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Distribution of Distance Associated with Marriage Migration

K. N. S. Yadava and Soni Srivastava
Department of Statistics, Banaras Hindu University, Varanasi-221005, India.
e-mail: knsy@banaras.ernet.in

Sabina Islam
Department of Statistics, Shahjalal University of Science and Technology, Sylhet, Bangladesh. e-mail: sabina-sta@sust.edu

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Abstract

Age at marriage has always remained a subject of interest among demographers and social scientists due to its significance in the study of current and prospective fertility behaviours. One of the important components of the analysis of the nuptiality process is to study the marriages according to the distance associated with it. Many models have been developed to study the relationship between marriage and the associated distance, but keeping Hindu society in mind. In this paper an attempt has been made to formulate a model for marriage migration according to the distance associated with marriage migration in a Muslim community. For this a single parameter exponential distribution has been proposed and compared with the Pareto-exponential function applied by Yadava et al (1998). It was found that exponential distribution provided a good approximation at the survey area and therefore was considered suitable to describe the distance associated with marriage migration in a Muslim community.

1 Introduction

The pattern of marriage migration varies from society to society according to the customs and social norms of the society concerned. In fact, the distance associated with marriage migration provides an idea about the social contact and it has become a subject of interest among social scientists. Researchers involved with the study of the spatial pattern of the society have been giving more attention to the marriage field emphasising its relationship between marriage and associated migration distance. A variety of models have been developed to study the distribution of distance associated with marriage migration in India and other parts of the world during the last few decades (Libbee and Sopher, 1975; Morril and Pitts, 1967; Perry, 1969a and 1969b; Samuel, 1994; Sharma, 1984; Yadava et al., 1988).

Sharma (1984) proposed a probability model to describe the distribution of distance associated with marriage migration for Northern India based on the assumption that (i) the distribution of marriages being uniform up to a certain distance (say) D i.e., the number of marriages are proportional to the area of the distance interval d_1 to d_2. That is the number of marriages with distance interval $(d_1 < d_2 < D)$ are proportional to $\Pi(d_2^2 - d_1^2)$ and (ii) after the distance D in a particular direction, the distribution of distance follows an exponential form, that is the number of marriages in the distance interval d_1 to d_2 $(D < d_1 < d_2)$ is

$$\left[e^{-\lambda(d_1-D)} - e^{-\lambda(d_2-D)}\right] \pi(d_2^2 - d_1^2) \tag{1}$$

where λ is the risk parameter. The concept behind taking this model was that the distance factor is immaterial up to a certain distance, and marriages are arranged without giving due consideration to the distance and after that particular distance as mentioned above the marriage probabilities will be a decaying function of the distance. It is a fact that an increase in distance involves more expenditure besides increased difficulties in travelling long distance places. Also there is less chance of getting information about a suitable match for the girl.

In 1988, Yadava et al extended the model proposed by Sharma (1984) as: If M is the number of marriages at distance 'r', then

$$M < 2\pi r f(r) dr \tag{2}$$

where

$$\begin{aligned} f(r) &= e^{-\lambda(r-D)}, \text{ if } r > D \\ &= 0, \qquad\quad\ \text{if } r \leq D \end{aligned} \tag{3}$$

This model provided a better approximation as compared to the Sharma's (1984) model. It should, however, be noted that the above models for the distance associated with marriage migration have been proposed/developed keeping in mind the Hindu society involved in the process. The marriage pattern of Muslim society is quite different from that of a Hindu society. In a Hindu society, most of the marriages usually take place out-side the village because cross-cousin marriages are prohibited. It is generally assumed that persons of a particular caste living in a village are the members of one clan having common ancestor and therefore, all the boys and girls of a village are related as brothers and sisters. On the other hand, cross-cousin marriages are widely accepted in the society of Muslims as a result of which most of the marriages take place within the village or neighbouring villages. Therefore, the models proposed by Sharma (1984) and Yadava et al. (1988) are not suitable to describe the marriage distance of Muslim society. Fortunately, a set of data is available from a sample survey entitled "Impact of Migration on Fertility in Bangladesh: A study of Comilla district". The Comilla district is bounded on the North by Brahmanbaria zila, on the east by India, on the south by Feni and Noakhali Zilas and on the West by Narayanganj, Munshiganj and Chandpur zillas. It is one of the oldest districts of Bangladesh. The cluster survey sampling methodology has been adopted for the selection of sample. A total of 2696 sample households from 10 clusters have been interviewed. The details about "Impact of Migration on Fertility in Bangladesh: A study of Comilla district" survey can be seen in Hossain (2000). Hossain tried to fit the models mentioned earlier. These models did not provide a good fit and Hossain (2000) then applied the Pareto-Exponential function proposed by Morril and Pitts (1967) to describe the distance associated with marriage migration for his data of Bangladesh. Though this model provided better approximation than the models proposed by Sharma (1984) and Yadava et al (1988) but still did not adequately fit to the data set utilised. It seems that a model to describe the distribution of distance associated with marriage migration in a Muslim community should be based on the assumption that the number of marriages is a decaying function of distance, i.e., as distance increases the number of marriages decreases. Exponential distribution may be a good example for this situation and it is proposed in this paper.

2 Model

2.1 Pareto-Exponential Function

Hossain (2000) applied Morril and Pitts's (1967) model to study distance associated with marriage migration on the data of Bangladesh. In brief, this model is
If Y is the number of marriages, D is the distance associated with marriage migration then the Pareto exponential function (Morril and Pitts, 1967) may be expressed as follows:

$$Y = aD^{-b}e^{-cD} \tag{4}$$

where a, b, and c are the parameters. Taking logarithms on both sides of the above equation, the equation takes the linear form:

$$\log_e Y = \log_e a - b \log_e D - cD \tag{5}$$

The parameters a, b and c can easily be estimated from equation (5) using the method of least squares.

2.2 Exponential Distribution

Due to the reasons as pointed out above the number of marriages at various distances in a Muslim community may be a decaying function of distance i.e., the number of marriages tends to fall quite rapidly for higher distances, and consequently an exponential distribution may appear to be a suitable one to describe the distance associated with marriage migration. Suppose x denote the distance associated with the marriage migration then the probability density function of x is as follows:

$$f(x) = \begin{cases} \theta e^{-\theta x}, & \text{if } x \geq 0 \\ \\ 0, & \text{otherwise} \end{cases} \tag{6}$$

where θ is the risk parameter. Then the cumulative distribution function of females getting married at a distance less than or equal to x is given by:

$$F(x) = \begin{cases} 1 - \theta e^{-\theta x}, & \text{if } x \geq 0 \\ \\ 0, & \text{otherwise} \end{cases} \tag{7}$$

This distribution contains only one parameter θ which is to be estimated. The maximum likelihood estimate of θ is given :

$$\hat{\theta} = \frac{1}{\bar{x}} \tag{8}$$

where $\bar{x}$ is the observed sample mean distance associated with the marriage migration.

3 Application

Both the Pareto-Exponential and Exponential models are applied to the data of Bangladesh for different marriage cohorts as taken by Hossain (2000). Table 1 shows the number of marriages according to the distance in different marriage cohorts. It was found that the Pareto-Exponential model suitably described the data for the marriage cohorts 'before 1971', 1971-1980 and 1981-1990 but did not fit well for the marriage cohort 1991-1997 whereas, the exponential model was found suitable for all the data sets. Thus, a better fit of the distance associated with marriage migration, particularly for marriages of Muslim community could be obtained by the exponential distribution as compared to the Pareto-Exponential function as applied by Hossain (2000).

Table 1: Distribution of the distance associated with marriage migration for different marriage cohorts, Comilla, Bangladesh

Distance (in miles)	Total Marriages			Before 1971			1971-1980			1981-1990			1991-1997		
	Obs.	Exp $\mathcal{M}\ A$	Exp $\mathcal{M}\ B$	Obs.	Exp $\mathcal{M}\ A$	Exp $\mathcal{M}\ B$	Obs.	Exp $\mathcal{M}\ A$	Exp $\mathcal{M}\ B$	Obs.	Exp $\mathcal{M}\ A$	Exp $\mathcal{M}\ B$	Obs.	Exp $\mathcal{M}\ A$	Exp $\mathcal{M}\ B$
0-3	792	788.57	806.98	294	286.34	280.22	155	172.59	158.57	203	225.90	215.36	140	166.8	153.65
3 - 6	442	431.98	411.47	121	137.12	137.94	90	69.52	79.05	131	105.39	113.82	100	73.3	80.28
6 - 9	219	217.43	209.80	74	66.16	67.9	37	34.86	39.41	62	56.54	60.16	46	37.5	41.95
9 - 12	87	106.73	106.98	31	31.99	33.43	14	18.64	19.64	27	31.62	31.80	15	20.1	21.92
12 - 15	48	51.75	54.55	18	15.49	16.45	10	10.30	9.79	13	18.04	16.81	7	10.9	11.45
15 - 18	29	24.91	27.81	7	7.50	8.10	5	9.09	8.52	11	10.43	8.88	6	6.1	5.98
18 - 21	18	11.93	14.18	3	5.39	5.95	4	-	-	7	6.07	7.15	4	5.3	5.06
21 - 24	4	5.70	7.23	2	-	-	0	-	-	0	-	-	2	-	-
Total	1639	1639	1639	550	550	550	315	315	315	454	454	454	320	320	320
θ		-	0.2245		-	0.2364		-	0.2320		-	0.2126		-	0.2164
$\hat{a}$		6.9874			6.0231			5.5435			5.7546			5.4658	
$\hat{b}$		-0.2534			-0.2407			-0.1668			-0.1670			-0.1785	
$\hat{c}$		0.1440			-0.0129			-0.3722			-0.2379			-0.2586	
χ^2		8.44	9.98		3.527	5.24		9.12	4.82		11.33	5.45		18.79	10.53
d.f.		4	6		3	4		2	4		3	5		3	5

$\mathcal{M}\ A$ means Model A: Pareto-Exponential; $\mathcal{M}\ B$ means Model B: Exponential model

4 Conclusions

In this paper the distribution of the distance associated with marriage migration has been studied using Pareto-Exponential function and the exponential distribution. The findings indicated that the exponential distribution provides a better approximation to the distribution of distance associated with marriage migration in Muslim community.

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