FACTORS DETERMINING SEX RATIO IN BARAK VALLEY: AN EMPIRICAL PROGNOSTICATION
7.1. INTRODUCTION

In the previous chapter, a broad picture has been presented about the nature and pattern of behavioural pattern of sex ratio in the context of a fairly extensive cross section study. In an attempt to further strengthen our finding of the previous chapter and to highlight the exact quantitative relationship between sex ratio and the factors governing it, we have used regression analysis. Examination of this relationship may help us in identifying the major factors that determine the behavioural pattern of sex ratio and go along way in helping the policy makers.

RESULTS OF REGRESSION FUNCTION

7.2. Model-I: Female Infant Mortality and Sex Ratio

The first relationship that we specify is between sex ratio and female infant mortality in the valley and its constituent districts. In terms of sheer survival, males are biologically weaker than females. This means that in societies where males and females receive similar treatment, females live longer than males. But in societies, where the social and cultural values are disadvantageous to females, the community experiences relatively higher mortality among the females than males. This imbalance in the mortality of females as compared to male children can be directly observed in Indian data on infant and child mortality as well as in the low sex ratio. Infact, the sex differentials mortality in under 5 age group have important demographic consequences on sex ratio more particularly in the juvenile age group. If child mortality levels are low and their sex differentials marginal, sex ratio would not vary significantly. On the other hand, if child mortality levels are high with an excess of female child mortality, sex ratio is likely to be adversely affected. Thus variation in the sex composition of population may occur as a result of the
differences in the levels of infant and child mortality and sex differentials within these. Keeping this in mind, we have chosen female infant mortality as the first explanatory variable to measure its effect on sex ratio. The results of the regression analysis as estimated by using the linear method for Barak Valley are shown below. [The results of the present all exercises for the three constituent districts have been reported separately in the Appendix-4]. The first regression model formulated is therefore, as follows

\[ SR = a - b \times Fim \quad (1), \text{ where } Fim = \text{Female Infant mortality} \]

Barak Valley: \( 1081.118 - 0.702 \times Fim \)

\[ R^2 = 0.493, \quad F = 14.606 \]

\[ t = (43.713) (-3.822) \]

The first model can be accepted for Barak Valley both on theoretical as well as statistical ground. 70% of the variation in sex ratio in the valley can be explained by female infant mortality. The negative sign which is in terms of our theoretical model implies that lower female infant mortality leads to higher sex ratio and vice versa. The coefficient of F is also satisfactory. The estimated parameters which is as high as 0.702 possess the expected sign and is statistically significant also. The equation explains almost 50% of the overall variation in sex ratio. This implies that sex ratios are more strongly affected by female infant and child mortality i.e. higher the mortality, lower the sex ratio and vice versa. Hence, level of sex ratio can be used as an index of differential mortality by sex prevailing in the community. It needs to be mentioned here that female infant and child mortality has immediate effect on sex ratio since it directly affects the child sex ratio which in turn has its effect on overall sex ratio. An excess female mortality in under 5 age group is significant since it pulls down the sex ratio appreciably. In this connection, we can refer to Agnihotri [2000] when he says that sex ratio are more strongly affected by
sex differentials in mortality particularly infant and child mortality than by the overall mortality levels.

Though female infant mortality emerges as an important determinant of sex ratio for the valley as a whole, but it is quite probable that the characteristic features of the individual districts may remain concealed in these aggregative results. We therefore next specify the results of the constituent districts of the same model.

Taken individually, the districts show considerable amount of variation with the overall behavioural pattern of sex ratio for the valley as a whole. Explanatory power of the variable increases even further in case of cachar district with female infant and child mortality explaining almost 90% of the variation of sex ratio and the coefficient not only has the expected sign but is statistically significant also. $R^2$ is also as high as 0.80, so the function is acceptable both on statistical grounds and on theoretical grounds i.e., not only the expected negative relationship between Fim and SR has been established but t value of the coefficient and F statistics are also found to be statistically significant. Thus, on the whole, results obtained from the analysis are fairly robust and credible. Thus theoretical and statistical soundness of the above function indicates the acceptance of Fim as an important explanatory variable of sex ratio in the valley as well as in the Cachar district.

However, female infant mortality can not be accepted as an explanatory variable in case of the other two districts of Hailakandi and Karimganj. In case of Hailakandi, the statistical insignificance of the coefficient does not allow us to accept Fim as an explanatory variable for sex ratio though it has the expected sign. The value of $R^2$ is also not acceptable. It thus implies that the above function does not hold true for Hailakandi district.
In case of Karimganj district, though the coefficient for Fim is satisfactory and is statistically significant also, yet the model cannot be accepted as the coefficient does not possesses the expected sign. Contrary to our expectation, we thus find the existence of positive relation between Fim and SR which immediately rejects the acceptability of theoretical expectations of the above function. In this connection, we can take help of primary data on female infant mortality for the Karimganj district which reveals that among all the districts as well as Barak Valley, Karimganj district record highest infant mortality among females. Inspite of this, we observe quite favourable sex ratio in the Karimganj district which is reflective of the fact that higher female infant mortality is in no way adversely affecting the sex ratio there. It may be possible that though Fim is high in the Karimganj district, but it is overpowered by favourable socio-economic status of women as revealed from their higher literacy and work participation rates. Moreover, socio-economic variables cannot be kept in water tight compartment and thus favourable influence of certain variables may outweigh the adverse effect of the other.

We therefore, find that the model can be accepted for Barak Valley as a whole and the Cachar district also fits in well into the model, yet for the remaining two districts of Hailakandi and Karimganj, the model cannot be accepted. However, the significance of the coefficient of Fim for Barak valley and Cachar district shows the extent to which variation in sex ratio can be explained by this variable. In this context, we may relate the phenomenon with discriminatory intra house resource allocation of Sen which gets reflected in terms of adverse child sex ratio. At the same time, we cannot discount the possibility that Fim may be poverty driven also. Barak valley with poor economic setup may fail to provide basic infrastructural facilities particularly in the health sector which takes a toll of even those lives who are regarded as stronger and hardier. Though in the earlier chapter, we have discussed that gender discrimination persists and increases even when availability
of resources is not a constraint, still it does not seem to be impossible to explain Fim in terms of poverty when families have to make choices about how to allocate limited resources between individual members. According to Das Gupta et al [2001] “Infant mortality and poverty are positively associated in the Indian society”.

7.3. Model-II: Female Literacy and Sex Ratio

We next specify the function in which we use female literacy as an explanatory variables. As we know, the most important aspect of the socio-economic status of an individual is one’s educational level. Increasing literacy exposes individuals to more gender egalitarian ideals. It is expected that an increase in female literacy rate could contribute towards balanced sex ratio.

Since more literate a women, the higher the age at marriage, and female work force participation and in general, the lower the required dowry and associated marriage cost. Most of these variables are likely to give more autonomy to a female which manifests interms of higher worth of females with consequent results for female survival. Most of the earlier works on sex ratio attempted to trace the relation in terms of economic account i.e., female work force participation and female literacy, as an explanatory variable has never been tested earlier. Murthi et al [1995] for the first time have extended the range of explanatory factors to include female literacy. They observe that female literacy has a negative and statistically significant effect not only on child mortality but also on the extent of female disadvantage on child survival. It is worth noting that higher female literacy reduces child mortality and anti-female bias on child survival. Recently, Das Gupta et al [2001] have developed an integrate econometric explanations by combining cultural factors with female literacy and female work participation using data for 3 census years, 1961 – 1981 to derive the estimated effects of all these factors on sex ratio. The results
show positive and statistically significant association between female literacy and sex ratio. However, such an exercise is also undertaken here when we propose the following model to analyse the impact of female literacy on sex ratio.

\[ SR = a + b \text{Lit}_F \]  

(2), Where \text{Lit}_F = Female literacy

The following are the results of the model for Barak Valley:

Barak valley: \[ 804.686 + 3.93 \text{Lit}_F \]  

\[ R^2 = 0.154, F = 2.735 \]

\[ t = (7.073) \text{ (1.654)} \]

The above results reveal that the model is not acceptable for Barak Valley since \( R^2 \) is extremely low. However, the coefficient possesses the expected sign. But the coefficient is not come out statistically significant. In case of individual districts also, similar is the trend i.e., though all the coefficient of female literacy have the expected sign, yet none of them is statistically significant and value of \( R^2 \) is also very low. The model, therefore, cannot be accepted in our case either in case of Barak Valley or even for the constituent districts.

The model though has been theoretically satisfactorily, yet it is proved to be statistically insignificant. But this does not mean that the relationship can be discarded outrightly. This is not to deny that female literacy donot play any significant role in determining a favourable sex ratio. Though literacy rate may not have immediate impact on sex ratio, the impact of literacy may be experienced in a favourable way on sex ratio over a period of time. So that literacy rate has a long-term effect. Our model and its findings based on primary data pertaining to a point of time. Becoming literate in the true sense of the term is a continuous process spanning over a period even several years. This is applicable is case of an individual, for a society to become truly literate, it may take several decades. It is a
long term and continuous process where we cannot and should not expect instant result. As such an increase in literacy need not necessarily correspond to an equal and immediate impact, to say, a positive outlook over that time span. It works over a period of time to change the attitude of the female members of the society. Only after the society attains this position, the positive impact of literacy in general and in particular, its impact on sex ratio becomes visible. We can thus say that improvement in literacy more particularly female literacy firstly, changes the outlook of the society and after which the status of women may improves which in turn may favourably affect the sex ratio after a considerable period of time. Perhaps lagged model might have been more satisfactory. However, since we donot have the necessary primary data across social and linguistic class for lagged variables, such a model can not be worked out.

7.4. Model-III: Dowry System and Sex Ratio

Seldom has there been so firm a consensus on a social issue in India as exists today on the subject of dowry and its casual relationship with sex ratio. From researchers to scholars – all have attributed the decline in sex ratio more particularly the sudden decline in child sex ratio in 2001 census to the prevalence of dowry system. The cost of the dowry is so high that many would prefer to pay for an ultrasound and abort the foetus if female, then risk the chance of a baby girl. Today, the dowry system is seen as the prime motive for two other crimes – female foeticide and infanticide having adverse impact on sex ratio. Thus, dowry not only leads to devaluation of a girl child by increasing her vulnerability at the time of marriage but also deepens the perception of a daughter as a liability. The high cost of raising and marrying daughters lead to discrimination against them which explain the masculine juvenile sex ratio in India. It is in this context, that we specify the next model in which we have chosen dowry as another explanatory variable. As the
higher existence of dowry leads to lower sex ratio and vice versa, sex ratio is considered to be a negative function of dowry.

$$SR = a - b \text{Dow} \quad \text{(3)}$$

The results of the above model for Barak Valley is reported below

Barak valley: $999.784 - 0.172 \text{Dow}$

$$R^2 = 0.030, F = 0.456$$

$$t = (61.657) (-0.675)$$

Though the sign of the coefficient of the model for Barak Valley has the expected sign but the model cannot be accepted since the coefficient of dowry is not only very low but also statistically insignificant. Moreover, the overall fit of the model as revealed by $R^2$ is also very much unsatisfactory. The non-significance of the model can be reconciled in terms of our primary observation where we observe that in case of only 15% of the respondent’s marriage, dowry has been paid. Though dowry is considered to be a social evil as the Indian society is witnessing and experiencing its consequences for decades and it is a social custom very much deep rooted and practised one, but the nature of dowry system practiced in Assam in general and Barak Valley in particular, is totally different from what it is in the Indian context. So far India and other regions (north and north western) are concerned, dowry is almost an integral or unavoidable part of the process of institution of marriage and in most of the cases, the sole deciding factor of a possible marriage is the amount of dowry only, its acceptance to the groom’s family, keeping aside all other relevant qualifications. All these lead to neglect of female child, which adversely affect the sex ratio.

Fortunately in the social set up of Assam as well as in Barak Valley, this type of dowry system is almost non existent. Dowry in the Indian context is an economic
compulsion and demand and amount involved in it is huge and at times, it is beyond the capacity of the brides family that ultimately affects the sex ratio. However, in case of Barak Valley, whatever dowry is practiced, has no economic compulsion rather it is voluntary in nature and no demand and pressure is involved with it and the practice is limited to social custom aspect only. Hence, dowry is the most insignificant consideration in case of the marriages and due to this, the intensity of dowry as a problem is very much non existent here. Thus, so far Barak Valley is concerned, the impact of dowry on the society as a whole and sex ratio in particular is very lower or almost nil. Such tendency in Barak Valley goes a long in raising the status of women in the valley.

The most important problem associated with dowry and which requires special mentioning is the increasing incidence of female foeticide. In the Indian context, couples in the advanced stage go for Sex Determination Test (SDT) and there is large scale abortion of female foetuses because of possible recurring involvement of dowry which leads to an adverse effect on sex ratio. In this connection, we can mention about the sudden decline in child sex ratio more particularly in 2001 census in India as well as in the most prosperous states that raised a hue and cry among the scholars and media panalists. However, in Barak Valley, being one of the most backward region of the country, neither the facilities of SDT is easily available here nor the couples in general have enough financial strength to go for such test. Besides these, the most important factor is that though economic infrastructure of Barak Valley in comparison to India or even to Assam is very poor, but the social structure such as literacy in general and female literacy in particular is very much favourable here. Moreover, the secondary as well as primary data reveal the extent to which the sex ratio is increasing in the region. All these reflect that the outlook of the society towards female is very much positive here unlike the other major states in India. The society in itself has lot of strength to
prevent all these evils against females like dowry, bride burning (an after effect of dowry), female foeticide, having significant bearing which adversely affect the sex ratio. Prof. Ashish Bose [2001] who has attributed the present trend of declining sex ratio particularly child sex ratio to the prevalence of dowry system in India therefore does not hold true for the region under study.

A deeper probe into the behavioural aspect of sex ratio with respect to the dowry system for the individual districts however, provides a slightly different picture. The coefficient of dowry [results of which are reported in Appendix-4] for the three districts is slightly different. So far as Cachar district is concerned, the coefficient is negative as expected but is not statistically significant. Hence the model cannot be accepted as in the case of Barak Valley. In case of Hailakandi district, dowry can not be accepted as an explanatory variable also since the coefficient does not possess the expected sign. However, it is only in the district of Karimgani, the coefficient emerges statistically significant besides having the negative sign. Interestingly, Karimganj district does not record a very high percentage of dowry. Thus, there may be so many hidden underlying reasons as is common in most cases of socio-economic indicators but cannot be grasped in the course of this present work and may be sort out else where. We therefore find that taking an overall view, the model can not be accepted for Barak Valley as well for the other constituent districts with the only exception of Karimganj district.

7.5. Model-IV: Son Preference and Sex Ratio

Preference for a male child has often been considered to be one of the major factors responsible for sex ratio imbalance in India. In our patriarchal society, a women’s status is determined by her reproductive performance, more particularly the birth of a son since expected gains in terms of money and labour besides
economic support and social security in old age are more in case of a male child compared to female child. Besides these, the Hindu scriptures insist on having atleast a male child to perform the last rite of his parents. Again, in our society, sons are considered to be responsible for carry on the lineage in a patriarchal setup and therefore naturally become the legal heir. Such outlook towards sons as compared to daughters is an outcome or a corollary of the patriarchal system we are having in our society for centuries. Moreover, in the Indian context, the prevalence of dowry is most important contributory factor towards male preference. All these factors influenced the preference for male sex and create a natural dislike towards the female sex and lead to neglect and ill treatment by the parents in their families. So this type of treatment and upbringing at times has a direct bearing on infant care and therefore resultant mortality differentials by sex. Since preference for a male child can drastically change the sex proportions of females in the society, we have selected son preference as another important explanatory variable. The sex ratio is considered to be a negative function of son preference. The results obtained from the estimated exercise for Barak Valley are as follows:

\[ SR = a - b \text{Son}_p \]  

Barak Valley: 1091.094 - 0.317 Sonp \[ R^2 = 0.092, F = 1.639 \]

\[ t = (13.956) \quad (-1.280) \]

The results show that the regression coefficient of son preference has a negative effect on SR in Barak valley as expected but it is not statistically significant. The overall fit of the model as indicated by the value of \( R^2 \) is also unsatisfactory. It reveals that though expected theoretical relationship between \( \text{Son}_p \) and SR has been established but the model can not be accepted for Barak valley on statistical grounds. The statistical insignificance of the variable means that son
preference has no effect in bringing about a variation in sex ratio in Barak Valley though it is the prime factor in determination of sex ratio in the rest of the country.

In this connection, it needs to be highlighted here that in a patriarchal society like ours, the preference for son is very much prevalent and Barak valley is no exception. As is evident from our primary data, that the Barak Valley as a whole as well as constituent districts also show that more than 50% of the respondents have expressed their preference for sons. This is only too natural in a patriarchal setup. In our social setup, daughters after marriages go the their husband’s house where as sons continue to be with their parents. So sons are considered to be better support for aged parents both emotionally as well as physically. As our field survey report also reveals this factor as mainly responsible for son preference in this region but it not so strong a factor as in the rest of the country to be actually affecting the sex ratio.

Thus inspite of the prevalence of son preference in the region, it is not exerting its adverse effect in the form of female infanticide, foeticide and neglect resulting into higher female mortality as it is happening in other parts of the country which have important bearing on sex ratio. Rather it is observed from the various socio-economic indicators that the status of women in the region is fair enough and the society gives due respect to women. So in most of the cases, the females are not considered to be inferior to their male counterpart or a burden to the families. Due to very low level of dowry here, son preference also do not play a dominant role in determination of sex ratio as in other parts of the country. As such cases of female foeticide is very low or almost non-existent. Here, the society is open and respectable towards women, though couples have son preference, but when a girl child is born, she is not discriminated against. She also gets the necessary care and attention that a boy would have got. Higher female participation in the labour market
in this region is also responsible for a better status of women in the society and relatively lower level of female discrimination. All these lead us to conclude that son preference is no way has any chance to adversely affect the sex ratio in Barak Valley.

As the attitude towards male child in the constituent districts of the region may remain concealed in the results for the overall valley, we have next applied the same model for the individual district also [results reported in Appendix-4]. The results vary significantly while considering the individual districts. In case of Cachar district, the coefficient possesses positive sign which is therefore theoretically unacceptable. But the statistical insignificance of the coefficient makes it difficult to accept Son\textsubscript{p} as an explanatory variable for SR in the Cachar district. The results however, reveal that Son\textsubscript{p} emerge as negative and statistically significant only for the Hailakandi district since value of the coefficient is 0.982 and R\textsuperscript{2} is also as high as 0.96 revealing the goodness of fit of the model. The significance of this coefficient in Hailakandi district may be that among all the districts, it is only this district which has the highest percentage of son preference of 65%. This may perhaps be due to high percentage of Muslim population whose preference for son is much higher than that of the other communities. The level of literacy which has an important bearing on sex ratio is also one of the lowest in this district. Thus, son preference which in no way influences the sex ratio in Barak Valley and the other two districts, plays a significant role and explains the variation in sex ratio in Hailakandi district.

So far Karimganj district is concerned, though the coefficient of son preference has the expected sign but it is statistically highly insignificant (-0.744). Thus, the variable does not emerge as significant explanatory variable for explaining the sex ratio even in this district. On the whole, when all the districts are
taken together, the function does not show any significant relationship between Sonp and SR.

7.6. Model-V: Female Work Participation and Sex Ratio

As discussed in the previous chapter, female work participation has emerged as the most important determinant of sex ratio in Barak Valley. Our review of literature also, [Bardran (1974), Miller (1981), Agnihotri (2000)] established a close link between sex ratio and female work participation. Direct access to economic resources brings about equitable allocation of household resources by enhancing the relative bargaining position of women vis-à-vis men which in turn favourably affects their health and survival. This not only increases the status of women in the society, but also influences sex ratio in a favourable way. This provides the rational for inclusion of this factor for analysing the variation in the behavioural pattern of sex ratio. Thus, sex ratio can be considered as an increasing function of female work participation. The regression equation used for the purpose of estimating the above coefficient is,

\[ SR = a + b \text{ Fwp} \]  

The following are the estimated results of the model for Barak Valley

Barak Valley: 812.630 + 694 Fwp \[ R^2 = 0.482, F = 13.926 \]  
\[ t = (16.658) (3.722) \]

The model gives a better fit to the sample data in Barak Valley in terms of the \[ R^2 \] value which is almost 5 and the F - statistics for overall significance of the fitted regression has been found to be statistically highly significant. The coefficient of the independent variable is not only statistically significant and has the expected sign,
but it also explains almost 70% of the change of the dependent variable. The model therefore seems to be satisfactory on all accounts and hence can be accepted in our case. So far as the constituent districts are concerned, all the coefficients of Fwp not only have the expected sign but all are statistically significant also. The regression model gives much better fit in case of Barak Valley and Hailakandi district than the other two districts of Cachar and Karimganj. Incase of Hailakandi, the explanatory power of the variable increases even further with Fwp explaining 83% of the variation of sex ratio and the coefficient not only has the expected sign but is statistically significant. $R^2$ is also as high as around 0.70. In other two districts also, besides possessing the expected sign, the coefficient of Fwp is statistically significant too. T value is 2.055 in Cachar and 2.143 in Karimganj districts. This reveals that among all the explanatory variables discussed so far, the model with Fwp as an explanatory variable of sex ratio is acceptable both on statistical as well as on theoretical grounds. Infact, the present finding corroborates our previous findings (discussed in the earlier chapter) that Fwp is the most crucial determinant of behavioural pattern of sex ratio in the valley.

Female work participation is the main component of female entitlement in Barak Valley and its constituent districts like the rest of the country since it ensures them more equitable access to basic survival inputs. This inturn is reflected in terms of balanced sex ratio. Thus, gainful economic activities of women can be taken as an important factor of influence on its own through its impact on the breakdown situation. As Dreze and Sen [1993] argue that “in determining how the family benefits should be divided importance seems to be attached to who is contributing how much to the joint prosperity of the family”. In this connection, it is quite relevant to mention about the behavioural pattern of sex ratio of various social groups based on primary data of the valley where we find highly favourable sex ratio among SCs in contrast to the national trend. Interestingly, though SC group of women donot
perform well in health and literacy indicators, but their highest work participation must have helped them to procure greater share of household resources which has brought about their survival advantages and hence a favourable sex ratio. Murthi et al [1995] have found strong association between Fwp and female disadvantage in child survival and argue that higher level of Fwp is associated with lower levels of female disadvantage in child survival and this effect is statistically significant.

Barak Valley which has been marked as a region with higher women’s status, highly favourable sex ratio further substantiate this fact. It is the increasing work participation of females which have been instrumental in bringing about a balance in the sex composition of population in this region. In this connection, it is worth noting that Barak Valley which is regarded as the most backward region with poor economic base, the increasing work participation of women is likely to contribute to the family resources, that is already impoverished, which in turn gives her better position and command in the family that is sure to improve the survival chances of females. The study therefore also reveals an important fact that sex ratio does not have anything to do with economic prosperity of the region. Punjab for instance, which is one of the most economically prosperous states of the country has an extremely poor record as far as sex ratio is concerned. Kerala in contrast does not have a significant economic growth but has the best sex ratio in the country. Similarly, Barak Valley can be placed in the same scale as Kerala, since inspite of lower rate of economic growth, the region witnesses a better sex ratio, inspite of being a constituent unit of Assam which has an unfavourable sex ratio. Economic development therefore, atleast in the Indian context is not an important determinant of sex ratio. Rather it is the status of women, judged by her own individual economic status, rather than the economic status of the region, which may be considered as an important determinant of sex ratio. In our discussion relating to cross section of the population across different social, linguistic and
religious groups we have observed that where higher work participation among females is recorded, sex ratio is also found favourable.

Our findings therefore is similar to the work of Das Gupta et al [2001], who developed a variety of econometric models to explore the relationship between various explanatory variables with sex ratio and found positive and statistically significant association between Fwp and SR. They suggested that female survival relative to males is mainly determined by economic component affected by perceived economic contributions of women. All these studies further strengthens our findings. Among all the explanatory variables, variations in sex ratio are largely explained by variations in Fwp. Our study thus suggests that an increase in female work participation is the most important contributory factor behind favourable sex ratio in the region.

7.7 Model-VI: Age at marriage of the female and Sex Ratio

As reported in the earlier chapter, there exists a close relationship between age at marriage and health status of women which has its influence on sex ratio. As we know, early marriage increases the probability of early childbearing which in turn increases the risks of infant death which are known to be high among very young mothers. Besides infant death, the teenage mothers themselves run the risk of life. Study by Jejeebhoy and Rama Rao [1995] reveals that adolescent maternal mortality ratios are almost twice as high as those reported for women aged 25–39; 1484 per 100,000 live births among women aged 15–19 compared to 735, 708 and 736 for women aged 25–29, 30–34 and 35–39 respectively. Accordingly to them, "as a result of the combined effects of shorter average maternal height, competition for nutrients between the mother’s growth needs and the growth of her foetus, also due to poorer placental functions of adolescent mothers, the risk of
maternal mortality and peri and neonatal mortality are exceptionally high among adolescents". Thus while lower age at marriage increases the risk of maternal as well as infant mortality, higher age at marriage, on the other hand, works in opposite direction which means that higher age at marriage favourably affects the sex ratio. Besides, reducing the mortality risk related with maternity, the higher age at marriage also improve the overall status of women by allowing her to study further or pursue her vocational interest. Keeping this in mind, age at marriage has also been selected as an explanatory variable to estimate its influence in quantitative terms on sex ratio. Accordingly, the ratio can be taken as an increasing function of age at marriage.

\[ SR = a + b \text{Mar}_{age} \]  \hspace{1cm} (6), where \( \text{Mar}_{age} = \text{Age at marriage} \).

The estimated result for Barak Valley reveals the following result.

Barak Valley: \( 999.580 - 0.045 \text{Mar}_{age} \) \hspace{1cm} \( R^2 = 0.002, F = 0.030 \)

\[ t = (22.140) \hspace{0.5cm} (-0.174) \]

The results indicate that the model is unacceptable for Barak Valley both on theoretical as well as statistical grounds. The value of \( R^2 \) also indicate the extremely poor fit of the model. The basic results suggest that age at marriage is playing a very insignificant role in bringing about a variation in sex ratio in the valley. Though it is assumed as well as expected that higher age at marriage improves the health status of women and also provides better opportunities of education and learning thereby improving their overall status which favourably affects the sex ratio, but the non-significance of this coefficient in the valley implies that it does not have direct and immediate impact on sex ratio. It may happen that, this explanatory factor is a long period phenomenon which takes considerable time lag to bring about the change as expected, as a result of which there will be delayed effect of \( \text{Mar}_{age} \) on
SR like literacy (Lit). Moreover, we did not make time series study here which
further constraints the possibility of measuring its long run effect on SR. In the
present work, we have rather made a cross section study for a particular point of
time, the effect of which cannot be judged immediately.

While considering the districts individually we observe that the coefficient of
age at marriage for Cachar and Hailakandi district possess expected sign i.e.
theoretical relationship between SR and Mar_{age} has been established but are not
statistically significant compelling us to reject this model for these districts also.
Moreover, R^2 is too low as well. In case of Karimganj district, the coefficient
possesses negative sign like Barak Valley but not significant. Thus, on the whole,
the model cannot be accepted either for Barak Valley or for any of the three
districts.

To identify a superior model, we have next tried multiple regression model
and thereby included more than one explanatory variable in the model to examine
whether the behavioural pattern of sex ratio improves any further. The rationale for
inclusion of these factors for analysing the variation in SR is that the influence of
single variable on SR may be completely different from the combined effects of
series of variables on SR. Keeping this in mind, we specify the next model in which
we include both Fwp and Lit to examine their joint influence on SR. These two
explanatory variables have been incorporated since they both reveal their dominant
role upon sex ratio.

\[
SR = a + b Fwp + C Lit \quad (7)
\]

Barak Valley: 795.087 + 0.668 Fwp + 0.051 Lit

\[ R^2 = 0.483, F = 6.544 \]

\[ t = (8.623) \quad (2.985) \quad (0.228) \]
The model for Barak Valley reveals that thought the regression coefficient for Fwp has expected sign and emerges statistically significant, yet the explanatory power of the variable has fallen. The coefficient of Litf not only lacks statistical significance but its explanatory power too has declined even further. R² is also not very high and more importantly, it does not improve in comparison to the previous models, indicating that the goodness of the fit of the model has not improved.

Taken individual district, we find that in case of Cachar district, though both the coefficients have the expected positive sign but are not statistically significant. R² is also as low as 0.296. Thus statistical insignificance of coefficients and very low value of R² do not allow us to accept the model for the district of Cachar.

As far as Hailakandi district is concerned, it is observed that R² value is not only high (0.944) but it improves considerably when we compare it with the previous model for the district. Moreover, coefficient of Fwp is not only positive but also statistically significant (5.024). However, incase of the coefficient of female literacy, the results are not the same. The positive coefficient for Litf now becomes negative due to the introduction of the additional variable indicating the presence of multi-collinearility. However, multi-collinearility is not unusual in case of socio economic variables, which are highly interdependent. Thus, taking an overall view the model cannot be accepted for Hailakandi district.

In case of Karimganj district, though the value of R² improves considerably, yet the model cannot be accepted in view of the statistical insignificance of the coefficient of Fwp.

Thus, for Barak Valley as well as for the three districts, the model cannot be accepted. The inclusion of the two variables of female literacy and female work...
participation in the same model has not improved the explanatory power of the model and hence this model is rejected for our purpose of explaining the behavioural pattern of sex ratio.

We have next attempted to test the subsequent model in incorporating three explanatory variables such as female literacy, female work participation and age of females at marriage. The model thus specified is as follows:

\[ SR = a + b \text{Fwp} + c \text{Lit}_f + d \text{Mar}_{age} \]  

(8)

The result of the model for Barak Valley is as follows:

Barak Valley: 538.855 + 0.898 Fwp + 0.253 Lit\(_f\) + 0.594 Mar\(_{age}\) \(R^2 = 0.695\), F=6.544, 
\[ t = (4.793) \quad (4.629) \quad (2.327) \quad (3.009) \]

The results of the above model reveals that \(R^2\) is almost 70. Therefore in comparison to all the other models examined by us, the explanatory power of the model emerges to be the best. The coefficient of female literacy and female work participation which were statistically insignificant when examine individually now become significant when considered jointly with other variables and the coefficients can also be accepted on theoretical grounds as well. Taking an overall view it may be concluded that the model can be accepted on all accounts as satisfactorily explaining the behavioural pattern of sex ratio in Barak Valley. The acceptance of the model thus once again supports our hypothesis that the improved socio-economic status of women plays the most important role in improving the sex ratio of the region.

Thus, we find that the combination of the above variables i.e., Fwp, Lit\(_f\) and Mar\(_{age}\) explain the best result so far quantitative analysis is concerned. In this
context, it is quite relevant to mention that in the previous chapter, where we have explained the theoretical implications of the various socio-economic variables on SR, the above mentioned three variables emerge as the most important contributory factors explaining the pattern of sex ratio in the region.

Examining the above model for the individual districts, it is revealed that the explanatory power of the variables increase even further in case of Cachar district with $R^2$ value as high as 0.82. All the coefficients not only have the expected sign but are statistically significant also. So the function is acceptable for Cachar district as well. In case of Hailakandi district, where $R^2$ is not only very high (0.97) but improves to a large extent, still the model cannot be accepted for the district. Because, among three variables, only Fwp has the expected sign and statistical significance. The coefficient of Mar$_{age}$ possesses the expected sign but lacks statistical significance and the coefficient of Lit$_f$ is negatively related with SR. On account of these factors, the model cannot be accepted for Hailakandi district. In Karimganj district, we find the highest value of $R^2$ (0.99) and F statistics for overall significance of the fitted regression has been found to be highly significant. All the coefficients are positive as expected and are statistically significant also. So the model is acceptable for this district also.

We, therefore, find that the above model is most satisfactory both on statistical and theoretical grounds for Barak Valley as a whole and for Cachar and Karimganj districts as well, though the same can not be accepted for Hailakandi district. This reveals that, the combined effects of three variables exert tremendous influence in explaining the behavioural pattern of sex ratio in Barak Valley and its constituent districts.
To examine if the explanatory power of the model can improve even further, we have incorporated female infant mortality as an additional variable and specified the following model,

\[ SR = a + b \text{Fwp} + c \text{Lit}_f + d \text{Mar}_{age} - e \text{Fim} \] .......................... (9)

The result of the model for Barak Valley is stated below:

Barak Valley: 683.450 + 0.724 Fwp + 0.151 Lit\(_f\) + 0.501 Mar\(_{age}\) - 0.276 Fim \(R^2 = 0.733\)

\[ t = (4.362) \quad (3.117) \quad (0.746) \quad (2.434) \quad (-1.292) \quad F = 8.216 \]

The above result shows quite satisfactory value of \(R^2\). However, lower explanatory power of the coefficient for female literacy and female infant mortality do not permit us to accept the model for Barak Valley. Though all the explanatory variables have the expected sign and coefficient of Fwp and Mar\(_{age}\) emerge statistically significant, yet the model can not be accepted for our purpose. It is interesting to note that Fim when used as an individual variable gives satisfactory result and the model was accepted for Barak Valley and Cachar district. However, when used in combination with other variables, not only the explanatory power of the variable declines, the coefficient also becomes statistically insignificant. All these lead us to reject the model immediately for Barak Valley.

To test whether the explanatory power of the model can improve any further we incorporate another important variable—i.e., son preference into the model and specify the model in the following way:

\[ SR = a + b \text{Fwp} + c \text{Lit}_f + d \text{Mar}_{age} - e \text{Fim} - f \text{Son}_p \] .......................... (10)
The results of the equation are as follows:

Barak Valley : 557.362 + 0.742 Fwp + 0.276 Litf + 0.507 Mar_age - 0.304 Fim - 0.202 Sonp

\[ t = (2.636) \quad (3.159) \quad (1.118) \quad (2.444) \quad (-1.396) \quad (0.897) \]

\[ R^2 = 0.751, \quad F = 6.627 \]

The results for Barak Valley reveal that the value of \( R^2 \) is quite high (0.75) and it improves considerably in comparison to the previous models. All the coefficients also have the expected sign and so far as the statistical significance is concerned, it is there for the coefficients of Fwp and Mar_age and other coefficients of Litf, Fim and Sonp are not statistically significant. Thus the function though theoretically established, cannot be accepted on statistical ground.

We may now turn to our next and the last model where we have included all the six explanatory variables to measure their combined effects on sex ratio. The regression model formulated, therefore, is

\[ \text{SR} = a + b \text{Fwp} + c \text{Litf} + d \text{Mar}_\text{age} - e \text{Fim} - f \text{Sonp} - g \text{Dow} \] (11)

The results of the model are as follows:

Barak Valley : 489.008 + 0.667 Fwp + 0.466 Litf + 0.583 Mar_age - 0.120 Fim - 0.146 Sonp

\[ t = (2.392) \quad (2.938) \quad (1.765) \quad (2.884) \quad (-0.504) \quad (0.679) \quad (-0.306) \quad R^2 = 0.798, \quad F = 6.592 \]

(1.533)

The above model gives the highest value of \( R^2 \) which is as high as 0.798 revealing the best fit of the model tested so far. Among all the six coefficients, all have the expected sign but only two of them i.e., Fwp and Mar_age emerge
statistically significant and remaining four are insignificant. In this context, the model cannot be accepted for Barak Valley.

7.8. Conclusion

The discussion so far made reveals that we have developed a total of eleven models taking sex ratio as the dependent variable and the important determinants identified as the independent variables. The first accepted model where we have specified the relation of sex ratio with female infant mortality play a significant role in predicting the behaviour of sex ratio for Barak Valley and Cachar district. The second model where we have related sex ratio with female work participation has been accepted for Barak Valley as well as all the three districts. However, the best model which has been accepted on all accounts for explaining satisfactorily the behavioural pattern of sex ratio is that where we have jointly introduced three independent variables, namely, female work participation, female literacy and age at marriage. The model emerges to be the best predictor of sex ratio in Cachar and Karimganj districts as well as Barak Valley with the only exception of Hailakandi district.

In the overall analysis, it could be said that among the various explanatory variables female infant mortality has a negative and significant effect on sex ratio. Thus, it can be inferred that the sex ratio in the region are to some extent handicapped by differential mortality. Infact, sex ratio more particularly child sex ratio in the region would have been much better if there were lower infant and child mortality among females. In this context, we donot rule out the possibility of discrimination at the level of intra house hold resource distribution. However, the overall impoverishment of the region may have some influence in aggravating the situation further. Since the British period, the economy of Barak Valley has been
peripheral. Still now, the economy of the valley is not in a good shape, sharing only 10.39% of state GDP. Obviously, the district per capita income is below the state average and the figure come up to only about 84% of the corresponding per capita income figure of Assam [Roy and Bezbaruah : 2002]. Under such a situation, it may be possible that malnutrition which is very much attached with poverty and lack of health awareness (which is again the consequence of poverty) result into increased mortality among females. Our study further reveals that the problem is more acute in rural areas dominating Barak Valley because of inadequate medical facilities and health care system, unhygienic living condition, poor sanitation etc. It is now well admitted that health of women is both the cause and effect of development of a nation or a region, hence much has to be done before achieving full health status of women.

The foregone analysis further suggests that dowry system and son preference have very insignificant effect on sex ratio and are not valid for the region. This leads us to believe that the socio-economic factors which are dominant in other places for gender discrimination and hence unbalanced sex ratio are not relevant for Barak Valley. This definitely highlights the crucial fact that the region has progressive socio-cultural attitudes towards women inspite of its poor economic infrastructure. While India as a whole is stigmatized by female infanticide, foeticide, dowry death and bride burning etc. having serious implications on sex ratio, such things are really unheard of in this region. All these reflect the positivity of the society towards female that on its own can check the dominance or evil effects of all the factors. However, favourable factor like female work participation has emerged as playing the most important role in influencing the sex ratio. The findings in this chapter suggest that female work participation has a positive impact on sex ratio and the influence of this factor on determination of sex ratio trends has been found to be statistically significant. Favourable record of female work participation rate
certainly helps to raise the economic status of women in the society which in turn reduce the rampant practice of dowry and preference for male child as is common in other parts of the country.

The analysis further shows that the combination of three explanatory factors, namely, Fwp, Litf and Mar age exert much stronger positive and significant impact on sex ratio and are playing the most important role in bringing about a favourable sex composition of population in the region. We can thus conclude that favourable social factors as well as female work participation emerge as the most important determinants of the current trend of sex ratio in Barak Valley and dowry, son preference etc. which have strong relevance for India or other regions donot operate in the region with same magnitude indicating lower extent of gender discrimination in the region.

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