A Probabilistic Approach of male out-migration from Eastern Uttar Pradesh in India

Migration is an important source of major socio-economic change of a nation or region. It is expected that migration incoming decades may play a crucial role in achievement of comprehensive policies and programs regarding spatial distribution of population and hence relating to socio economic cultural and demographic situation of a region particularly in developing countries. It is worth mentioning that the problem of human movement bring policy makers and development, planners to a new level of awareness (Bilsborrow, R., Oberai, A. and Standing G.,1984), the relationship between migration and other socio-economic factors, resources environment and sustainable development on several planning process at the regional as well as national levels.

The term migration has generally been restricted to change in residence between specifically designed political or statistical areas. Along with the size and composition of population, it influences the socio-economic and cultural characteristics of the concerned population. The flow of money from urban to rural areas through migrants has increased the social and economic status of the migrant's families. Migrants play an active role in the social and economic developments of their household particularly in developing countries. Thus out-migration from rural area is an important vehicle for socio-economic and demographic change in the native villages. A number of attempts have been made during the past few decades to study the migration phenomena at macro-level (Friedlander and Roshier, 1966; Lee, 1966; Greenwood, 1971). They have generally used a macro level deterministic approach. These studies have not provided the adequate explanation for the tremendous regional and local heterogeneity planning, especially in developing countries. In recent years the studies of migration decision process at micro level have useful in which main emphasis on probabilistic and stochastic models of migration. A number of descriptions and theoretical studies of migration have appeared in both developed and developing countries (De jong and Gardner, 1981' Bilsborrow et al, 1987). Micro-level studies governing number of migrants per household is essential a random variable and thus requires a stochastic approach for this study.

Nature of migration

Human grouping is a very vital event in the study of out-migration pattern at micro-level. The most common unit of human grouping is a household. The characteristics of a household are bound to play an active role in the decision of an individual to move or not to move from a

household. Considering the out-migration from rural to urban areas, the household can be categorized into two main groups.

1. An adult male aged fifteen years and above alone migrates from the villages leaving behind his family.
2. Individuals (males) migrate along with their family.

These two types of migration affect the socio-economic and cultural activities of origin and destination places of the migrants differently. In this paper, some probability models are proposed to study the distribution of households according to number of both types of out-migrants as mentioned above at the household level. The main objective of the paper is to develop probability model for the total number of migrants from a household. The suitability of the model is tested through observed data.

A probability model for rural out-migration may be obtained on the basis of the following assumptions.

1. Let α be the probability that a household is exposed to the risk of migration at the survey point and (1- α) the probability that the household is not exposed to the risk of migration
2. There are two types of households which are exposed to the risk of migration. In the first type, only males aged 15 years above migrate and in another type of household males migrate with their family members. Let β and 1- β be the respective proportions of the two types of households exposed to the risk of migration.
3. The survey data indicates that the probability of K singles male (aged 15 years and above) migrating from a household is greater than the probability of K+1 males migrating (K=1, 2, 3, ...). Thus the probability is a decreasing function of K and therefore it creates a situation where the number of migrants follows a displaced geometric distribution.

$$P(A=k) = pq^{k-1}, k = 1,2, \dots \dots \dots \dots \dots (1)$$

and p=1-q

4. In the 1- β proportion the migrants move with their family members indicating that they move in groups. In this situation the risk of occurring a cluster may vary from household to household and they follow displaced poison distribution.

$$P(B=k) = \frac{e^{-m}m^{k-1}}{k-1!} \quad and\ m>0$$

From the above four assumption probability law (Johnson & Kotz, 1969) the probability model for the number of total out-migration, x from household becomes

P(x=0) =1- α, k=0

P(X=1) = α β p, k=1

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and P(X=k) = α [βpq^{k-1}+ (1- β) $\frac{e^{-m}m^{k-2}}{k-2!}$], k=2, 3... (3)

$and\ m>0$

The model (3) involves four parameters α, β, p, and m. These parameters are estimated by equating the proportion of the zeroth cell, proportion of first cell and sample mean and sample variance to their corresponding theoretical values which are represented by following equations.

$$\frac{N_0}{N} = 1 - \alpha \quad (4)$$

$$\frac{N_1}{N} = \alpha\beta p \quad (5)$$

$$\mu_1 = \alpha[\frac{\beta}{p} + (1-\beta)(m+2)] \quad (6)$$

$$\mu_2 = \alpha[\beta(\frac{p}{q^2}) + (1-\beta)(m)] \quad (7)$$

Where N_0 N_1 and N denotes the number of observations in zeroth cell, first cell and the total sample respectively, μ_1 μ_2 presents the observed mean and variance. The estimate values of the parameters are obtained by solving equation (4) to (7) simultaneously. During estimating the form of p results in $ap^3+bp^2+cp+d=0$; the real roots of this equation are found by Newton-Raphson method.

Data and Methodology

A primary source of data has been used for this study. The area of the study is Varanasi district in Eastern Uttar Pradesh which has long been known for its high population density and low per capita income. The uneven distribution of population also plays an important role in causing of rural out migration. The rural area of Varanasi district in eastern Uttar Pradesh has primarily been an agrarian economy, but due to uncertainty of rainfall it is not a totally dependable source. Therefore out migration has proved to be a good source of income for villages are improving their economic status.

The household level primary data has been collected on the basis villages selected and included in the "Rural Development and Population Growth; a sample survey 1978" conducted under the auspices of Centre of Population Studies, Banaras Hindu University,

For completeness, it is worthwhile to mention that RDPG survey 1978 was conducted in a total of 19 villages selected from two blocks of Varanasi districts by classifying all the villages into three group's namely semi-urban, remote and growth-centres (villages near industrials units). In that survey the information on household structure, household facilities, migration, fertility, mortality and morbidity were obtained from each selected household.

This study is based on information collected from **six villages** (three semi-urban and three remote) selected from Varanasi Tahsil and focus at the pattern of migration and development of the household by adopting a modified definition of a household, which is often adopted for migration study to be conducted at the place of origin. The proposed study adopted

"*A household will be defined as a group of people who usually stay together and share a common kitchen, inclusive of persons usually living outside of the village but claiming to belong to the respective households*" (RDPG survey, 1978). The information about household has been collected from two types of villages following a stratified cluster sampling method (villages being the clusters). The village included in the RDPG, 1978 survey of Varanasi Tehsil will be classified in two groups according to distance from Varanasi city to form two strata. The villages located within the radius of 10 km from the Varanasi city will form the first stratum, known as semi urban villages; while those situated beyond 10 km from the city constitute the second stratum called remote villages. There are randomly select three villages from 8 and 6 villages included in the RDPG from the above two strata respectively. The data will be collected by personal interview method and migration record including questions on the present age, education, marital status, occupation, age at migration, year of migration, place of migration, nature of migration, reasons of migration, remittances, etc. for each migrated person of the households.

Result and Conclusion

Table1 gives the distribution of observed and expected number of household according to the total number of out-migration in two types of villages. The risk of migration in a household, α is highest ($\hat{\alpha}$=0.4605) in Remote village and lowest ($\hat{\alpha}$=0.2321) in semi urban villages. The estimated values of β in two types of village are found to be 0.9029 and 0.9465 respectively. This shows that in semi urban village, the proportion of the households exposed to the risk of migration for male aged 15 years and above is less than Remote type of villages. But proportions of migrants belonging to group with their wife, children, other dependent members etc. are high in comparison to Remote villages. This may be due to more facilities, higher education, and kinship relation prevailing in the semi urban villages. $\alpha[\frac{\beta}{p} + (1-\beta)(m+2)$ give the

average number of migrants per household which is highest (0.9810) in Remote village than in semi urban (0.4944).

After applying a χ^2-test the calculated χ^2 in significant at 5 percent level of significance in two types of village. This suggests that the proposed model under consideration is a better approximation to observed distribution of rural out migration at the micro level. Thus it may be a useful tool in calculating the various probabilities connected with the out-migration from the household and also for predictions in specified populations.

References

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Table1. Distribution of observed and expected number of households according to total number of migrants from a household in two type of village, 2012

No. of Migrants	Type of Village			
	Remote		Semi urban	
	Observed	Expected	Observed	Expected
0	362	436.2	483	408.9
1	180	145.0	101	136.0
2	64	38.7	11	36.3
3	27	16.5	5	15.5
4.	7	6.7	6	6.3
5	8	6.7	5	6.3
6.	9	8.3	7	7.7
7	7	6.7	6	6.3
8+	7	6.2	5	5.8
Total	671	671	629	629
$\hat{\alpha}$		0.4605		0.2321
$\hat{\beta}$		0.9029		0.9465
$\hat{p}$		0.6456		0.730
$\hat{m}$		. 68853		13.6142
χ^2		44.6512		47.63265
df		8		8