# INTERGENERATIONAL OCCUPATIONAL MOBILITY OF THE TRIBAL AND NON-TRIBAL PEOPLE OF UDALGURI DISTRICT: A MARKOV CHAIN APPROACH

Anjali Chakravarty, Associate Professor, Head, Department of Statistics, Tangla College, Tangla, Assam, 784521 anjali931963@sify.com

# **ABSTRACT**

Occupation, among income, education, status, gender, race, environment, culture etc, plays a vital role in determining the social mobility of a group of people. The present paper, with the help of Markov chain approach, attempts to examine the occupational mobility of the tribal and non-tribal people of Udalguri district, one of the four districts of the newly created Bodoland Territorial Area District (BTAD) of Assam,. The study of occupational mobility of these people has become immensely important as the newly formed autonomous district (BTAD) opened up new offices as well as new opportunities that have brought changes to the lives of the people.

The findings from analyzing a set of primary data with the help of Markov Chain approach reveal that the occupational mobility of the Tribal community in Udalguri district in general has undergone a great change and there are reasons to believe that it occurs due to the formation of BTAD.

**Key words:** Markov Chain, Social mobility, Intergenerational Occupational mobility, Horizontal and Vertical mobility, Upward/ Downward mobility etc.

### **Introduction:**

Intergenerational (across generations) occupational mobility refers to changes in occupational status that occur between two generations, that is, of father and son or family members of one generation and the next. It shows the ability of a person or persons to move up or down the hierarchal structure of social stratification. Occupation along with income, education, gender, race, environment, culture etc is some of the determinants for potential social mobility. There are two types of occupational mobility, horizontal and vertical. Horizontal mobility refers to a change of occupational position or role of an individual or a group without involving any change in its position in the social hierarchy. On the contrary, vertical mobility refers essentially to changes in the position of an individual or a group along the social hierarchy. Sociologists analyse, distinguish vertical mobility in between how far an individual is mobile in his or her career, and how much his/her position differs from that of his parents (Giddens, 1997). It was Prais (1955) who first applied Markov Chain Theory to measure social mobility. Each society is characterized by transition probability matrix so most of the proposed measures were based on the elements of matrix. Matras (1960) has listed some examples of it. Measures related to occupation changes of a particular individual based on Semi Markov processes were proposed by Ginsberg (1971), Bartholomew (1982), Mukherjee and Chattopadhyay (1989) and others. Mukherjee and Chattopadhyay (1986) and Chattopadhyay (1993) developed the measures to represent the overall pattern of association and the direction of movement when the social classes are ordered with respect to certain characters.

The primary concern of this study is to find out mobility between occupations rather than between social classes and positions, although these concerns overlap each other. In this study it is proposed to investigate the occupational mobility among the tribal and non-tribal people of Udalguri district with the following objectives:

(i) To examine the inter-generational occupational mobility,

(ii) To examine the direction of movement / mobility of the tribal and non-tribal people of the district under study.

# **Material and Mathods:**

As for Primary data, we have randomly taken 2000 respondents. All belong to 40-50 age groups. For Secondary data we take help from the websites of the district administration of Udalguri

district, the Census reports of government of India, books, periodicals and some other relevant web sites.

For methodology, Markov Chain and some commonly used indices are used in this study. Long run behavior of Markov chain and physical interpretation of limiting probabilities are analyzed in this study.

**Markov chain:** Markov chain is named after the Russian Mathematician Andrei Andreivich Markov. It is a stochastic process that has a countable number of possible states for which future probabilities are determined only by the present state of the process. Markov Analysis is a dependent analysis. In Markov Analysis future of a process depends on present state of the process, not on the past state of the process. Markov Analysis rests on the transition probability matrix (TPM) and the initial conditions. Social mobility is a phenomenon whose future depends on the earlier states of affairs. Again the Structure of a society or future development of society depends on initial structure (Initial probability distribution) and transition probability matrix in the first survey. Of these two features, initial distribution has a diminishing influence on the process as time passes. In the long run, therefore, the structure of society is determined by transition probability matrix. That is why the study of mobility gets cantered at the TPM. In other words study of mobility is a function of the elements of TPM.

Let  $\{X_n, n = 1, 2, 3, ...\}$  be the discrete time discrete state space stochastic process. It follows Markov chain of first order if

$$\begin{split} P(X_n = k \ / \ X_{n-1} = j, \ X_{n-2} = i, \ \ldots) = P(X_n = k \ / \ X_{n-1} = j) = p_{jk} \text{ holds, and the Markov chain is of order h if } \\ P(X_n = k \ / \ X_{n-1} = j, \ X_{n-2} = i, \ \ldots , X_{n-h} = c, \ \ldots) = P(X_n = k \ / \ X_{n-1} = j, \ \ldots , X_{n-h} = c) \text{ holds true. The transition probability matrix associated with Markov chain } \end{split}$$

 $P = (p_{jk})_{N \times N}$ , where  $j, k \in S$  = state space of the Markov chain,  $\sum_{k} p_{jk} = 1$  for all  $j \in S$ 

In long run i.e. when n is large,  $P^{(n)}(=P^{(\infty)})$  reduces to a stochastic matrix with identical rows and this matrix.

Indices used:

Total mobility: The amount of mobility generated by the movements of the sons from the status of his father. It is measured by

$$TM = N - \sum_{l}^{k} n_{ij}$$
, N is the sample size (2.1)

Structural Mobility:

 $SM = N - \sum_{i} \min(n_{i0}, n_{0i})$ (2.2)

Pure Mobility:

$$PM = TM - SM \tag{2.3}$$

Glass Index (for the ith category)

 $I_{G(i)} = Nn_{ij} / n_{i0} \times n_{0i}$ (2.4)

Yasuda Index

$$I_{y} = \frac{(\sum_{i} n_{ii} - \sum_{i} (n_{i0} n_{0i} / N))}{(\sum_{i} \min(n_{i0}, n_{0i}) - \sum_{i} (n_{i0} n_{0i} / N))}$$
(2.5)

**The Study area and people:** Udalguri, one of the four districts of BTAD, Assam, has been taken up for study as changes in the lives of the tribal people are seen after the formation of Bodoland Territorial Area District (BTAD). Udalguri is dominated by the Bodos, the largest plain tribe of Assam, having nearly 14 lacs populations. To fulfill the aspirations of the Bodo people relating to their cultural identity, language, education and economic development BTAD was formed. **Class schema:** 

To measure generational differences of occupations in origin and destination we need a class schema which should be stratified by occupational groups with their respective roles As the social structure of the study area i.e. Udalguri district of Assam, is predominantly agrarian, as the people belong to different ethnic or minority groups, as the people have different occupational back ground, and as the social arrangement on land is diverse, therefore, the Revised Indian National Classification of Occupations (NCO) 2004 has been used with some modification. This modification is done with the help of Daniel Thorner's model of agrarian class structure as discussed by D.N. Dhanagare<sup>1</sup>

Revised Indian National Classification of Occupations (NCO) 2004 a	and the Indian classes used
in this study:	

Revised	Indian National Classification of Occupations	Indian class	ses used in this study
(NCO)	2004		
1.	Legislators, Senior Official and Managers	I.	High salaried (executives,
			administrators, engineers, doctors,
			principals, managers, professors,
			M.L.A.s, M.P.s etc.)
2.	Professional	II.	Middle salaried (lecturers, lower
			administrators, supervisors, teachers,
			technicians etc)
3.	Technicians and Associate Professionals	III.	Low salaried, III & IV grade
			employees (peon, choukidars, khalasi,
			army personnel)
4.	Clerks	IV.	Land lords, big farmers, Big
			businessmen
5.	Service Workers and Shop and Market Sales	V.	Medium farmers, medium
	Workers		businessman, pig-poultry farmers
6.	Skilled Agricultural and Fishery Workers	VI.	Poor farmers, petty businessmen
7.	Craft and Related Trades Workers	VII.	Skilled labourers (drivers, carpenters,
			mechanics, masons, plumbers, artisan,
			supervisors of manual workers,
			equipment operators, tailors,
			fisherman etc.)
8.	Plant and Machine Operators and Assemblers	VIII.	Unskilled labourers
9.	Elementary Occupations	IX.	Non-reported and others
х.	Workers Not Classified By Occupations		

# 3. Result and Discussion:

Let us first discuss the results that are found in tribal category of the Udalguri, BTAD, Assam. **3.1.1Tribal Category:** 

Let us denote  $n_{ij}$  to mean the frequency in the (ij)<sup>th</sup> cell. Table-3.1 shows the number of sons in (Fathers) category j whose fathers (Grand fathers) was in category i.

<sup>&</sup>lt;sup>1</sup>Dhanagare, D.N., (1983), Peasant Movements in India 1920-1950, Oxford University Press, Delhi, pp. 13-16.

Sons	Ι	II	III	IV	V	VI	VII	VIII	IX	Total
Fathers										
Ι	0	0	0	0	0	0	0	0	0	0
Π	0	0	0	0	0	0	0	0	0	0
III	0	0	0	0	0	0	0	0	0	0
IV	0	3	0	130	68	55	0	0	23	279
V	0	7	0	36	137	49	7	8	34	278
VI	4	13	12	0	15	130	0	48	0	222
VII	0	0	8	0	0	4	5	0	6	23
VIII	0	0	3	0	0	0	26	87	0	116
IX	0	0	12	0	0	24	20	16	10	82
Total	4	23	35	166	220	262	58	159	73	1000
Column %	0.4	2.3	3.5	16.6	22.0	26.2	5.8	15.9	7.3	

Table-3.1 Occupational distribution of sons by occupation of their fathers (for1st to 2nd generation)

The row totals  $n_i$  shows the number of sons with their fathers in category i. The column totals  $n_i$  show the occupational distribution of sons.

Denoting by  $m_{ij}$  the frequency in the  $(ij)^{th}$  cell, Table-3.2 shows the number of Respondents in category j whose fathers were in category i. under this situation, corresponding to each father there was exactly one offspring viz. the respondents of the household.

Table-3.2: Occupational distribution of Sons by occupation of their fathers (for 2nd to  $3^{rd}$  generation)

Son Father	Ι	II	III	IV	V	VI	VII	VIII	IX	Total
		0	0	0	0	0			0	4
Ι	4	0	0	0	0	0	0	0	0	4
II	4	16	3	0	0	0	0	0	0	23
III	0	16	7	0	0	0	4	4	4	35
IV	5	31	0	96	26	0	0	0	8	166
V	3	30	24	61	85	5	0	9	3	220
VI	0	24	16	42	51	68	20	29	12	262
VII	0	8	10	0	3	18	15	4	0	58
VIII	4	20	20	10	24	15	10	48	8	159
IX	0	15	20	11	14	13	0	0	0	73
Total	20	160	100	220	203	119	49	94	35	1000
Column %	2.0	16.0	10.0	22.0	20.3	11.9	4.9	9.4	3.5	

For analyzing the data, using  $m_{ij}$  values of Table-3.1 and 3.2 with the help of maximum likelihood method we have estimated the occupational transition probabilities in the following two Tables-3.3 and 3.4.

Son	Ι	II	III	IV	V	VI	VII	VIII	IX
Father									
Ι	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
II	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
III	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IV	0.0	0.01075	0.0	0.45695	0.24373	0.19713	0.0	0.0	0.08244
V	0.0	0.02518	0.0	0.12950	0.49280	0.17626	0.02518	0.02878	0.12230
VI	0.01802	0.05856	0.05405	0.0	0.06757	0.58558	0.0	0.21622	0.0
VII	0.0	0.0	0.34783	0.0	0.0	0.17391	0.21739	0.0	0.26087
VIII	0.0	0.0	0.02586	0.0	0.0	0.0	0.22414	0.75	0.0
IX	0.0	0.0	0.14634	0.0	0.0	0.29268	0.24390	0.19512	0.12195

 Table-3.3: Estimated T.P.M from fathers category to sons category (2nd generation)

 Table-3.4: Estimated TPM from father category to sons category (3<sup>rd</sup> generation)

Son 1	Ι	II	III	IV	V	VI	VII	VIII	IX
Father									
I	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
II	0.17391	0.69565	0.13044	0.0	0.0	0.0	0.0	0.0	0.0
III	0.0	0.45714	0.2	0.0	0.0	0.0	0.11429	0.11429	0.11428
IV	0.03012	0.18675	0.0	0.57831	0.15663	0.0	0.0	0.0	0.04819
V	0.01364	0.13636	0.10909	0.27727	0.38636	0.02273	0.0	0.04091	0.01364
VI	0.0	0.09160	0.06107	0.16031	0.19466	0.25954	0.07633	0.11069	0.04580
VII	0.0	0.13793	0.17241	0.0	0.05172	0.31035	0.25862	0.06897	0.0
VIII	0.02516	0.12579	0.12579	0.06289	0.15094	0.09434	0.06289	0.30189	0.05032
IX	0.0	0.20548	0.27397	0.15069	0.19178	0.17808	0.0	0.0	0.0

To see the intergenerational and intra-generational social mobility, using equations (2.1), (2.2) and (2.3) from Table -3.1, 3.2 and Table-3.3, 3.4 we have calculated Total mobility, Structural mobility and Pure mobility. These are put in the Tables-3.5 and 3.6. **Table-3.5: Table for TM, SM, PM (for 2^{nd} and 3^{rd} Generation)** 

Mobility Generation		Total	Structural	Pure
2 <sup>nd</sup> Generation	Value	501	180	321
2 Generation	Value in%	50.1	18.0	32.1
3 <sup>rd</sup> Generation	Value	661	272	389
5 Generation	Value in %	66.1	27.2	38.9

From the above Table-3.5  $2^{nd}$  Generation it can be inferred on the basis of the survey 50.1% sons are totally mobile with respect to their fathers. 18.0% changes from fathers to sons are due to structural change in the society and 32.1% mobility can be explained as pure mobility.

On the other hand, 3<sup>rd</sup> Generation shows that 66.1% sons are totally mobile with respect to their fathers. 27.2% changes from fathers to sons are due to structural change in the society and 38.9% mobility can be explained as pure mobility.

Also from Tables-3.1 and 3.3 we can observe the following intra and inter generational changes.

 Table-3.6: Percentage distribution of father's and son's by their occupation.

Gr Generation	oup	I	п	III	IV	V	VI	VII	VIII	IX
2 <sup>nd</sup> Generation	Father's in%	0	0	0	27.9	29.8	22.2	2.3	11.6	8.2
	Son's in %	0.4	2.3	3.5	16.6	22	26.2	5.8	15.9	7.3
3 <sup>rd</sup> Generation	Father's in%	0.4	2.3	3.5	16.6	22	26.2	5.8	15.9	7.3
5 Generation	Son's in %	2	6	10	22	20.3	11.9	4.9	9.4	3.5

On the basis of figures shown in the Tables, the values of the indices are given below:

Glass Index (for the i<sup>th</sup> category) Table-3.7: Glass index (for 2<sup>nd</sup> and 3<sup>rd</sup> generation)

	Group	Ι	II	III	IV	V	VI	VII	VIII	IX
	Generation									
	2 <sup>nd</sup>	0.0	0.0	0.0	2.81	2.24	2.24	3.75	4.72	1.67
F	3 <sup>rd</sup>	50	4.35	2	2.63	1.90	2.18	5.28	3.21	0.0

### Yasuda Index

For 2 <sup>nd</sup> generation	$I_{y2} = 0.4893$
For 3 <sup>rd</sup> generation	$I_{y3} = 0.3385$

Mobility measures based on TPM [Table-3.3]  $2^{nd}$  generation. We have the TPM P = (P<sub>ii</sub>)

0.0 0.45695 0.24373 0.19713 0.0 0.01075 0.0 0.0 0.08244 0.0 0.02518 0.0 0.12950 0.49280 0.17626 0.02518 0.02878 0.12230  $0.01802\ 0.05856\ \ 0.05405\ \ 0.0$ 0.06757 0.58558 0.0 0.21622 0.0 0.0 0.0 0.34783 0.0 0.0 0.17391 0.21739 0.0 0.26087 0.0 0.22414 0.75 0.0 0.02586 0.0 0.0 0.0 0.0 0.0 0.0 0.14634 0.0 0.0 0.29268 0.23490 0.19512 0.12195Here  $P^{\infty} =$ 0.0 0.0 0.279 0.278 0.222 0.023 0.116 0.082 0.0 0.0  $0.0 \ \ 0.0 \ \ 0.279 \ \ 0.278 \ \ 0.222 \ \ 0.023 \ \ 0.116 \ \ 0.082$ 0.0 0.0 0.0 0.279 0.278 0.222 0.023 0.116 0.082 0.0  $0.0 \quad 0.0 \quad 0.279 \quad 0.278 \quad 0.222 \quad 0.023 \quad 0.116 \quad 0.082$ 0.0  $0.0 \ \ 0.0 \ \ 0.279 \ \ 0.278 \ \ 0.222 \ \ 0.023 \ \ 0.116 \ \ 0.082$ 0.0  $0.0 \quad 0.0 \quad 0.279 \quad 0.278 \quad 0.222 \quad 0.023 \quad 0.116 \quad 0.082$ 0.0  $0.0 \quad 0.0 \quad 0.279 \quad 0.278 \quad 0.222 \quad 0.023 \quad 0.116 \quad 0.082$ 0.0  $0.0 \ \ 0.0 \ \ 0.279 \ \ 0.278 \ \ 0.222 \ \ 0.023 \ \ 0.116 \ \ 0.082$  $0.0 \ \ 0.0 \ \ 0.0 \ \ 0.279 \ \ 0.278 \ \ 0.222 \ \ 0.023 \ \ 0.116 \ \ 0.082$ 

Mobility measures based on TPM [Table-3.4]  $3^{rd}$  generation We have the TPM P = (P<sub>ij</sub>)

1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.13044 0.0 0.1739 0.0 0.69565 0.0 0.0 0.0 0.0 0.0 0.45714 0.2 0.0 0.0 0.0 0.11429 0.11429 0.11428 0.0301 0.18675 0.0 0.57851 0.15663 0.0 0.0 0.0 0.04819 0.01364 0.13636 0.10909 0.27727 0.38636 0.02273 0.0 0.04091 0.01364 = 0.06107 0.16031 0.19466 0.25954 0.07633 0.11069 0.0458 0.0 0.09160 0.0 0.13793 0.17241 0.0 0.05172 0.31035 0.25862 0.06897 0.0 0.02516 0.12579 0.12579 0.06289 0.15094 0.09434 0.06289 0.30189 0.05032 0.0 0.19178 0.17808 0.0 0.0 0.0 0.20548 0.27397 0.1506

Considering the table-3.1 (transition from first to second generation) we may construe the following: The column percentages indicate that:

0.4 pc of the house-hold sampled occupied the professional category -I,

0.23 pc were in professional category-II,

3.5 pc were in professional category – III,

16.6 pc, 22 pc, 26.2 pc and 15.9 pc of the house-holds (sampled) were observed occupying professional category IV, V, VI and VIII while 5.8pc and 7.3pc were in categories VII and IX

What is revealed here is that most of the house-holds were in category IV, V, VI and VIII (Land lords, big farmers, big businessman; Medium farmers, medium businessman, pig-poultry farmers; Poor farmers, petty-businessman and Unskilled labour)

The column percentages of table-3.1 (transition from second to third generation) indicate that: 2 pc of the house-hold sampled occupied the professional category -I,

16 pc were in professional category-II,

10 pc were in professional category – III,

22 pc, 20.3pc, 11.9 pc of the house-holds (sampled) were observed occupying professional category IV, V and VI while 4.9 pc, 9.4 pc and 3.5 pc were in categories VII, VIII and IX respectively.

It is evident that most of the house-holds surveyed were in the professional categories II, III, IV, V and VI (Middle salaried, Low salaried, Big farmers/ Big businessmen, Medium farmer/businessmen/pig, poultry farmer, and Poor farmer/petty businessmen).

Considering the TPM in table-3.3, (second generation) it is seen that the society of the households surveyed reveals that society is mobile. Nature of the social mobility as revealed by the TPM is not perfect on the ground that the rows of the TPM drawn/derived are not identical. While, it negates the nature of perfect immobility of the society under study as the TPM derived is not an identity matrix.

A similar conclusion holds good for the third generation house-holds as revealed by the TPM in table-3.4.

### 3.1.2: Non-Tribal category:

Following the same procedure we analyzed the data for Non-Tribal category but for economy of space we have given here only the findings.

Considering the transition from  $1^{st}$  to  $2^{nd}$  generation, we have been found that:

2.3 per cent of the first generation house-hold heads (sampled) occupied professional category-I, 13.7 per cent occupied professional category-II.

3.9 per cent occupied professional category-III [Low salaried, III & IV grade employees (peon, choukidars, khalasi, army personnel)]

3.2 per cent were in professional category-IV (Land lords, big farmers, Big businessmen)

32.8 per cent were in professional category- V (Medium farmers, medium businessman, pig-poultry farmers), while 27.3 per cent, 6.3 per cent, 6.2 per cent and 4.3 per cent were in professional categories – VI (Poor farmers, petty businessmen), VII (Skilled labourers (drivers, carpenters, mechanics, masons, plumbers, artisan, supervisors of manual workers, equipment operators, tailors, fisherman etc.), VIII (Unskilled labourers) and IX (Non-reported and others) respectively.

Considering the transition from  $2^{nd}$  to  $3^{rd}$  generation, we have found that:

5.9 pc of  $2^{nd}$  generation members (sampled) were in Professional category – I,

19.7 pc occupied in professional category – II,

7.1 pc occupied in professional category – III,

9.2 pc were in professional category – IV,

21.7 pc members occupied professional category - V and 24.2 pc occupied professional category VI, while 7.4 pc, 2.5 pc and 2.3 pc of the house-hold heads (sampled) were in professional categories VII, VIII and IX respectively.

It is evident from the above findings that, while considering the transitions from the first generation to second generation and from second to third generation, most of the house-hold heads were in the professional categories II, V and VI (Middle salaried, Medium farmer/ pig, poultry farmer and poor farmer/ petty businessmen).

Considering the TPM for second generation, it is seen that the society of the house-holds surveyed reveals that society is mobile. Nature of the social mobility as revealed by the TPM is not perfect on the ground that the rows of the TPM drawn/derived are not identical. While, it negates the nature of perfect immobility of the society under study as the TPM derived is not an identity matrix.

A similar conclusion holds good for the third generation house-holds as revealed by the TPM. **4. CONCLUSION:** 

From the study we find that most of the Non-tribal respondents in the Tribal dominated Udalguri district are in the occupations of Middle salaried (occupational category II); Medium farmer/businessmen, pig-poultry farmer (occupational category V); and poor farmer/ petty businessmen (occupational category VI). The 2.3 pc found holding higher occupations in second generation has increased up to 5.9 pc in the third generation. An increase of 5 pc is also seen in the third generation in the occupation category of land lord, big farmers/businessmen from their fathers' generation. The falling percentage seen in the VIII occupational category (from 6.2 pc of second generation to 2.5 pc of third generation) proves that the Non-Tribal society of Udalguri district has been experiencing upward mobility. The falling percentage of these un-skilled labourers (occupational category VIII) is a clear symptom of upward educational as well as occupational mobility.

Upward occupational mobility is also observed in the Tribal society of Udalguri district. Although Tribal are basically cultivators now a good number of them are seen occupying various occupations. The decrease of percentage in the category of poor farmers, petty businessmen (from 26.2 in the second generation to 11.9 in the third generation) tells the growing upward mobility of the Tribal community. There is also increase in almost all the higher occupational categories. The cause behind the upward mobility of the present (Third) generation Tribal people may be found in the formation of the Bodoland Territorial Area District (B.T.A.D.), a separate land for the Tribal which has opened up new opportunities for the Tribal people.

#### **5. ACKNOWLEDGEMENT:**

Sincere thanks to: Prof. Dr. Sarat C. Kakati, Dept. of Statistics, Dibrugarh University, Dibrugarh, and Mr Jayanta Kumar Chakravarty, Associate Prof. Department of English, Tangla College, Tangla.

### **REFERENCES:**

- [1] Bartholomew, D.J. (1982): *Stochastic Models for social processes*, John Wiley & sons.
- [2] Boudon, R. (1973): *Mathematical Structure of Social Mobility*, Amsterdam: Elsevier
- [3] Breen, R. (ed.), (2004), Social mobility in Europe, Oxford: Oxford University Press.
- [4] Dhanagare, D.N. (1983): Peasant Movements in India 1920-1950, Oxford University Press.

Delhi.

- [5] Ginsberg, R.B. (1971): Semi-Markov Processes and mobility, J. Math. Sociology, 1:233-362
- [6] Glass, D.V. and Hall, J.R. (1954): "Social mobility in Britain: A study of intergenerational Change in status", in D V Glass (ed.) *Social Mobility in Britain*, London: Rutledge & Kegan Paul
- [7] Guha, A. (1979): "Assamese Peasant Society in the Late nineteenth Century, Structure and Trend", Occasional Paper No. 25, Centre for Studies in Social Sciences, Calcutta.
- [8] Heath, A.F.(1981): *Social Mobility*, Fontana paper backs, London
- [9] Kumar, S., Heath, A. and Heath, O. (2002): "Determinants of social mobility in India" *Economic and Political Weekly* 37:2983-2987
- [10] Mcfarland, D. (1970): "Intergenerational Social Mobility as a Markov Process: Including a Time Stationary Markovian Model That Explains Observed Declines in Mobility Rates Over Time", *American Sociological Review*, 35, No 3.
- [11] Matras, J. (1960): "Comparison of Intergenerational Occupational mobility patterns: An application of the formal theory of Social Mobility", *Population Studies*, 15:187-97.
- [12] Medhi, J. (1984): *Stochastic processes*, New Age International (P) Limited (2<sup>nd</sup> edition), New Delhi.
- [13] Mukherjee, S.P. and Chattopadhyay, A.K. (1956): "Measures of mobility and some associated inferences problems", *Demography India*, 15:269-280.
- [14] Mukherjee, S.P. and Chattopadhyaya, A.K., (1989): Measurement of Occupational Mobility using semi Markov models, communications in statistics, *Theory and Methods*, 18(5):1961-1978.
- [15] Prais, S.J. (1955): "Measuring Social Mobility", *Journal of the Royal Statistical Society*, Series A, Part I, 118:56-66.
- [16] Rogoff, N. (1953): *Recent Trends in Occupational Mobility*, The Free Press of Glencoe, Glencoe.
- [17] Tyree, A. (1973): "Mobility ratios and association in mobility tables", *Population studies: A Journal of Demography*, vol.27, issue3.
- [18] Yasuda, S. (1964): 'A Methodological Inquiry into Social Mobility", *American Sociological Review*, 29 (Feb), 16-23.