DETERMINANTS OF FEMALE LABOUR FORCE PARTICIPATION IN BURMA: AN EMPIRICAL ANALYSIS OF SOCIO-ECONOMIC SURVEY DATA

Myat Mon*

Abstract

This paper seeks to identify the major determinants of female labour force participation (LFP) in the urban area and to examine how these determinants associate with female LFP. The data from the socio-economic survey of urban women undertaken in Rangoon, Burma, during May to July 1998, are analyzed by the logistic regression model. A number of potential variables for inclusion in the logistic regression are identified on the basis of results of the chi-squared tests and also on the basis of theoretical models which explain female participation in the labour force. The results suggest that husband's income and marital status are important factors while educational attainment does not significantly affect (less significant for unmarried women than for married women) Burmese urban women entering into the labour force.

♣ The author has Bachelor and Master of Commerce degrees from the Institute of Economics,Rangoon where she taught from 1984 to 1988. She also attained a Master of Computer Information Systems degree from Assumption University. She recently submitted her Ph.D. thesis to the School of Economic Studies, University of New England, Australia. She started teaching in the School of Management, Assumption University of Thailand in 1990.

[1] The definition of LFP is somewhat different from the ILO's definition. In this study, women in labour force or workforce are considered for those who are currently employed.

INTRODUCTION

There is a big difference between working men and working women since women are burdened with childbirth and the responsibility for raising the family as well as domestic work. Women are considered the weaker sex and employers prefer hiring men to women. There are many factors such as age, marital status, education, husband's income and the number of children, which have a bearing on the decision of a woman to be in the workforce. The degree of correlationship between each variable and female LFP rate varies from country to country which has achieved different levels of economic development, as economic development of the country creates better employment opportunities and better social welfare programs for women and children. In the case of Burmese women, it is expected that determinants of female LFP would be different from those of other countries.

Socio-Economic Survey

The population for the study consists of all the residing women in Rangoon. In order to obtain a representative sample, samples from different regions and different social classes were taken. There are 34 townships in Rangoon city development area (1998), geographically classified by downtown area, urban area and peri-urban area.

Given the nature of the townships, a multi-stage sampling scheme was used in the survey. At the first stage all the townships were classified into three categories: downtown area, urban area and peri-urban area. At the second stage, classification was according to the general status of dwellings in the different regions. Ten townships were selected, namely, 2 townships in the urban area for upper class, 2 townships in urban area for middle class, 2 townships in the downtown area for middle class and 4 townships in the peri-urban area for the poor. This allocation is roughly based on a proportional allocation schedule. At the third stage, 20-30 households in each township were selected at random from the list of households within the different blocks which was obtained from each local council office. In all, 280 women were interviewed. The survey was conducted from June to mid July in 1998.

Model Specification

Association between status of women employment and each of the socio-economic variables can be analysed and degree of each relationship can also be found using Chi-square tests. However, the dependent variable (working status or employment participation of women) may be influenced by a number of factors simultaneously. To examine such relationships between a dependent variable and a set of independent variables, multiple regression analysis can be utilised. However, the dependent variable in this study is a dichotomous variable generated from responses to the question: "Why do some women work and others do not?" and the independent variables consist of numeric, categorical and dummy variables. A major problem associated with the use of multiple regression is that the predicted values do not necessarily lie in the range 0 to 1, and therefore cannot be interpreted as a probability (Norusis 1993, p. 31). Given the nature of the dependent variable, Y, which takes value Y=1 if the respondent (female) is in the workforce; and takes value Y=0 if the female is not in the workforce, the two models, Probit and Logit models, can be used. Both of these models provide a prediction for the probability that a female with a given set of characteristics is in employment/workforce. However, since logistic model is easier to understand and uses a standard form of analysis, logistic regression model is used in this study.

Model of Logistic Regression

In the logistic model with more than one independent variable, the model can be written as

Prob. [A female is the workforce] =

$$P\,[y=1] = \frac{e^{z}}{1+e^{z}} = \frac{1}{1+e^{-z}}$$

where Z is a linear function of the explanatory variables. If X_1, X_2,...... X_k represent various characteristics of the household and female respondent, then "Z" equation would be as follows:

$$Z = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots + \beta_k X_k$$

X_i = i^{th} Explanatory variables
(i = 1,2, ….., k)

β_i = Parameters of the model
(i = 0, 1, 2, ….. , k)

Under this model, the probability that a female, with a given set of characteristics, is not in the workforce is given by

$$P\,[y=0] = 1 - P[y=1]$$
$$= \frac{e^{-z}}{1+e^{-z}} = \frac{1}{1+e^{-z}}$$

In order to be able to calculate probabilities associated with employment, it is necessary to estimate the parameters of the model. Once the variables are specified, these parameters are estimated using the maximum likelihood methods.

Selection of Variables

A number of potential variables for inclusion in the logistic regression are identified on the basis of results of the chi-squared tests and also on the basis of theoretical models which explain female participation in the labour force.

Theoretically, age is an important factor and the age distributions of female participation vary considerably (Durand 1975, pp. 38-44). The female LFP rate reaches a peak before the onset of childbearing and a few years after the period of childbearing and declines during the child-rearing period. All women in the sample are between 17 and 65 years of age and are economically active. However, the influence of other factors may result in different participation patterns for women in the age group.

Marital status is a major influencing factor on female LFP, as married women have greater household responsibilities than unmarried women. According to the Chi-square test, the survey data showed a strong association between marital status and women in employment (Mon 2000, pp. 272-3). Thus, it is important to examine the effect of marital status along with other independent variables on female participation in the workforce.

Many empirical studies have found that better educational attainment of women not only leads to greater labour force participation but also increases their productivity. However, in some cases there is only a little or non-linear relationship between education and female LFP rate. This means that increments in education do not necessarily improve women's opportunities for meaningful economic participation (Standing 1978, pp. 141-62; Smock 1981, pp. 209-40; Jones 1984, pp. 38-9). According to the survey data, the Chi-square analysis which tests the association between two selected variables, did not show a strong relationship between female education and women's employment in Burma (Mon 2000, pp. 270-2). Nevertheless, it is expected that logistic analysis may provide a more definitive measure of the influence of education on female employment.

It is feasible that educational attainment can be measured either by the different levels of achievement such as primary, middle and high, or it can also be measured through the number of "years of schooling" with a minimum value of 1, and a maximum of 20. The average number of years of schooling is 11 with a standard deviation of 4.52. As the range is not significant, this variable is treated as a numeric variable taking integer values.

It is clear from the preliminary Chi-square analysis that a husband's income determines female participation in the labour market particularly for married women. But, unmarried women (particularly divorced and widowed women) may receive financial assistance from their working children or other family members. Thus, husband's income may not be an appropriate indicator of the financial position of the household. In the present study alternative specifications using husband's income and total income of the family are explored.

Husband's income and the income of other family members would be used in the two different models for the comparison of the probabilities of married and unmarried women in economic activities. The standard deviations and the ranges of incomes (both husband's income and total family income) are quite significant. Inevitably, these variables are also used as numeric in the model. It is also expected that these two variables would be highly correlated. Therefore, only one of these two variables is used in each model specified. The total family income would be strongly related to "the number of working people in a family". In the case of husband or family income, relatively high levels of income indicate affluence and are expected to have a negative impact.

Many studies found that low fertility leads to increases in the female LFP rate (ESCAP 1995, p. 59). Thus, the number of children and their age profiles are expected to influence a female's decision to enter workforce. In general, young children are highly demanding of the mother's time. Having a child or children younger than 5 years usually discourages women from entering the labour force. Although variables of children and infants seem to have the same characteristics, "children" includes working children, children older than 5 years (school-age) and younger than 5 year and "infant" includes children younger than 5 years and even the unborn (if woman is pregnant, 0.5 is used in this variable). Therefore, these two variables are expected to have different influences on the logistic model. The number of children can affect the employment of married women, but this factor does not affect single women, and thus, the "size of family" (number of family members) is used instead.

Another variable, "type of family", nuclear or extended, probably affects female employment since the kinship system and extended family still exist in Burmese culture. The extended family may be expected to provide an adequate alternative child care and make it possible for a woman to be employed. The two categories of families, "extended family" and "nuclear family" are considered in this study. This variable is used as a dummy variable.

Notation and Description of variables in Logistic Regression model

The following is the list of variables using in the estimation of the model.

Dependent variable

Employment status = 1 if woman is working
= 0 otherwise

Independent variables

Age (A) = Age of the female respondent (discrete variable)

Marital (M) = Marital Status (dummy variable)
1 = unmarried; 0 = married woman (unmarried includes single, divorced and widowed women)

School (S) = Years of schooling (discrete variable)

H-income (H) = Husband's income (continuous variable)

T-income (T) = Total income of family members (continuous variable) {excluding working woman's income}

Children (C) = No. of children (discrete variable)

Infants (I) = No. of children younger than 5 years including pregnancies (discrete variable)

W-people (W) = No. of working people in the family (discrete variable) {excluding working woman interviewed}

F-type (Ft) = Type of family (dummy variable, 1 = nuclear, 0 = extended)

F-size (Fs) = Size of family (discrete variable) (number of family members including respondent)

Coefficients and interpretation

Given the logistic model which postulates

$$\text{Prob [Female in workforce]} = \frac{1}{1 + e^{-Z}}$$

$Z = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k$, the following interpretation holds for each of the coefficients.

Each β_i can be shown to be

$$\frac{\partial \log (\text{odds ratio})}{\partial x_i} = -b_i$$

where odds ratio is defined as

Odds ratio =

$$\frac{\text{P[Female in workforce]}}{\text{P[Female not in workforce]}} = e^{-z}$$

Therefore, β_i provides a measure of change in the logarithm of the odds ratio of the chance of a female working to not working.

For continuous variables, it is possible to compute the change in probability when the variable, X_j is increased by unit. This change can be calculated using

$$\frac{\partial P}{\partial X_j} = \frac{B_j e^{-Z}}{[1 + e^{-Z}]^2}$$

Some of the important statistics from the logistic regression are listed below.

β (B) = Estimated logistic coefficient of each variable (It can be interpreted as the change in the log odds associated with a one-unit change in the independent variable)

S.E = Standard error of estimates

Sig = Significance value or p value {This value is compared with significance level (α) to determine whether each independent variable is significant or not in the model. If the significance (p) value of a variable is less than the designated value of α (1% or 5% or 10%), the corresponding variable is significant}

R_I = Partial correlation associated with an explanatory variable *i*, its value represents how much each variable contributes to this model.

As discussed above, the first logistic regression model is developed with eight selected variables. The output of logistic regression from SPSS package is as follows:

From the above model, out of eight independent variables, three are obviously significant with α=0.05, namely marital status, husband's income and number of working people. The other significant variables with α=0.10 are years of schooling, the family size and having infants. The sign of the B-values (β) shows whether a variable has a positive or negative effect on employment. And 'B' (β) values show a positive or a negative association between female employment status and each variable. The coefficients of marital status, educational level and family size are positive. It implies that for an increase in one unit of marital status (i.e. married = 0 to unmarried = 1), the log odds value will increase by

Table 1. SPSS Results for Model I

---------------------- Variables in the Equation -------------

Variable	B	S.E.	Wald	df	Sig	R
AGE	-.0009	.0156	.0031	1	.9559	.0000
MARITAL	1.9173	.4039	22.5297	1	.0000	.2427
SCHOOL	.0687	.0368	3.4848	1	.0619	.0653
H_INCOME	-1.3E-05	5.926E-06	4.5829	1	.0323	-.0861
W_PEOPLE	-.5736	.1820	9.9337	1	.0016	-.1509
F_SIZE	.2346	.1350	3.0211	1	.0822	.0541
F_TPYE	.2891	.3786	.5832	1	.4451	.0000
INFANT	-.7180	.4316	2.7680	1	.0962	-.0470
Constant	-.7061	.9924	.5063	1	.4768	

1.92. Similarly, the coefficients of educational level and family size can be interpreted in the same way. Since "years of schooling" is a discrete number, the log odds for one unit change in value of this variable may be less obvious. Thus, the logistic coefficients of such independent variables are small. But it does not necessarily mean that it has a lesser effect on the probability of female employment.

Another negative association is found for the number of working people in family. This is revelatory of the fact that the greater the number of working family members, the fewer the number of women that participate in the workforce. It is reasonable to infer, therefore, that the income of others in the workforce contributes substantially to their families' financial needs. It seem obvious that a husband's income combined with the number of working people bear a relationship to each other.

Furthermore, this model finds a negative effect of pregnancy or the presence of an infant on female participation in employment. This negative coefficient explains that since married women have to devote more time to looking after the children, they have less chance to work outside. It also shows that mothers may quit their jobs during pregnancy and in the early years of the child-rearing period and that they resume employment after the children are old enough to go to school.

However, a positive coefficient of "family size" indicates that having more family members increases the chance of women being in the workforce. The more family members in this case means more dependent people in a family.

The R statistic is the partial correlation between the dependent variable and each of the independent variables. The R-statistic shows the contribution of each variable to the model. Among the significant variables, marital status (0 for currently married, 1 for currently unmarried) is the most important followed by the factor, "the number of working people", which has the second highest value of "R". The variable "husband's income" is third in this ranking.

Like the Chi-square analysis, the logistic regression analysis also finds a weak positive effect of women's education on female workforce. Fourthly, the "R" value of educational level explains a small contribution to the probability of woman in work. A possible reason for such a weak indication may be that women with low education also participate in lower types of employment and highly educated women participate in white collar jobs.

Finally, "family size" and "having infants" follow according to "R" values.

From Table 2, "percent correct" (75.19%) shows how well the model

Table 2. Classification Table for Female Employment Status (Model I)

	Predicted		
Observed	0	1	Percent Correct
0	63	37	63.00%
1	28	134	82.72%
	Overall		75.19%

fits for comparing the prediction to the observed outcomes.

Moreover, another variable, the number of children could probably be an influencing factor for married women in the workforce. As mentioned earlier, since variables of "children" and "infant" have some different characteristics, these two variables are expected to have different influence. Thus, the variable of "Infant" is removed and the number of children is substituted in model II. The results of model II are as follows:

In terms of the percentage of correct prediction of female participation in employment, both model I and II appear to perform the same. In model II, family size has a positive coefficient of significance at 10% level and the use of the new variable (number of children) has not improved the predictive power of model II

Table 3. SPSS Results from Model II

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---------------------- Variables in the Equation -------------

Variable            B       S.E.      Wald     df      Sig        R

AGE             .0264      .0204    1.6682      1    .1965    .0000
MARITAL        1.9413      .4042   23.0626      1    .0000    .2459
SCHOOL          .0532      .0380    1.9616      1    .1613    .0000
H_INCOME    -1.3E-05 6.122E-06    4.4647      1    .0346   -.0841
W_PEOPLE       -.5424      .1830    8.7853      1    .0030   -.1396
CHILDREN       -.1887      .1516    1.5491      1    .2133    .0000
F_TPYE          .2875      .3780     .5784      1    .4469    .0000
F_SIZE          .2658      .1399    3.6074      1    .0575    .0679
Constant      -1.5923      .9938    2.5674      1    .1091
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Table 4. Classification Table for Female Employment Status (Model II)

	Predicted		
Observed	0	1	Percent Correct
0	62	38	62.00%
1	28	134	82.72%
	Overall		74.81%

Husband's income vs. total income

It is quite apparent that husband's income greatly affects the status of wife and children and is an important determinant of whether a wife is employed or not. However, as unmarried women have no financial assistance from husbands, the husband's income is not an important factor in their decision to enter labour force. But divorced and widowed women probably have the children who can support them financially. In this case, total income of the family members is expected to be a more important factor which influences on the probability of an unmarried woman entering the workforce. Therefore, this variable is substituted for husband's income in the third logistic regressing model. The results of the model III are as follows:

Model III provides very meaningful results and reasonably good output, although "percent correct" is only 73.28%, as shown in Table 6. There are four explanatory variables that are found to be significant.

As in model I, almost all the same results are found in model III. The only difference is that "total family income" is used in model III instead of "husband's income" in model I. Model III also finds a negative coefficient of total family income which suggests that the more other family members earn, the less likely are women to enter the workforce.

According to the "R" value of each variable, the same ranks (as in model I) for the importance of the significant variables also resulted in model III, which lists the variables in order of importance with "marital status" taking the lead and "the number of people", "husband's income", "years of schooling" and "family size" trailing behind.

Table 5. SPSS Results from Model III

---------------------- Variables in the Equation -------------

Variable	B	S.E.	Wald	df	Sig	R
AGE	.0074	.0144	.2609	1	.6095	.0000
MARITAL	2.2197	.3839	33.4256	1	.0000	.3003
SCHOOL	.0617	.0362	2.9143	1	.0878	.0512
T_INCOME	-9.9E-06	4.117E-06	5.7436	1	.0165	-.1037
W_PEOPLE	-.5117	.1833	7.7914	1	.0052	-.1289
F_SIZE	.2258	.1339	2.8450	1	.0917	.0492
F_TPYE	.3488	.3741	.8692	1	.3512	.0000
Constant	-1.2686	.9399	1.8217	1	.1771	

Table 6. Classification Table for Female Employment Status (Model III)

	Predicted		
Observed	0	1	Percent Correct
0	60	40	60.00%
1	30	132	81.48%
	Overall		73.28%

Three alternative specifications for the logistic models have been considered with the different sets of independent variables. In all the models, marital status, husband's income (or total family income), and the number of working people in the family are found to be significant at the 5%level of significance. In models I and III, years of schooling and family size are also found significant at 10% level of significance. The inclusion of the variable, infants, in model I, makes its goodness of fit of this model, 75.19%, better than the two alternative specifications, which have 74.81% and 73.28% of correct prediction. In terms of goodness of fit, model I which uses "husband's income" may be selected.

However, model III which uses "total family income" is conceptually better, since the variables included in model III are important or relevant for both married and unmarried women. Some variables such as husband's income and infants used in the model I are quite irrelevant for unmarried women, particularly for single women who take up a large proportion of the sample. Therefore, models I and III will be used.

Application of the Logistic Model

The logistic model specified for this study and data collected through the survey can be used in examining the influence of different variables on the participation rates of women in the workforce. The model has the potential to indicate the effect of a particular variable or the possibility that a female will be in employment, given a set of characteristics defining the socio-economic situation of a female. Since it is not feasible to examine all possible combinations, a few cases are considered below for purposes of illustration.

Probabilities of a woman in the workforce by educational level and marital status

The steps involved in the calculation of these probabilities are quite simple and straightforward. Once the model is selected, for any given woman with specific characteristics, numerical values of the variables (discrete, continuous and dummy variables) are used in calculating the estimated Z values based on the estimates of parameters. The resulting Z-score is used in calculating the probabilities based on the logistic model. However, the question is which model should be used. If model I is to be applied, then the variable husband's income needs to be set at zero and the variable on using "having infant" is also at zero for unmarried women. On the other hand, model III, which uses total family income, may be a better model to consider unmarried women. Thus model III is used in the illustration below.

According to model III (total income model) there are seven explanatory variables, which feature in the computation of the Z-value. The estimated model is

$$Z = -.1.269 - .0074A+2.22M+.062S - .00001T- .512W+.226Fs+.349Ft$$

Where A stands for Age of woman respondent, M stands for Marital status, S equals Years of schooling, T, Total family income, W for No. of working family members, Fs, Family size, Ft, Type of family.

Since the aim of this illustration is to examine the effect of marital status, the remaining variables are fixed at the following values.

The probability of an unmarried women (widowed or divorced) in employment, with a set of following characteristics, age of 40 years, years of schooling 11, total family income K33,145 and number of working people

1.5, family size of 4.2 in a nuclear family, is calculated below. The values used here are the arithmetic means of the continuous variables.

Z = -.1.269 - .0074(40.8) +2.22 (1)+.062(11) - .00001(33145)- .512 (1.5) +.349(1) +.226(4.2)

= 2.14

Prob (the woman in employment) =

$$\frac{1}{1+e^{-2.14}} = 0.8945$$

The probability that the woman with these average socio-economic characteristics in employment is estimated to be 0.894.

The probability of a married woman in the employment with the same set of characteristics can be obtained by first calculating Z-value using estimated coefficients. In this case,

Z= -0.08199

Given this Z-value, the probability that a married woman with these characteristics is in employment is equal to:

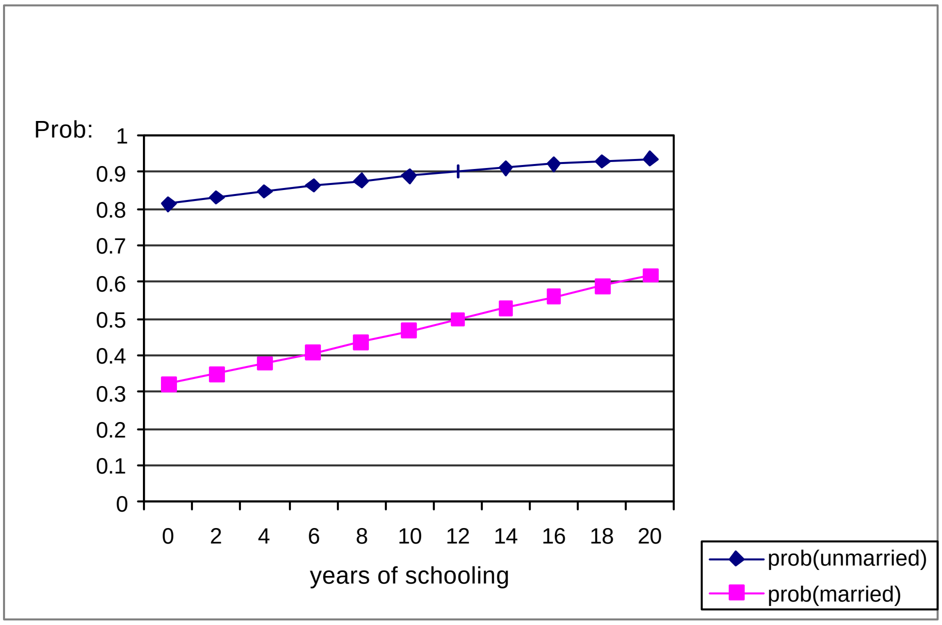
P [Married woman with given characteristics in employment] = 0.4795

It should be emphasized that the probabilities for married women and unmarried women, computed using the logistic model, are conditional upon the characteristics of the women. Therefore, it is feasible to examine changes in the probabilities as a function of changes in the characteristics of the women. For example, if the woman under consideration receives no financial support, then the Z-value is 2.47 and

P[Woman is in employment] = 0.9217

Based on this model, the likelihood of a woman to be in employment can be evaluated for a various sets of characteristics. As an illustration those probabilities are calculated for typical women (with characteristics outlined before) by marital status and educational attainment. These probabilities are plotted in Figure 1. The figure shows that the gap in probabilities for married and unmarried women is reduced as the years of schooling increase. For unmarried women, probabilities for labour force participation are quite high. But for married women, years of schooling has a positive influence and probability increases from a low of 0.3 to a figure above 0.5.

Figure 1. Probability of Women in Employment by Marital Status and Educational Level
(All other characteristics set at averages)



Probability of being in employment: income level by marital status

This section will examine the effect of income level and marital status on the probability of being in employment for women possessing typical characteristics. These probabilities are calculated using Z-values derived from the estimated parameter.

For married woman with typical characteristics, the Z value is given by

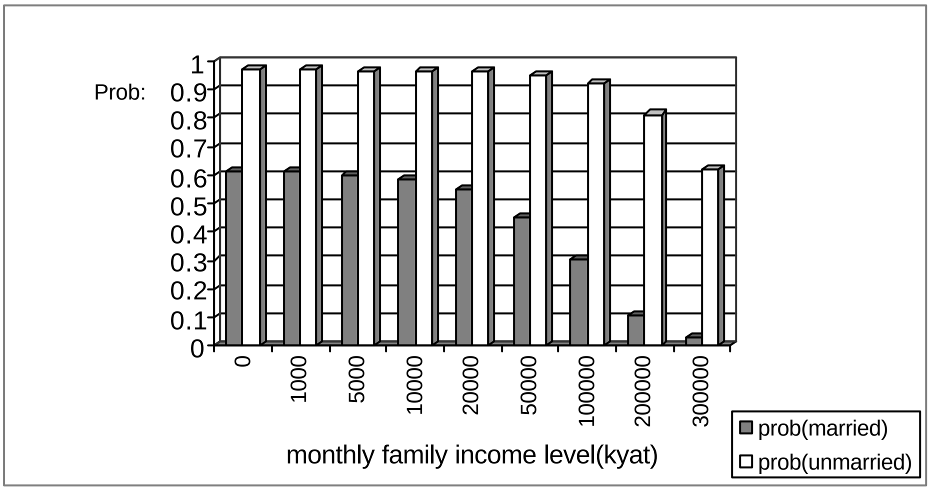
Z = - .706 - .0009A + 1.92M + .068S -.000013T-.574W+.235Fs+.289Ft -.718I (from model I)

For unmarried women, the Z-value is given by

Z = -.1.269 - .0074A + 2.22M +.062S -.00001T- .512W+.226Fs+.349Ft (from model III)

Figure 2 shows the probabilities for married and unmarried women for different levels of family income. As discussed before, family income is an important determinant of labour force participation by women. In the case of unmarried women, the family income has very little influence on the participation probabilities, but shows a

Figure 2. Probability of Woman in Employment and Family Income level by Marital Status



small reduction when the monthly family income is in excess of K100,000.

But the results are very contrasting for married women. Participation probabilities are quite high, above 60 per cent where there is negligible family income but shows a sharp decline when income exceeds K50,000. Probabilities of participation are negligible and close to zero when family income level reaches K300,000. As the largest amount of family income is contributed by the husband, it can be concluded that the effect of husband's income is more pronounced for the female participation in employment for married women, but family income has negligible influence in the case of unmarried women.

Concluding Remarks

The usefulness of the logistic model in assessing the probabilities of female participation in the labour force is amply demonstrated by the two illustrations above. As mentioned earlier, the logistic model can be used in assessing numerous other scenarios.

It is important to note that the results presented here are based on the 1998 survey of women conducted during this course of study. If similar survey data were available from an earlier time period, it would be feasible to examine the trends and shifts in the logistic regression model used. A similar survey at a future point of time would provide an indication of changing circumstances and practices in relation to women in employment. Model I and III are recommended to apply in the similar situations. Using model I or III depends on the marital status of women.

Limitations

Due to time and financial constraints, only 262 women could be interviewed. Although just 262 households cannot adequately represent the social life of all women in urban Burma, it is expected that the survey results will be representative of the total female population in Rangoon. Although survey design and sample households were well set up, enumerators may select some different households for their convenience which were not in the pre-sample, resulting in communicator associated bias. The survey data may also be subject to response errors and biases. These errors and biases may occur from both interviewers and respondents. For example, an interviewer may change a respondent's answer to fit his/her understanding or perception. Unpaid family workers and casual workers are counted as working women. However, some may work casually or in their family businesses, but they might not mention their economic activities. The interviewers also may not clarify such types of employment. In this case, such women may be counted as non-working women. Moreover, many respondents were reluctant to reveal their actual income. Those who are waged or salaried workers tended to provide only their actual salary, but their other income such as over-time, bonus and other fringe benefits may have been omitted. Although some women, mostly those in government service, are doing another subsidiary job, it was difficult to get this information.

Notwithstanding these limitations, the survey has provided some very useful indicators of female status and a key satisfactory model which identifies important determinants of female employment.

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