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Labour Supply and Earning Functions of Educated Married Women: A Case Study of Northern Punjab

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This study analyses labour supply of educated married women in Mandi Bahauddin, a typical district of northern Punjab in Pakistan. The study finds that the education level and economic compulsion are important factors affecting women's labour force participation decision. But, otherwise, they are independent in their decision-making, e.g., the women living in joint families or those with less educated husbands and/or parents are not socially constrained in terms of participation. Human capital variables like education, experience, and training, besides the nature of occupation and distance from the central city, are the important factors affecting women's earning rates, while the hours of work are mainly determined institutionally.

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Keywords: Labour Force and Employment, Size, and Structure, Time Allocation and Labour Supply

1. INTRODUCTION

Women constitute about half of the total population in Pakistan, and the same is true for gender distribution in the rural areas. Thus the pattern of labour force participation by women is of critical importance in determining the dependency burden, living standards, and saving rates among households. The present study is an attempt mainly to analyse the patterns of labour force participation among married women. In particular, the study explores the determinants of women's labour force participation decision, their wage rates, and hours of work. Our sample consists of currently married women with at least 10 years of schooling,[1] because normally they are likely to be relatively freer in their labour supply decisions as compared to unmarried and/or less educated women. The analysis is conducted in a manner of a case study and thus it is confined to the women living in the district Mandi Bahauddin. This is a typical district of the Punjab (the largest province of Pakistan), with a mixed rural and urban blend and is mainly inhabited by lower to upper middle class families.

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[1]In Pakistan's education system, the first main educational diploma, namely, the Secondary School Certificate, is normally completed in 10 years.

Factors determining the employment of women are extremely complex. At the individual level women's decision to work is subject to such factors as the availability of jobs, education level and skills. At the aggregate level female labour force participation is largely determined by the factors that are indicative of economic, social and demographic circumstances of the locality under consideration. In the present study we shall consider both on supply side and demand side factors but focus mainly on households' structures reflecting their socio-economic characteristics.

Women are induced to participate in the labour market by the push and pull factors. The push factors mainly represent financial pressure. Women from the poorest families are pushed into the labour market due to severe economic necessity [Kazi and Raza (1986)]. Particularly, in a society divided by income groups, women belonging to lower income classes are more likely to participate in the labour market. A high family income might greatly reduce the necessity of augmenting income by involving women in the labour force. The pull factors are such attributes that create demand for labour and include the level of education, training and experience.

Neoclassical economists consider education to be one of the key determinants of women's entering the labour market. The higher the education level, the greater is women's participation in the labour market [Becker (1965) and Mincer (1980)]. Furthermore, socio-economic characteristics like education might make certain jobs more available to them. Investment in human capital such as experience and on-the-job training enhance productivity, which in turn leads to higher labour earnings [Mincer and Polachek (1974); Killingsworth and Heckman (1986)].

Demographic factors like age and family size are also considered to be important in affecting the labour force participation rates of the women. It has been observed that large family size and dependency burden might push mothers into the labour force. Other variables like family structure and education level of husband and parents can also be considered as potential determinants constraints on women's work participation. Some of the other factors that could influence women's participation in the labour force include availability of jobs, occupation and the distance from the possible place of work.

To analyse the factors affecting women's earning rates we estimate an earning (or wage) function. In this equation we use age, human capital variables, occupations and distance from the district as the independents variables. We also estimate the hours of work equation using human capital variables, occupation and demographic variables (number of children, numbers of dependents and age) as explanatory variables. To remove the selectivity bias, we use Heckman's three-stage procedure for the estimation of participation, wage and hours equation. This procedure is widely used in literature [Sultana, *et al.* (1994), Khandker (1988) and Hyder (1999)].

The study is organised as follows. In Section 2 we discuss the characteristics and descriptive analyses of data. Methodology and estimation procedures are discussed in Section 3, while the results are presented in Section 4. Finally, Section 6 consists of summary and conclusion.

2. THE DATA

Data for this study are drawn from the field survey of the district Mandi Bahauddin. Conducted in the year 2002. The respondents are married women aged 15-60

years with at least secondary school education. The sample consists of 210 respondents selected through stratified random sampling, where strata are based on administrative division of the district and rural/urban residence. In all, 112 respondents are selected from the urban area of Mandi Bahauddin (the district headquarter) and Malikwal (the other major city). Another 68 respondents are taken from Gojra (a small town), while the remaining 30 respondents belong to the villages Miana Gondal and Waryait. The relative sizes of the three sub-samples are determined keeping in view the relative sizes of the population in the three district zones.

Some of the key demographic features of the district available from the 1998 Population Census are summarised in Table 1, which shows that Mandi Bahauddin is a medium sized district with a population of more than a million. The proportion of male population is slightly larger than that of female population, while the proportion of working age population is slightly higher among the female category. Labour force participation among the working age population is moderate among the male population but dismally low among the female population; 1.47 only. The age distribution of the working age population indicates steady decline in the proportion of that proportion of population and the age bracket increases. This is explained by two reasons. First, in a growing population, the number of births also grows over time, implying that the proportion of young population remains higher than that of the older population. Second, with increase in mortality rate with age the proportion of older persons further declines.

Table 1

Distribution of Respondents by Age and Labour Force Participation

	Total	Male	Female
Population (Number of persons)	1160552	594127	566425
Percentage of Working Age Population (15-60)	52.44	51.49	53.44
Percentage of Workers in the Working Age Population	30.85	59.90	1.47
Percentage of Working Population by Age Groups			
15–20	19.71	19.82	19.59
21–30	30.04	29.18	30.92
31–40	21.45	21.34	21.55
41–50	16.65	16.88	16.42
51–60	12.15	12.78	11.52
Percentage of Population with Primary Education	47.15	58.53	35.31
Percentage of Population with Secondary Education	11.81	16.61	6.87

The table also shows that the literacy rates in the district are at slightly better than the ones at the level.[2] The table shows that the disparity between literacy rates of male and female populations is also at par with the country. However, females are significantly discriminated against for higher than the primary education levels. Another interesting observation is that the difference between the labour force participation rates of male and female working-age populations is much higher; 59.9 for male against 1.47 for female. Since one of the reasons for obtaining education beyond primary level is to increase earning potentials, one can infer that the educational discrimination is not as

[2]The literacy rates at the country level for both sexes, male and female, were 43.9 percent, 54.8 percent, and 32.0 percent respectively.

high as one can interpret independent of the labour force participation data. The proportion of with secondary education in the female population does not seem to be too low when one considers the female labour force participation rate.

Out of the total sample of 201 married women considered in this study about 50 percent women are found to be participating in the labour market both inside and outside the home for cash income production.[3] The distribution of participating and non-participating women by age is reported in Table 2. The pattern of female labour force participation shown in the table reflects the influence of a variety of factors such as those related to life-cycle phenomena (for example, family need for income), job structure, hiring criteria, and cultural norms. The table shows that married women in the youngest age group 15–25 years display lower level of activity as compared to those in the higher age groups. This is so because most probably the women in this age group prefer not to work due to small family size and high child bearing period or because they do not have enough experience and skills. Data show that, as expected, the female labour force participation is highest in the peak productive age 30–45 years.

The distributions of participating women with respect to weekly hours allocated to the market work and their monthly wage income are given in Table 3, while the distribution of working women by occupation, average working hours and wage income are given in Table 4. In our sample, majority of women is working in the medical and

Table 2

Distribution of Respondents, by Age and Labour Force Participation

Age	Working Women	Non-working Women	Total
Up to 20 Years	2	7	9
	(2.02%)	(6.86)	(4.48%)
	[22.22%]	[77.78%]	
21-25 Years	9	43	52
	(9.09%)	(42.16%)	(25.87%)
	[17.31%]	[82.69%]	
26-30 Years	40	30	70
	(40.40%)	(29.41%)	(34.83%)
	[57.14%]	[42.86%]	
31-35 Years	26	13	39
	(26.26%)	(12.75%)	(19.40%)
	[66.66%]	[33.33%]	
36-40 Years	17	4	21
	(17.17%)	(3.92%)	(10.45%)
	[80.95%]	[19.05%]	
41-45 Years	5	2	7
	(5.05%)	(1.96%)	(3.48%)
	[71.43%]	[28.57%]	
46-60 Years	0	3	3
		(2.96%)	(1.49%)
		[100%]	
Total	99	102	201
	[49.25%]	[50.75%]	

Note: Values in round (square) brackets are percentages from the column (row) totals.

[3]For the purposes of this study, female labour force participation (hereafter FLFP) is defined as the act of working inside or outside the home for cash income production. Likewise, non-participation means that the person under consideration had never worked or worked in the past and then left due to some reason.

Table 3

Distribution of Working Women, by Hours of Work

Labour Supply (Hours per Week)	Number of Working Women	Monthly Wage Income (Thousand Rupees)
Up to 30 Hours	2	Up to 2000
30 to 40 Hours	81	2000 to 4000
40 to 50 Hours	8	4000 to 10000
50 Hours and above	8	10000 or above
Total	99	Total

Table 4

Distribution of Working Women, by Occupation

Labour Supply (Hours per Week)	Number of Women	Average Weekly Hours	Average Weekly Income (Rupees)
Teachers	75	36.7	3998
Doctors	7	57	34143
Health Workers	17	45	5019
Total	99	39.6	6305

teaching professions. Usually, they spend 6 to 8 hours per day in the labour market, and the market time is more or less fixed by the employers. The table depicts that about 81 percent of the workingwomen are supplying 30 to 40 hours to the labour market weekly and 16 percent of them are allocating even higher than 40 hours per week. The statistics also show that mostly the women are earning low monthly income. As discussed above, the majority of them are teachers, health workers, health visitors and mid wives. That is why their wage rates are not so high. About 60 percent of them are earning even less than Rs 4000 per month. Only a small proportion of women are highly educated, who are engaged in professional type of occupations (doctors: homeopathic and allopathic), and earn higher than Rs 10000 per month. It is also apparent that by far the working hours are longer and wage incomes higher for doctors, followed by health workers.

3. METHODOLOGY

Our analytical framework involves the determination of decision to work, hours of work, and the wage rate per hour. Labour force participation decision involves choosing one of the two actions only, that is, to work or not to work. The dependent variable can take only two binary values: 1 if a women is in the labour market and 0 if she is not. As is well known, in such a situation linear regression equation is not suitable. Therefore we consider two non-linear models, namely logistic probability (Logit) model and normal probability model (Probit) model along with the linear probability model.

Labour force participation status and hours of work are jointly determined by the process of maximisation of utility derived from consumption and leisure. Furthermore since we do not observe non-participants' wages and hours of work we face the problem of sample selection bias if we use the truncated sample for participating women only in the estimation of hours and wage equations. A partial correction is obtained if we use Heckman's (1979) three-step procedure for adjusting for such selection bias in predicting

wage rate and hours of work. In the first step a Probit model for labour force participation decision is estimated. In second step, the inverse Mill's ratio is constructed from the Probit estimates. Then in the third step the earning and hours of work functions are estimated using the inverse Mill's ratio as an additional explanatory variable in each of the two functions. This procedure produces consistent estimates of regression parameters.

Formally, denote the binary dependent variable, that takes the value of one for participating women and zero for the non-participating women, by Y, the column vector of explanatory variables by X and the row vector of the corresponding regression parameters by α. Further denote the density function of a normal standardised variable by $f(z)$. Then using the subscript i for the observation index, the three models for the determination of labour force participation decision are specified as follows.

Linear Probability Model: $$Y_i = \alpha X_i + \varepsilon_i \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

Probit (Normal Probability) Model: $$Y_i = \int_{-\infty}^{\alpha X_i} f(z)dz + \varepsilon_i \quad \ldots \quad \ldots \quad (2)$$

Logit Model: $$Y_i = \frac{1}{1+e^{-\alpha X_i}} + \varepsilon_i \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

There may be a number of economic and social factors leading women to decide whether to enter in the labour market or not. These explanatory variables are woman's education level, years of education of husband, mother and father, number of children, number of other dependents, joint or nuclear family setup, woman's age, distance from the district headquarter, husbands monthly wage income, net assets of the family, and the number of other workers in the family. The exact manner in which each variable is measured or constructed is described in the results table in Section 4. While the reasons for including most of these variables are obvious and well documented in literature, the variable 'distance from district headquarter' is included to indicate access to job opportunities. Since all the sample women are educated, they are most likely to find jobs in city and the chances of them pursuing job would be higher if they reside nearer to district headquarter. To avoid repetition the economic justification of each variable is discussed in more detail in the section on empirical results.

To evaluate the earning structure of women, the statistical earning function of Mincer and Polachek (1974) is augmented by other factors affecting earning rates of the women. It can be written as follows.

$$\ln W_i = \beta X_i + u_i \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

Here $\ln W_i$ is the natural log of the hourly earning rate of worker i, X_i is the vector of the observations i on independent variables affecting the wage rate and β the vector of the corresponding regression parameters. The factors affecting a woman's earning rates that are included in the study are the woman's education level, experience, years of training; occupation and distance from the district headquarter.

Similarly we estimate the following hours of work equation using women's education level, her occupation, hourly wage rate, age, the number of dependents and the number of children in the family as the explanatory variables.

$$H_i = \phi X_i + v_i \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

H_i denotes hours of work per month, while X_i and ϕ are the vectors of explanatory variables and the regression parameters respectively.

Following Heckman's (1979) three-step estimation procedure, the inverse Mills ratio computed from the Probit model given in Equation (2) will be included as an additional explanatory variable in both the Equations (4) and (5).

4. EMPIRICAL RESULTS

We divide the presentation and discussion of results in three sub-sections, one each pertaining to the determination of labour force participation decision, wage rate and hours of work.

4.1. Estimates of the Labour Force Participation Equation

Table 5 shows that with only few exceptions there is not much difference in the qualitative nature of results across the three probability models of labour force participation. It appears that the most important factors affecting the female labour force participation decision are the level of education, distance from the district headquarter, the number of other workers in the family, family set up and the women's age. Wage income of husbands is also found to be a significant factor in determining female labour force participation decision in the Probit and Logit models, while the effect of net wealth of the family is significant only in case of linear model.

Before interpreting the meanings of various regression parameters, we first notice that the education levels of husbands, mothers and fathers, the number of children and the number of other dependents are all insignificant in influencing the female labour force participation decision. On theoretical ground the effect of husbands' education on the probability of female labour force participation was expected to be positive, similarly, one could expect that the daughters of educated mothers and fathers are more likely to participate in the labour force. Our results, however, do not confirm to this theoretical expectation and there could be several explanations for this result. First, since our sample consists of educated women, they are likely to be independent in decision-making. Second, the effect of the education level of mothers and fathers is basically seen on the level of a woman's education. The daughters of educated parents are more likely to participate in the labour market mainly because they would also be educated. This channel has already been taken into account because the education level of women has been included as a separate explanatory variable in the model. The insignificant regression coefficients of mothers and fathers' years of schooling therefore mean that there is no additional effect of parents education on their daughters' labour force participation decision over and above what has already been captured through the effect of daughters education. In any case it appears that the women's own education level is much more important in influencing their labour force participation decision than the education level of their closed relatives.

Table 5

Estimated Probability Models for Female Labour Force Participation

Explanatory Variable	Linear Model	Normal (Probit) Model	Logistic (Logit) Model
Intercept	–0.460	–3.09	–5.286
	(–2.22*)	(–4.50*)	(–4.27*)
Woman's Education Dummy	0.164	0.539	0.879
= 1 if Senior Secondary, 0 Otherwise	(1.93**)	(2.01*)	(1.97*)
Woman's Education Dummy	0.166	0.606	0.958
= 1 if Bachelors, 0 Otherwise	(1.80**)	(2.08*)	(1.95*)
Woman's Education Dummy	0.291	1.168	1.942
= 1 if Masters, 0 Otherwise	(2.07*)	(2.18*)	(2.06*)
Woman's Education Dummy	0.364	1.556	2.768
= 1 if Professional, 0 Otherwise	(1.65)	(2.11*)	(1.86**)
Education Years of Husband	-0.010	–0.029	–0.0469
	(-0.86)	(–0.74)	(–0.74)
Education Years of Mother	0.007	0.017	0.026
	(0.76)	(0.54)	(0.49)
Education Years of Father	0.002	0.004	0.013
	(0.34)	(0.16)	(0.34)
Distance from District Headquarter	0.004	0.013	0.0121
	(2.23*)	(1.97*)	(1.91**)
Monthly Wage Income of Husband	–0.0001	–0.018	–0.035
	(–1.24)	(–2.10*)	(–1.93**)
Net Wealth	-0.00001	–0.00004	–0.00006
	(–2.04*)	(1.47)	(–1.34)
Number of Other Workers	–0.164	–0.587	–0.952
	(–2.75*)	(–3.04*)	(–2.89*)
Number of Children	0.016	0.0458	0.059
	(0.70)	(0.62)	(–2.89)
Number of Dependents	0.025	0.108	0.153
(Other than Children)	(0.76)	(1.07)	(0.48)
Family Set Up	0.308	1.018	1.678
= 1 if Joint, 0 Otherwise	(3.79*)	(3.74*)	(3.62*)
Woman's Age	0.0245	0.0852	0.149
	(4.33*)	(4.46*)	(4.23*)
Sample Size	201	201	201
R^2	0.264		
McFadden R^2		0.24	0.24

Note: The dependent variable is set equal to one for workers and zero for non-workers. The statistics significant at 5 percent and 10 percent levels are indicated by * and ** respectively.

Coming to the role of number of children and the number of other dependents, we find that both these variables have insignificant influence in female labour force participation decision and this result has straightforward interpretation. There are two competing effects of increase in number of children and other dependents on the female labour force participation decision. On one hand married women living in families with large number of children and other dependents have greater economic pressure that can push them into the labour market. On the other hand increase in the number of children or other dependents results in higher level of activity at home and women may be inclined to stay home in order to fulfill the increased commitments at home. Our results suggest that although economic pressure to participate in the labour force is somewhat dominant

over the pressure of increased activity at home, the net effect of the two is quite insignificant. As a result the number of children or the number of other dependents do not have any significant effect on labour force participation decision of women.

Since the presence of highly insignificant parameters in regression equation is expected to erode the quality of results, we drop the highly insignificant variables from regression equation before interpreting the parameters. We follow the stepwise general to specific procedure to drop insignificant variables in the light of Theil's benchmark criterion. According to this criterion a variable is dropped from the equation if the *t* value of its regression coefficient is less then 1 in absolute terms. The variable with the smallest *t*-value, provided it is also less than 1 in absolute terms, is dropped first and the equation is re-estimated. The same rule is applied on the re-estimated equation and the process is continued till all the *t*-values are greater than 1 in absolute terms.

The final estimates obtained with this procedure are presented in Table 6. Here we find that only two parameters remain insignificant at 5 percent or 10 percent level, but absolute values of their *t*-statistics are greater than 1. We also observe that the estimated regression parameters remain highly stable after the insignificant variables have been dropped from the equation. This shows that the parameters estimates obtained under any of the three models are robust.

Table 6

Estimates of the Restricted Probability Models

Explanatory Variable	Linear Model	Normal (Probit) Model	Logistic (Logit) Model
Intercept	–0.509	–3.199	–5.449
	(–3.01*)	(–5.41*)	(–5.00*)
Woman's Education Dummy =	0.160	0.502	0.843
1 if Senior Secondary, 0 Otherwise	(0.194**)	(1.96**)	(1.96*)
Woman's Education Dummy =	0.174	0.602	0.972
1 if Bachelors, 0 Otherwise	(2.06*)	(2.25*)	(2.16*)
Woman's Education Dummy =	0.282	1.111	1.879
1 if Masters, 0 Otherwise	(2.20*)	(2.30*)	(2.19*)
Woman's Education Dummy =	0.357	1.460	2.704
1 if Professional, 0 Otherwise	(1.72**)	(2.09*)	(1.87**)
Distance from the District Headquarter	0.004	00.012	0.0197
	(2.24*)	(1.98*)	(1.87**)
Monthly Wage Income of Husband	–0.0002	–0.018	–0.036
	(–1.33)	(–2.18*)	(–1.99*)
Net Wealth	–0.00001	–0.00003	–0.00005
	(–1.82**)	(–1.21)	(–1.10)
Number of Other Workers	–0.141	–0.487	–0.820
	(–2.57*)	(–2.82*)	(–2.72*)
Family Set Up =	0.332	1.091	1.799
1 if Joint, 0 otherwise	(4.33*)	(4.18*)	(4.06*)
Woman's Age	0.024	0.083	0.145
	(4.85*)	(4.93*)	(4.59*)
Sample Size	201	201	201
R^2	0.255		
McFadden R^2		0.23	0.23
F-statistic	6.507		

Note: The dependent variable is set equal to one for workers and zero for non-workers. The statistics significant at 5 percent and 10 percent levels are indicated by * and ** respectively.

Also notice that apart from the parameter estimates in the OLS model the interpretation of regression coefficients in the probability models is not very straightforward. Therefore we postpone this task for the time being and rather concentrate on signs and significance of various parameters estimates. The first obvious observation is that the estimated values of intercept in all the models are highly significant, suggesting that there are many other factors not included in the analysis that could have significantly effect the labour force participation decision of women. This observation is further confirmed with low values of R^2 in OLS regression and low values of McFadden R^2 in Probit and Logit regression. However, this observation should not be taken as a poor reflection on the quality of our results. Low value of R^2 is a typical phenomenon in cross-section studies specially when the number of observations is in hundreds. There are inevitably many unknown factors affecting the variables under consideration, no matter how careful one tries to be in selecting the potential explanatory variables.

We find that woman's education level is very important in determining their labour force participation decisions. All the regression coefficients of woman's education dummies are positive and they monotonically increase with the education level. Thus there is a clear evidence to conclude that the women with higher level of education are more likely to participate in the labour force. The results comply with the conventional economic interpretation of Becker's (1965) theory of household production and time allocation. The higher the educational level of women, the higher is the opportunity cost for them producing the non-market output and higher the probability of participating in the income producing activities outside the home.

The distance from the district is another factor that has significant influence on the labour force participation decision of women. The results indicate that the women who live at a great distance from the district headquarter are more likely to participate in the labour market. At first sight this result appears difficult to interpret. Data show that about 30 percent of women live in villages and their participation rate is higher than the one in the remaining subset. One of the reasons for this unexpected result is that the participation rates are higher in the city and villages than in the towns and the majority of sampled women in city and villages live further far away from the district headquarter than those living in the towns.

Wage income of husbands is another important factor influencing the labour force participation decision of wives though the relevant regression coefficient is not found to be significant in linear probability model. In any case the evidence suggests that increase in wage income of husbands reduce the probability of their wives participation in the labour force. Similar results are found with respect to net wealth of the family and the number of other workers (other than husband and wife) in the family. Thus the women living in economically better-off families are less likely to participate in the labour force. These results suggest that the economic need and hardship is an important factor to push women to the labour market. Thus the women, whose husbands do not earn much or those who do not have enough wealth to live own or those who live in the family where there are not many other earners, have to participate in the labour market in order to supplement their families' income.

The family set-up in which the women live has a significant relationship with their labour force participation pattern. The results show that women living in joint families

participate more than those living in the nucleus families. The most plausible explanation for this result is that the pressure of many persons in the joint family reduce the pressure of households chores and the educated women can offered to come out of the home and work for cash reward. The result also implies that there is no significant adverse pressure of relatives in the joint families against women participation. Another interpretation could be that since the joint families are expected to be larger than the nuclear families, they can more effectively exploit the economies of scale through the division of labour. Thus the educated women living in joint families are more likely to work for cash reward, while the uneducated ones are assigned the job of household activities.

Finally, we find that the probability of female labour force participation increases with the increase in age of women. A simple interpretation of this result is that younger women would hardly command decent wages due to low level of education and lack of experience and training. They would rather prefer to improve their educational qualification and/or acquire some training before stepping into the labour market.

For the interpretation of regression parameters, we have computed the probability derivatives for all the variables. These derivatives measure the effect of one unit change in an explanatory variable on the probability of labour force participation. For a dummy variable the probability derivative measures the change in the probability of labour force participation when the dummy variable takes the value of 1 rather than zero. It should also be obvious that the probability derivatives in the linear probability model are directly given by the corresponding regression coefficients. Since the Probit and Logit models are non-linear, their probability derivatives are not constant. Therefore we estimate these derivatives at the mean of the sample. The estimates presented in Table 7 are found to be quite consistent across the three models.[4] For example according to the linear estimates the probability of labour force participation for a woman with senior secondary level education is higher than that for a woman with secondary level education by 0.16 (or 16 percentage points). The corresponding figure both in the Probit and Logit models is 0.15 (or 15 percentage points). Similarly according to the linear model the probability that a woman with a bachelor degree participates in the labour force is 17.4 percentage points higher than that with matriculation. The corresponding figure for Probit and Logit models are 18.2 and 17.4 respectively. The probability derivative for the master level and professional level education can be interpreted likewise. As expected, the probability of labour force participation increases monotonically with the level of education. Thus, for example, senior secondary level education increases the probability of labour force participation by 15 to 16 percentage points as compared to the secondary level education. On the other extreme compared to the secondary level education, professional education increases the probability of labour force participation by at least 35.7 percent and at most 48.2 percent depending upon the model under consideration.

The results indicate that increase in the distance from the district headquarter by one kilometer results in increase in the probability of labour force participation by about 0.4 percentage points. Thus, for example, a woman living at 20 kilometer distance from the district headquarter is 4 percentage points more likely to participate in the labour force than the woman with otherwise similar characteristics but living at 10 kilometer distance.

[4]The only dissimilarity, between the linear and the non-linear models, is found in the effect of wage income of husbands on the labour force participation decision.

Table 7

Probability Derivatives with Respect to Independent Variables

Explanatory Variable	Linear Model	Normal (Probit) Model	Logistic (Logit) Model
Woman's Education Dummy =			
1 if Senior Secondary, 0 Otherwise	0.1602	0.1517	0.1502
Woman's Education Dummy =			
1 if Bachelors, 0 Otherwise	0.1740	0.1819	0.1735
Woman's Education Dummy =			
1 if Masters, 0 Otherwise	0.2822	0.3359	0.3353
Woman's Education Dummy =			
1 if Professional, 0 Otherwise	0.3573	0.4412	0.4822
Distance from the District Headquarter	0.0041	0.0037	0.0035
Monthly Wage Income of Husband	–0.0002	–0.0054	–0.0064
Net Wealth	–0.000016	–0.00001	–0.000009
Number of Other Workers	–0.1443	–0.1473	–0.1463
Family Set Up =			
1 if Joint, 0 otherwise	0.3324	0.3298	0.3207
Woman's Age	0.0244	0.0251	0.0259

Note: The dependent variable is set equal to one for workers and zero for non-workers.

The probability derivative for the wage income of husband is quite different between the linear model and the non-linear models. The difference would be most likely due to the presence of a few extreme values for husbands' income. Since the estimates based on non-linear models are preferable to the corresponding estimates based on the linear model, we do not give much credential to the latter. Thus considering the Probit and Logit estimates we find that an increase in wage income of husband by say 10000 rupees per month reduces the probability of their wives' labour force participate by about 6 percentage points.

Although the effect of net wealth of the family on women's labour force participate decision is statistically significant, but the magnitude of this effect is rather small. For example, if the net wealth of the family increases by 1 million rupees the probability of labour force participate of women decreases by about one percentage point only. On the other hand the effect of increase in number of other workers (other than husband and wife) in the family on women's labour force participate decision is quite prominent. For example, the addition of just one other worker in the family reduces the probability of women's labour force participate by at least 14 percentage points.

We find that the nature of family set up has very strong bearing on the female labour force participation decision. The women living in joint families are at least 32 percentage points more likely to participate in the labour market than those living in nuclear families.

Finally the women's age also has quite a sizeable impact on their labour force participate decision. An increase in the woman's age by one year is expected to increase the likelihood of her participation in the labour force by about 2 percentage points.

4.2. Estimates of the Wage Equation

Table 8 presents two sets of results for the wage Equation (4), one without correction for selectivity bias and the other with the correction. The regression coefficient of inverse Mills ratio is statistically insignificant and the regression coefficients of various variables are quite similar across the two equations. This implies that no systematic selectivity bias is introduced due to censoring of non-working women from the sample and any one of the two equations can be used for analysis. It thus follows that the non-working women in our sample with characteristics similar to those of the working women in the sample would have fetched the same earning rates as the working women, had they chosen to work. In any case the overall explanatory power of the two regression equations is quite impressive both in terms of overall explanatory power and the statistical significance of the individual regression coefficients.

Table 8

The Estimated Earning Functions

Explanatory Variables	Wage Equation with no Correction for Selectivity Bias	Wage Equation Corrected for Selectivity Bias
Intercept	2.427	2.439
	(13.92*)	(13.83*)
Woman's Education Dummy	0.134	0.153
= 1 if Intermediate, 0 Otherwise	(1.23)	(1.33)
Woman's Education Dummy	0.378	0.406
= 1 if Bachelors, 0 Otherwise	(3.62*)	(3.487*)
Woman's Education Dummy	0.788	0.846
= 1 if Masters, 0 Otherwise	(5.83*)	(4.94*)
Woman's Education Dummy	1.368	1.388
= 1 if Professional, 0 Otherwise	(5.35*)	(5.36*)
Years of Experience	0.105	0.107
	(3.59*)	(3.62*)
Experience Square	–0.0035	–0.003
	(–2.54*)	(–2.48*)
Years of Training	0.091	0.084
	(1.81**)	(1.63)
Woman's Occupation Dummy	0.594	0.607
= 1 if Doctors, 0 Otherwise	(2.84*)	(2.88*)
Woman's Occupation Dummy	–0.012	–0.008
= 1 if Lower Medical Staff, 0 Otherwise	(–0.10)	(–0.07)
Distance from the District Headquarter	–0.006	–0.005
	(–2.24*)	(–1.91**)
Inverse Mills Ratio		–0.054
		(–0.55)
N	99	99
R^2	0.685	0.685
Adjusted R^2	0.649	0.647
F-statistic	19.2	17.3

Note: The statistics significant at 5 percent and 10 percent levels are indicated by * and ** respectively.

As with the participation equations, the intercept in the wage equation is quite significant. Since the intercept measures the mean of the natural log of hourly earning rate when all the explanatory variables are set equal to zero, it follows that a woman with secondary education, no experience, no training, working as a teacher and living within the district headquarter would earns Rs 11.32 per hour according to the first equation and Rs 11.46 per hour according to the second equation. If such a woman works 40 hours per week she would earn about Rs 1800 or about US$31 per month.

The effect of education on hourly earning is positive and highly significant for the women with bachelor or higher degrees. Although the women with senior secondary education earn more than those with the secondary education, the difference is statistically insignificant. We also find that hourly earnings increase monotonically with the level of education. According to our estimates in the first equation for example, a woman with senior secondary education earns on average about 13.4 percent more than a woman with secondary education. Likewise compared to the women with secondary education, those with bachelors, masters and professional degrees earn on average 37.8 percent, 78.8 percent and 136.8 percent more respectively.

As in most of the studies the wage rate is found to increase at diminishing rate with years of experience. According to the first equation for example, for the women with no experience the instantaneous rate of return per year of experience is 10.5 percent. The rate of return declines to 10.4 percent, 9.1 percent and 8.4 percent for the women with one year, two years and three years experience respectively.

The effect of training on earnings is also positive, but the associated regression coefficient is not very significant. In any case the women with one additional year of training are rewarded with 9 percent increase in their earning rates. The earning rates of women also depend on their profession. The doctors are found to earn about 60 percent more than the teachers and the difference is statistically significant. On the other hand the woman classified in lower medical staff (midwives, health workers and health visitors) earn on average about 1 percent less than the teachers and the difference is highly insignificant. This means that the teachers and the lower medical staff make more or less the same earnings, while the doctors earn much more.

Finally our results show that with each kilometer increase in the distance from the district headquarter the earning rate decrease by about one half percent. Thus, although an increase in distance from the district headquarter increases the probability of LFP, it reduces the earning rate at the same time. In other words the women living in far-flung areas have no less probability of LFP, but their earning potential is inversely affected in a significant way. The women living far away from the district headquarter have limited job options to choose from, which adversely affect their earnings. Although they can travel to main city for a job but the traveling and time cost still constrain their choices.

4.3. Estimates of the Hours Equation

This brings us to the final stage of analysis that is the determination of work hours. The estimates of the hours-equation with and without selectivity bias correction are presented in Table 9. As with the wage equation, the selectivity bias is not found to be present in our estimates. Judged by the t statistics, inverse Mills ratio again appears a redundant variable and its inclusion in the regression equation does not have much effect on the parameters estimates.

Table 9

The Estimated Hours of Work Equations

Explanatory Variables	Hours Equation with no Correction for Selectivity Bias	Hours Equation Corrected for Selectivity Bias
Intercept	109.813	111.335
	(6.02*)	(5.69*)
Woman's Education Dummy	–11.577	–12.652
= 1 if Masters, 0 Otherwise	(–1.17)	(–1.14)
Woman's Education Dummy	40.232	39.676
= 1 if Professional, 0 Otherwise	(1.67**)	(1.63)
Woman's Occupation Dummy	41.145	41.296
= 1 if Doctors, 0 Otherwise	(2.62*)	(2.61*)
Woman's Occupation Dummy	29.226	29.555
= 1 if lower Medical Staff, 0 Otherwise	(3.50*)	(3.47*)
Woman's Hourly Wage Rate	0.183	0.183
	(1.42)	(1.42)
Woman's Age	1.316	1.215
	(2.26*)	(1.65)
Number of Children	–3.037	–3.119
	(–1.28)	(–1.29)
Number of Dependents (Other than Children)	–2.504	–2.544
	(–1.20)	(–1.20)
Inverse Mills Ratio		1.577
		(0.23)
N	99	99
R^2	0.478	0.478
Adjusted R^2	0.432	0.426
F-statistic	10.3	9.07

Note: The statistics significant at 5 percent and 10 percent levels are indicated by * and ** respectively.

The overall explanatory power of regression equation is not very impressive. Although the value of R^2 is reasonably high, most of the regression coefficients are statistically insignificant. Only a few variables account for most of the variation in the hours of work equation. The main reason for this result is that in most cases the workers do not have free choice on work hours; they have to work more or less fixed number of hours per day and fix number of days per week. This also explains as to why the estimated intercept is extraordinarily large and significant.

The education level of the workers does not have much effect on their hours of work. The preliminary results show that hours of work are not much different across secondary, senior secondary and bachelor levels of education. The results presented in the table show that the women with masters degree on average work about twelve hours per month less than the women with secondary education, but the difference is statistically insignificant. On the other hand the women with professional degree work much longer hours than those with secondary education and the difference is marginally significant. The reason is that women with professional degrees have more options to work extra hours. On average a woman with professional degree works about 40 hours more during a month than the one with the secondary level education.

The effect of women's occupation on hours of work is most prominent among all the variables. Doctors are found to work about 41 hours more in a month than the

teachers, while those employed as lower medical staff work about 29 hours more than the teachers. In both cases the difference is statistically significant.

Contrary to expectations, the effect of wage rate on hours of work is not very significant. In a static leisure-income choice model, these results could have been explained by arguing that the income effect of an increase in wage rate can mostly offset the substitution effect. In the intertemporal leisure-income choice model, on the other hand, the theoretical effect of wage rate on the work hours is unambiguously positive. The following argument can plausibly explain our results. Not all the women participate in the labour force as a result of their long-term planning. Many of them are casual workers who enter or exit the labour force in response to changes in circumstances like changes in financial position of the family, marriage, birth of a child, etc. The behaviour of those who work on long-term basis is closer to the life cycle theory. Thus, an increase in wage rate is expected to induce longer hours of work. On the other hand, casual workers' behaviour is closer to the one in the static model. For them the effect of wage rate on work hours is ambiguous. For some of them, labour supply curve could well be backward bending. Since we have a mixed sample consisting of both the 'serious' and casual workers, the effect of wage rate on work hours is somewhat weak. In any case, one rupee increase in hourly wage rate results in about 0.18 additional hours of work per month. To translate this response into a more understandable figure, consider a woman who works 40 hours per week or 160 hours per month. For this woman if the wage rate increases by Rs 1000 per month, she will be inclined to work for the extra 1.125 hours per month. The magnitude of response to changes in wage rate is therefore quite weak.

We also find that the hours of work increase with the woman's age and the relationship is statistically significant. For example, increase in age by 10 years results in 13 hours increase in work hours per month. A large number of women in the sample (about 98.5 percent) are no more than 45 years old and the majority (84.6 percent) is even younger (up to 35 years of age). Thus, young women who have not yet reached the peak age of work, dominate our sample. This explains why hours of work keep on increasing with age.[5]

Finally our results show that an increase in the number of children or other dependents results in reduced hours of work, but the two effects are statistically insignificant. If we compare this result with the results on labour force participation, we are lead conclude that although the increase in number of children and the other dependents do not affect the women's labour force participation decision, they do constrain their choices on the hours of work.

5. CONCLUSION

This study has analysed the married women's labour supply decision both in terms of labour force participation decision and the hours allocated to earning activities. The study also analyses the earning function of the women who decide to participate in earning activities. The analyses is conducted as a case study confined to the women living in the district Mandi Bahauddin, a typical district of the Punjab (Pakistan), which has a mixed rural and urban blend and is inhabited mainly by lower-to-upper middle class

[5]In our preliminary analysis, we also included square of age as an additional explanatory variable but it turned out to be a redundant variable.

families. The sample consisted of currently married women with at least secondary school (10 years of schooling) education. The study also takes into account the possibility of sample selection bias by employing Heckman's three-stage estimation procedure.

The empirical results suggest that there are strong and systematic factors that explain the labour force participation decision of women in the district. The main findings of the study are as follows. The woman's education level appears to be the most important factor in influencing their LFP decision as well as their earning potential. The women who are better educated are more likely to work for cash rewards and their hourly earnings are also higher. However, education level does not have much effect on the hours that women allocate to paid work. Only the women with professional qualification, who have enough options available, work longer hours than those with any other educational qualification.

The financial position of the family, in which a woman live, significantly influences her labour force participation decision but it does not have any bearing on her hours of work. The women whose husbands earn low incomes and who live in families with low assets or fewer other workers are more likely to participate in the labour force. Therefore, one of the main factors that bring women to the labour force is economic pressure and hardship.

The women living in joint families are not socially constrained from participation in the labour market; they are rather more likely to participate in the labour force due to availability of other family members to work at home. Thus joint families seem to exploit the economies of scale through division of labour, whereby educated women specialise in paid work while uneducated women are expected to perform home activities. The study also finds that the older women are not only more likely to participate in labour force than the younger ones, those who do participate also work longer hours.

Another important finding is that the education level of husbands, mothers or fathers does not influence the labour force participation decision of married women. Thus, apart from economic pressure, women appear to be independent in decision-making while choosing between work for cash rewards and home activities.

Besides the level of education, other factors that affect a woman's earning rate are the other human capital variables like experience and training, the nature of occupation and the distance from the central city. The return to experience and training is positive as expected. Furthermore the return to experience is also diminishing as is well founded in the literature. The hourly wage rate for teachers is more or less the same as for lower medical staff while the doctors earn much more, as expected. Women who live in far-flung areas have to choose a job from a limited set of options; therefore they have to be content with relatively lower wage rates.

When it comes to hours of work, women do not have much choice; most of them are engaged in such profession where the hours of work are institutionally fixed. The only major factors that influence hours of work are the nature of occupation and the woman's age. The women employed as lower medical staff work much longer hours than the teachers and the doctors work even more. The older women are on average found to work longer hours than the younger ones.

On the whole the study finds that economic factors are most important in influencing the labour force participating decision of women and in shaping their wage

and work profiles. Some of the social factors considered in the study do not appear to have adverse effect in this regard. For example women living in joint families are not socially constrained from participating in labour force. Their labour force participation rate is also not adversely affected just because they are married to uneducated husband or born to uneducated parents. Finally, apart from the age of women themselves, demographic characteristics of families do not have any major impact either on the labour force participation decision of the women or their choice of work hours.

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