CHAPTER FOUR

DETERMINANTS OF WOMEN'S LABOUR FORCE PARTIPATION AND EARNING FUNCTIONS

4.1 Introduction

There has been strong and growing interest in determinants of female labour force participation in developing countries as many researchers were of the opinion that the composition of models for female labour force participation in developing countries are different from that of developed countries. The difference in composition of models between developing countries and developed countries lies in the way the informal sector is addressed. Developing countries are usually characterised by a large informal sector, often larger the formal sector. Results from studies that differentiated the formal and informal sectors indicate that child care cost is higher in the formal sector compared to informal sector. In addition, other fixed costs, such as transportation cost is often higher in developed nations. Therefore, when formulating female labour force participation models, the difference in cost of participation must be taken into consideration (Hill, 1989; Tiefenthaler, 1994).

Previous research in this area often applies dichotomous models used in developed countries such as United States to model determinants of female labour force participation (Tiefenthaler, 1994). However, in recent years, studies such as Hill (1989) and Tiefenthaler (1994) have used models that have triple choices and quadruple choices respectively; thus including work in the informal sector as a choice.

Despite the drawbacks discussed above, dichotomous models continue to be a popular choice among researchers who undertake studies in developing countries (Cox and Psacharopoulos, 1992; Wong and Levine, 1992; and Winter; Malhotra and Degraff, 1997). This study applies dichotomous models to determine female labour force participation for both urban and rural areas, mainly due to lack of information on fixed costs.

4.2. The Determinants of Female Labour Force Participation

This section tries to identify major determinants of individuals' labour force participation decisions. The *Probit* equations were estimated separately for each community instead of common equation with dummy variables to represent communities. *Probit* equations are used instead of ordinary least squares (OLS) as regression assumes that the observations are random sample of a population. However, in this case, the sample of working women in the population is not a random sample, but a truncated one. In other words, the sample only covers people whose offered wage exceeded their reservation wage. Therefore, estimates will yield bias results. In order to correct the selectivity bias, a two-step procedure suggested by Heckman (1989) is used. The first step involves estimating the *Probit* equation, and computing the inverse Mill's ratio (Lambda). In the second step, in order to correct for selectivity, earnings function is estimated using OLS regression, with Lambda is included as a regressor.

The independent variables included in the *Probit* equations are age, years of schooling, number of children and household income. Table 4.0 shows the mean and standard deviation of selected determinants of female participation equation.

Age is an important determinant of female labour force participation and previous studies such as Psacharopulous and Cox (1992) found its effects to be large. An individual in her teens would be less likely to be in the work force because of opportunities for schooling, and a long work life ahead to earn a return to schooling. However, as the primary motivation for this survey was to investigate fertility patterns, the data include only married women during their child-bearing years (between 15 to 39 years). Consequently, one must be careful in making population inferences on the effect of age on labour force participation. The average age for this sample is about 30 years.

The average years of schooling is highest among the women from Kota Baru (an average of 9.29 years of schooling), while women from Carey Island are on the other extreme with an average of 5.32 years of schooling.

Age and years of schooling are important determinants of female labour supply as they affect reservation wage directly. Most studies include age and education into equations as a series of dummy variables. The ages are usually grouped together, often by five year intervals, while educational attainment is distinguished by level. However, in this study, age and education levels is entered into the *Probit* equation as number of years.

The other regressors included in this study are the number of children below six years old and those aged between 6 to 14. Evidence suggest that children have an important effect on the labour force participation decision of married women (Ashenfelter and Heckman, 1974; Nakamura and Nakamura, 1992). In fact, according to a study by Nakamura and Nakamura (1992), child status variable account for a large share of explained variation in empirical studies of female labour supply . The child status variable in this study was segregated into categories as it is generally predicted that the presence of children below

Table 4.1
Means and (Standard Deviations) of Variables for Probit Equation

Variable	KB	PK	PC	KM	KC	KI
Age of respondent	30.26	30.68	30.87	31.45	31.18	31.02
	(5.47)	(5.41)	(5.79)	(5.68)	(5.14)	(5.58)
Years of schooling	9.29	5.51	5.32	8.92	7.89	6.76
	(6.09)	(3.01)	(3.60)	(11.23)	(7.22)	(3.44)
No. of children below 6	1.30	1.30	1.16	1.24	1.17	0.85
	(0.99)	(1.02)	(1.04)	(1.03)	(0.89)	(0.87)
No. of children	1.34	1.58	1.58	1.69	1.16	1.58
between 6 to 14	(1.41)	(1.50)	(1.59)	(1.51)	(1.20)	(1.46)
Household income	0.45	0.74	0.22	0.64	0.92	0.56
('000')	(0.50)	(0.44)	(0.42)	(0.48)	(0.27)	(0.50)

Note KB = Kota Baru, PK = Pulau Ketam, PC = Carey Island, KM = Malays from Klang, KC = Chinese from Klang, KI = Indians from Klang.

six years of age will increase the value of a woman's time in the house and in turn lower her probability of participating in the labour force. Heckman (1974) predicted that having one child below six will raise the asking wage of women by 15 percent, thus lowering her participation. Similarly, Velez and Winter (1992) found that the predicted probability of a woman participating in the labour force is .20 if there are young children in the household and .25 if no young children are present. Having older children (7-14 years) also raises the value of woman's in the house, but the effect is not as strong as for young children.

Household income is also included as regressor as it is generally used as a proxy for wealth. Higher household income is expected reduce the value of woman's time at home, relative to that of her market time. Therefore, household income is expected to have a negative impact on female labour force participation.

The geographic area is also expected to affect female labour force participation. Urban women are generally expected to have a higher labour force participation compared to rural dwellers as urban women are expected to have more liberal views towards

employment. Instead of using dummy variables to represent the communities, the participation decision for each community has been estimated separately. Such segregation makes it easier to explain the variation among communities.

4.3 Probit Results of Female Labour Force Participation

The *Probit* results to predict the probability of married women's labour force participation is presented in Table 4.2 and Table 4.3 below. The chi-square statistics are significant across the six communities, indicating that the selected determinants influence labour force participation decision.

Coefficients for number of children below six years are negative across the communities, with the exception of Carey Island, implying that the probability of a married woman working declines with the presence of young children. In the case of Carey Island, the plantation owners have provided child-care centre for young children. Therefore, it is not surprising that the presence of children has a positive effect on labour force participation. In addition, with the exception of Kota Baru and Carey Island, coefficients for young children are significant across all the communities.

Coefficients for number of children aged between 6 to 14 are positive across all communities, with the exception of Pulau Ketam and Indians from Klang. However, t-statistics reveals that the coefficient for both the communities are insignificant.

Other than Malays from Klang, the relationship between age coefficients and labour force participation are positive across all the communities. Generally, the probability to participate in the labour force is higher among single women compared to married women. However, as this survey only included married women aged between 15 to 39

Table 4.2
Probit Estimates for Females from Rural Communities

Variable	Kota Baru	Pulau Ketam	Pulau Carey
Constant	-1.68	2.39	-1.57
	(-1.59)	(-1.69)*	(-1.31)
No of children below 6	-0.58	-0.21	0.34
	(-4.16)*	(1.36)	(1.90)
No of children from 6 to 14	0.04	-0.22	0.30
	(0.32)	(1.56)	(1.99)*
Household income ('000')	0.96	0.62	-0.52
	(3.30)*	(1.70)*	(-1.19)
Age of women	0.07	0.35	0.07
	(2.10)*	(0.86)	(1.79)*
Years of schooling	0.10	0.04	0.004
	(2.34)*	(0.09)	(0.67)
Chi-square	46.81	15.82	22.11
Log- likelihood	332.60	258.63	208.31
No of observations	317	201	203

Note Absolute t-statistics in parentheses. * indicates that coefficient is significant with at least a 95 percent level confidence.

years, it is not possible to make such comparisons. The coefficient are only significant for women from Kota Baru, Carey Island and Indians from Klang.

Years of schooling coefficients have the expected positive sign for all communities, with the exception of Indians from Klang. The implication is that the probability of women working increases with the years of schooling. Despite showing the expected sign, the coefficient is only significant for the Kota Baru, Malays and Indians from Klang

The only surprising finding in Table 4.2 and 4.3 is coefficients for household income. Excluding the Carey Island community, coefficients for all the other communities are

Table 4.3
Probit Estimates for Females for Urban Communities

Variable	Malays from Klang	Chinese from Klang	Indians from Klang
Constant	-0.85	-2.07	-1.42
	(-0.74)	(-1.56)	(-1.19)
No of children below 6	-0.54	-0.50	-0.53
	(-3.14)*	(-2.79)*	(-2.67)*
No of children from 6 to 14	0.19	0.03	-0.18
	(1.45)	(0.19)	(-1.31)
Household income ('000')	1.47	0.54	1.32
	(4.22)*	(0.96)	(4.05)*
Age of women	-0.01	0.05	0.06
	(-0.31)	(1.53)	(1.81)*
Years of schooling	0.03	0.08	-0.09
	(1.73)	(1.42)	(-1.83)*
Chi-square	41.77	34.84	16.63
Log- likelihood	250.68	258.39	249.11
No of observations	215	200	206

Note Absolute t-statistics in parentheses. * indicates that coefficient is significant with at least a 95 percent level confidence.

positive, implying that women with higher household income have higher probability of participating in the labour force.

4.4 Earnings Functions

The earnings function has been formulated based on the standard Mincerian wage earning equation, where log of monthly earnings (LWAGE) are regressed on level of schooling, experience, and experience squared, log hours.

Unlike the participation equations, a set of dummy variables are used in the earnings function, with university level serving as reference group. Alternatively, for communities

that do not yield any respondents with university level education, pre-university level is used as the reference group. The dummy variables are defined as PR for individuals who have completed primary education (six years), LS for those who have completed lower secondary education (nine years of schooling), US for those who have completed upper secondary education, PU for those who have completed pre-university education.

Experience (EXP) variable used here is actually potential experience as (i.e., *Age –years of schooling –7*). The potential experience is used as a proxy for real experience. However, as females move in and out of labour force (i.e., maternity leave), potential experience will be an over estimate of their actual experience. In addition, the experience squared (EXP^2) is also entered as an independent variable to test if the earnings function is parabolic in the experience term.

The log of monthly hours (LHOUR) worked is also included on the right hand side of equation rather than using the log of hourly wage as the left hand side variable, in order to allow the elasticity of earnings to hours to differ from one.

In order to overcome sample selection bias, the inverse Mills (Lambda) is included as a regressor in the OLS wage equation. A positive Lambda value implies that characteristics that make an individual more likely to be in the work force also lead to higher earnings, while a negative Lambda value means that characteristics associated with staying out of the work force lead to higher earning.

Table 4.4
Means and Standard Deviations of Variables Included in Wage Equations

ocation	KB	PK	PC	KM	KC	KI
R	0.17	0.75	0.74	0.37	0.53	0.45
	(0.37)	(0.44)	(0.44)	(0.49)	(0.50)	(0.50)
S	0.28	0.14	0.14	0.27	0.19	0.28
	(0.45)	(0.34)	(0.34)	(0.45)	(0.40)	(0.45)
US	0.36	0.03	0.03	0.30	0.18	0.10
	(0.48)	(0.18)	(0.18)	(0.46)	(0.39)	(0.31)
PU	0.12	-	-	-	0.04	-
	(0.33)				(0.20)	
EXP	13.91	19.02	19.01	14.59	16.57	18.78
	(9.18)	(7.66)	(7.66)	(15.17)	(12.46)	(7.33)
EXP2	277.53	419.32	419.32	440.34	425.03	406.10
	(388.52)	(266.34)	(266.34)	(752.28)	(660.52)	(256.04)
LHOUR	5.57	5.02	5.47	5.27	5.22	5.41
	(0.27)	(0.64)	(0.18)	(0.55)	(0.50)	(0.36)
LWAGE	6.16	5.70	5.7	5.58	5.89	5.75
	(0.75)	(1.02)	(1.02)	(0.07)	(0.90)	(0.79)

Means and standard deviations for the variables are shown in Table 4.4. For all levels of education, women from Kota Baru have the highest average. Similarly, they also earn higher wages compared to other communities.

To see whether adjustment for sample selection makes a big difference for rates of return to schooling and experience, the earnings functions were estimated with and without Lambda. The results are presented in Table 4.5 and Table 4.6. Examining the non-corrected model for Kota Baru, females earn a higher return to primary and pre-university education, but a lower return to lower secondary and upper secondary education. The coefficient of experience is identical for both the corrected and uncorrected regressions.. The Lambda coefficient is negative and significant indicating the uncorrected regression coefficients are biased.

Table 4.5
Estimates for Earnings Functions (Rural Communities)

Variable	Corrected for selectivity			Uncorrected for selectivity		
	KB	PK	PC	KB	PK	PC
Constant	7.43	1.20	3.14	3.82	2.11	2.59
Level of schooling						
PR	-0.06	-0.13	-0.16	0.09	-0.09	-0.18
LS	0.16	-0.06	0.10	0.12	-0.03	0.09
US	0.20	0.10	0.24*	0.12	0.10	0.24*
PU	0.21	-	-	0.22	-	-
EXP	0.05	1.36	0.82	0.05	1.30	0.86
EXP^2	0.005	-1.44	-0.85*	0.02	-1.36	-0.88
LHOUR	0.04	0.30*	0.20*	0.13	0.33*	0.20
LAMBDA	-0.24*	0.16	-0.15	-	-	-
Adj R-squared	0.09	0.07	0.12	0.04	0.06	0.10
N						

Note: * indicates that coefficient is significant with at least a 95 percent level confidence.
KB = Kota Baru, PK = Pulau Ketam, PC = Carey Island

Results for Pulau Ketam shows that returns to schooling and potential experience is lower for the model uncorrected for selectivity. In addition, the sign on experience squared is negative, indicating a concave earnings function. The Lambda is positive and insignificant at the 5 percent level, indicating that the characteristics associated with high earnings also increase the probability that the woman will be in the labour force.

The model corrected for selectivity in Carey Island has a lower returns to primary level of education and experience but a slightly higher return to lower secondary education. Coefficient for experience square carries a negative sign, indicating a concave earning

Table 4.6
Estimates for Earnings Functions (Urban Communities)

	Corrected for selectivity			Uncorrected for selectivity		
Variable	KM	KC	KI	KM	KC	KI
Constant	7.78	-15.67	2.72	7.79	4.43	2.49
Level of schooling						
PR	-0.27	-0.61*	0.17	-0.28	-0.63*	0.18
LS	0.20	-0.36*	0.23	-0.20	-0..37*	0.22
US	-0.31	0.05	0.32*	-0.30	0.04	0.32*
PU	-	-0.02	-	-	-0.019	-
EXP	-0.42	-0.07	0.34	0.39	-0.04	0.33
EXP^2	-0.41	0.03	-0.50	-0.40	0.05	-0.49
LHOUR	-0.09	0.22	.0.24*	-0.06	0.23*	0.24*
LAMBDA	0.08	0.24*	-0.03	-	-	-
R-squared	0.03	0.35	0.12	0.04	0.30	0.13
N						

Note: * indicates that coefficient is significant with at least a 95 percent level confidence.
KM = Malays from Klang, KC = Chinese from Klang, KI = Indians from Klang.

function. The Lambda is negative and insignificant at 5 percent level, implying that characteristics which earn a higher return also make a woman less likely to be in the work force.

Corrected equation for the urban Malay community shows a lower return to school for primary level but a higher return for the upper secondary level and experience. Coefficient for experience squared is negative, suggesting a concave earnings function. The Lambda is positive and insignificant.

Both corrected and uncorrected equation for the urban Chinese community show very high return to primary level and lower secondary level of schooling compared to the other communities. In addition, both the coefficients are negative and significant. The equation corrected for selectivity show a lower return to schooling for primary and lower secondary level, but a higher return to upper secondary and experience. Lambda is positive and significant at 5 percent level hinting that women with higher wages are also likely to have lower reservation wage.

The corrected earning function for urban Indian community shows a higher return to lower secondary education and experience, but a lower return to primary education. Coefficient for experience squared is negative, indicating a concave earnings function. Lambda is negative and insignificant implying that attributes that contribute to higher returns also reduce the probability of labour force participation.

4.5 Comparison across urban and rural communities

Comparison across the urban and rural Malay community shows coefficients for the independent variables are mostly insignificant, with the exception of Lambda which is significant in the rural Malay community. Consequently, the adjusted R^2 for both the communities are very low (9 per cent for rural community and 2 per cent for urban community). The Lambda for the rural community is negative, while the Lambda for the urban community is positive. This implies that characteristics which earn higher returns have opposite impact on the labour force participation of rural and urban women.

he experience squared variable is positive for the rural community but negative for rban community, implying that the earning function for urban community is concave.

oefficients for Lambda are positive for both the rural and urban Chinese communities, suggesting that the same variables associated with higher earnings also increase the probability of participation in the labour force. In addition, coefficients for primary, lower secondary and upper secondary level have the same signs across both communities. On the other hand, coefficient for experience squared has the opposite signs, with the earning function for rural community being concave. Adjusted R^2 is very much higher in the urban community as coefficients for Lambda, primary and secondary education level and hours worked are significant. In the rural community, only the coefficient for hours worked is significant.

The similarity across the urban and rural Indian communities are much stronger compared to Malay and Chinese communities. Coefficients for Lambda and experienced squared are negative across the rural and urban communities. Therefore, the characteristics that are identified with higher earnings, also reduces the probability of labour force participation. In addition, earning functions are concave for both communities. Coefficients for lower secondary, upper secondary and hours worked are positive in both communities. The only variation was found in the primary education level where coefficient in the rural community is negative, while the coefficient for the urban community is positive. In terms of significance, coefficients for upper secondary education and hours worked are significant in both community, while coefficient for

ence squared is significant for the rural community, but insignificant for the urban unity. Due to the similarities in both communities, the adjusted R^2 for both unities are very close (12.6 percent for rural and 12.4 per cent for urban).

important to point out that the return to education is much higher in urban munities compared to rural communities. This is closely related to diversity of upational structure among urban communities.

Comparison across ethnic groups

mong the rural communities, the adjusted R^2 is highest for the Indian community, llowed by the Malays and Chinese, implying that the earnings function has a better fit" when explaining female earnings for the Indian community. Return to experience s highest among the Chinese, followed by Indians and Chinese. Returns to primary level education was highest for the Indian community, followed by Chinese and Malay. For lower secondary level, the returns are highest among Malays, followed by Indians and Chinese. The Indians had the highest returns for the upper secondary level, followed by Malays and Chinese.

In the urban setting, the adjusted R^2 is highest for the Chinese, followed by Indians and Malays. Comparisons of returns to experience revealed that the Malays had the highest returns, followed by Indians and Chinese. However, returns to education was much higher among the Chinese compared to the other two communities.

5 Summary

ıe *Probit* participation equations, the presence of young children had the most gnificant impact on the labour force participation. For all the communities, with :ception of Carey Island, the effect of young children was negative, indicating that the 'esence of young children will reduce labour force participation of married women.

part from that, years of schooling showed consistent positive sign for all the ɔmmunities, except for urban Malay community. Such results imply that educated /omen are more likely to participate in the labour force.

rom the analysis of earnings functions, the inclusion of Lambda does show much 'ariation in the results. In addition, the Lambda is only significant for Malay community rom the rural area and the Chinese community from the urban area. Psacharopoulos and :zannatos (1992) pointed out not correcting for selectivity is not a serious limitation.

Γhe conventional human capital variables do not perform well in explaining both the ırban and rural sector earnings. The weak explanatory power of the regressors show that ɔne has to be careful in using the conventional models to explain behaviour in specific :ommunities. In addition, it also indicates that more research is needed to explain determinants of earnings in community level studies.

Returns to education is generally higher among the urban communities compared to the rural communities. With the exception of Malays from Klang, coefficients for hours worked showed a positive. This indicates that positive income effects have a much stronger bearing than negative effects.

Comparison across urban and rural communities show similarity among the Indians, while the comparison across the Malays and Chinese show high disparity.

The comparison across the ethnic groups do not yield any consistent patterns. From here, one can conclude that the characteristics of a community such as location, the development stage and the main income generating activities of the location have a much stronger effect on earning than culture and urban-rural differences.