, the test for endogeneity reveals that remittance is not appeared as the endogenous variable for both the models. The descriptive statistics suggest that only about half of the households received any sort of remittances. In this endeavor, the impact of internal migration on household income needs to be explored for the rural Bangladesh since the contribution of remittance in household income is not up to the mark. This section is devoted to study the impact of migration as a whole on household income ignoring the contribution of remittances separately.

Model Specification and Estimation

The basic equation for household income (main outcome of migration) according to the NELM hypothesis can be expressed as,

$$Y_{ik} = \beta_{ok} + \beta_{1k} Mig_{ik} + \beta_{2k} Z_{ik} + \varepsilon_{ik} ; \text{ where } k = \text{on-farm, off-farm} \dots\dots\dots (4.1)$$

In the above models, Y represents household income;  $Mig_i$  represents the number of migrants;  $Z_i$  represents the vector of covariates consisting of mainly household characteristics. The study considers the number of migrants at the household level as endogenous variable since migration directly affects household income and reversely household income can also cause migration resulting dual causality.

The following two-stage least squares (2SLS) analysis is performed to estimate the parameters when endogeneity problem exists. The 2SLS regression has the advantage that it separates the

movements of migration that are uncorrelated with error term which predicts past migration but has no direct impact on the outcome variable (household income).

$$\text{Stage 1: } Mig_i = \alpha_0 + \alpha_1 X_i + \alpha_2 X_i + \varepsilon_i \dots\dots\dots (4.2)$$

$$\text{Stage 2: } Y_{ik} = \beta_{0k} + \beta_{1k} Mig_{ik}(\hat{)} + \beta_{2k} Z_{ik} + \varepsilon_{ik} \dots\dots\dots (4.3)$$

Where,  $X_i$  is a vector of instruments that satisfies the requirements of instrumental exogeneity and relevance. The model is to be estimated jointly with the assumption that  $(\varepsilon_i, \varepsilon_{ik})$  follows *i.i.d* multivariate normal distribution.

In the estimation process, the first-stage model estimates the relationship between endogenous variable (migration) and instruments along with other independent variables to isolate the problem-free component of the migration variable that is not correlated with the error term. It is also required to confirm the significance of the instruments in the first-stage. The second-stage model uses this problem-free component to estimate the effects of migration variable on the household income. The key challenge to obtain the robust estimates of the above model is to find out an appropriate instrument for the endogeneous variable (migration). This study attempts to use migration network and share of male/female in 16-39 age groups at household level as instruments because literature suggests that these variables act successfully as the potential IVs to study the impact of migration on food security outcome such as per capita per day calorie intake and household income (Azzarri and Zezza, 2011; Karamba *et al.*, 2011; Hossain *et al.*, 2013; Taylor *et al.*, 2003).

## Variables used in the Model

### (a) Endogenous Variables:

$Y_{i1}$ = On-farm income (crop, fishery, dairy, poultry, nursery etc)

$Y_{i2}$ = Off-farm income (wage/salary, labour selling, tailoring, business, pension, safety net help, other transfers including internal remittances)

$Mig_i$ = Number of migrants

### (b) Exogenous Variables:

Total operative land of household

Education of household head (Years of schooling)

Region of residence (East=0, West=1)

Housing condition (poor quality=0, Good quality=1)

Religion (Muslim=0, Non-Muslims=1)

Gender of household head (Female=1, Male=0)

Distance from commercial centre (in km)

Number of adult male members (Labor Force)

Rice purchasing status of the households (Yes=0, No=1)

NGO membership of the households (Yes=1, No=0)

### (c) Instrumental Variables

Migration network (Yes=1, No=0) [Yes indicates the job informants by relatives/ friends/ neighbors (as prior migrants)]

Share of male/female in 16-39 age groups at household level (in percentage)

## Summary statistics of the study variables

The summary values of the study variables according to the migration status is given in Table 4.1. The average amount of on-farm income has not been found significantly different on the basis of migration status of the households, however, the average amount of off-farm income has

been found significantly ( $p < 0.01$ ) higher for migrant-sending households than for non-migrant households. The average number of migrants per household is estimated at 1.43 for migrant-sending households. The findings indicate that migrant-sending households (107.47 decimals) possess significantly ( $p < 0.01$ ) higher operative land than their non-migrant counterparts (83.27 decimals). The average education of the household heads has been found significantly ( $p < 0.01$ ) higher for the migrant-sending households (Years of schooling 4.95 vs. 4.25 years). The percentage of good quality of houses has been found significantly ( $p < 0.05$ ) higher for migrant-sending households. The percentage of female-headed households has been observed higher for migrant-sending households (7.40%) than that of the non-migrant counterparts (4.60%). The percentage of households having NGO membership was found significantly ( $p < 0.01$ ) higher in non-migrant samples in comparison to migrant-sending households.

**Table 4.1: Summary Values of the Main Variables according to the Migration Status**

Main Variables	Non-migrant households	Migrant households	Total
<b>Dependent variables</b>			
Annual average amount of on-farm income (in Taka)	46735.35	53722.69	51411.14
Annual average amount of off-farm (in Taka)	89375.23***	116036.24***	107216.23
<b>Endogenous Variables</b>			
Average number of migrants per household	-	1.43	-
<b>Independent/ Exogenous variables</b>			
Average amount of operative land of household	83.27***	107.47***	99.47
Average years of schooling of the household head	4.25***	4.95***	4.72
Percentage of West regional households	49.60	50.20	50.00
Percentage of good quality house	72.70**	77.70**	76.00
Percentage of non-Muslims in the study population	10.30	11.00	10.80
% of Female headed household	4.60	7.40	6.50
Average distance from commercial centre (km)	22.03		
Average labor force of the study households	1.80	1.30	1.63
% of the households not to have purchased rice	29.00	31.90	30.91
% of households having NGO membership	38.20***	28.60***	31.80
<b>Instrumental Variables</b>			
% of households reported to have migration network	-	98.40	-
Average Share of male/female in 16-39 age groups at household level	64.76***	91.87***	82.89

\*\*\*  $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.10$

## Results and Discussions

As described earlier, the impact of migration on household income is explored with the help of instrumental variable (IV) regression model stated in equation (4.3). The study assumes the number of migrants as endogenous variable since the decision of migration hinges upon unobserved household characteristics which also impact on the outcome variable, the household income. To estimate the parameters with the endogeneity problems two instrumental variables are considered, namely *migration network* and *share of male/female in 16-39 age groups* at household level. The correlation analysis reveals that both the instruments have significant ( $p < 0.001$ ) correlation with the endogenous variable ( $r = 0.65, 0.202$ ) and very poor correlation with dependent variable ( $0.035, 0.091; 0.104, 0.111$ ). In order to assess the impact of instrumental variables on endogenous variable (number of migrants), separate regression analyses have been carried out first and the findings indicate that all the instruments have high F-value ( $F = 1645.50$  for migration network,  $F = 95.97$  for share of male/female in 16-39 age groups at household level).

In addition, the study has considered a number of independent variables such as operative land of household, education of household head, region of residence on the basis of east-west divide, housing condition, religion, gender of the household head, distance from commercial centre, labor force of the households, rice purchasing status and NGO membership of the households.

The Sargan  $N \cdot R$ -sq test indicates that all the instruments are strongly uncorrelated with the disturbance term for on-farm income model; however, the test indicates a marginal rejection of the null hypothesis that the instruments are uncorrelated with the error term for off-farm income. In this situation, second stage IV regression (IVReg-2) has been performed with orthogonal options. After orthogonalization using share of male/female in 16-39 age groups at household level and household labour force, the Hansen-J-Statistic confirms to overcome the overidentification problem. Finally, the generalized method of moments (GMM) estimation

technique of IV regression has been adopted in order to obtain the robust estimates and the necessary test statistic confirms the goodness of fit for both on-farm and off-farm model. It is to be noted that the significance level (p-value) of Wu-Hausman F test and Durbin-Wu-Hausman chi-sq test confirms the endogeneity of number of migrants for both on-farm and off-farm models.

The GMM estimates of the model (equation 4.3) for the on-farm income indicate that the number of migrants has insignificant ( $p < 0.39$ ) negative impact on on-farm income. The reasoning behind the insignificant impact, maybe, that labour depletion in farming resulted from internal rural-urban migration is minimum due to migration of redundant labour. In this regard, Taylor *et al.* (2003) found the significant negative impact on on-farm income in the context of rural China. Among the covariates, total operative land of the household, education of the household head, region of residence and distance of household from commercial centre have significantly positive impact on on-farm income. On the contrary, housing condition and religion have highly significant negative impact on on-farm income.

On the other hand, the GMM estimates of the model (equation 3.3) for the off-farm income indicate that the number of migrants has highly significant ( $p < 0.001$ ) positive impact on off-farm income (Table 4.2). The explanation of the finding lies in that migration cannot result in labour loss in off-farm economic activities since labour migrated from this sector is possibly redundant and/or it might be that the change in the composition of the left behind labour force is re-arranged in such a fashion as to facilitate in augmenting the off-farm production and hence off-farm income. Besides, internal remittances, a direct outcome of rural-urban migration, is itself a part of off-farm income. This might cause migration to put such a positive impact on off-farm income. In addition, total operative land of the household, education of the household head, housing condition, household labour force, NGO membership and distance from commercial centre were found to have significantly positive impact on off-farm income and conversely,

region of residence and rice purchasing status were found to have highly significant negative impact on off-farm income.

**Table 4.2: Estimated Effects of Migration on Income from different Sources using 2-Stage Instrumental Variable Regression.**

Dependent Variable: On-farm income; Off-farm income,

Endogenous Variables: Number of migrants in the household

Instrumental variables: Migration network, Share of male/female in 16-39 age groups at household level

Explanatory variables	On-farm income		Off-farm income		Total income	
	Coef.	P>z	Coef.	P>z	Coef.	P>z
Number of migrants	-2078.751	0.392	9048.591	0.013	5394.391	0.213
Total operative land of Household	380.9738	0.000	56.67864	0.075	430.1455	0.000
Education of HH (Years of schooling)	1263.703	0.001	6045.447	0.000	7510.325	0.000
Region (East=0, West=1)	14720.4	0.000	-42969.57	0.000	-29548.07	0.000
Housing (poor quality=0, Good quality=1)	-9203.966	0.030	25112.44	0.000	14255.84	0.019
Religion (Muslim=0, Non-Muslims=1)	-7932.812	0.045	1589.974	0.830	-7889.542	0.328
Gender of HH	2556.477	0.403	-10607.72	0.290	-6887.246	0.509
Distance to Commercial Area	224.3886	0.005	301.1901	0.004	549.137	0.000
Labor force of the household	2724.422	0.267	19957.72	0.000	24108.2	0.000
Rice purchasing status of the households (Yes=0, No=1)	34479.56	0.000	-20795.06	0.000	16409.08	0.024
NGO membership of the households (Yes=1, No=0)	477.9325	0.866	20283.63	0.000	19803.75	0.000
Constant	-13073.34	0.045	37166.07	0.009	23669.35	0.122
No. of observations	2254		2254		2254	
R-squared centered	0.5450		0.1540		0.3877	
R-squared uncentered	0.6395		0.5371		0.6988	
F-test with P-value	<b>67.58 (p&lt;0.0001)</b>		<b>24.38(p&lt;0.0001)</b>		<b>55.81(p&lt;0.0001)</b>	
Tests of over identifying restrictions						
Sargan N*R-sq test Statistic	1.111		2.655		0.719	
P-value	0.2919		0.1032		0.3964	
Hansen-J-Statistic	0.825		1.970		0.598	
P-value	0.3638		0.1604		0.4392	
Test for endogeneity (H <sub>0</sub> : Regressor is exogenous)						
Wu-Hausman F-test	3.42024		2.71906		0.17564	
P-value	0.06453		0.09930		0.67519	
Durbin-Wu-Hausman chi-sq test	3.43483		2.73152		0.17664	
P-value	0.06384		0.09839		0.67427	

## 4.2 Impact of Migration on Different Household Expenditures through Working-Leser Model

Several studies have reported that impact of migration is seen for the societies which migrants leave and those in which they settle. The impact of migration at the household level can be assessed by analyzing the expenditure pattern of the surveyed households. To analyze the marginal expenditure patterns of migrant sending and non-migrant households, it is necessary to choose a proper functional form for the econometric model. The selected functional form must satisfy the following arguments:

**First**, it must provide a good statistical fit to a wide range of goods, including food, housing and education.

**Second**, the selected form must mathematically allow for rising, falling or constant marginal propensities to spend over a broad range of goods and expenditure levels.

**Third**, the chosen form should conform to the criterion of additivity (i.e., the sum of the marginal propensities for all goods should equal unity).

A very useful functional form which meets all of these criteria is the **Working-Leser model**, which relates budget shares linearly to the logarithm of total expenditure. This model can be written as

$$\frac{C_{ij}}{EXP} = \beta_i + \lambda_i * \log(EXP) \dots\dots\dots(4.4)$$

where  $C_{ij}$  denotes the total expenditure of a household  $i$  due to cause  $j$ ;  $C_{ij}/EXP$  is the share of expenditure due to cause  $j$  of household  $i$ ;  $EXP$  is the total expenditure of a household. Adding up requires that summation of  $C_{ij}/EXP$  equals 1.

The modified version of the model is,

$$\frac{C_{ij}}{EXP} = \beta_i + \lambda_i(\log EXP) + \sum [\lambda_i(z_i)] \dots\dots\dots(4.5)$$

Where  $C_{ij}$  denotes the total expenditure of a household  $i$  due to cause  $j$ ;  $C_{ij}/EXP$  is the share of expenditure due to cause  $j$  of household  $i$ ;  $EXP$  is the total expenditure of a household. Adding up requires that summation of  $C_{ij}/EXP$  equals 1. Let  $z_i$  denote the household and community characteristic variable for  $i$ . This modified Working-Leser model allows the demographic and regional variables as covariates and has the advantage that the coefficients can be explained in the elasticity form. The following two sub-sections deal with the application of the Working-Leser Model to study the impact of migration on household expenditure by developing the models for different heads of household expenditures as well as different shares of food expenditures.

#### **4.2.1 Impact of Migration by analyzing the Expenditure Pattern in Different Heads**

This section makes an attempt to explore whether and how the migrant and non-migrant households behave distinctly in utilizing their budget share of income for expenditure in order to get an idea about their expenditure pattern. This study has also considered two-way interaction variable namely logarithm of per capita total expenditure times predicted number of migrants. Since the variable of interest is the migration status of the household in terms of predicted number of migrants, the section mainly centers round the findings pertaining to this variable and the two-way interaction variable only.

##### Results and discussions:

The results portrayed in Table 4.3 indicate that the models have significantly fitted for the variables Per capita agricultural expenditure, Per capita food expenditure, Per capita others expenditure (medication, education, religious and other festivals and housing) and Per capita expenditure on clothing.

The positive coefficients of the log total household expenditure indicate that the share of total household expenditure for the per capita agricultural expenditure and per capita others

expenditure (medication, education, religious and other festivals and housing) significantly increase with the increase in total household expenditure of the surveyed households. On the other hand, negative log coefficient of household expenditure implies a reverse scenario for food expenditure and expenditure on clothing. The coefficient of interaction between per capita total expenditure and predicted number of migrants indicates that with the increase in per capita total expenditure the share of per capita agricultural expenditure significantly decreases for the migrant-sending households. In addition, the share of food expenditure increases significantly with the increase in per capita total expenditure for these households. These findings give the indication that rural to urban migration functions as a route out of agriculture in Bangladesh and a qualitatively positive change takes place through a better and more expensive food-mix for the migrant-sending households in rural origin. The overall finding implies that migration tends to exert negative impact on farm income and positive impact on food security.

**Table 4.3: Estimated Regression Models (Working-Laser Model) for the Different Shares of Households Expenditures**

Explanatory Variables and Interactions	Estimated Coefficients for the Models against Different Shares of Household Expenditures			
	Per capita Agricultural Expenditure	Per capita Food Expenditure	Per capita Others Expenditure	Per capita expenditure on Clothing
Predicted probability of migration	0.3301***	-0.3258***	0.0235	-0.0279
Logarithm of per capita total expenditure	0.0817***	-0.2191***	0.1598***	-0.0224***
Region (west=1, east=0)	0.0489***	-0.0374***	-0.0229***	0.01136***
Asset Score	-0.0004**	-0.0009***	0.0006***	0.0008***
Total amount of land	0.0003***	-0.0001***	-0.0002***	-0.00004***
Age of household head	-0.0003	-0.00003	0.0004*	-0.00011
Years of schooling of household head	-0.0022***	0.0018***	0.0003	0.00008
Logarithm of per capita total expenditure * Predicted probability of migration	-0.0325***	0.0319***	-0.0021	0.00266
Constant	-0.7724***	2.8977***	-1.4146***	0.2893***
R <sup>2</sup> and Adjusted R <sup>2</sup>	0.34 & 0.34	0.52 & 0.51	0.37 & 0.36	0.124 & 0.121
F-test with P-value	147.18 (p<0.01)	298.46 (p<0.01)	161.73 (p<0.01)	39.83 (p<0.01)

\*\*\* p<0.01 \*\* p<0.05 \* p<0.10

#### **4.2.2 Impact of Migration on Expenditure of Different Shares of Food Items**

Migration has become the key component that can influence the food expenditure patterns of the households. This study has used the working laser model to analyze the pattern of expenditures on different shares of food items. However, the total food expenditure has been analyzed by segregating it to per capita rice & wheat expenditure, per capita vegetable expenditure, per capita protein expenditure, per capita fat expenditure, and per capita other food expenditure. The models significantly fit for per capita rice & wheat, per capita vegetable, per capita protein, per capita fat and per capita other foods (Appendix Table 4.2).

Since per capita food expenditure and predicted number of migrant are the variables of interest, explanation of these variables represents the main findings of the table. The coefficient of per capita food expenditure indicates that share of per capita rice & wheat expenditure decreases highly significantly as total food expenditure increases. A similar kind of scenario has been observed for the share of per capita vegetable expenditure. On the other hand, the shares of per capita protein, per capita fat and per capita other foods expenditures increase very significantly as total food expenditure increases. These findings reveal that the rural households tend to allocate more portion of their expenditure to protein, fat and other food items like fruits, sweets, drinks etc. when their total food expenditure increases. The coefficient of the two-way interaction variable between food expenditure and number of migrant gives the interesting result that the share of per capita rice & wheat expenditure increases with the increase in total food expenditure for the migrant-sending households. In addition, share of per capita protein expenditure is found to decrease with the increase in total food expenditure for these households. So happens, probably because these households tend to purchase better quality rice and wheat compare to previous kinds and regarding protein there is little scope to do this.

### 4.3 Impact of Migration on Income Distribution

#### Inequality of Income Distribution: Lorenz Curve

A very useful formulation as a solution to the problem of performing the ‘Distribution of income’ can be made even if the functional form of the distribution  $f(x)$  is not known. This can be achieved through ‘ the curve of concentration’ defined as follows:

$N$ = Total frequency of population

$I$ = Total income

$N_x$ = Number of individuals with income  $x$  or more

$I_x$ = Total amount of income possessed by  $N(x)$

$P_x = \{N - N_x\} / N$ = Proportion of persons with income less than or equal to  $x$

$Q_x = \{I - I_x\} / I$ = Proportion of income of the persons with income less than or equal to  $x$

The straight line  $Q_x = P_x$  is known as ‘Line of equal distribution’. The graphical form of this function is known as Lorenz Curve (Figure 4.1). The design of concentration of income is compared with the line of equal distribution. As a measure of the difference between distributions, Gini proposed a concentration ratio defined as follows:

Let  $p(x)$  is plotted on  $x$ -axis and  $q(x)$  on  $y$ -axis. Put  $OC=1$  on the  $x$ -axis and  $OA=1$  on the  $y$ -axis.

$OB$  is the  $q(x)=p(x)$  line and the point  $D$  is on the curve,  $q=f(p)$ .

Therefore concentration ratio,  $g=(\text{area } BOD)/(\text{area } BOC)$ .

An alternative computation of the gini coefficient was suggested by Barrow (1998) using the equation:

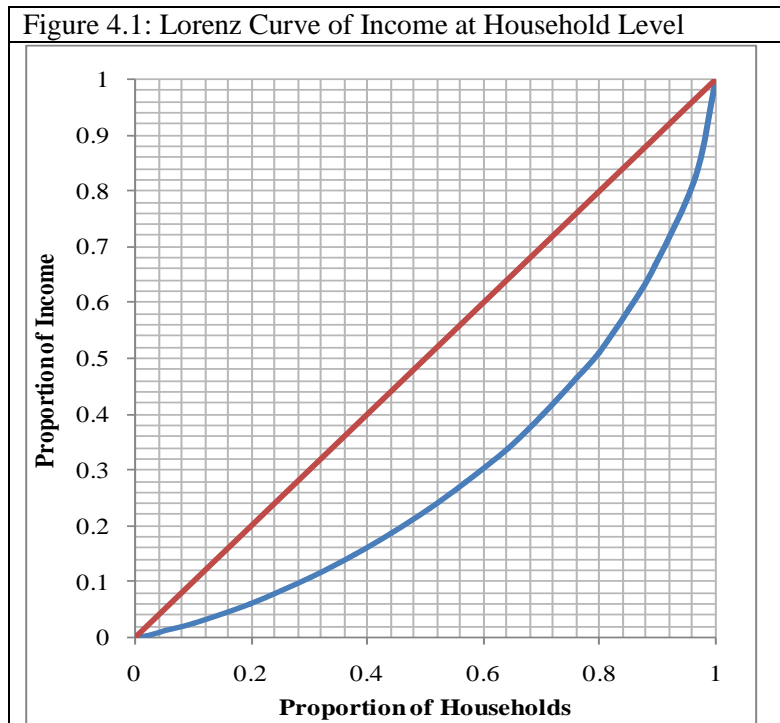
$$G = \frac{\text{Area}(BOD)}{\text{Area}(BOC)} = \frac{\text{Area}(BOD)}{\text{Area}(BOD) + \text{Area}(BDOC)},$$

Where,  $BDOC = \frac{1}{2} \{(x_1 - x_0)(y_1 + y_0) + (x_2 - x_1)(y_2 + y_1) + \dots + (x_k - x_{k-1})(y_k + y_{k-1})\}$

$BOD = (\frac{1}{2} \times 100 \times 100) - BDOC$

The distribution of income at household level along with the necessary elements for drawing Lorenz curve is given in Appendix Table 4.3. Figure 4.1 shows the Lorenz curve at household level of the study population.

The purpose of calculating Gini concentration ratio is to explore whether remittance has any contribution in income distribution of the rural households. So the Gini concentration ratio is calculated twice; without considering the amount of remittance in total income and considering the amount of remittances in total income. It was found that without considering the amount of remittance Gini concentration ratio was found 0.489 (Appendix Table 4.4) while considering the amount of remittance Gini concentration ratio was found 0.417 (Appendix Table 4.3). The results indicate that internal remittance plays an equalizing impact in the income distribution of the rural households.



The study also found that income is more equally distributed among the non-migrant households than their migrant counterparts as the Gini concentration ratio was found 0.423 (Appendix Table

4.5) for migrant households while it was 0.390 (Appendix Table 4.6) for non-migrant households.

This chapter concludes that rural to urban migration exerts negative impact, though insignificant, on on-farm income and significantly positive impact on off-farm income. Moreover, the analysis on expenditure pattern by migration status explores its positive impact on food security and the Gini-coefficient analysis finds out a positive contribution of this migration to income distribution in the left-behind community of the migrants.

# **CHAPTER V**

## **PATTERN OF MIGRATION**

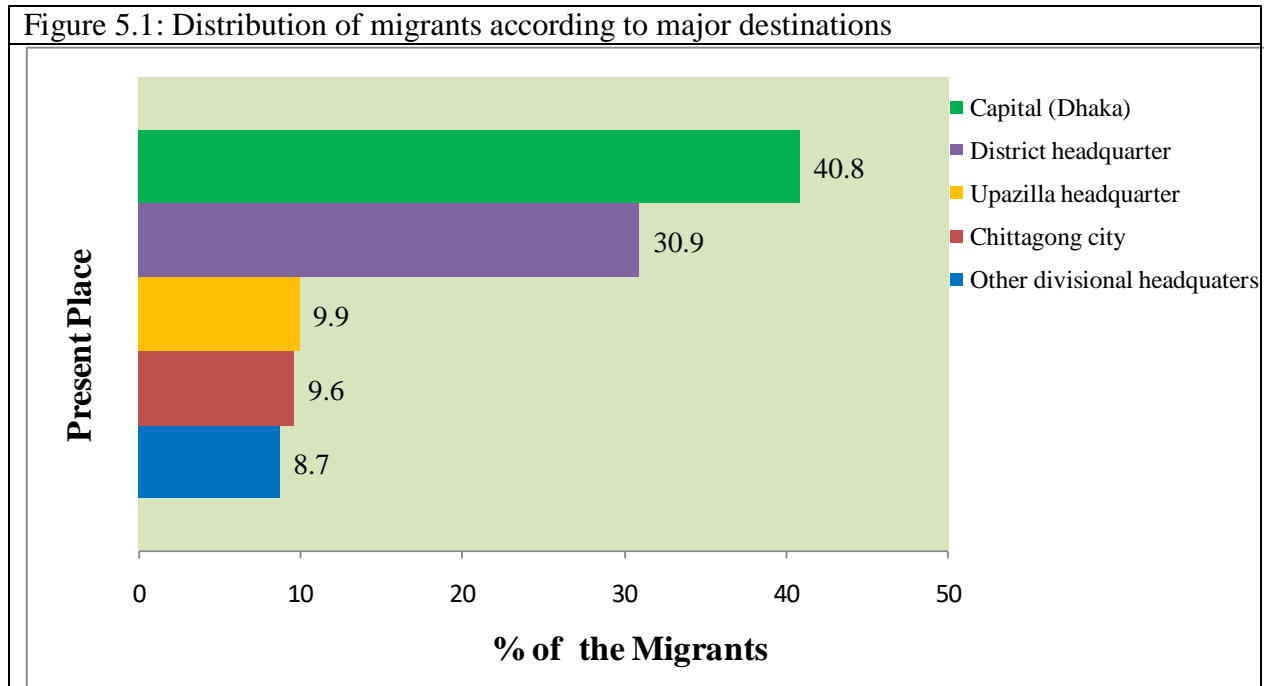
The previous two chapters of this thesis deal with the determinants and impact of migration in various dimensions. This chapter provides insights of the study on the pattern of migration using both deterministic and probability models. In particular, Working Leser model has been used to study the pattern of migration according to cause and destination, and probability models have been used to describe the distribution of households according to the number of migrants.

### **5.1 Migration Stream by Destination and Cause**

The process of migration is incepted by some factors related to origin and ends up with some factors related to destination. The former ones are called push factors and the latter ones are called pull factors. Actually, these two types of factor complement each other in the sense that what lacks in origin is perceptibly fulfilled at destination. For example, if a person wants to migrate for the reason of unemployment, he or she perceives that there must be the scope of employment at his/her targeted destination. Rural to urban migration in Bangladesh flows to some recognized places and for some typical causes. Though some previous studies (for example, Hossain *et al.*, 2013) discussed this migration flow by destination and cause with the help of only descriptive statistics, those did not do this by inferential statistics. Against this backdrop, this study tries to explore the changing pattern/behavior of migration flow by destination and cause through the inferential tool of Working-Leser model. The first sub-section deals with the flow by destination and the second sub-section deals by cause.

### 5.1.1 Flow of Migration by Destination

The destination of the migrants from the rural areas of Bangladesh has broadly been categorized into five places: Dhaka city, Chittagong city, Other divisional cities, District headquarters and Upazilla headquarters. Figure 5.1 shows the distribution of migrants according to the major destination places.



The results indicate that about two-fifths of the migrants were found to migrate to the capital city Dhaka. It is interesting to note that about three-in-ten migrants were found to migrate to the district headquarters around the country. Beside these two kinds of place, almost similar percentages of migrants migrated to Chittagong, other divisional headquarters and upazilla headquarters.

The modified version of the Working-Leser Model (Adams, Jr., 2006) in semi-log ratio form along with the household and community characteristics, as described in the Chapter two, is employed here to study the flow of migration according to destination. The model can be expressed as follows:

$$\frac{C_{ij}}{y_i} = \beta_i + \alpha_i * (\log y_i) + \sum \lambda_i z_i \dots \dots \dots (5.1)$$

Where  $C_{ij}$  denotes the total migration from a cluster  $i$  to destination  $j$ ;  $C_{ij}/y_i$  is the share of migration to destination  $j$  from cluster  $i$ ;  $y_i$  is the total rural-urban migration from this cluster; and  $z_i$  denote household and community characteristic variable. This modified Working-Leser model allows the demographic and regional variables as covariates and has the advantage that the coefficients can be explained in the elasticity form.

To estimate above equation, the various household and community characteristic variables need to be specified. Considering the required covariates, the final model becomes as follows:

$$\frac{C_{ij}}{y_i} = \beta_i + \alpha * (\log y_i) + \lambda_1 * PCIC + \lambda_2 * PIMHHC + \lambda_3 * DTS + \lambda_4 * DCA + \lambda_5 * PFHH + \lambda_6 * DD + \lambda_7 * ELC + \lambda_8 * LTT + \varepsilon_i \dots \dots (5.2)$$

Where,

$C_{ij}$ = Total number of migrants in the  $j$ th destination

$y_i$ = Total number of migrants of the community

PCIC= Log of Per-capita income of community

PIMHHC= Log of Proportion of international migrant households in community

DTS= Distance to Railway station

DCA=Distance to commercial/industrial area

PFHH= Percentage of farmer households

DD= Distance to Dhaka City

ELC= Educational level of community

LTT= Land tilling technology of community

**Table 5.1: Estimated Coefficients of Working-Leaser Model (using OLS) to measure the Flow of Migration according to Major Destinations**

Explanatory Variable	Estimated Models for the Major Destinations of Migration				
	Dhaka	Chittagong	Other division	District HQ	Upazilla HQ
Logarithm of total migrants	-0.4518*** (0.906)	-0.03666 (0.118)	0.080822 (0.102)	0.209943* (0.128)	0.19768** (0.08)
Logarithm of Per Capita Income of Community	- 0.19467*** (0.145)	0.03425 (0.061)	-0.000621 (0.053)	0.094883 (0.067)	0.06616 (0.044)
Logarithm of Percentage of International Migrant HHs in Community	0.03812* (0.022)	0.00892 (0.018)	0.006160 (0.0156)	-0.048801** (0.0196)	-0.00440 (0.0128)
Distance to Train Station	-0.00201** (0.0009)	0.00010 (0.0007)	0.001084* (0.0006)	-0.000343 (0.0008)	0.00117** (0.001)
Distance of Commercial/ Industrial area	- 0.00493*** (0.0017)	0.00373*** (0.0014)	0.000825 (0.0012)	0.000279 (0.002)	0.00010 (0.001)
Percentage of Farmer Households	0.00113 (0.00133)	-0.0030*** (0.0011)	-0.000087 (0.0009)	0.001688 (0.001)	0.00033 (0.001)
Distance to Dhaka	-0.00014 (0.00021)	0.00029* (0.00018)	0.000147 (0.0002)	0.000342* (0.0002)	0.00004 (0.0001)
Education level of community (at least 12 years of schooling)	0.00881** (0.00405)	-0.00467 (0.0033)	0.002248 (0.003)	-0.003683 (0.004)	-0.00271 (0.002)
Land Tilling Technology (Mechanized=1, Non-Mechanized=0)	0.09551 (0.126)	-0.19846** (0.1025)	0.058540 (0.088)	0.086369 (0.111)	-0.04196 (0.07)
Constant	3.91009*** (0.906)	0.05726 (0.738)	-0.360050 (0.637)	-1.339* (0.800)	-1.268** (0.523)
<b>Adjusted R<sup>2</sup></b>	0.422	0.381	-0.034	0.190	0.127
<b>F statistic</b>	5.779***	5.038***	0.787	2.542**	1.955*

Note: Figures within parenthesis indicate the Standard Error \*\*\* $\rho < 0.01$  \*\* $\rho < 0.05$  and \* $\rho < 0.10$

### Findings:

The estimated coefficients (along with standard error of estimates) of Working-Leaser model (using OLS) to measure the flow of migration according to major destinations is shown in Table 5.1. The value of adjusted  $R^2$  and its p-value indicate that the model significantly fit for all variables except *other divisional Headquarters*. According to the destination, the result shows that the share/proportion of migrants to Dhaka tends to decrease significantly as the total migration flow increases. The study found that the shares of migrants to District headquarters and Upazilla headquarter increase significantly with the increase in total migration flow. This finding clearly gives the message that proportionately, though not absolutely, the migration flow shows a declining tendency to the capital city, while the opposite tendency gets started towards the upazilla and district headquarters. The plausible explanation for this finding is that the inconveniences resulted from the already existed population pressure in Dhaka city discourage the rural people to migrate to this city, whereas the newly developed nearby upazilla and district level growth-centers attract them to migrate to these towns.

#### **5.1.2 Flow of Migration according to Major Causes (Push factors & Pull factors)**

Literature suggests that two factors simultaneously act for migration decision (Hossain, 2000; 2005; 2013). These are push factors and pull factors. These two factors are closely related with the socioeconomic conditions at origin and destination respectively. Braunvan, (2004) argued that people tend to be pulled to the areas of prosperity and pushed from the areas of adversity. Figure 5.2 and 5.3 shows the percentage of migrants according to the push factors and pull factors respectively.

Figure 5.2: Push factors of migration

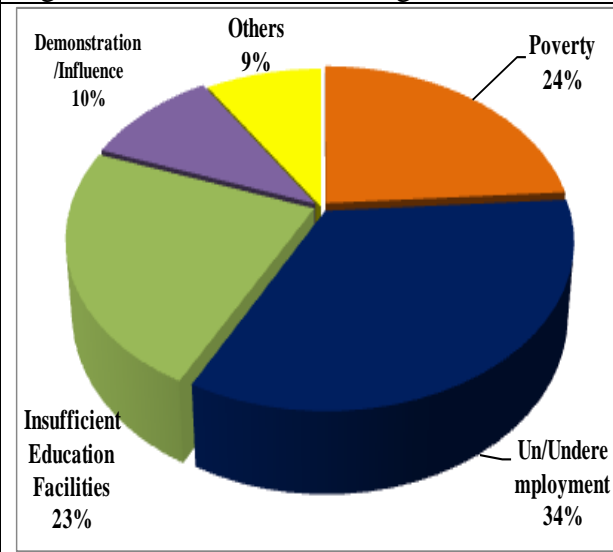
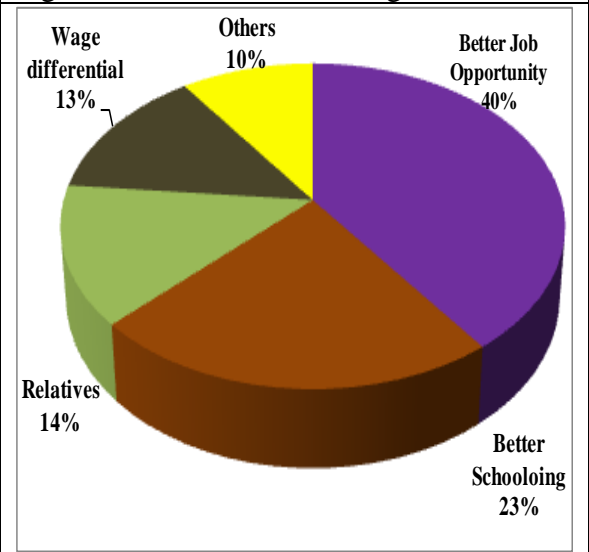


Figure 5.3: Pull factors of migration



The findings show that poor economic opportunity plays a leading role in making the rural-urban migration decision. Among the push factors, it is found that over half of the migrants migrated due to poverty and un/under employment. In addition, near one-quarter of the migrants migrated due to poor education facilities. Among the pull factors, 40% reported to migrate to find out a better job opportunity and 23% did so for better schooling facility.

Flow of migration according to push factors

The Working-Leser model according to the major causes (push factors) of migration can be expressed as following:

$$\frac{C_{ik}}{y_i} = \alpha_i + \beta * (\log y_i) + \omega_1 * WLFLS + \omega_2 * PCIC + \omega_3 * NOC + \omega_4 * PLCUI + \varepsilon_i \quad \dots \dots \dots (5.3)$$

Where,

C<sub>ik</sub>= Total number of migrants for the factot/cause k from the community i

Y<sub>i</sub>= Total number of migrants from the community i

WLFLS= Female wage labor in lean season

PCIC= Log of Per capita income of community

NOC= Number of crops in community (at least two crops=1, multi crop=0)

PLCUI= Percentage of land under irrigation of community

**Table 5.2: Estimated Coefficient of Working-Leser Model (using OLS) to measure the Flow of Migration according to Major Causes (Push Factors)**

Explanatory Variables	Major causes of migration (Push Factors)				
	Poverty	Un/under employment	Insufficient education facilities	Demonstration effect & influence	Others (natural calamities, reluctance to agricultural work, social/political victimization)
Logarithm of total migrants	-0.32846** (0.133)	0.10545 (0.145104)	-0.05172 (0.108337)	0.08213 (0.100750)	0.19260*** (0.064805)
Wage Labor of Female In Lean Season	-0.00086** (0.0004)	-0.00024 (0.000478)	0.00046 (0.000357)	0.00067** (0.000332)	-0.00003 (0.000213)
Logarithm of per Capita Income of Community	-0.28895*** (0.069)	0.01497 (0.075497)	0.29487*** (0.056367)	-0.06347 (0.052420)	0.04259 (0.033718)
No. of Crops (at least Two crops=1, Otherwise=0)	-0.09611* (0.049)	0.11425** (0.054557)	-0.02008 (0.040733)	0.02151 (0.037881)	-0.01958 (0.024366)
% of land of community under irrigation	-0.00132 (0.001)	0.00257* (0.001482)	-0.00116 (0.001106)	-0.00047 (0.001029)	0.00038 (0.000662)
Constant	4.67300*** (0.823)	-0.45051 (0.899113)	-2.55537*** (0.671292)	0.38154 (0.624282)	-1.04946** (0.401553)
<b>Adjusted R<sup>2</sup></b>	0.387	0.026	0.360	0.024	0.117
<b>F statistic</b>	8.440***	1.321	7.638 ***	1.294	2.569**

Note: Figures within parenthesis indicate the standard error  
 \*\*\* $\rho < 0.01$  \*\* $\rho < 0.05$  and \* $\rho < 0.10$

### Findings:

Table 5.2 represents the estimated coefficients of Working-Leser model (using OLS) to measure the flow of migration according to major push factors. The model is found significantly fit for the variables (causes) poverty, insufficient education facilities and other causes (natural calamities, reluctance to agricultural work, social/political victimization). The negative log coefficient of the total migrants indicate that the share of migrants due to poverty significantly decrease with the increase in total migrants from the surveyed households. A reverse scenario is

found for the other causes (natural calamities, reluctance to agricultural work, social/political victimization). These findings reveal that relatively, rural to urban migration because of poverty is on decline, while the relative migration flow due to factors of natural calamities, reluctance to agricultural work and social/political victimization is on rise. Probably, this happens because of decreasing rate of poverty and increasing trend of negative socio-politico and climate change in rural Bangladesh.

Flow of migration according to pull factors

The Working-Leser model according to the major causes (pull factors) of migration can be expressed as following:

$$\frac{C_{il}}{y_i} = \omega_i + \phi * (\log y_i) + \xi_1 * ELC + \xi_2 * PCIC + \xi_3 * PIMHHC + \xi_4 * AHSC + \xi_5 * PMHC + \varepsilon_i \dots \dots \dots (5.4)$$

where, C<sub>il</sub>= Total number of migrants for the factor l from community i

y<sub>i</sub>= Total number of migrants from the community i

ELC= Education level of the community

PCIC= Log of Per capita income of community

PIMHC= Proportion of international migrant households in community

PMHC= Percentage of Muslim Households of the community

AHSC= Average household size of community

**Table 5.3: Estimated Coefficient of Working-Leser Model (using OLS) to measure the Flow of Migration according to Major Causes (pull factors)**

Covariates	Major causes of migration (Pull factors)				
	Better Job opportunity	Better Schooling	Existence of Relatives	Wage differentials	Others (Transfer/Weakness for destination/Others)
Logarithm of total migrants	0.0185 (0.1708)	-0.1947* (0.105)	0.3185*** (0.086)	-0.0587 (0.109)	-0.08347 (0.08177)
Education level of community (at least 12 years of schooling)	0.0036 (0.005)	-0.0031 (0.0028)	0.0003 (0.002)	-0.0003 (0.003)	-0.00047 (0.0022)
Per Capita Income of Community	-0.0233 (0.0804)	0.340*** (0.049)	-0.0223 (0.04)	-0.237*** (0.051)	-0.05732 (0.03851)
Proportion of international migrant sending HH	0.0367 (0.024)	-0.023 (0.015)	-0.0019 (0.012)	-0.0182 (0.015)	0.00606 (0.01140)
Average household size of community	-0.0287 (0.0503)	0.0516* (0.0309)	-0.0614** (0.0252)	0.0163 (0.032)	0.02229 (0.02406)
% of Muslim HH of community	0.0008 (0.001)	0.0008 (0.001)	0.0003 (0.001)	0.0007 (0.001)	-0.00040 (0.0006)
Constant	0.561 (0.972)	-2.692*** (0.598)	-0.410 (0.488)	2.649*** (0.619)	0.892* (0.465)
<b>Adjusted R<sup>2</sup></b>	-0.038	0.455	0.142	0.253	-0.019
<b>F statistic</b>	0.640	9.224***	2.626**	4.326***	0.817

Note: Figures within parenthesis indicate the standard error

\*\*\* $\rho < 0.01$  \*\* $\rho < 0.05$  and \* $\rho < 0.10$

### Findings:

The estimated coefficients of Working-Leser Model to measure the flow of migration according to major pull factors are presented in Table 5.3. It is found that the model significantly fits for the variables *better schooling*, *existence of relatives* and *wage differentials*. The negative coefficient of the total migrants for the variable *better schooling* indicates that, with the increase in total migrants the share of migrants due to better schooling criteria decreases significantly. In contrast, the positive coefficient of the total migrants for the variable *existence of relatives* reveals that the share of migrants due to having relatives at their desired destination increases highly significantly with an increase in the total number of migrants. The findings reveal that the scope of better education at urban destination cannot keep pace with increasing number of migrants for this purpose because of which the migration flow for this very reason decreases significantly in

relative sense and networking at destination plays a vital role for rural-urban migration strongly supporting the social capital theory of migration

## 5.2 Pattern of Migration by Income Distribution

### Decile Distribution of Income

The distribution of income accruing to households in each decile group is presented in Appendix Table 5.1. The average household income, per capita income and proportion of population in each decile have also been computed. The findings show that the lowest decile group had 7.4% population and 2.38% income. For this group, per household income was Tk37770.66 and per capita income was Tk9277.73 in a year. The findings have clearly revealed that the average income increase sharply at the higher deciles.

**Table 5.4: Distribution of the Households according to their Annual Income into Decile Groups**

Decile of HHs Income	% of population in each decile			% of income accruing to households in each decile		
	Migrant HH	Non-Migrant HH	Total	Migrant HH	Non-Migrant HH	Total
<b>Lowest 5%</b>	<b>3.558</b>	<b>3.209</b>	<b>3.579</b>	<b>0.889</b>	<b>1.160</b>	<b>0.999</b>
Decile-1	7.478	7.233	7.400	2.226	2.807	2.376
Decile-2	8.158	8.950	8.256	3.569	4.106	3.666
Decile-3	8.917	9.823	9.363	4.390	5.095	4.773
Decile-4	9.506	9.429	8.870	5.354	5.903	5.281
<b>Decile 1-4</b>	<b>34.058</b>	<b>35.435</b>	<b>33.888</b>	<b>15.539</b>	<b>17.911</b>	<b>16.096</b>
Decile-5	9.914	9.738	9.799	6.431	6.746	6.415
Decile-6	10.310	10.132	10.324	7.616	7.893	7.697
Decile-7	10.843	10.217	10.429	9.523	9.236	9.295
Decile-8	10.888	10.836	11.350	11.922	11.323	11.687
Decile-9	11.172	12.468	11.439	15.963	15.365	15.883
Decile-10	12.814	11.174	12.772	33.006	31.526	32.927
<b>Top 5%</b>	<b>6.402</b>	<b>5.685</b>	<b>6.632</b>	<b>21.746</b>	<b>20.669</b>	<b>21.926</b>

Further, the bottom 40% of the households comprising 33.89% of the study population receive 16.10% of the total income, while only the topmost decile comprised 12.77% of the population

receive 32.93% of the total income. Interestingly, top 5% households alone account for about 22% of the total income. The average income of the bottom 40% households was Tk63760.59 per household. The average income of highest decile was about 8 times higher as compared to the average income of bottom 40% households. The distribution of income according to decile group is consistent with other studies in Bangladesh. For example, Household Income and Expenditure Survey 2010 of BBS reported that bottom 40% households accounted for about 14% income and top-3 decile contributed for about 72% income (BBS, 2011). The decile distribution of income indicates the high discrimination of income between lower and higher groups of the surveyed households.

Table 5.4 shows a comparative picture of the income distribution of income distribution between migrant and non-migrant households. The results indicate no remarkable variation among the migrant and non-migrant households according to the income distribution.

### **5.3 Probability Models for Household-Level Migration**

Model building in migration studies at the micro-level has greater importance because it explains the pattern, trend, volume of migration and factors active on it. Among several approaches, a study of migration through a probability model at the household level (micro level) was first initiated by Singh and Yadava in 1981. Several attempts have been made to study the pattern of rural out-migration through the use of probability models (Hossain, 2000; Iwunor, 1995; Sharma, 1988; 1987; 1985; Yadava, 1993; Yadava and Singh, 1983; Yadave *et. al.* 1991; 1994).

#### **5.3.1 Probability Models for the Number of Male Migrants Aged 15 Years or Above**

In the pioneer work, Singh and Yadava (1981) found that the distribution of households according to number of male migrants (aged fifteen years and above) is satisfactorily fitted by a negative binomial distribution. They applied this probability distribution to the observed number of migrants from households taken from the Demographic Survey of Varanasi (1969-1970). Sharma

(1984) also examined the model by applying it to another set of data from different groups of villages.

Sharma (1985) has proposed a probability model for the number of rural male out-migrants aged 15 years and above from a household under the assumptions (i) At any point in time,  $\alpha$  be the probability of migrating out from a household and  $(1-\alpha)$  be the probability of not migrating from a household; (ii) If  $p$  represents the probability of a single individual migrating from a household, the pattern of migration from each household follows the geometric distribution. If  $x$  represents the number of migrants from a household, then  $x$  follows the inflated geometric distribution with probability density function as

$$\left. \begin{aligned} P(x = 0) &= 1 - \alpha + \alpha p \\ P(x = k) &= \alpha q^k p \text{ for } k = 1, 2, 3, \dots \end{aligned} \right\} \dots\dots\dots (5.5)$$

where  $p+q=1$ .

Sharma (1985) used method of moments to estimate the parameters  $\alpha$  and  $p$  of model (5.5) and obtained the asymptotic expressions for variance and covariance of the estimators using multivariate central limit theorem. After a decade, Iwunor (1995) proposed an alternative estimation technique based on likelihood function and obtained the variance and covariance of the estimators. Though Iwunor used the likelihood function using multinomial combination, but finally estimated the parameters by mean-zero frequency method. Considering the limitations of the estimation techniques used by the earlier researchers, Hossain (2000) proposed an alternative estimation technique based on likelihood function by using all the observations to estimate the parameters. Hossain (2000) also derived the expressions for exact variance and covariance of the estimators. The study compared the estimators obtained by Hossain's proposed method, Sharma's method and Iwunor's method by applying to the same set of data. The main contribution of Hossain's study was to derive an improved estimation technique including the expressions for

variances and covariance. Hossain (2000) also applied this model to the Bangladesh data and found suitable to describe the distribution of adult male migrants.

Hossain (2000) proposed a new model to describe the distribution of migrants (male  $\geq 15$  years) and derived the maximum likelihood estimators of the parameters including variances and covariance. He has applied this model to the Comilla (Bangladesh) data as well as Varanasi (India) data. The comparison of the results obtained by Hossain (2000) clearly indicates that the proposed model provided better fits than Sharma's model for most of the study cohorts.

As the pattern of migration changes over time, it is required to verify whether this model is still applicable to describe the distribution of male migrants aged 15 years & above at household level using an extensive nationwide dataset. It is to be noted that the model was applied earlier for a micro-level data collected from 10 rural clusters from Comilla district of Bangladesh. This study makes an attempt to apply the model proposed by Hossain (2000) in order to describe pattern of adult (age 15 years and above) male migration at household level. The model including the estimation procedure is illustrated below:

### The Model

The probability model proposed by Hossain (2000) for describing the pattern of the number of male migrants aged 15 years & above from households has been derived using assumptions: (i) At the survey point, the household is either exposed to the risk of migration or it is not exposed to the migration risk with respective probabilities  $\alpha$  and  $(1-\alpha)$ ; (ii) The probability of migrating one male from a household is greater than the probability of migrating two males, and probability of two males migrating is greater than that of three males from a household and so on. Thus, the pattern of migration from a household is a decreasing function and follows a logarithmic series with parameter  $\lambda$ . If  $x$  represents the number of male migrants aged 15 years

and above from a household, then under the assumptions (i) and (ii), the probability function of  $x$  is given by,

$$\left. \begin{aligned} P(x=k) &= 1 - \alpha, \quad \text{for } k=0 \\ &= \alpha \left[ \frac{-\lambda^k}{k \log(1-\lambda)} \right] \text{ for } k=1,2,3,\dots; 0 < \lambda < 1; 0 < \alpha < 1. \end{aligned} \right\} \dots \dots \dots (5.6)$$

Estimation

Hossain (2000) used maximum likelihood method to estimate parameters of the above model. Let  $n_k$  ( $k= 0, 1, 2\dots m$ ) represents the no. of observations of the  $k$ -th cell and  $\sum n_k=n$ . The likelihood function for the random sample  $(X_1, X_2, \dots X_n)$  can be expressed as:

$$L = (1 - \alpha)^{n_0} \prod_{k=1}^m \left[ \alpha \left( \frac{-\lambda^k}{k \log(1-\lambda)} \right) \right]^{n_k}$$

$$L = \frac{(1 - \alpha)^{n_0} (-\alpha)^{n-n_0} \lambda^{\sum_{k=1}^m n_k x_k}}{(\prod_{k=1}^m x_k^{n_k}) [\log(1-\lambda)]^{n-n_0}} \dots \dots \dots (5.7)$$

Where  $x_k$  indicates the value of  $k$ . Taking logarithm of equation (1) and differentiating with respect to  $\alpha$  and  $\lambda$  respectively and equating to zero gives:

$$\frac{d \log L}{d \alpha} = - \frac{n_0}{1 - \alpha} + \frac{n - n_0}{\alpha} = 0 \dots \dots \dots (5.8)$$

$$\frac{d \log L}{d \lambda} = \frac{\sum_{k=1}^m n_k x_k}{\lambda} + \frac{n - n_0}{(1 - \lambda) \log(1 - \lambda)} = 0 \dots \dots \dots (5.9)$$

The estimator of  $\alpha$  can be written as:

$$\hat{\alpha} = \frac{n - n_0}{n}$$

From equation (3) the estimating equation of  $\lambda$  is

$$(1 - \lambda) \log(1 - \lambda) \sum_{k=1}^m n_k x_k + (n - n_0) \lambda = 0$$

The numerical solution of the above equation gives the desired estimate of  $\lambda$ .

### Application

The model discussed above has been applied to the real data collected from 60 nationwide rural clusters (primary sampling units of BBS) of Bangladesh. Table 5.5 shows the estimated values of the parameters, variances and covariance, observed and expected number of households according to the number of male migrants (aged 15 years & above) for surveyed households. The highly insignificance value of  $\chi^2$  indicates the very adequacy of the model to describe the pattern of adult male rural-urban migrants from a household. The estimated value of the risk parameter  $\alpha$  for the model was found 0.1556 which is very close to the value ( $\alpha=0.1765$ ) obtained by Hossain (2000) using the sample data collected from 10 rural clusters of Comilla district. The results lead to conclude that the internal rural-urban migration tendency from Comilla district was higher in 2000 than that from the rest of Bangladesh in 2012. The estimated value of  $\lambda$  was found 0.3044 which moderately differs from Hossain's (2000) as it was 0.4875 for Comilla Dataset.

The model has also been applied to the two household cohorts according to East-West divide reported by the World Bank poverty assessment study of Bangladesh (World Bank, 2008). It is to be noted that the economic opportunity varies between these two regions that reflects their migration behavior. Hossain *et al.* (2013) reported that the percentage of households with internal migrants was higher in the western region (27.22%) than that in the eastern region (19.19%); while the percentage of households with international migrants was markedly higher in the eastern region (15.67%) than in the western region (4.65%).

Appendix Table 5.4 shows the estimated values of the parameters, variances and covariance, observed and expected number of households according to the number of male migrants aged 15 years & above according by East-West divide. The  $\chi^2$  values indicate that the model fits well for both the household cohorts- East region and West region. The estimated values of risk parameter

$\alpha$  were found to vary significantly between the two regions. It is found that the risk parameter is higher ( $\alpha=0.201$ ) for the households from West region than the households from East ( $\alpha=0.125$ ). The higher value of  $\alpha$  for households from West region indicated that such households have a greater chance of internal rural-urban migration than the households from East region. The findings clearly corroborate the findings of Hossain *et al.*, (2013) regarding percentage of internal and international migrant sending households according to East-West divide. The estimated values of  $\lambda$  were found 0.261 and 0.347 for West and East regions respectively.

**Table 5.5: Distribution of observed and expected number of households according to their number of male migrants aged 15 years and above in Bangladesh**

No. of Migrants per HH	Household Cohort			
	RUM-2012 (Origin)		Findings of Hossain (2000) for Comilla Dataset	
	Observed	Expected	Observed	Expected
0	6782	6781.98	1941	1941.00
1	1042	1048.28	296	303.38
2	165	159.55	79	73.95
3	38	32.38	29	24.04
4	4	9.19	9	14.63
5	1		3	
6			0	
7			0	
8			0	
Total	8032	8031.38	2357	2357
$\chi^2$		3.73		2.022
d.f		2		2
Parameter estimation				
$\alpha$		0.1556		0.1765
$\lambda$		0.3044		0.4875
V( $\alpha$ )		0.00001636		$6.17 \times 10^{-5}$
V( $\lambda$ )		0.000265		0.00076
COV( $\alpha, \lambda$ )		0.0000		0.0000

### 5.3.2 Probability Models for the Total Number of Migrants from a Household

As mentioned earlier, several models have been proposed to study the distribution of households according to total number of migrants. Among these models, Hossain (2000) used the probability model proposed by Yadava (1993) by employing maximum likelihood method to estimate the parameters. In addition, Hossain (2000) developed the expression to estimate the variances and covariance of the parameters. Needless to mention that Hossain (2000) found better fitting of the model than that found by Yadava (1993) including the estimate of variances and covariance of the parameters. This study attempts to re-apply this model for describing the distribution of households according to total number of migrants for an extensive nationwide dataset of Bangladesh.

#### The Model

The probability model proposed by Yadava (1993) has been developed under the following assumptions:

- (i) At origin, let  $\beta$  be the proportion of households with at least one migrant.
- (ii) Out of  $\beta$ , let  $\zeta$  be the proportion of household with only one migrant at origin.
- (iii) From the remaining  $(1-\zeta)\beta$  proportion of households,  $\pi$  be the proportion of household from which only males  $\geq 15$  years migrants and  $(1-\pi)$  be the proportion of households that resembles the both type of migrants.
- (iv) Considering both the  $\pi$  and  $(1-\pi)$  proportion of households, the number of migrants from a household follows a mixture of two displaced geometric distribution.
- (v)  $p_1$  and  $p_2$  be the probability of migration of a person from  $\pi$  and  $(1-\pi)$  proportion of households respectively.

On the basis of above assumptions, the probability distribution for the total number of migrants,  $x$ , is given by

$$\begin{aligned}
 p(x=k) &= 1-\beta, \text{ if } k = 0 \\
 &= \xi\beta, \text{ if } k=1 \\
 &= (1-\xi)\beta \{ \pi p_1 q_1^{k-2} + (1-\pi) p_2 q_2^{k-2} \} \text{ if } k=2, 3, \dots \dots \dots (5.10)
 \end{aligned}$$

If it is assumed that the probability of migration from both types of households are same, i.e.  $p_1 = p_2 = p$ , then the probability model is given as:

$$\begin{aligned}
 p(x=k) &= 1-\beta && \text{for } k = 0 \\
 &= \xi\beta && \text{for } k = 1 \\
 &= (1-\xi)\beta pq^{k-2} && \text{for } k=2,3, \dots \dots \dots (5.11)
 \end{aligned}$$

Estimation

The three parameters  $\xi$ ,  $\beta$  and  $p$  to be estimated from the observed distribution of total number of migrants from households. As mentioned earlier, Hossain (2000) used maximum likelihood method to estimate the parameters. In brief, the estimation technique is illustrated below:

Let  $x_1, x_2, \dots, x_n$  denote a random sample of size  $n$  from the population ( $\cdot$ ). Further, suppose that  $n_k$  ( $k=0,1,2, \dots, m$ ) be the number of observations corresponding to the value of  $k$  and  $\sum_{k=0}^m n_k = n$ .

The likelihood function for the given sample can be expressed as

$$\begin{aligned}
 L &= \prod_{k=0}^m [p(x=k)]^{n_k} = (1-\beta)^{n_0} (\xi\beta)^{n_1} \prod_{k=2}^m \left[ (1-\xi)\beta pq^{k-2} \right]^{n_k} \\
 &= (1-\beta)^{n_0} \xi^{n_1} \beta^{n-n_0} (1-\xi)^{n-n_0-n_1} p^{n-n_0-n_1} q^{\sum_{k=3}^m (k-2)n_k} \dots \dots (5.12)
 \end{aligned}$$

Taking logarithms of (5.12) and differentiating with respect to  $\beta$ ,  $\xi$  and  $p$  respectively and equating to zero, we get

$$\frac{\delta \log L}{\delta \beta} = -\frac{n_0}{1-\beta} + \frac{n-n_0}{\beta} = 0 \dots\dots\dots (5.13)$$

$$\frac{\delta \log L}{\delta \xi} = \frac{n_1}{\xi} - \frac{n-n_0-n_1}{1-\xi} = 0 \dots\dots\dots (5.14)$$

$$\frac{\delta \log L}{\delta p} = \frac{n-n_0-n_1}{p} - \frac{\sum_{k=3}^m (k-2)n_k}{1-p} = 0 \dots\dots\dots (5.15)$$

Solving equations (5.13), (5.14) and (5.15) the estimators of  $\beta$ ,  $\xi$  and  $p$  can easily be obtained as

$$\hat{\beta} = \frac{n-n_0}{n}, \quad \hat{\xi} = \frac{n_1}{n-n_0} \quad \text{and} \quad \hat{p} = \frac{n-n_0-n_1}{(n-n_0-n_1) + \sum_{k=3}^m (k-2)n_k}$$

In order to estimate the variances and covariance of the estimated parameters, Hossain (2000) used the large sample approximation. The second partial derivations of logL can be obtained as:

$$\frac{\delta^2 \log L}{\delta \beta^2} = -\frac{n_0}{(1-\beta)^2} - \frac{n-n_0}{\beta^2} \dots\dots\dots (5.16)$$

$$\frac{\delta^2 \log L}{\delta \xi^2} = -\frac{n_1}{\xi^2} - \frac{(n-n_0-n_1)}{(1-\xi)^2} \dots\dots\dots (5.17)$$

$$\frac{\delta^2 \log L}{\delta p^2} = -\frac{(n-n_0-n_1)}{p^2} - \frac{\sum_{k=3}^m (k-2)n_k}{(1-p)^2} \dots\dots\dots (5.18)$$

$$\frac{\delta^2 \log L}{\delta \beta \delta \xi} = \frac{\delta^2 \log L}{\delta \beta \delta p} = \frac{\delta^2 \log L}{\delta \xi \delta p} = 0 \dots\dots\dots (5.19)$$

Here,  $E(n_0) = n(1 - \beta)$ ,  $E(n_1) = n\xi\beta$ ,  $E(n_k) = n(1 - \xi)\beta pq^{k-2}$  for  $k=2,3,\dots,m$ .

Again  $E(n - n_0) = np$ ,  $E(n - n_0 - n_1) = n\beta(1 - \xi)$

$$\begin{aligned} E\left[\sum_{k=3}^m (k-2)n_k\right] &= E[n_3 + 2n_4 + 3n_5 + \dots + (m-2)n_m] \\ &= n(1 - \xi)\beta pq[1 + 2q + 3q^2 + \dots + (m-2)q^{m-1}] \\ &= n(1 - \xi)\beta q\left[\frac{1 - q^{m-2}}{p} - (m-2)q^{m-2}\right] \text{ for small } m \dots \dots (5.20) \end{aligned}$$

$$= \frac{n(1 - \theta)\beta q}{p} \quad \text{for large } m \quad \dots \dots (5.21)$$

Using the above facts, the expected values of the second partial derivatives can be obtained as:

$$-E\left(\frac{\delta^2 \log L}{\delta \beta^2}\right) = \frac{E(n_0)}{(1 - \beta)^2} - \frac{E(n - n_0)}{\beta^2} = \frac{n}{\beta(1 - \beta)} = \phi_{11}(\text{say}) \dots \dots (5.22)$$

$$-E\left(\frac{\delta^2 \log L}{\delta \xi^2}\right) = \frac{E(n_1)}{\xi^2} + \frac{E(n - n_0 - n_1)}{(1 - \xi)^2} = \frac{n\beta}{\xi(1 - \xi)} = \phi_{22}(\text{say}) \dots \dots (5.23)$$

$$\begin{aligned} -E\left(\frac{\delta^2 \log L}{\delta p^2}\right) &= \frac{E(n - n_0 - n_1)}{p^2} + \frac{E\left[\sum_{k=3}^m (k-2)n_k\right]}{(1 - p)^2} \\ &= \frac{n\beta(1 - \xi)q + n(1 - \xi)\beta p[1 - q^{m-2} - (m-2)pq^{m-2}]}{p^2 q} \\ &= \phi_{33}(a)(\text{say}), \quad \text{for small } m \quad \dots \dots (5.24) \end{aligned}$$

$$\text{and } -E\left(\frac{\delta^2 \log L}{\delta p^2}\right) = \frac{n\beta(1 - \xi)}{p^2 q} = \phi_{33}(b)(\text{say}), \text{ for large } m \quad \dots \dots (5.25)$$

The covariances between the estimators becomes zero since

$$E\left(\frac{\delta^2 \log L}{\delta \beta \delta \xi}\right) = E\left(\frac{\delta^2 \log L}{\delta \xi \delta p}\right) = E\left(\frac{\delta^2 \log L}{\delta \beta \delta p}\right) = 0$$

and hence the variances of the estimators can be obtained as:

$$\left. \begin{aligned} V(\hat{\beta}) &= \frac{1}{\phi_{11}}, \quad V(\hat{\xi}) = \frac{1}{\phi_{22}}, \quad \text{and} \\ V(\hat{p}) &= \frac{1}{\phi_{33}(a)} \quad \text{when } m \text{ is small} \\ &= \frac{1}{\phi_{33}(b)} \quad \text{when } m \text{ is large.} \end{aligned} \right\} \dots\dots\dots (5.26)$$

Application:

The application of the model to the nationwide data collected from 60 rural clusters of Bangladesh indicates that the model describe very suitably the distribution of households according to the total number of migrants. The estimated values of the parameters, variances and covariance, observed and expected number of households according to the total number of migrants for the surveyed households are also presented in the Table 5.6.

The average number of migrants per households under the proposed model is given by the formulae,

$$\zeta \beta + (1-\zeta) \beta (1+1/p) \dots\dots\dots(5.27)$$

The average number of migrants per household was found lower (0.2608) for the study households comparing to the figure (0.3339) found by Hossain (2000). This depicts that the migrant sending rate at household level has shown a declining trend from the rest of the country over time as compared with that from Comilla during 2000.

The estimated values of the parameters showed that the proportion of households having only one migrant ( $\zeta$ ) is 0.73095 for the surveyed households which is greater than the proportion (0.67281) found by Hossain (2000) in case of Comilla district. This implies that the proportion of households having single migrant is increasing over time. The estimated value of the parameter  $\beta$

was also found 0.1820 which almost equals to the one (0.1829) found by Hossain (2000) for 10 rural clusters of Comilla. The estimated probability of migration of a person is found 0.6217 which is significantly higher than 0.3955 (found by Hossain, 2000) indicating an increasing trend of migration probability among the surveyed population.

**Table 5.6: Distribution of observed and expected number of households according to their number of total migrants in Bangladesh**

No. of Migrants per HH	Household Cohort			
	RUM-2012 (Origin)		Findings of Hossain (2000) for Comilla Dataset	
	Observed	Expected	Observed	Expected
<b>0</b>	6782	6782	1941	1941.00
<b>1</b>	1103	1103	292	292.00
<b>2</b>	256	252.43	67	56.17
<b>3</b>	86	95.48	37	33.95
<b>4</b>	47	36.12	17	20.52
<b>5</b>	10	13.66	6	12.40
<b>6</b>	3	8.14	7	7.50
<b>7</b>	1		3	11.46
<b>8</b>	1		5	
<b>9</b>	2		0	
<b>Total</b>	<b>8291</b>	<b>8290.8</b>	<b>2357</b>	<b>2357</b>
$\chi^2$	<b>5.58</b>		<b>7.35</b>	
d.f	<b>3</b>		<b>5</b>	
<b>Parameter estimation</b>				
$\beta$	0.1820		0.182873	
$\xi$	0.73095		0.672811	
$\rho$	0.621746		0.39554	
$V(\beta)$	1.7957E-05		$6.29 \times 10^{-5}$	
$V(\xi)$	0.00013033		0.000507	
$V(\rho)$	0.00247217		0.000712	
<b>Covariances</b>	0.00000		0.00000	
Average no. of migrants per household	0.26076		0.3339	

Appendix Table 5.5 presents the estimated values of the parameters, variances and covariance, observed and expected number of households according to the total number of migrants for the households of East-West divide respectively. The values of chi-square were found insignificant for both the datasets, which indicate that the model fits well to the observed data. The average number of migrants was found higher for the households located in West region (0.3087) than that for east region (0.2284). The estimated values of the parameter ( $\zeta$ ) showed that the proportion of households having only one migrant was higher for the households of west region (0.7665) than those for the east region (0.6951), which indicates that households from west region have a greater tendency of sending single internal rural-urban migrants. The higher estimated value of the parameter  $\beta$  for west region (0.2265) comparing to the east region (0.1519) indicates that west region has more migrant sending households.

Apart from the typical features of migration pattern, particularly internal rural-urban, as documented by different studies at home and abroad, this study has tried to explore some distinct characteristics of rural-urban migration through model-based analysis. This chapter has made an attempt to document these findings and concludes that proportionately, a declining trend of rural-urban migration flow is found out to Dhaka; while the opposite trend is found towards district and upazilla headquarters. It is also observed that migration flow due to poverty from rural to urban areas shows a declining tendency; whereas the flow due to natural calamities and sociopolitical victimization shows an increasing tendency. The probability model-based analysis discovers that all of the concerned models exhibit better fits for both datasets from Comilla-district survey by Hossain (2000) and nationwide survey (RUM-2012) tending to prove the time-invariant applicability of these models on both small regional sample to large national sample in the context of Bangladesh. The key findings from this analysis reveal that the incidence of single-migrant households is on rise over the time and the rural-urban migration flow from the West tends to be higher than that from the East.

## **CHAPTER VI**

### **CONCLUSION AND RECOMMENDATION**

This final chapter attempts to draw conclusions on the key findings of the study discussed in the previous chapters and also tries to provide some recommendations accordingly. This research work has produced three contributing chapters. The first contributing chapter deals with identifying the determinants of internal rural-urban migration at both community and household levels; the second one deals with determining the impact of rural-urban migration on household income and expenditure at origin; and the third one deals with exploring some untypical features of rural-urban migration pattern in the context of Bangladesh. The conclusions are drawn sequentially against the core findings of the corresponding chapters and recommendations are made based on these findings. In addition, some key messages are given for sharpening the stakeholders' understanding about rural-urban migration issue in this country.

The analyses have been performed on a nationally representative survey dataset generated for a research project on rural-urban migration. These analyses are widely used model-based and the concerned models are found to fit well for the dataset. In some cases, novel and innovative application of model is done and in this respect the unique contribution of this study is reflected in the literature.

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 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 rail station

does not corroborate the findings of previously done similar studies, particularly by Yadava (1987); which reveals the time and space specificity of research. The intuitive and plausible explanation of the present finding lies in that the nearer the urban destinations from the rural origins, the more tendencies 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 education level of the household head, occupation of the household head, total operative land, debt status, sex of the household head, dependency ratio, age of the household head, and family size. At household level in rural Bangladesh, these predictors play a vital role in making decision for internal rural-urban migration. It is also evidenced from the findings that for variation in analytical technique, the predictors vary as well. For example, in the multiple logistic regression model, region is identified as a highly significant predictor while in the Poisson regression model it is not; conversely, migration network is identified as a highly significant predictor in the Poisson regression model while it is not in the multiple logistic regression model. Finally, many a predictor identified in this study are corroborated by the previously done similar studies at home and abroad. In addition, the discriminant function analysis has identified some significant discriminating factors that distinguish between migrant sending and non-migrant households at rural origin. The major discriminators are identified as years of schooling of the household head, household size and age of the household head and apart from this an overall positive discriminating impact of dummy variables is derived from the hierarchical discriminant function analysis. Though these discriminators are not deemed to be the determinants of migration, these can be applied for satisfactorily classifying the rural households into two groups as migrant-

sending and non-migrant households. Though the analysis on identifying determinants apparently seems to contradict with the title of the thesis, actually this analysis focuses on the impact of some attributes on rural-urban migration and this is also one kind of impact analysis viewed reversely. From these findings the policy-makers can extract many policy implications as per their interests and targets.

The model-based analysis extracts the findings regarding the impact of internal rural-urban migration on the household income and expenditure at origin that rural to urban migration exerts negative impact, though insignificant, on on-farm income and significant positive impact on off-farm income. Moreover, the analysis on expenditure pattern by migration status explores that with the increase in per capita total expenditure, the share of per capita agricultural expenditure significantly decreases for the migrant-sending households. In addition, the share of food expenditure increases significantly with the increase in per capita total expenditure for these households. These findings give the indication that rural to urban migration functions as a route out of agriculture in Bangladesh and a qualitatively positive change takes place through a better and more expensive food-mix for the migrant-sending households in rural origin. The overall finding implies that migration tends to exert negative impact on farm income and positive impact on food security. Furthermore, the Gini-coefficient analysis finds out a positive contribution of this migration to income distribution in the left-behind community of the migrants.

This study has tried to explore some characteristics of rural-urban migration through model-based analysis that are distinct from the typical features of migration pattern, particularly internal rural-urban, as documented by different studies at home and abroad. The findings reveal that proportionately, a declining trend of rural-urban migration flow is found out to Dhaka; while the opposite trend is found towards district and upazilla headquarters. It is also observed that migration flow due to poverty from rural to urban areas shows a declining tendency; whereas the flow due to natural calamities and sociopolitical victimization shows an increasing tendency. The

probability model-based analysis discovers that all of the concerned models exhibit better fits for both datasets from Comilla- district survey by Hossain (2000) and nationwide survey (RUM-2012) tending to prove the time-invariant applicability of these models on both small regional sample to large national sample in the context of Bangladesh. The key findings from this analysis reveal that the incidence of single-migrant households is on rise over the time and the rural-urban migration flow from the West tends to be higher than that from the East.

### **Key messages from the study:**

- Internal rural-urban migration decision is influenced not only by the individual characteristics of the migrants but also by the household and community level attributes. This proves the applicability of the NELM and social capital theories of migration in the context of Bangladesh.
- Rural-urban migration contributes significantly to off-farm income, food security and income distribution at origin. But it affects on-farm income very insignificantly and functions as a route out of agriculture.
- Rural-urban migration pattern has changed in Bangladesh in course of time in terms of destination, cause and demographic feature.

### **Recommendations:**

- Measures should be taken to well-manage the rural-urban migration process and leverages resulted from this process should be properly utilized.
- Further development in district and upazilla headquarters is needed to trim the migration flow rate to Dhaka.

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## Appendix

**Appendix Table 3.1: Group means and equality of means (Wilk's Lambda statistic) between non-migrant and migrant households**

Variables	Non-Migrant		Migrant		Wilk's Lambda	p-value
	Mean	S.D	Mean	S.D		
Landholding of household	79.99	117.21	108.72	197.15	0.994	0.002
Years of Schooling of the household head	4.02	4.09	4.92	4.55	0.991	0.000
Dependency ratio	79.96	66.60	52.66	51.32	0.951	0.000
Asset score	21.99	14.39	26.86	16.09	0.979	0.000
Household size	4.76	1.725	5.84	2.23	0.943	0.000
Age of the household head	43.50	12.74	49.98	13.22	0.948	0.000

**Appendix Table 3.2: Eigenvalue and Significance of the Discriminant Function between Non-migrant and Migrant sending Households**

Eigenvalue	Canonical Correlation	Squared Canonical Correlation	Wilks' Lambda	Chi-square	Degrees of freedom	p-value
0.604	0.614	0.377	0.623	736.67	17	0.000

**Appendix Table 4.1: First-stage Regression Estimates of Number of Migrants of Households**

Explanatory Variables	Coef.	S.E	t	P>t	[95% Conf. Interval]	
Total operative land of Household	-0.00016	0.00010	-1.60	0.109	-0.00036	0.00004
Education of HH (Years of schooling)	0.00357	0.00359	0.99	0.321	-0.00348	0.01061
Region (East=0, West=1)	-0.08300	0.03066	-2.71	0.007	-0.14313	-0.02287
Housing (poor quality=0, Good quality=1)	-0.00834	0.03633	-0.23	0.819	-0.07959	0.06292
Religion (Muslim=0, Non-Muslims=1)	-0.00634	0.05021	-0.13	0.900	-0.10480	0.09213
Gender of HH	0.29686	0.06367	4.66	0.000	0.17201	0.42172
Distance to Commercial Area	-0.00041	0.00081	-0.50	0.615	-0.00199	0.00118
Labor force of the household	0.24320	0.01975	12.31	0.000	0.20446	0.28193
Rice purchasing status of the households (Yes=0, No=1)	0.04632	0.03612	1.28	0.200	-0.02451	0.11715
NGO membership of the households (Yes=1, No=0)	-0.05885	0.03313	-1.78	0.076	-0.12381	0.00611
Share of male/female in 16-39 age group	0.00024	0.00021	1.15	0.252	-0.00017	0.00065
Migration network	1.21736	0.03369	36.13	0.000	1.15129	1.28343
Constant	-0.50753	0.08970	-5.66	0.000	-0.68343	-0.33164
Number of Obs.	2254					
F(12, 2241)	168.63(p-value=0.000)					
R-Squared	0.4745					
Adj R-Squared	0.4717					

**Appendix Table 4.2: Estimated Regression Models (Working Laser model) for Different Share of Food Expenditures**

Explanatory variables and Interactions	Estimated Coefficients for the Models of Different Food Items				
	Per capita Rice & Wheat	Per capita Vegetable	Per capita Protein	Per capita Fat	Per capita Other Foods
No. of Migrant	-0.1915***	0.0077	0.1460***	-0.0034	-0.0049
Logarithm of per capita food expenditure	-0.1633***	-0.0216***	0.1169***	0.0158***	0.0106**
Region (east=0, west=1)	0.1631*	-0.1169***	-0.59816***	0.0884*	0.1155*
Asset Score	-0.0011***	-0.0006***	0.0009***	0.0004***	0.00005
Total operative land of Household	0.00005***	-4.79e-08	9.10e-06	3.88e-06	-9.21e-06
Age of Household Head (HH)	0.0006***	-0.00005	-0.00003	0.0001	-0.0001
Education of HH (Years of schooling)	-0.0023***	-0.0004	0.0011**	0.0010***	- 0.00084***
Food Expenditure* No. of Migrant	0.02011***	-0.0005	-0.01565***	0.0003	0.00084
Food Expenditure * No. of Migrant *Region(E_W)	-0.0009**	-0.00029	0.00046	-0.00002	0.00011
Food Expenditure * Region	-0.0154	0.01231***	0.0656***	-0.0095*	- 0.014295**
Constant	1.9081***	0.30942***	-0.9172***	-0.0806*	0.0353722
R <sup>2</sup> and Adjusted R <sup>2</sup>	0.41 & 0.41	0.11 & 0.11	0.33 & 0.33	0.05 & 0.05	0.04 & 0.04
F-test with P-value	156.12 (p<0.01)	28.09 (p<0.01)	110.25 (p<0.01)	13.01 (p<0.01)	10.51 (p<0.01)

\*\*\* p<0.01    \*\* p<0.05    \* p<0.10

**Appendix Table 4.3: Calculation of Gini concentration ratio at household level including the amount of remittances**

Upper Limit of Income (x)	No. of household	N-Nx	P <sub>x</sub>	Total Income	I-Ix	Q <sub>x</sub>	A= P <sub>x</sub> + P <sub>x-1</sub>	B= Q <sub>x</sub> - Q <sub>x-1</sub>	A*B
≤30000	46	46	0.02	1013655.00	1013655.00	0.00	0.020	0.003	0.000
40000	71	117	0.05	2558315.00	3571970.00	0.01	0.072	0.007	0.001
50000	108	225	0.10	4926428.00	8498398.00	0.02	0.152	0.014	0.002
65000	221	446	0.19	12787650.00	21286048.00	0.06	0.298	0.036	0.011
80000	239	685	0.30	17398113.00	38684161.00	0.10	0.502	0.049	0.024
90000	169	854	0.37	14372128.00	53056289.00	0.14	0.682	0.040	0.027
100000	144	998	0.44	13779551.00	66835840.00	0.18	0.821	0.039	0.032
112000	147	1145	0.50	15576129.00	82411969.00	0.23	0.950	0.044	0.041
125000	144	1289	0.57	17133351.00	99545320.00	0.27	1.079	0.048	0.052
145000	163	1452	0.64	21924386.00	121469706.0	0.34	1.216	0.061	0.075
165000	132	1584	0.70	20489780.00	141959486.0	0.39	1.346	0.057	0.077
190000	136	1720	0.76	24122827.00	166082313.0	0.46	1.465	0.067	0.099
210000	80	1800	0.79	15968325.00	182050638.0	0.50	1.561	0.045	0.070
250000	122	1922	0.85	27945644.00	209996282.0	0.58	1.651	0.078	0.129
300000	104	2026	0.89	28409200.00	238405482.0	0.66	1.751	0.079	0.139
500000	152	2178	0.96	57311691.00	295717173.0	0.82	1.864	0.160	0.299
above 500000	77	2255	1.00	61981493.00	357698666.0	1.00	1.966	0.173	0.341
Total	2255			357698666.0					1.417
Gini's Concentration Ratio (G)=  1-1.417 = 0.417									

**Appendix Table 4.4: Calculation of Gini concentration ratio at household level excluding the amount of remittance**

Upper Limit of Income (x)	No. of household	N-N <sub>x</sub>	P <sub>x</sub>	Total Income	I-I <sub>x</sub>	Q <sub>x</sub>	A= P <sub>x</sub> + P <sub>x-1</sub>	B= Q <sub>x</sub> - Q <sub>x-1</sub>	A*B
≤30000	314	314	0.139	4008323.00	4008323.00	0.013	0.139	0.013	0.002
40000	96	410	0.182	3363405.00	7371728.00	0.023	0.321	0.011	0.003
50000	130	540	0.239	5918700.00	13290428.00	0.042	0.421	0.019	0.008
65000	192	732	0.325	11060016.00	24350444.00	0.077	0.564	0.035	0.020
80000	206	938	0.416	15033934.00	39384378.00	0.125	0.741	0.048	0.035
90000	150	1088	0.482	12842177.00	52226555.00	0.166	0.898	0.041	0.037
100000	108	1196	0.530	10341361.00	62567916.00	0.199	1.013	0.033	0.033
112000	127	1323	0.587	13506348.00	76074264.00	0.242	1.117	0.043	0.048
125000	111	1434	0.636	13241321.00	89315585.00	0.284	1.223	0.042	0.051
145000	129	1563	0.693	17392035.00	106707620.0	0.339	1.329	0.055	0.073
165000	104	1667	0.739	16200360.00	122907980.0	0.391	1.432	0.051	0.074
190000	124	1791	0.794	21979902.00	144887882.0	0.461	1.533	0.070	0.107
210000	76	1867	0.828	15147060.00	160034942.0	0.509	1.622	0.048	0.078
250000	94	1961	0.870	21546125.00	181581067.0	0.577	1.698	0.068	0.116
300000	84	2045	0.907	22927815.00	204508882.0	0.650	1.776	0.073	0.129
500000	141	2186	0.969	53479421.00	257988303.0	0.820	1.876	0.170	0.319
above 500000	69	2255	1.000	56609413.00	314597716.0	1.000	1.969	0.180	0.354
Total	2255			314597716.0					1.489
Gini's Concentration Ratio (G)=  1-1.489 = 0.489									

**Appendix Table 4.5: Calculation of Gini concentration ratio at household level in case of remittance receiving households**

Upper Limit of Income (x)	No. of households	N-N <sub>x</sub>	P <sub>x</sub>	Total Income	I-I <sub>x</sub>	Q <sub>x</sub>	A= P <sub>x</sub> + P <sub>x-1</sub>	B= Q <sub>x</sub> - Q <sub>x-1</sub>	A*B
≤30000	31	31	0.02	678555.00	678555.00	0.00	0.021	0.003	0.000
40000	52	83	0.05	1877535.00	2556090.00	0.01	0.076	0.007	0.001
50000	61	144	0.09	2792133.00	5348223.00	0.02	0.150	0.011	0.002
65000	138	282	0.18	8028905.00	13377128.00	0.05	0.282	0.031	0.009
80000	140	422	0.28	10177639.00	23554767.00	0.09	0.467	0.040	0.019
90000	102	524	0.34	8671087.00	32225854.00	0.12	0.627	0.034	0.021
100000	95	619	0.41	9075710.00	41301564.00	0.16	0.757	0.035	0.027
112000	88	707	0.46	9320074.00	50621638.00	0.19	0.879	0.036	0.032
125000	99	806	0.53	11742546.00	62364184.00	0.24	1.003	0.046	0.046
145000	103	909	0.60	13857399.00	76221583.00	0.29	1.137	0.054	0.061
165000	88	997	0.66	13683312.00	89904895.00	0.35	1.263	0.053	0.067
190000	103	1100	0.72	18251044.00	108155939.0	0.42	1.390	0.071	0.099
210000	57	1157	0.76	11347558.00	119503497.0	0.46	1.496	0.044	0.066
250000	96	1253	0.83	21980538.00	141484035.0	0.55	1.597	0.086	0.137
300000	77	1330	0.88	20983907.00	162467942.0	0.63	1.712	0.082	0.140
500000	116	1446	0.95	43222353.00	205690295.0	0.80	1.840	0.169	0.310
above 500000	63	1509	1.00	50472083.00	256162378.0	1.00	1.958	0.197	0.386
Total	1509			256162378.0					1.423
Gini's Concentration Ratio (G)=  1-1.423 = 0.423									

**Appendix Table 4.6: Calculation of Gini concentration ratio at household level in case of remittance non-receiving households**

Upper Limit of Income (x)	No. of households	N-Nx	P <sub>x</sub>	Total Income	I-Ix	Q <sub>x</sub>	A= P <sub>x</sub> + P <sub>x-1</sub>	B= Q <sub>x</sub> - Q <sub>x-1</sub>	A*B
≤30000	15	15	0.020	335100.00	335100.00	0.00	0.020	0.003	0.000
40000	19	34	0.046	680780.00	1015880.00	0.01	0.066	0.007	0.000
50000	47	81	0.109	2134295.00	3150175.00	0.03	0.154	0.021	0.003
65000	83	164	0.220	4758745.00	7908920.00	0.07	0.328	0.047	0.015
80000	99	263	0.353	7220474.00	15129394.00	0.14	0.572	0.071	0.041
90000	67	330	0.442	5701041.00	20830435.00	0.20	0.795	0.056	0.045
100000	49	379	0.508	4703841.00	25534276.00	0.25	0.950	0.046	0.044
112000	59	438	0.587	6256055.00	31790331.00	0.31	1.095	0.062	0.067
125000	45	483	0.647	5390805.00	37181136.00	0.36	1.235	0.053	0.066
145000	60	543	0.728	8066987.00	45248123.00	0.44	1.375	0.079	0.109
165000	44	587	0.787	6806468.00	52054591.00	0.51	1.515	0.067	0.102
190000	33	620	0.831	5871783.00	57926374.00	0.57	1.618	0.058	0.094
210000	23	643	0.862	4620767.00	62547141.00	0.61	1.693	0.046	0.077
250000	26	669	0.897	5965106.00	68512247.00	0.67	1.759	0.059	0.103
300000	27	696	0.933	7425293.00	75937540.00	0.74	1.830	0.073	0.134
500000	36	732	0.981	14089338.00	90026878.00	0.88	1.914	0.139	0.266
above 500000	14	746	1.000	11509410.00	101536288.0	1.00	1.981	0.113	0.225
<b>Total</b>	<b>746</b>			<b>101536288.0</b>					<b>1.390</b>
Gini's Concentration Ratio (G)=  1-1.390 = 0.390									

**Appendix Table 5.1 : Classification of households by annual income into Decile groups**

Decile of HHs Income	No. of Population in each decile	% of population in each decile	% of income accruing to households in each decile	Average income per HH	Per capita income
<b>Lowest 5%</b>	<b>443</b>	<b>3.579</b>	<b>0.999</b>	<b>30529.66</b>	<b>8063.14</b>
Decile-1	916	7.400	2.376	37770.66	9277.73
Decile-2	1022	8.256	3.666	58028.69	12832.18
Decile-3	1159	9.363	4.773	72954.18	14729.32
Decile-4	1098	8.870	5.281	86658.94	17205.51
<b>Decile 1-4</b>	<b>4195</b>	<b>33.888</b>	<b>16.096</b>	<b>63760.59</b>	<b>13724.87</b>
Decile-5	1213	9.799	6.415	101978.32	18916.01
Decile-6	1278	10.324	7.697	121281.32	21542.14
Decile-7	1291	10.429	9.295	147767.53	25753.44
Decile-8	1405	11.350	11.687	185791.36	29753.07
Decile-9	1416	11.439	15.883	251393.89	40123.60
Decile-10	1581	12.772	32.927	525808.50	74497.85
<b>Top 5%</b>	<b>821</b>	<b>6.632</b>	<b>21.926</b>	<b>694052.71</b>	<b>95527.35</b>

**Appendix Table 5.2: Classification of migrant households by annual income into Decile groups**

Decile of HHs Income	No. of Population in each decile	% of population in each decile	% of income accruing to households in each decile	Average income per HH	Per capita income
<b>Lowest 5%</b>	<b>314</b>	<b>3.558</b>	<b>0.889</b>	<b>29948.55</b>	<b>7248.69</b>
Decile-1	660	7.478	2.226	37761.40	8639.35
Decile-2	720	8.158	3.569	59750.82	12697.05
Decile-3	787	8.917	4.390	75479.64	14290.30
Decile-4	839	9.506	5.354	90825.34	16346.40
<b>Decile 1-4</b>	<b>3006</b>	<b>34.058</b>	<b>15.539</b>	<b>65793.29</b>	<b>13241.83</b>
Decile-5	875	9.914	6.431	108385.47	18828.11
Decile-6	910	10.310	7.616	130059.67	21438.41
Decile-7	957	10.843	9.523	161552.32	25490.49
Decile-8	961	10.888	11.922	202243.57	31778.13
Decile-9	986	11.172	15.963	270810.07	41472.94
Decile-10	1131	12.814	33.006	563655.95	74755.43
<b>Top 5%</b>	<b>565</b>	<b>6.402</b>	<b>21.746</b>	<b>752769.84</b>	<b>98592.86</b>

**Appendix Table 5.3: Classification of non-migrant households by annual income into Decile groups**

Decile of HHs Income	No. of Population in each decile	% of population in each decile	% of income accruing to households in each decile	Average income per HH	Per capita income
<b>Lowest 5%</b>	<b>114</b>	<b>3.209</b>	<b>1.160</b>	<b>30996.97</b>	<b>10332.32</b>
Decile-1	257	7.233	2.807	38002.33	11090.18
Decile-2	318	8.950	4.106	55587.93	13110.36
Decile-3	349	9.823	5.095	68977.36	14823.21
Decile-4	335	9.429	5.903	79910.17	17890.34
<b>Decile 1-4</b>	<b>1259</b>	<b>35.435</b>	<b>17.911</b>	<b>60619.45</b>	<b>14444.67</b>
Decile-5	346	9.738	6.746	92568.27	19797.84
Decile-6	360	10.132	7.893	106860.05	22262.51
Decile-7	363	10.217	9.236	126728.04	25834.37
Decile-8	385	10.836	11.323	153292.36	29862.15
Decile-9	443	12.468	15.365	208014.05	35216.83
Decile-10	397	11.174	31.526	438493.71	80629.83
<b>Top 5%</b>	<b>202</b>	<b>5.685</b>	<b>20.669</b>	<b>582954.67</b>	<b>103892.91</b>

**Appendix Table 5.4: Distribution of observed and expected number of households according to their number of male migrants aged 15 years and above according to East-West divide in Bangladesh**

No. of Migrants per HH	Household Cohort			
	West Region		East Region	
	Observed	Expected	Observed	Expected
0	2589	2588.76	4193	4193.00
1	557	561.98	485	487.71
2	80	73.34	85	84.62
3	13	15.78	25	19.58
4	1		3	6.51
5	0		1	
Total	3240	3239.86	4792	4791.42
$\chi^2$	<b>0.982</b>		<b>3.06</b>	
d.f	<b>1</b>		<b>2</b>	
Parameter estimation				
$\alpha$	0.201		0.125	
$\lambda$	0.261		0.347	
V( $\alpha$ )	0.0000495		0.0000228	
V( $\lambda$ )	0.0005		0.0006	
COV( $\alpha, \lambda$ )	0.000		0.000	

**Appendix Table 5.5: Distribution of observed and expected number of households according to their total number of migrants according to East-West divide in Bangladesh**

No. of Migrants per HH	Household Cohort from West Region		Household Cohort from East Region	
	Observed	Expected	Observed	Expected
0	2589	2589	4193	4193
1	581	581	522	522
2	114	113.93	142	138.71
3	39	40.60	47	54.68
4	19	14.47	28	21.56
5	3	7.97	7	13.9
6	0		3	
7	1		0	
8	0		1	
9	1		1	
<b>Total</b>	<b>3347</b>	<b>3346.97</b>	<b>4944</b>	<b>4943.85</b>
$\chi^2$	<b>2.62</b>		<b>3.49</b>	
d.f	<b>2</b>		<b>2</b>	
<b>Parameter estimation</b>				
$\beta$	0.2265		0.1519	
$\xi$	0.7665		0.6951	
$\rho$	0.6436		0.6058	
$V(\beta)$	0.000052		0.000026	
$V(\xi)$	0.000236		0.000282	
$V(\rho)$	0.005664		0.00438	
<b>Covariances</b>	0.000		0.000	
Average no. of migrants per household	0.3087		0.2284	