CHAPTER VI

Distribution of Labour Time Across SNA, Extended-SNA and Non-SNA Activities: A Principal Components Analysis

6.1 Introduction

Two theoretical explanations of gender differences in time use predominate in the literature - the economic bargaining perspective and the gender perspective (Coltrane 2000; Risman 1998; Shelton and John 1996). The economic/bargaining perspective emphasizes rationality and relative resource levels and the reasons why women's and men's time allocations should have changed in response to shifting economic, demographic and normative conditions. Women's rising educational attainment, their economic contribution, and more participation in paid activities have reduced their comparative advantage in unpaid (relative to paid) work. At the same time declines in rates of marriage, increases in age at first marriage and declines in fertility rates have reduced unpaid work demands. Consequently, women are expected to reallocate increasing amounts of time from unpaid to paid work. Further, because increases in women's education, employment and earnings have strengthened their bargaining power, men's unpaid work time should also be increasing. This perspective points to continuing change in women's and men's work time allocations within household increases nowadays as women realized substantial gains over the decade in education, labor force experience, wages and occupational attainment, both in absolute terms and relative to men (Blau 1998).

The gender perspective instead emphasizes the resiliency of gender inequality and elements that work against change in the gender division of labor. According to gender theorists, unpaid work is not a gender-neutral bundle of chores that women perform out of comparative advantage or lower resources but instead, integral to the reproduction of unequal power relations between women and men (Thompson and Walker. 1995). Further, not engaging in unpaid work, or at least avoiding certain activities, is one way how men display masculinity and reinforce their structural and cultural power (Brines 1994; Risman 1998). Hence, this perspective predicts that sharply differentiated gendered

time use patterns may have been fine-tuned to reflect changing demographics, economics, and norms, but the recreation of gender inequality continues to be a fundamental product of gendered time allocations. Definitions of acceptable feminine behavior have broadened to include wage earning; however, women's performance of domestic labor is still part and parcel of being a "good" wife and mother (Riggs 1997). Moreover, the gender perspective implies that women should have less free time than men because women are responsible for ensuring that all unpaid work gets done, regardless of how much time they spend in paid work. While women have increased their hours of paid employment, men still spend more hours in paid work than women, and married men allocate more time to paid work compared to married women (Rones, Ilg and Gardner 1997; Sayer, Cohen and Casper 2004). Findings from cross-sectional data document that women do more housework and child care than men, and marriage, children and employment increase women's household labor but have little or no effect on men's unpaid work (Ahmeduzzaman and Roopnarine 1992; Aldous, Mulligan and Bjarnason 1998; Bianchi et al. 2000; Brines 1994; Coltrane 2000; Coverman and Sheley 1986; Presser 1994; Shelton 1992; Shelton and John 1996; South and Spitze 1994; Zick and Bryant 1996). These aspects of theoretical perspectives find support in the literature and empirically it has been proved in this study in the previous chapter where socio-economic variables have been taken into account to show the influence of certain variables on women's paid work.

Again, the literature on trends in time use suggests that women and men have altered time use patterns such that gender differences in work allocations have narrowed. Between 1970 and 1995 the effects of marital and parental status on women's paid work hours declined while the effects of women's human capital characteristics increased and gender gaps in labor force participation, experience and job tenure narrowed (Blau,1998). Women continue to do more housework than men but a decomposition of changes in the amount of time women and men spend on housework indicates that women's propensity to do housework has declined since the 1960s while men's has increased (Bianchi et al., 2000). Additionally, there appears to be no gender gap in leisure time since the time women and men spend in the combination of paid and unpaid work is similar (Blau 1998; Robinson and Godbey, 1999; Zick and McCullough, 1991). In sum, two scenarios emerge from the time use literature. Research based on cross- sectional data at one point

in time suggests that the reallocation of women's and men's time has stopped well short of true similarity, because the male identity is still synonymous with being the breadwinner, while the female identity is still enmeshed with being the caregiver (Gerson 1993; Hochschild, 1989; Potuchek, 1997). On the other hand, analyses of trends in time use suggest that a gradual evolution in the reallocation of women's and men's time between paid and unpaid activities is occurring. The equivalent findings may be due to variations in sample populations, methodologies, definitions of work and free time, and/or a focus on only one domain of time use. What is needed is careful examination of comparable estimates of paid and unpaid work and free time to assess the extent to which women's and men's time use has continued to converge across all domains, or whether instead change has stalled. In this chapter, time disposition pattern of both men and women are considered to show the relative importance of gender differences in work allocations.

6.2. Labour Time Commitments by Rural Households Under Study: A Disaggregated Time Analysis

It is observed from the IV th and Vth chapter that in villages women contribution in field activities (preparation of land, sowing seeds etc.) as paid agricultural labour is higher in those households where the farmers have small land holding and subsequently also make larger contribution in post harvest activities (threshing, winnowing etc.) and animal husbandry (poultry rearing, grazing etc) as unpaid family helper where farmers have large land holdings. In the study villages some kind of differences between the rural folk in respect of activities they performed are noticeable. Women workforce in Jalpaiguri district is heavily engaged in their household management along with agricultural activities and some artisanal activities whereas women of Darjeeling district are concentrated only in their field activities and household management. Geographical constraint in hills of Darjeeling restrict women workforce to participate outside the boundaries of home economies.

Table 6.1: Average Labour Time Commitments by Rural Workers to SNA, Extended SNA & Non-SNA Activities

DISAGGREGATED GENDER ANALYSIS IN JALPAIGURI

Activity type	Activities	Weekly hours expended by all women	Weekly hours expended by all men	Daily hours expended by all women	Daily hours expended by all men	Daily hours expended per women	Daily hours expended per man
SNA1	Land preparation	3559.5	5250	508.5	750	3.39	5
SNA2	Crop husbandry	77	966	11	138	0.07	0.92
SNA3	Post-harvest activities	1239	182	177	26	1.18	0.17
SNA4	Crop protection	28	756	4	108	0.02	0.72
SNA5	Kitchen gardening	252	91	36	13	0.24	0.08
SNA6	Market sales & purchase	0	742	0	106	0	0.70
SNA7	Livestock tending	759.5	105	108.5	15	0.72	0.1
SNA8	Livestock grazing	136.5	150.5	19.5	21.5	0.13	0.14
SNA9	Making dungcakes	851.2	0	121.6	0	0.81	0
SNA10	Poultry rearing	231	0	33	0	0.22	0
SNA11	Water & fuel collection	434	28	62	4	0.41	0.02
SNA12	Processing & storage	105	388.5	15	55.5	0.1	0.37
SNA13	Dwelling construction	105	1298.5	15	185.5	0.1	1.23
SNA14	Well/Irrigation construction	1113	273	159	39	1.06	0.26
SNA15	Common infrastructure	430.5	1326.5	61.5	189.5	0.41	1.26
SNA16	Making handicrafts	245	154	35	22	0.23	0.14
SNA17	Market purchase & sales	42	56	6	8	0.04	0.05
XNA1	Cooking & cleaning	3181.5	0	454.5	0	3.03	0
XNA2	Childcare	1557.5	210	222.5	30	1.48	0.2
XNA3	Care of elderly	794.5	0	113.5	0	0.75	0
XNA4	Community work	164.5	217	23.5	31	0.15	0.20
XNA5	Education & tutoring	161	84	23	12	0.15	0.08
XNA6	Training programmes	91	28	13	4	0.08	0.02
NNA1	Leisure	385	381.5	55	54.5	0.36	0.36
NNA2	Personal care	389.9	0	55.7	0	0.37	0
NNA3	Social conversation	637.7	238	91.1	34	0.60	0.22
NNA4	Rest & relaxation	6175	6307	882	901	5.88	6.00

Source: *TAS Survey data*

The tables shows a clear cut demarcation of work on gender basis. We get a distinct picture of time disposition by men and women in productive and unproductive as well as paid and unpaid activities. If we consider the time utilization pattern of Jalpaiguri district in Table 6.1 then one can easily say that women are involved in various activities on the farm ranging from sowing and harvesting to tutoring of their children but the traditional division of labour by sex prescribed that women's work be strictly limited to the home. While peasant men were responsible for all the agricultural tasks performed in the field, such as ploughing, transplanting and harvesting to marketing of agricultural produce.

Women are burdened with 'indoor' agricultural tasks (i.e. pre-planting and post harvest operations); they undertake to handle the seeds, and do arduous and labour intensive tasks like winnowing, parboiling and husking. But since all this work is done indoors and thus invisible like other post harvesting work done by women, is excluded from the definition of 'social production'. It thus is beyond the scope of traditional Marxist economic analyses of labour exploitation in agriculture. Women also contribute a considerable amount of time in animal husbandry activities related to cattle raising, grazing of livestock etc. Gathering of fodder, watering and feeding are undertaken predominantly by women than by men. Besides the on-farm and animal husbandry activities, women continue to do traditional activities such as cooking, washing utensils and clothes and bringing up the children. Women thus perform multifarious roles of child bearers and rearers, housekeepers in addition to often being breadwinners of the family or supplementers of family income. The participation of male labour force in Extended SNA activities are too negligible compared to their female counterpart. Toiling from dawn till dusk within their homes, women's scope for social intercourse or rest/relaxation is very limited.

Similar analysis can also be extended to the other activities represented in the Table 6.2.The analysis brings focus to bear on activities performed autonomously by rural men and women and also to other activities where the household effort is jointly shared by both. Identification of gender structures within such rural activities also uncovers the prevailing gender division of labour among households in rural Bengal, as listed under Table 6.1 As this structural schema indicates, 7 principal SNA activities and 2 XNA activities involve work-sharing between rural men and women. Another 3 SNA activities are carried out autonomously by men, against the 7 SNA activities, 4 XNA activities and 1 NNA activities to which women make autonomous time allocations. As the average daily time contributions in the table show, in most shared SNA activities, except land preparation, kitchen gardening and the building of common village infrastructure, the roles of rural women are subsidiary to those of men. In land preparation and infrastructural activities, rural women and men make nearly matching contributions, and in kitchen gardening, women take the lead. Among XNA and NNA activities, the only ones in which men share significantly are community work, rest & relaxation and leisure. Rural men do not profess to participate in social conversation which they deem to be akin

to gossip. Daily opportunities for them to socialise occur in the midst of work, and are therefore not recorded separately. However, for rural women who have to work long hours within the home, the hour or so that they spare each day to meet peers and friends is their only social outlet.

Table 6.2: Average Labour Time Commitments by Rural Workers to SNA, Extended SNA & Non-SNA Activities

(DISAGGREGATED GENDER ANALYSIS IN DARJEELING)

Activity type	Activities	Weekly hours expended by all women	Weekly hours expended by all men	Daily hours expended by all women	Daily hours expended by all men	Daily hours expended per women	Daily hours expended per man
SNA1	Land preparation	1426	1649	203	235	2.03	2.35
SNA2	Crop husbandry	1001	1025	143	146	1.43	1.46
SNA3	Post-harvest activities	686	630	98	90	0.98	0.9
SNA4	Crop protection	691	777	98.7	111	0.98	1.11
SNA5	Kitchen gardening	191	152	27.2	21.7	0.27	0.21
SNA6	Market sales & purchase	373	392	53.2	56	0.53	0.56
SNA7	Livestock tending	609	529	87	75.5	0.87	0.75
SNA8	Livestock grazing	230	111	32.8	15.8	0.32	0.15
SNA9	Making dungcakes	0	0	0	0	0	0
SNA10	Poultry rearing	109	74	15.5	10.5	0.15	0.10
SNA11	Water & fuel collection	269	201	38.4	28.7	0.38	0.28
SNA12	Processing & storage	94	63	13.4	9	0.13	0.09
SNA13	Dwelling construction	62	645	8.85	92.1	0.08	0.92
SNA14	Well/Irrigation construction	148	405	21.1	57.8	0.21	0.57
SNA15	Common infrastructure	216	529	30.85	75.5	0.30	0.75
SNA16	Making handicrafts	120	82	17.14	11.7	0.17	0.11
SNA17	Market purchase & sales	1	16	0.14	2.28	0.00	0.02
XNA1	Cooking & cleaning	2201	146	314	20.8	3.14	0.20
XNA2	Childcare	783	262	111	37.4	1.11	0.37
XNA3	Care of elderly	343	188	49	26.8	0.49	0.26
XNA4	Community work	719	704	102	100	1.02	1.00
XNA5	Education & tutoring	240	260	34.2	37.1	0.34	0.37
XNA6	Training programmes	0	10	0	1.42	0	0.01
NNA1	Leisure	577	424	82.4	60.5	0.82	0.60
NNA2	Personal care	686	621	98	88.7	0.98	0.88
NNA3	Social conversation	569	476	81.28	68	0.81	0.68
NNA4	Rest & relaxation	581	543	83	77.5	0.83	0.77

Source: *TAS Survey data*

Although the gender involvement in most of the activities is socially defined, it is socially accepted that women be attributed with managerial functions, thus playing a pivotal role in livestock management and household management. The pattern of work carried out solely by women such as post harvest activities (threshing, winnowing) water-fuel collection, child care, livestock tending however, restrict women in the domestic sphere

and limit there accessibility and participation outside the home domain. Whereas, activities carried out solely by men like, market sales and purchases, crop husbandry and construction work, are activities, which give them the power of decision-making in the household. This is particularly so, since, such monetary transactions are accompanied with the authority to deal with the household income and expenditure, even though the women's contribution to the income generation is visible in terms of the activities they undertake or are income saving.

Thus to show the impacts of time distribution between different SNA, XNA and Non-SNA activities on the daily life of women and men Principal Component analysis has been done to figure out the major influencing activities in the lives of women and men in rural villages as they are overburdened with these activities.

6.3. Inter-relation between Activities of Rural Men & Women: Principal Component Analysis

6.3.1. Principal Component Analysis of Women's Activities

It can be observed from the correlation matrices of activities for women in two districts that the majority of activities are significantly correlated with each other. But the activities are related either positively or negatively with each other. It is clear from the correlation matrix, when women are engaged in land preparation, they are not spending time for crop husbandry as this is the task usually undertaken by men, thus land preparation (SNA1) and crop husbandry (SNA2) are negatively related with each other in Jalpaiguri district. Again women are mostly involved in all kinds of post harvest activities and thus land preparation (SNA1) and post harvest activities (SNA3) are positively related with each other. Similarly for Darjeeling district land preparation (SNA1) and common infrastructure(SNA15) are negatively related with each other. Thus the correlation matrices are showing the strong interrelationship among the activities. (Table 6.3 and 6.4-See Appendix A).

Although the variations of time spent or distribution of time in different SNA, XNA and Non-SNA activities are seemingly interrelated for women in the districts of Jalpaiguri and Darjeeling , imputation of cause and effect relation across observed patterns of activity is a complex task. While in the main, the declining time in certain activities may

be attributed to the rise in time of others, the inter-activity relation is in itself a combination of direct and oblique cross influences where decrease in time for any particular activity may rise or redistribute the time for another activity and thus the activities are either forward-linked or backward linked with each other. Thus a proper investigation of principal activities to identify the work load of women in the rural villages must take recourse to specific mathematical tools of analysis which fit the dataset.

In the previous chapter, simple multiple regression analysis was undertaken to shed some light on the influences of socio-economic variables on the paid activities of women in rural villages, but here in this chapter, the specification of the major activities that are carried by both men and women and the inter- relationships between these SNA, XNA and Non-SNA activities of men and women are the major concern.

The higher order of series interdependence in the correlation matrices drawn on different activities offers indication that multicollinearity exists between the pairs of predictor activities that could render normal regression procedures ineffective. This combination of circumstances implies that overall variation in time for different activities may be adequately explained by fewer than actual activity loading trends, justifying the recourse to Principal Component Analysis in order to decompose the variation in components attributable to each activity trend and to rank the activities with respect to the influence they have on work structure of a rural economy. The zero determinants of the singular correlation matrices also suggest likewise, because of liner dependence between their columns and rows.

The standard model for the multiple regression analysis has been represented in matrix form below. The regression model comprises of 24 explanatory variables instead of total 27 variables, as certain variables are neither related positively or negatively with the other variables. Thus by eliminating those variables the present study chooses only the related variables The major statistical technique used for the analysis is Principal Component Analysis. The PCA technique permits data reduction into fewer sets of meaningful factors which represent clusters of interrelated variables on the basis of the strength of inter-correlations between the variables. The factor model used in the present study is given by

The factor model is as follows:

(1) $Z=AF+U$

where: Z is an (n x 1) vector of n standardized variables, i.e., $Z_i = (X_i - X,)$ where the X are the n original variables and the X_i are the standard errors of the original variables; i= 1, 2, ..., n.

A is the (n x m) matrix of factor coefficients, also called factor loadings; m < n.

F is the (m x 1) vector of factors.

U is the (n x 1) error vector.

U is distributed independently of F and both F and U have multivariate normal distributions. $E(U) = 0$, and $E(F) = 0$. $E(UU') = V$, a diagonal matrix. $E(FF') = I$, i.e., the factors are uncorrelated and with variance equal to 1. It follows that Z has a multivariate normal distribution with an (n x n) correlation matrix C or an (n x n) expected covariance matrix $R = E(ZZ'/N) = AA' + V$.

The elements of the diagonal of AA' are called the communalities and the elements of V are called the specific variances of the n variables. Hence, A is not unique, i.e., any orthogonal transformation of A will reproduce the correlation matrix: $R = AA' + V = ATT'A' + V$, where T is an orthogonal matrix. Thus, it may be said that A is unique only up to an orthogonal transformation.

A particular test of the appropriateness of Principal Component Analysis (PCA) to activity specification modelling based on these principles is provided by the Kaiser-Meyer- Olkin (K-M-O) Measure of Sample Adequacy routinely provided in SPSS output, which compares the magnitude of the simple correlation coefficients r^2_{ij} between paired activity series to the partial correlation coefficients (PCC_s) $r^2_{ij.1,2....i-1,j-1,k-1,k}$. If the sum of squared PCCs between all activity pairs is small compared to the sum of squared simple correlation coefficients, the K-M-O index is close to 1, indicating that the most of the series variance is sourced from the lateral collinearity of activity set in the dataset. Small values of the statistic on the other hand would indicate that PCA is appropriate since the interdependence between any activity pair would not be attributable to the indirect influence of total time consumption by women in respect of other activities. Generally,

K-M-O statistic varies from 0 to1 and a value close to1 indicate patterns of correlations that are relatively compact and so PCA would yield distinct and reliable components. K-M-O test run individually for Jalpaiguri district and Darjeeling district and the values of the index for Jalpaiguri and Darjeeling being 0.75 and 0.79 respectively, establishes that most of the interdependence apparent within activity dataset matrices occurs because of the dominant trends in a few major activities (more time consuming) and the collinear trends of other activity series.

Table 6.5: KMO and Bartlett's Test in Jalpaiguri (Women)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.759
Bartlett's Test of Sphericity	Approx. Chi-Square	1132.199
	Df	276
	Sig.	.000

Table 6.6: KMO and Bartlett's Test in Darjeeling (Women)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.791
Bartlett's Test of Sphericity	Approx. Chi-Square	1087.145
	Df	253
	Sig.	.000

Bartlett's test the null hypothesis that the original correlation matrix is an identity matrix . For PCA to work, the study need some relationship between activities and if the correlation matrix was to be the identity matrix then all the correlation coefficients would be zero. Therefore we want this test to be significant and it is found to be significant in both the districts at less than 0.05 significance level. Thus correlation matrices were not identity matrices, as illustrated and exists some relationship between the different SNA, Extended-SNA and Non-SNA activities. For present dataset of activities Bartlett's test is highly significant ($p<0.001$) and therefore PCA is appropriate for the dataset of activities of women.

Communality gives the percentage variation in the variable explained jointly by all the derived factors. The extraction communalities are useful as these are obtained using the extracted factors. Extraction communalities for a particular variable give the total amount of variance in that variable, explained by the extracted factors. Low communalities such as for dwelling construction, education and tutoring across the set of activities of women

for this study in the two districts indicating that other activities are little related to dwelling construction or we can say that time use in agricultural activities are not much affected by time spent on dwelling construction. Though communalities for land preparation, livestock tending and livestock grazing, poultry rearing depict strong relationship with the other set of activities, high communalities for market purchases and sales is meaningless when the study is concentrating on women activities, as we know that these are the activities that are solely perform by the male counterpart of household. Thus from the higher value of communality for any particular activity it can't be concluded that particular variable is important for the study rather sometimes low communality may be meaningful if the activity is related to well defined factor. Thus, what is crucial is not the communality coefficient per se, but rather the extent to which activity plays a role in determining factor for other set of activities.. The communality for a given variable can be interpreted as the proportion of variation in that variable explained by the nine factors. In other words, if we perform multiple regression of land preparation against the nine common factors, we obtain an $R^2 = 0.881$, indicating that about 88 percent of the variation in land preparation (communality value for land preparation i.e SNA1 is .881 for both Jalapiguri and Darjeeling) is explained by the factor model. The results suggest that the factor analysis does the best job of explaining variation in land preparation, post harvest activities, crop protection, livestock management, poultry rearing, processing and storage etc.

But how well the model of PCA is doing for analysing the activity pattern can be better understood from the values of communalities if the values are close to one for each of the activity then it would indicate that the model explains most of the variation for those variables. In this case, the model does better for some activities than it does for others. The model explains better for most of the activities like poultry rearing, livestock management, processing and storage, care of elderly, kitchen gardening, making handicrafts, training programmes that are autonomous activities for women. However, for activity like dwelling construction the model does not do a good job, explaining only about half of the variation.

If we take all of the communality (h_i)values and add them up then the total communality value will be equal to the total eigen value(λ_i) of variables, thus, $\Sigma h_i = \Sigma \lambda_i$

Here, the sum total of eigenvalues that are greater than one in Jalpaiguri and Darjeeling is 18.016 and 17.726 (Table 6.7 and 6.8) The proportion of the total variation explained by the NINE factors (since, 9 variables have eigen value greater than 1) are,

18.016÷24= 0.751 percent(Jalpaiguri)
17.726÷24= 0.738 percent(Darjeeling)

6.7. Women's Timeuse by Activities: Principal Components Analysis (Jalpaiguri)

Activity	Communality *	PC	Eigenvalue	% of Variance	Cumulative %
Land preparation	0.881 *	1	6.151	25.6	25.6
Post-harvest activities	0.855 *	2	2.667	11.1	36.7
Crop protection	0.828 *	3	1.906	7.94	44.7
Kitchen gardening	0.628 *	4	1.528	6.36	51.0
Livestock tending	0.748 *	5	1.421	5.92	56.9
Livestock grazing	0.713 *	6	1.288	5.36	62.3
Making dungcakes	0.717 *	7	1.098	4.57	66.9
Poultry rearing	0.900 *	8	1.001	4.16	71.0
Water & fuel collection	0.709 *	9	1.001	4.10	75.1
Processing & storage	0.818 *		$\Sigma\lambda_i$=18.016		
Dwelling construction	0.700 *				
Common infrastructure	0.798 *				
Making handicrafts	0.747 *				
Market purchases & sales	0.724 *				
Cooking & cleaning	0.687 *				
Childcare	0.680 *				
Care of elderly	0.673 *				
Community work	0.782 *				
Education & tutoring	0.728 *				
Training programmes	0.721 *				
Leisure	0.738 *				
Personal care	0.788 *				
Social conversation	0.714 *				
Rest & relaxation	0.770 *				

This gives us the percentage of variation explained in the model. This might be looked at as an overall assessment of the performance of the model. However, this percentage is the same as the proportion of variation explained by the first nine eigen values, obtained in

the following Tables 6.7 and 6.8 . The individual communalities tell how well the model is working for the individual variables, and the total communality gives an overall assessment of performance. Since the data are standardized in this case, the variance for standardized data is going to be equal to one. Then the specific variances can be computed by subtracting the communality from the variance as expressed below:

$$\hat{\psi}_i = 1 - \hat{h}_i$$

We recall, that the data were standardized before analysis, so the variances of the standardized variables are all equal to one.

The eigen value or latent root for a given factor measures the variance in all the variables. The ratio of eigen values is the ratio of explanatory importance of the factors with respect to the other variables. If a factor has low eigen value, then it is contributing little to the explanation of variances in the variables and may ignored as redundant with more important factors. It measures the amount of variation in the total sample accounted for by each factor. It is not the percent of variance explained but rather a measure of amount of variance in relation to total variables(since variables are standardized to have means of 0 and variances of 1, total variance is equal to the number of variables).

The pattern of interdependence between the activity loading trends, which captures the gap behaviour of these series of activities is of considerable interest since it identifies which interdependent activity group have either more or less importance in the course of the activity structure of rural household. This behaviour may be interpreted from the communality attached to each activity-loading series in the output of dataset, which statistically reports the proportion of variance in each individual activity loading series that can be explained by its co-variances with other collinear activity loading series. The scaling of communality by order of magnitude of explained variances also identifies the dominant activity whose factor loadings exercise the greatest influence on the loading of other activities. The tables (6.7 and 6.8) presents the comparative results on activity interdependence of women in terms of time-use.

Table 6.8. Women's Timeuse by Activities: Principal Components Analysis (Darjeeling)

Activity	Communality*	PC	Eigenvalue	%of Variance	Cumulative %
Land preparation	0.881 *	1	6.028	26.2	26.2
Post-harvest activities	0.854 *	2	2.666	11.5	37.8
Crop protection	0.819 *	3	1.795	7.80	45.6
Kitchen gardening	0.701 *	4	1.506	6.55	52.1
Livestock tending	0.852 *	5	1.333	5.79	57.9
Livestock grazing	0.717 *	6	1.274	5.53	63.5
Making dungcakes	0.906 *	7	1.080	4.69	68.2
Poultry rearing	0.669 *	8	1.043	4.31	72.5
Water & fuel collection	0.838 *	9	1.001	3.95	76.4
Processing & storage	0.659 *		$\Sigma\lambda_i$ = 17.726		
Dwelling construction	0.845 *				
Common infrastructure	0.751 *				
Making handicrafts	0.729 *				
Market purchases & sales	0.715 *				
Cooking & cleaning	0.677 *				
Childcare	0.670 *				
Care of elderly	0.733 *				
Community work	0.727 *				
Education & tutoring	0.797 *				
Training programmes	0.737 *				
Leisure	0.798 *				
Personal care	0.739 *				
Social conversation	0.770 *				
Rest & relaxation	0.731 *				

Now the study has a measure of how much variance each successive factor extracts, the study can return to the question of how many factors to retain. According to the Kaiser criterion, we can retain only factors with eigenvalues greater than 1. In essence this is like saying that, unless a factor extracts at least as much as the equivalent of one original variable, we drop it. This criterion was proposed by Kaiser (1960), and is probably the one most widely used. Hair, et.al. (1998, pp 103) reports that this rule is good if there are 20 to 50 variables, but it tends to take too few if there are <20 variables, and to many if there are >50. Stevens (2002, pp 389) reports that it tends to take too many if there

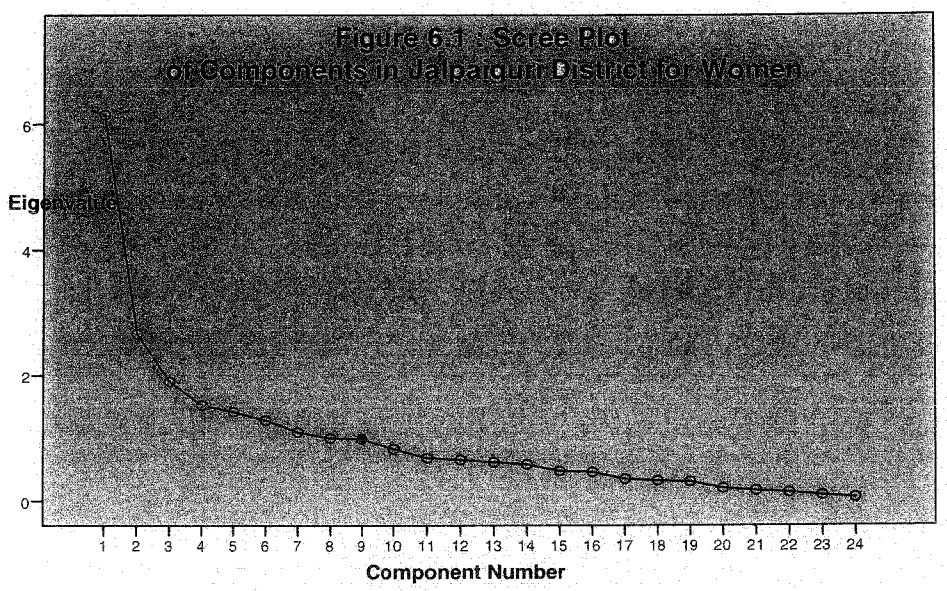


Figure 6.1 : Scree Plot
of Components in Jalpaiguri District for Women
Eigenvalue
0
2
4
6
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Component Number

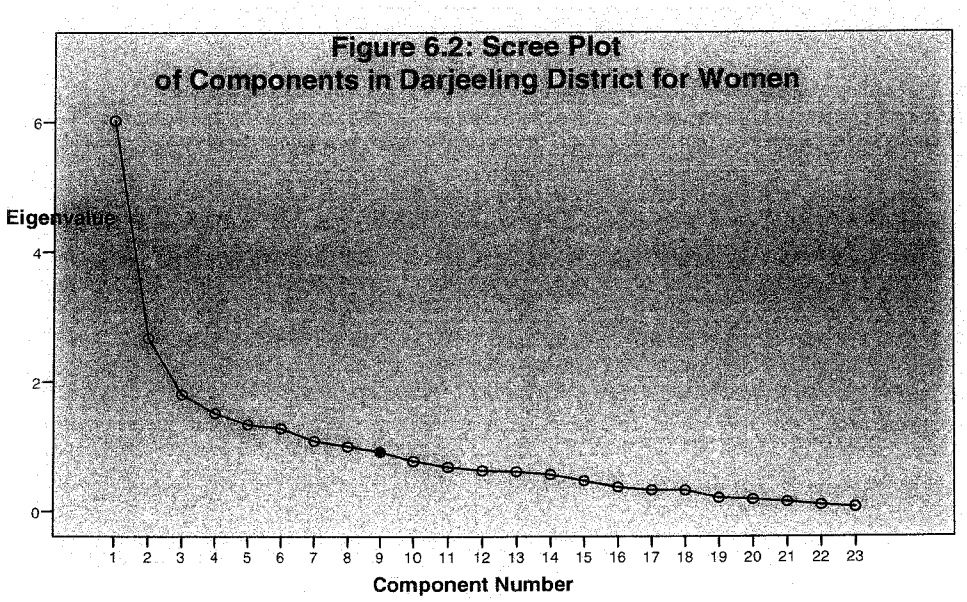


Figure 6.2: Scree Plot
of Components in Darjeeling District for Women
Eigenvalue
0
2
4
6
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Component Number

are > 40 variables and their communalities are around 0.4. It tends to be accurate with 10-30 variables and their communalities are around 0.7. In our study we have 27 variables and their communalities are more or less around 0.7, thus using this criterion, we would retain 9 factors (principal components).

A graphical method is the *Scree* test first proposed by Cattell (1966) for determining appropriate number of factors. Cattell suggests to take the number of factors corresponding to the last eigen value before they start to level off or find the place where the smooth decrease of eigen values appears to level off to the right of the plot. To the right of this point, presumably, one can find only 'factorial scree' – 'scree' is the geological term referring to the debris which collects on the lower part of a rocky slope. According to this criterion, we would probably retain 8 or 9 factors in our study. The figures under the column cumulative % indicate that nine factors extracted explain 75.1 of the total variance. We look for a sharp break in sizes of eigen values which results in change in the slope of the platform steep to swallow. We can see the slope of the scree plot changes from steep to swallow after the first nine factors. The eigen value also drops from above six to less than one when we move from 8 th to 9th factor. This suggests an nine factor solution may be the right choice for women in the two districts. The scree plot are shown in the following diagram for both the two districts.From the results of component matrix the factor loadings before rotation is carried out. For each of the variable, we get a loading in each of the columns representing factors. The extraction communalities in the previous Tables 6.7 and 6.8 is a summation of the square loadings on all the factors for a particular variable. The extraction communality value such as for land preparation (SNA 1), e.g., in the two districts can be obtained as:

$$\mathbf{(0.845)^2+(-0.331)^2+(-0.096)^2+(-0.059)^2+(-0.033)^2+(0.041)^2+(-0.131)^2+(-0.030)^2+(-0.154)^2 = 0.881}$$

$$\mathbf{(0.847)^2+(-0.333)^2+(-0.058)^2+(-0.048)^2+(0.059)^2+ (0.020)^2+(-0.162)^2+ (-0.101)^2+ (0.083)^2= 0.881}$$

Principal component method has been employed here to determine the relative weight of the selected activities on time use. The first principal component being the most important gives the basis for the relative weights to be assigned to various indicators, highest weight being assigned to those having higher contribution and vise-versa. The activities, land preparation, crop-husbandry, post-harvest activities, crop protection show

high loadings on PC 1 for both the districts. But activities like processing and storage, childcare, community work were important for Jalpaiguri district where water and fuel collection, cooking and cleaning and care of elderly were for Darjeeling. Likewise, those loadings high on one factor have low loadings on the remaining factors. The first PC 1 explained 25.6 percent of the total variances in Jalpaiguri district and 26.2 percent of the total variances in Darjeeling district in the variable set. Land preparation, crop husbandry or post harvest activities are the most laborious jobs in agriculture and most of the women from poor households in rural areas had to involve these arduous field jobs to sustain their livelihood and support their families and these women are mostly from landless families or marginal families. Again, activities like care of children, care of elderly, cooking and cleaning, water and fuel collection are the unpaid autonomous activities carried out by women of every rural community whether they are housewives or wage labourer in the rural economy.

Again PC 2 explained 11.1 percent of the total variation in Jalpaiguri and 11.5 percent of the total variation in Darjeeling district where important constituents are dwelling construction, well/irrigation construction, leisure and personal care. This component adds higher weights to livestock grazing in Darjeeling district and higher weights for poultry rearing in Jalpaiguri district. The implied reasoning is that time required for grazing cattle in a hilly terrain is much higher for want of open grazing lands in contrast to the same in the plains. Thus PC 2 showing the other extent of occupation of women who are involved in wage labour as construction worker but are not free from household duties and management of livestock of their household. Study reveals that women in rural households with cattle in milk spend approximately 1.5 to 4.5 hours weekly in milk production related work. Their first tasks upon waking are to clean the animal shed or area, collect the dung, and feed, water, and milk the animal. These activities take about one-and-a half hours. Other studies have shown that poultry rearing also requires greater input of time and labour from women in landless households in addition to their household work and gruelling but low-paid agricultural labour.

The correlation in Jalpaiguri district between variable SNA1 (i.e., land preparation) and PC 1 is explained by the appropriate factor loading 0.84, similarly strong correlation

between crop husbandry (SNA 2), post harvest activities (SNA 3), crop protection (SNA4), social conservation(NNA 3) and rest and relaxation(NNA 4) with PC 1 is given by the factor loading 0.81, 0.81, 0.58 and 0.78, 0.77. Again variable land preparation (SNA 1) is on the other hand negatively correlated with PC 2, PC 3 and PC 4 where component loadings are -0.33, -0.058 and -0.048. Even in Darjeeling district also PC 1 is strongly correlated with land preparation, crop husbandry, post harvest activities, social conversation and rest and relaxation. As we know land preparation, crop husbandry, post harvest activities are mostly paid SNA activities and are dominated by male member whether social conversation and rest and relaxation are personal activities and not included in the system of production boundary and these activities are enjoyed by every member for personal rest and relaxation. But it can be said that paid SNA activities are most arduous jobs or laborious jobs that people need more rest and relaxation for doing these jobs. The variance of land preparation is accounted for by component 1 is the appropriate component loadings squared; that is $(0.84)^2$=0.70= 70 percent. The variance of variable 1 i.e., land preparation accounted for by all the nine factors together is given by the communality h^2 which is computed earlier and gave same value for two districts as given below.

$$\mathbf{(0.845)^2+(-0.331)^2+(-0.096)^2+(-0.059)^2+(-0.033)^2+(0.041)^2+(-0.131)^2+(-0.030)^2+(-0.154)^2 = 0.88}$$

Thus we can compute the variance of every activities for both the two district of these nine factors. Conversely, $(1-h^2)$ = 12 percent of land preparation's variance is accounted for by some variable unique to land preparation. Hence the loading on land preparation's unique factor would be $\sqrt{1-h^2}= \sqrt{12}= 3.46$ for both the districts.

We can determine the importance of any given factor in terms of the amount of total variation in the data for which it accounts. As the variance of variable 1 i.e land preparation in Jalpaiguri district and Darjeeling district are accounted for by component 1 is $(.84)^2$, we may compute the total amount of variance among all variables accounted for by any component by adding the squared loadings in each column. Hence the total variance accounted for by component 1 of women in Jalpaiguri and Darjeeling district are given by

$(.84)^2 + (.81)^2 + (.81)^2 + \ldots\ldots\ldots\ldots\ldots (.77)^2 = 6.151$(Eigen value for land preparation in Jalpaiguri)
$(.84)^2 + (.81)^2 + (.82)^2 + \ldots\ldots\ldots\ldots\ldots (.77)^2 = 6.028$(Eigen value for land preparation in Darjeeling)

This value is referred to as variables 1's Eigen value. As mentioned earlier, since all variables are standardised the variance of each variable is equal to one. Thus the total variance in the data equals the number of variables, 24. It is, therefore, very easy to compute the proportion of total variance accounted for by a given variable by dividing its eigen value by the number of variables. In Jalpaiguri district, for variable 1 i.e., land preparation, this would be 6.151/ 24= 0.2562 = 25.6 percent and for variable 2 this would be 2.667/ 24 = 0.1111 = 11.1 percent and so on for other variables. Similarly in Darjeeling district the variance accounted for variable like land preparation, crop husbandry would be 6.028/24= 26.2 percent and 2.666/24=11.5 percent. (Tables 6.7 and 6.8)

The sum of these proportions gives the proportion of total variance in the data accounted for by the common variables, that is, 25.6 + 11.1 + 7.94 +6.36 +5.92 +5.36 + 4.57 + 4.16 + 4.10 = 75.1 percent for Jalpaiguri and 26.2+ 11.5+7.80 + 6.55+ 5.79+ 5.53+ 4.69+ 4.31+ 3.95= 73.8 percent. Sum of communalities will be equal to the sum of eigen values.

The component matrix of Jalpaiguri and Darjeeling reveals that the first component tends to load high on every variable while the subsequent components tend to have about 50 percent negative loadings and 50 percent positive loadings. Component matrix of both the district shows that variable 1 that is land preparation loads high on component 1 only whereas variables like common infrastructure, community work ,leisure and personal care i.e. loads high on component 2, again variables water and fuel collection and cooking and cleaning loads high on component 3.

Thus component 1 is more closely associated with SNA 1, SNA 2, SNA 3, NNA 3 and NNA4. Thus component 1 represent most time consuming arduous activities as well as as the least laborious activities such as leisure, personal rest and relaxation and thus component 1 representing two polar cases of activity structure. Thus activities with high loadings in component 1 explores the nature of employment of women as wage labour in agriculture on the basis of land holding pattern of households. At the same time it takes

into account high loadings of those activities that are not even counted as productive activities and mostly done for personal satisfaction. Again component 2 representing activity that are mostly done by male members of the society i. e common infrastructure along with community work. Women in rural household participate in less proportion in such kind of activities . But this componet 2 describes another occupational pattern of women wage worker such as construction worker. This component also shows high loadings for activities like poultry rearing or livestock grazing along with caring of elderly or children. Now the most interesting component is component 3 as it loads high on activities such as processing and storage and cooking and cleaning. These are kind of activities that women do in every agricultural household irrespective of caste, culture and status of land owner. These are mostly the unpaid jobs that women are bound to engage to maintain the family and also save her family income.

The pattern of interdependence between the activity loading trends, which captures the gap behaviour of these series of activities is of considerable interest since it identifies which interdependent activity group have either more or less importance in the course of the activity structure of rural household. This behaviour may be interpreted from the communality attached to each activity-loading series in standard SPSS output, which statistically reports the proportion of variance in each individual activity loading series that can be explained by its co-variances with other collinear activity loading series. The scaling of communality by order of magnitude of explained variances also identifies the dominant activity whose factor loadings exercise the greatest influence on the loading of other activities. The following table presents the comparative results on activity interdependence of men and women in terms of time-use.

If we concentrate on the component plots of women in Jalpaiguri and Darjeeling district then the components are clearly indicating high loadings for activities like land preparation, crop husbandry, post harvest activities, crop protection, kitchen gardening livestock management, water and fuel collection, processing and storage, dwelling construction, common infrastructure, cooking and cleaning, care of children, care of elderly and Non SNA activites such as personal care, social conversation and rest and relaxation. Under SNA activities loadings are high either for paid activities where women

6.9:Component Matrix of Activities for Women in Jalpaiguri

Activities	Component								
	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9
SNA1 Land preparation	**.845**	-.331	-.096	-.059	-.033	.041	-.131	-.030	-.154
SNA2 Crop husbandry	**.810**	-.268	-.239	-.157	.076	-.149	-.121	-.023	-.041
SNA3 Post harvest activities	**.815**	-.162	-.104	-.108	.119	-.260	.054	.129	.114
SNA4 Crop protection	**.585**	.199	.175	.086	.357	-.272	-.034	.063	-.045
SNA5 Kitchen Gardening	-.144	.207	.058	**-.519**	-.041	.177	.393	.025	-.473
SNA6 Market sales & purchase	**.762**	-.041	-.012	-.035	.202	.148	.010	.000	-.257
SNA7Livestock tending	.380	-.025	**.468**	.238	.354	.095	.202	-.271	-.216
SNA8 Livestock grazing	.189	-.241	.009	-.247	.295	**.475**	.129	-.392	**.511**
SNA10 Poultry rearing	.363	.445	-.020	-.477	.035	-.013	-.026	-.015	.387
SNA11 Water & fuel collection	.266	.237	**.624**	.267	.242	-.210	.251	.173	.185
SNA12 Processing & storage	**.469**	-.157	-.256	.141	.124	.081	.356	**.420**	.213
SNA13 Dwelling construction	.237	.268	**-.406**	**.523**	.255	-.045	-.029	-.391	-.104
SNA14 Well/ irrigation Const	.199	**.490**	**-.411**	.146	.276	.376	-.214	.082	-.081
SNA15. Common Infrastructure	-.001	**.603**	-.035	-.148	.352	.365	-.060	.238	-.139
SNA16 Making handicrafts	.317	-.140	**-.477**	.175	-.156	.230	**.473**	.057	.071
XNA1 Cooking and cleaning	.398	-.209	**.563**	-.245	.061	.195	-.178	-.168	.012
XNA2 Childcare	**.561**	-.134	.356	.093	-.232	.202	.160	.268	-.116
XNA3 Care of elderly	-.062	-.189	.248	**.417**	-.060	.443	**-.415**	.342	.133
XNA4 Community work	**.550**	**.550**	.029	.145	-.166	-.214	-.103	-.130	.022
XNA5 Education & tutoring	.342	.078	.149	.281	**-.557**	.309	.100	-.282	-.025
NNA1 Leisure	.132	**.729**	.139	.102	-.281	.038	.240	-.066	.131
NNA2 Personal care	**.504**	**.562**	.008	-.246	-.294	.051	-.248	.077	.023
NNA3 Social conversation	**.780**	.038	-.072	.043	-.250	-.157	-.030	.010	.098
NNA4 Rest & relaxation	**.773**	-.297	-.072	-.100	-.163	.091	-.126	-.034	-.132

Extraction Method: Principal Component Analysis.

6.10.Component Matrix of Activities for Women in Darjeeling

	Component								
Activities	**PC1**	**PC2**	**PC3**	**PC4**	**PC5**	**PC6**	**PC7**	**PC8**	**PC9**
SNA1 Land preparation	.847	-.333	-.058	-.048	.059	.020	-.162	-.101	.083
SNA2 Crop husbandry	.819	-.272	-.184	-.182	-.071	-.133	-.140	-.023	-.011
SNA3 Post harvest activities	.820	-.165	-.063	-.130	-.199	-.192	.106	.004	-.105
SNA4 Crop protection	.576	.200	.118	-.002	-.503	-.063	.043	-.058	.230
SNA5 Kitchen Gardening	-.142	.207	.126	-.487	.311	.011	.293	-.347	.482
SNA6 Market sales & purchase	.757	-.042	-.038	-.107	-.090	.190	.000	-.183	.227
SNA8 Livestock grazing	.183	-.240	-.019	-.349	.029	.484	.149	.657	.066
SNA10 Poltry rearing	.373	.442	.089	-.443	.042	-.025	.026	.296	-.198
SNA11 Water & fuel collection	.242	.243	.522	.244	-.484	.004	.388	.053	-.013
SNA12 Processing & storage	.478	-.160	-.259	.078	-.115	.144	.518	-.093	-.144
SNA13 Dwelling construction	.237	.267	-.546	.348	-.252	.037	-.108	.191	.431
SNA14 Well/irrigation Const	.204	.487	-.483	-.011	-.060	.432	-.172	-.122	-.059
SNA15 Common infrastructure	-.005	.604	-.091	-.275	-.102	.434	.009	-.261	-.110
SNA16 Making handicrafts	.326	-.144	-.487	.143	.336	.061	.430	.022	-.172
XNA1 Cooking and cleaning	.383	-.205	.582	-.189	-.031	.245	-.169	.121	.100
XNA2 Childcare	.549	-.132	.368	.198	.190	.151	.205	-.258	-.096
XNA3 Care of elderly	-.066	-.187	.214	.457	-.067	.589	-.202	-.127	-.173
XNA4Community work	.551	.549	.047	.206	-.002	-.220	-.141	.095	.015
XNA5 Education & tutoring	.341	.078	.182	.454	.518	.119	.014	.177	.348
NNA1 Leisure	.130	.729	.153	.198	.230	-.062	.216	.150	-.005
NNA2 Personal care	.518	.559	.138	-.111	.264	-.033	-.245	-.054	-.228
NNA3 Social conversation	.786	.035	-.004	.132	.122	-.212	-.045	.056	-.191
NNA4 Rest & relaxation	.777	-.300	-.006	-.041	.196	.018	-.168	-.085	.044

Extraction Method: Principal Component Analysis.

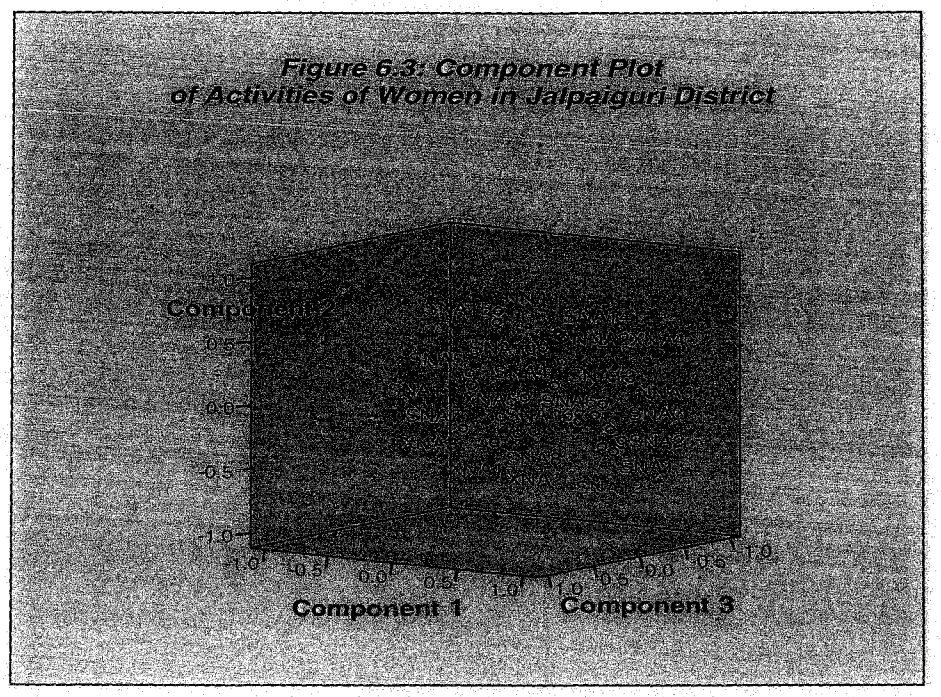


Figure 6.3: Component Plot of Activities of Women in Jalpaiguri District

are earning cashes or loadings are high for unpaid SNA activites such as post harvest activites, water and fuel collection, under Extended-SNA activities thus women are overburdened with the workload of cooking and cleaning and care of children and elderly along with all other SNA activities. Extended-SNA and Non-SNA activities. In case of Jalpaiguri, loadings of component matrixshow that women are engaging themselves in income generating activities to suppor their household such as land preparation or crop husbandry under SNA group and these women are mostly from landless households. They are also engaged in seasonal constructional activities, common infrastructure and follows same pattern of work roles as their husbands and also shares equal responsibility like men for upbringing of their family. On the contrary, high loadings on post harvest activities, tending animals or grazing animals in Jalpaiguri show their involvement in unpaid SNA activities also as commited labour within landed household family.

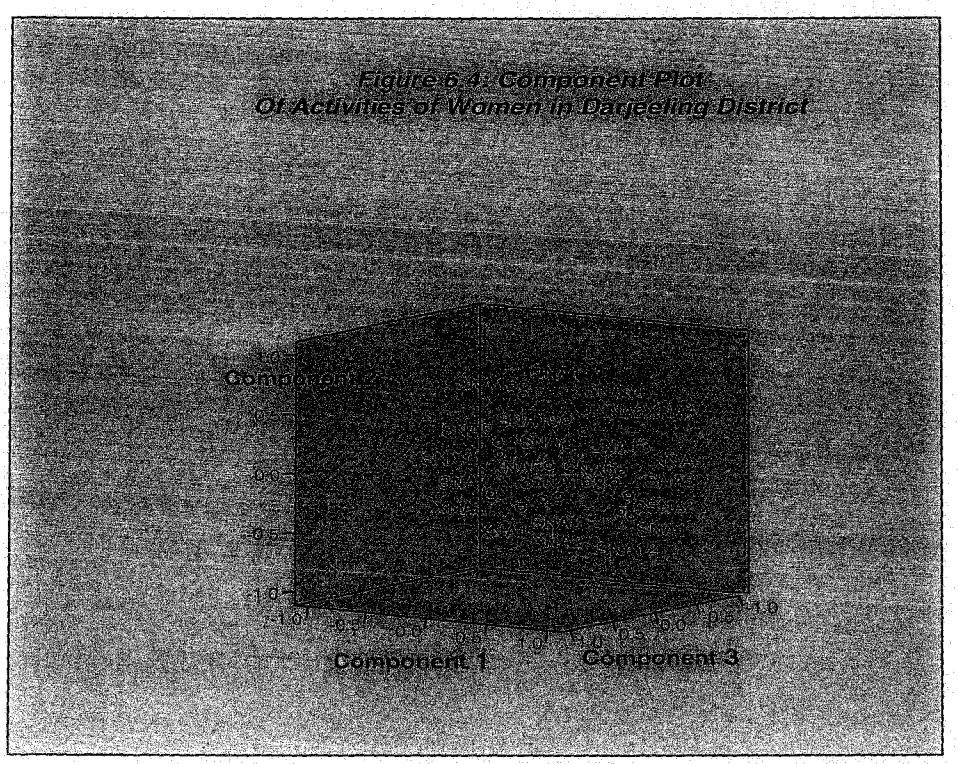


Figure 6.4: Component Plot Of Activities of Women in Darjeeling District

In Darjeeling women are heavily engaged in unpaid SNA activities such as water and fuel collection, animal husbandry and in post harvest activities also but their responsibility or time commitments in unpaid activities of all kind is equally shared by their spouses. Especially, in hills, existing nature of small holdings pattern among the households compel both men and women to take part in all kind of SNA, extended SNA and Non-SNA activities.

6.3.2. Principal Component Analysis of Men's Activities

Correlation among several activities done by men in Jalpaiguri and Darjeeling are shown in the following tables. The results of correlation matrices can be explained in the same way as the matrix for women. The activities like land preparation(SNA1), crop husbandry (SNA2), post harvest activities (SNA3), market sales and purchase (SNA6), well and irrigation construction (SNA14), common infrastructure (SNA15) show strong correlations with one another. Thus these six to seven activities seem to hang together among the SNA group of activities and these group of activities are mostly paid SNA activities. Whether activities like livestock tending, livestock grazing, poultry rearing,

water and fuel collection, processing and storage are not those kind of activities that are strongly related with men's behavioural pattern of time allocation because these are the unpaid activities among the SNA group which are not related with cash transaction or market economy. Again activities like community work (XNA4), training programmes (XNA6) demonstrates strong relationship with one another representing the group of extended SNA activities and another group of activities are NNA where leisure (NNA1), social conversation (NNA3), rest and relaxation are strongly correlated with land preparation, crop husbandry, construction work, etc.

If responses to the activities actually displayed the redundancy suggested by the pattern of correlations in Tables 6.11 and 6.12 (See Appendix B) it would be advantageous to somehow reduce the number of variables in this data set. In essence, this is what is accomplished by Principal Component Analysis: it allows the study to reduce a set of observed variables into a smaller set of artificial variables. Thus PCA analysis also has been done for the activities done by men in Jalpaiguri and Darjeeling district to show the interrelationship between the activities and to find out the major influential activities that are carried out by men in these two districts to get an overall idea of workload of women and men in rural economy of West Bengal. If we concentrate on the correlation matrices of men in these two districts then it will be clear that associationship among the activities are strong enough certifying to follow the same technique as before for women.

K-M-O test run individually for men in the two districts and the values of the index for Jalpaiguri and Darjeeling are 0.75 and 0.73 respectively, establishing the most of the interdependence apparent within activity dataset matrices occurs because of the dominant trends in a few bulk activities (more time consuming) and the collinear trends of other activity series. For these dataset of activities of men Bartlett's test is highly significant ($p<0.001$) and therefore PCA is appropriate here for these dataset of activities of men.

6.13: KMO and Bartlett's Test in Jalpaiguri (Men)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.752
Bartlett's Test of Sphericity	Approx. Chi-Square	1159.573
	Df	253
	Sig.	.000

6.14: KMO and Bartlett's Test in Darjeeling (Men)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.735
Bartlett's Test of Sphericity	Approx. Chi-Square	1693.320
	Df	325
	Sig.	.000

The eigen values associated with each factor, represent the variance explained by that particular linear component and the results also displaying the percentage of variance explained by the activities in the total variation. It is clear from the above tables that first few factors explained large amount of variance especially the first factor whereas the subsequent factors explains only small amount of variance.

The results from PCA analysis shows the factor loadings related with six factors derived from 23 variables under consideration and these six factors taken together explained 48 and 65 percent time disposition variances in different pre and post harvest activities in determining men's total time contribution in agricultural household in various SNA, Ex-SNA and Non-SNA activities in Jalpaiguri and Darjeeling district. The first factor PC I explained 13.54 and 28.40 percent of the variances in the activity set. Hence it may be concluded that men's activity are restricted in those areas which are related to market transaction and they are involved in those tasks that are strictly male dominated spheres in agriculture. PC 2 explained 9.8 and 11.7 percent of the total variations in the dataset.

Component beyond six for both the districts in fact contribute insignificantly to overall variation in men's activity loadings, indicating the dimension that the activity loading data can be considerably reduced without sustaining information loss, by narrowing the workload focus to a subset of the important activities that are carried by men in rural villages.

The first principal component of the component matrix of Jalpaiguri and Darjeeling district being the most important gives the basis for the relative weights to be assigned to various indicators, highest weight being assigned to those having higher contribution and vice-versa

Figure 6.5: Scree Plot of Components in Jalpaiguri District for Men

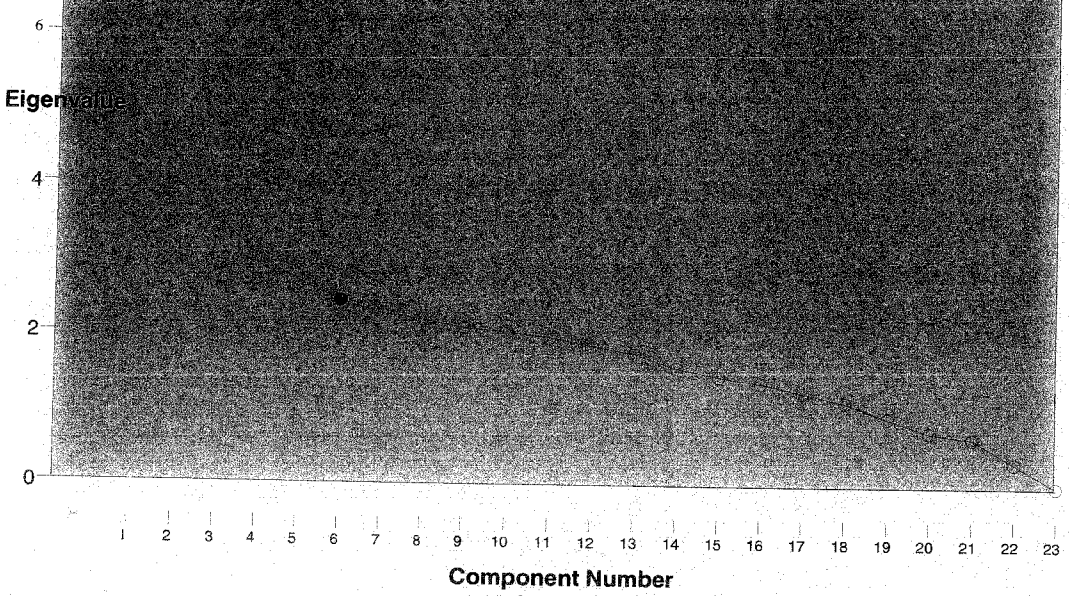
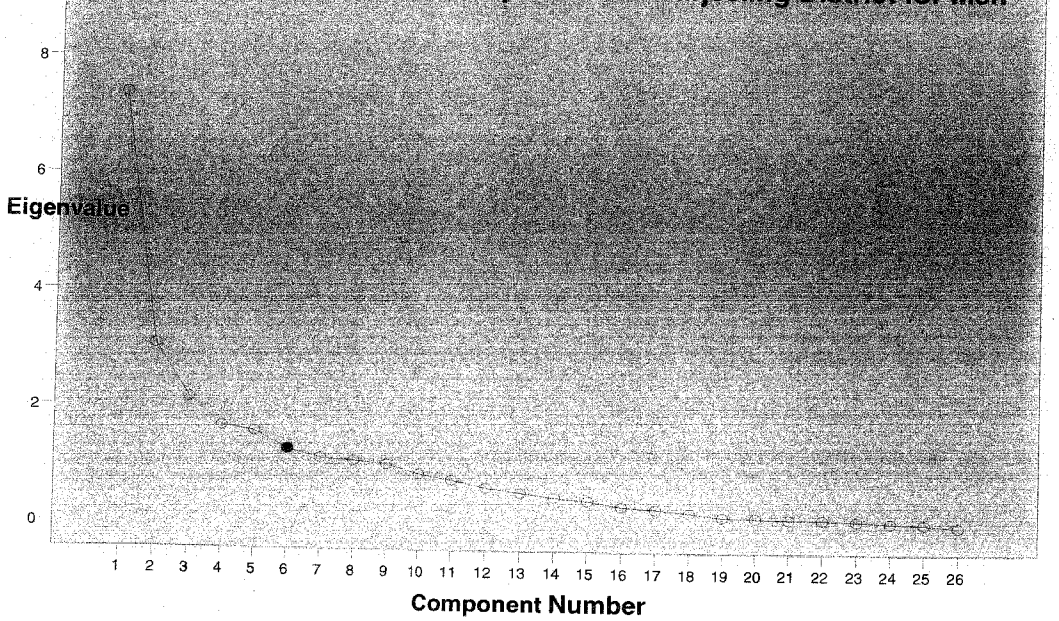


Figure 6.6: Scree Plot of Components in Darjeeling District for Men



6.15: Men's Timeuse by Activities : Principal Component Analysis (Jalpaiguri)

Activity	Communallty	PC	Eigenvalues	% of variance	Comulative %
Land Preparation	0.703	1	3.115	13.543	13.543
Crop husbandry	0.737	2	2.260	9.826	23.369
Post harvest acitivities	0.612	3	1.769	7.691	31.060
Crop protrecction	0.658	4	1.505	6.542	37.601
Kitchen gardening	0.208	5	1.346	5.853	43.455
Market sales & purchases	0.600	6	1.218	5.298	48.752
			$\Sigma\lambda_i$ =11.213		
Livestock tending	0.506				
Livestock grazing	0.452				
Making dungcakes	0.110				
Water & fuel collection	0.067				
SA 12 Processing & storage	0.488				
Duelling construction	0.419				
Well/irrigation construction	0.931				
Common infrusturcter	0.935				
Making handicrafts	0.622				
Market purchases & sales	0.512				
Child care	0.223				
Community work	0.301				
Education tutori	0.419				
Training programms	0.454				
Leisure	0.409				
Social conversation	0.613				
Rest & relaxtation	0.233				

Extraction Method: Principal Component Analysis.

The activities, land preparation, crop husbandry, market sales and purchase, processing and storage are showing high loadings on PC 1. Likewise, those loadings high on one factor have low loadings on the remaining factors. The first PC 1 explained 13.54 and 28.40 percent of the total variances in the variable set for men. The important constituents of PC 2 are dwelling construction ,well/ irrigation construction, common infrastructure, etc. and in Jalpaiguri men's loadings for NNA activities are very low indicating men are keen to enjoy their leisure time for personal care or rest relaxation. On the other hand, in Darjeeling district men's loadings are high for cash related tasks such as land preparation, dwelling construction as well as other leisure activities. Their loadings are high for tasks such as education and tutoring or community development programme.

6.16: Men's Timeuse by Activities: Principal Component Analysis (Darjeeling)

Activity	Communality	PC	Eigenvalues	% of variance	Comulative %
land preparation	0.846	1	7.385	28.405	28.405
Crop husbandry	0.888	2	3.059	11.765	40.170
Post harvest activities	0.817	3	2.147	8.260	48.430
Crop protection	0.599	4	1.663	6.396	54.826
Kitchen garding	0.441	5	1.577	6.065	60.892
Market sals & purches	0.656	6	1.276	4.907	65.791
Livestock tending	0.631		$\Sigma\lambda_i$ =17.107		
Livestock grading	0.686				
Poltry rearing	0.494				
Water & fuel collection	0.719				
Processing & storage	0.415				
Dwelling construction	0.529				
Well/irrigation construction	0.833				
Common infrsutructure	0.745				
Making handicrafts	0.754				
Market purches & sales	0.777				
Cooking & cleaning	0.452				
Child care	0.544				
Care of elderly	0.453				
Community work	0.737				
Eduation & turotring	0.502				
Training programmes	0.749				
Leisure	0.813				
Personnal care	0.577				
Social conversion	0.765				
Rest & relaxation	0.684				

Extraction Method: Principal Component Analysis.

The high loadings of variables on three major components for Jalpaiguri district depict that three groups of activities are very common within the rural menfolk. The leading activities that took the major variation in activity set are field-based activities, constructional activities, trade related activities such as market sales and purchases of agricultural product, community development, animal husbandry, training programmes, leisure, rest and relaxation, etc. Thus either menfolk are involved in income generating field based activities to maintain livelihood or skill generating programmes to improve their skill for agricultural production or for their personal satisfaction and rest relaxation, because most of them are small peasant farmers as well as tenants and sharecroppers. So

asset holding nature determines their pattern of employment as well as their nature of employment. Again they were keen to involve in activities like training and programmes or education and tutoring which can increase their efficiency in production technique by improvising their skill with knowledge.

Similarly, from the loadings of activities of three major components of Darjeeling district the study can conclude that men in this district follow the same pattern of activities but also bears an extra burden of activities such as collection of fodder, fuel and water, care of children, care of elderly (particularly absent in Jalpaiguri) etc. Because of the hard life in the hills and the problems encountered in collection of fodder, fuel and water because of extreme climate and difficult terrain, extra hands are required for such work which are usually carried out autonomously by women in majority of the households in the plains.

6.17:Component Matrix of Activities for Men (Jalpaiguri district)

	Component					
Activities	**PC1**	**PC2**	**PC3**	**PC4**	**PC5**	**PC6**
SNA1 Land preparation	**.737**	.377	-.103	.066	-.054	-.015
SNA2 Crop husbandry	**.782**	.212	.010	-.251	-.046	.127
SNA3 Post harvest activities	.046	-.334	**.617**	.124	.006	.319
SNA4 Crop protection	**.799**	.065	.095	-.014	-.039	.061
SNA5 Kitchen gardening	.001	-.143	.114	-.054	**-.401**	-.105
SNA6 Market sales & purchases	**.465**	-.204	**.427**	.243	.305	.087
SNA7 Livestock tending	.012	-.236	**.432**	.052	.045	**.508**
SNA8 Livestock grazing	**.513**	.156	-.257	.262	-.095	-.144
SNA9 Making dungcake	-.037	-.134	.161	.172	.159	-.103
SNA11 Water & fuel collection	-.115	-.102	-.001	-.020	-.102	-.181
SNA12 Processing & storage	**.595**	.087	.270	-.065	.111	-.191
SNA13 Dwelling construction	.110	**.496**	-.051	.135	-.369	.066
SNA14 Well/irrigation const.	-.356	**.825**	.285	-.069	.183	.074
SNA15 Common infrastructure	-.368	**.832**	.266	-.073	.170	.058
SNA16 Making handicrafts	.138	.129	-.281	**.560**	-.263	.354
SNA17 Market purchase & sales	.086	-.075	-.227	**-.457**	-.055	**.486**
XNA2 Child care	.134	-.042	-.285	-.338	.067	.050
XNA4 Community work	.059	-.182	-.160	.261	.231	-.342
XNA5 Education & tutoring	-.170	-.212	**-.458**	.128	.065	.339
XNA6 Training programmes	.291	-.017	-.117	.008	**.594**	-.047
NNA1 Leisure	.009	-.049	-.274	-.328	**.469**	.065
NNA3 Social conversation	-.076	.236	-.341	**.481**	.341	.295
NNA4 Rest & relaxation	.168	.035	-.120	**-.407**	-.075	.131

Extraction Method: Principal Component Analysis.

6.18:Component Matrix of Activities for Men (Darjeeling district)

Activities	Component					
	PC1	PC2	PC3	PC4	PC5	PC6
SNA1 Land preparation	**.758**	**-.503**	.070	-.013	.054	.097
SNA2 Crop husbandry	**.661**	**-.660**	-.007	-.112	.002	.061
SNA3 Post harvest activitries	**.692**	**-.570**	.026	-.078	-.079	.021
SNA4 Crop protection	**.638**	-.156	.162	-.061	-.200	-.314
SNA5 Kitchen gardening	.150	.213	**.498**	.107	-.318	.112
SNA6 Market sales & purchase	**.708**	-.218	.212	.177	.118	-.133
SNA7 Livestock tending	**.643**	.234	-.175	.116	.141	-.315
SNA8 Livestock grazing	**.530**	.064	**-.607**	-.049	.161	-.059
SNA10 Poultry rearing	.090	.127	.338	.045	**-.438**	**.402**
SNA11 Water & fuel collection	.405	.114	.304	.092	.317	**-.584**
SNA12 Processing & storage	.347	-.202	.127	**.458**	.137	.097
SNA13 Dwelling construction	**.558**	.398	-.040	-.053	-.236	-.005
SNA14 Well/irrigation const	**.808**	-.173	-.318	-.136	-.143	-.100
SNA15 Common infrastructure	**.694**	**.403**	.123	-.108	-.263	-.069
SNA16 Making handicrafts	.273	.132	.136	**.786**	-.116	-.110
SNA17 Market purchases & sales	.174	.306	-.334	**.715**	-.111	.134
XNA1 Cooking and cleaning	.243	-.140	.335	.198	.384	.273
XNA2 Childcare	.183	.142	.229	-.030	**.529**	.396
XNA3 Care of elderly	.136	.323	.209	.018	**.533**	-.048
XNA4 Community work	**.700**	.315	.263	-.156	-.229	-.032
XNA5 Education & tutoring	.327	**.449**	-.147	-.185	.335	.161
XNA6 Training programmes	.308	.191	**-.733**	.149	-.051	.236
NNA1 Leisure	.387	**.792**	-.011	-.179	.025	-.047
NNA2Personal care	**.493**	**.434**	.268	-.190	-.001	.195
NNA3 Social conversation	**.816**	-.030	-.206	-.097	.063	.206
NNA4 Rest & relaxation	**.753**	-.196	.048	-.023	.021	.274

Extraction Method: Principal Component Analysis, 6 components extracted.

The individual adjustment loadings of activities for two districts defined by principal components are plotted in 3 space simulation in the following figures (Figure .6.7 and 6.8) below to illustrate the interdependencies of women component loadings of activities within the activity structure. For better clarity, the activity loadings in these plots for each activity are viewed as topologies from forward as well as reversed viewpoints so that the sequence of activities carried out by women in the two districts can be visually ordered relative to the importance of each other. The three space simulations clearly shows the activity clustering in the three component plots. The closer the position of activities the close will be the associationship between them.

However, activity pattern as such represent the cumulative activity loading position of men both for Jalpaiguri and Darjeeling. Comparison of factor scores indicates that loadings are high for men in activities like land preparation, crop husbandry, crop protection, dwelling construction, market sales and purchases for primary and secondary production and low for cooking and cleaning, childcare, elderly care, livestock management, water and fuel collection. However, the loadings are high for women for all the activities leading to land preparation and post harvest activities along with other SNA activities excluding dwelling construction, market sales and purchases for primary and secondary production. High loadings are also found for Extended SNA activities of cooking and cleaning, childcare, elderly care, signifying that these are traditionally and additionally undertaken by women often as unpaid autonomous activities, constraining them to expend time in paid outside activities or in skill enhancement training. Thus comparison of components loadings for both men and women in the two districts are portraying the gender division of labour rooted in gender discrimination in the rural structure of Indian society.

Figure 6.7: Component Plot of Activities of Men in Jalpaiguri District

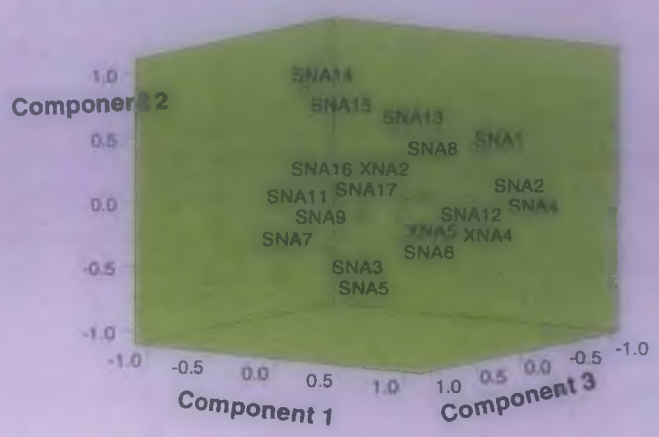
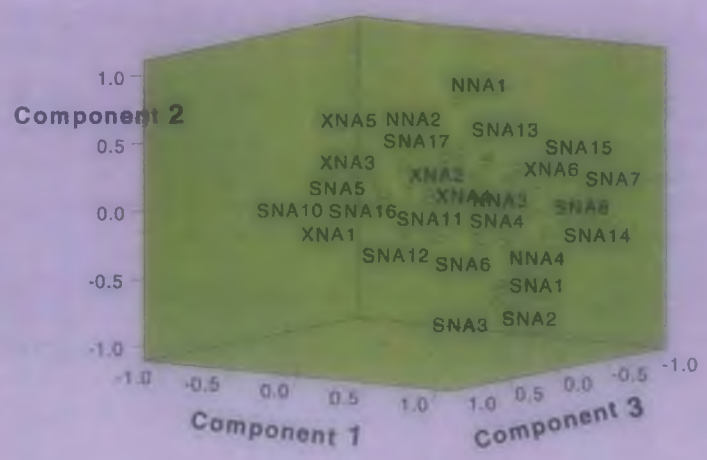


Figure 6.8: Component Plots of Activities of Men in Darjeeling District



6.4.Conclusion

The pattern of sexual division of labour, which seems to have existed for as long as records can show, is for women to have primary responsibility for final provisioning of the social group (the household) by way of food preparation and fuel and water collection and for men to concentrate on land clearing and preparation. Again women's choice of activities is being decided by men's land holding pattern. There is a basis for this allocation of tasks in women's reproductive capacity, which makes them less mobile. Field cultivation tasks are a shared concern but with a certain distinctiveness in the normal contribution of each sex.

Male specialization in land preparation extends to ploughing, while women's specialization in the final transformation of food products leads them to be involved rather at the tending (weeding) and harvest and post-harvest stages (harvesting itself and threshing and winnowing of grain). These are the very operations that are now proving ripe for mechanization. Hence, all the evidence is that contemporary technological changes in agricultural production processes are not only generally labour displacing (an

inherent consequence of mechanization) but specifically squeeze out female employment opportunities. Thus hypothesis 6th and 7th which states that 'women's own activity towards skill generation remains marginalised with increased time allocation towards other activities, owing to family consumption' and 'women are mostly engaged in the activities like domestic work,child care, cattle rearing, weeding etc., for which their economic participation in paid activities reduces' are accepted if results of PCA analysis are considered together. Technical changes have affected economic activities and the claims on their time in far broader ways than modern economic analysis tends to suggest. The impact varies among, and should be examined at the levels of, the household, the community, and the State.

Chapter References

Ahmeduzzaman, Mohammad, and Jaipaul L. Roopnarine.(1992): 'Socio-demographic Factors, Functioning Style, Social Support and Father's Involvement With Preschoolers in African-American Families.' *Journal of Marriage and the Family* 54:699-707.

Aldous, Joan, Gail M. Mulligan and Thoroddur Bjarnason.(1998): 'Fathering Over Time: What Makes the Difference?' *Journal of Marriage and the Family* 60:809-20.

Bianchi, Susan M., Melissa A. Milkie, Liana C. Sayer, and John P. Robinson (2000): 'Is Anyone Doing Housework? Trends in the Gender Division of Household Labor.' *Social Forces* 79:191-228.

Bittman, Michael, Paula England, Nancy Folbre, Liana C. Sayer, and George Matheson (2003): 'When Does Gender Trump Money? Bargaining and Time in Household Work.' *American Journal of Sociology* 109:186-214.

Blau, Francine D. (1998): 'Trends in the Well-Being of American Women, 1970-1995.' *Journal of Economic Literature* 36:112-65.

Brines, Julie.(1994): 'Economic Dependency, Gender and the Division of Labour at Home,' *American Journal of Sociology* 100:652-88.

Coltrane, Scott.(2000): 'Research on Household Labour: Modelling and Measuring the Social Embeddedness of Routine Family Work.' *Journal of Marriage and the Family* 62:1208-33.

Coverman, Shelley, and Joseph F. Sheley (1986): 'Change in Men's Housework and Child-Care Time, 1965- 1975.' *Journal of Marriage and the Family*, 48:413-22

Gerson, Kathleen(1993): *No Man 's Land*: Men 's Changing Commitments to Family and Work. New York: Basic Books.

Gujrati, D. N.(2004): '*Basic Econometrics*,' Fourth Edition, Tata Mc Graw Hill Publishing Company Ltd, New Delhi.

Hochschild, A., with Machung, A. (1989): The Second Shift: Working Parents and the Revolution at Home. New York: Viking.

Kmenta, J. (1971): 'Elements of Econometrics', London: Macmillan Publishing Company.

Koutsoyannis, A.(1996): 'Theory of Econometrics', Second Edition, Macmillan Press Ltd., Hampshire.

Potuchek, Jean L.(1997): Who Supports the Family? Gender and Breadwinning in Dual-Earner Marriages. Stanford University Press.

Presser, Harriet B.(199): 'Employment Schedules among Dual- Earner Spouses and the Division of Household Labor by Gender.' *American Sociological Review* 59:348-64.

Ramanathan, R. (2002): *Introductory Econometrics with Applications*, Cengage Learning India Private Limited, new Delhi.

Riggs, Janet M. (1997): 'Mandates for Mothers and Fathers: Perceptions of Breadwinners and Care Givers.' *Sex Roles* 37:565-80.

Risman, Barbara J.(1998): Gender Vertigo: American Families in Transition. Yale University Press.

Robinson, John F, and Geoffrey Godbey.(1999): Time for Life: the Surprising Ways Americans Use Their Time. Pennsylvania State University Press.

Rones, Philip L., Randy E. llg and Jennifer M. Gardner (1997): 'Trends in Hours of Work Since the Mid-1 970s.' *Monthly Labor Review* 120:3-14.

Sayer, Liana C.(2002): 'Trends and Gender Differences in the Nature of Nonmarket Work.' Paper presented at the annual meeting of the American Sociological Association, August, Chicago, IL.

Sayer, Liana C., Philip N. Cohen and Lynne M. Casper (2004): 'Women, Men and Work,' *The American People Census 2000*. Russell Sage Foundation and Population Reference Bureau.

Shelton, Beth A., and Daphne John (1999): The division of household labor. *Annual Review of Sociology* 22: 299–322.

Shelton, Beth Anne.(1992): Women, Men and Time: Gender Differences in Paid Work, Housework and Leisure. Westport, CT: Greenwood Press.

South, Scott J. and Glenna Spitze.(1994): 'Housework in Marital and Non-Marital Households.' *American Sociological Review* 59:327-47.

Thompson, Linda and Alexis J. Walker (1989): 'Gender in Families: Women and Men in Marriage, Work, and Parenthood.' *Journal of Marriage and the Family* 51:845-71.

-------- (1995): 'The Place of Feminism in Family Studies.' *Journal of Marriage and the Family* 57:847-65.

Zick, Cathleen D., and Jane L. McCullough (1991): 'Trends in Married Couples' Time Use: Evidence From 1977-78 and 1987-88. *Sex Roles* 24:459-87.

Zick, Cathleen D., and W. Keith Bryant (1996): 'A New Look at Parents' Time Spent in Child Care: Primary and Secondary Time Use.' *Social Science Research* 25:260-8