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PART-TIME EMPLOYMENT OF MARRIED WOMEN AND FERTILITY IN URBAN JAPAN

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ABSTRACT

Previous studies of female labor force participation in Japan often show that the estimates of female wage rates are "negative" in their single-equation models of labor supply. Based on the common belief that the substitution effect dominates the income effect for female labor supply, to disentangle the problem of the inconsistency is, therefore, necessary for the purpose of predicting the behavior of female labor supply and for guiding policy actions.

In this paper, we have estimated a logit model of married women's part-time employment and a fertility equation in the context of a simultaneous-equation model. By specifically differentiating part-time employed married women from full-time employed married women, we find that the structural coefficients of the part-time labor supply are significantly different from those of the full-time labor supply in terms of elasticity. However, contrary to the result of married women's full-time employment, we find little interdependency between married women's decisions to work as part-time employees and their fertility in urban Japan.

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I. INTRODUCTION

In 1981, the number of married women with spouse present (hereafter, married women) was about 29.8 million, 49.4 percent of which were in labor force.[1] About 8 million of the married women in the labor force were employed in non-agricultural and forestry industries and 29 percent of them were part-time employees.[2]

In Japan, women generally give priority to housework after marriage. They stay in (or enter) the labor market only as long as their jobs do not conflict with their housework, e.g., preparing meals, cleaning house, and raising children. Married women who re-enter the labor market at a later date often work at firms of relatively small size and/or become part-time employees at low wages in the seniority dominant lifetime employment structure.[3] The greatest increase in part-time employment for married women has been witnessed in manufacturing, wholesale and retail trade and the service industries.[4] They tend to enter and leave with the business cycle because of the types of the industries where they are employed and partly because of their primary responsibility in the household.

Previous studies of female labor force participation in Japan often show that the estimates of female wage rates are "negative" in their single-equation models of labor supply (Hill 1982). In recent years, however, female labor supply has been successfully analyzed by Hill (1982, 1983, and 1984) and Yamada and Yamada (1984). Hill constructs a logit model which explains the behavior of female labor supply for both grouped and disaggregated data well. Hill finds that the ratio of female employees to the total number of females over age 15 is a suitable measure for the female labor force participation rate in Japan.[5] Subsequently, Yamada and Yamada (1984) estimated a simultaneous-equation model of married women's labor supply and fertility in urban Japan and found a significant interaction between the two. However, these previous studies have not fully analyzed the labor supply of part-time employed married women because Hill (1982 and 1984) treats full-time and part-time employees together while Yamada and Yamada (1984) studies only full-time employed married women. Therefore, there exists little empirical evidence of the factors influencing the behavior of part-time employed married women in Japan.[6]

There are several reasons why we consider it equally valuable to study the labor supply of part-time employed married women as well as their full-time counterparts.

First, their employment has grown in secondary and tertiary industries in past years. Wholesale, retail and services in tertiary industry are likely to grow further as the economy grows in the future. Secondly, because of the reduction of the young labor force, ages 15 through 19, employers hire married women as part-time employees not only as the main substitute to make up the reduction, but also as the labor force against cyclical contraction of the economy. The employers adjust the number of part-time employees as well as their hours of work in response to peak hours and peak seasons of business. This reflects the fact that the firms usually incur low quasi-fixed costs for married women's part-time employment due to less fringe benefits, less specific job trainings, and their wage scale which is excluded from the seniority system. Thirdly, the historical increase in women's life expectancy and the rapid decrease in marital fertility permit a longer span of potential working years for married women. Fourthly, the main motivation for married women to enter the labor market is to supplement the household income. Their financial contribution to the household has become increasingly important in the past several years: their average monthly earnings are nearly 11 percent of their husband's.[7] This factor seems to be more important in influencing the decision to work as future part-time employees. Finally, 34.4 percent of

women not in the labor market wished to have held a job in 1979. 45.1 percent of the potential labor force wanted to be part-time employees while 12.2 percent wanted to be full-time.[8] These observations indicate that we can no longer ignore part-time employed married women in the labor market.

The present paper focuses on married women's part-time labor supply and fertility in urban Japan in a simultaneous-equation model. The increasing number of married women's part-time employment and the falling marital fertility rate can be treated as endogenous variables subject to the household decisions in the "new home economics" (Schultz 1974). Although one might argue that the reasons for married women's decisions to work as a part-time employee would differ from the reasons of full-time employed married women (Luft 1975), we rather consider that their decisions to become part-time employees in Japan is subject to the similar socioeconomic constraints as the full-time employed married women on the basis of the reasons stated earlier and according to Takahashi (1983) and Japan (Labor White Paper 1983).

Our model, which uses corss-sectional market averages, has several advantages. These advantages are fully discussed in Cain and Dooley (1976), Link and Settle (1981), and Yamada and Yamada (1984), however, we will only point out a few remarks here. First, distinguishing married women from all females, and also

urban Japan from all Japan, will yield a relatively homogeneous group of married women. Secondly, variations in tastes and transitory wages within a given geographical area can be averaged out. Thirdly, our estimates will circumvent a simultaneous equation bias by explicitly treating both married women's part-time labor supply and fertility as endogenous variables in the model. Finally, our estimates will permit comparisons with the estimates obtained with Japanese data (Hill 1984, and Yamada and Yamada 1984) and United States data (e.g., Long and Jones 1980).

The plan of this paper is as follows: Section II describes our statistical model and briefly mentions theoretical predictions of the variables in the model. Section III reports the empirical results. Finally, section IV gives a summary of the findings.

II. THE SPECIFICATION OF MODEL

The variables in our model are cross-sectional market averages obtained from the 1980 Population Census of Japan. The ratio of part-time employed married women to the total population of married women over age 15 is defined as the labor force participation rate of part-time employed married women in a given prefecture "i" (hereafter, $PARTLFP_i$). $PARTLFP_i$ have their values between zero and one.[9] The logit model of married women's part-time labor force participation is defined as follows (Pindyck and Rubinfeld 1976):

$$P_i = F(Y_i) = \frac{1}{1 + e^{-AX_i}} , \quad \ldots\ldots (1)$$

where P_i is the probability of being in labor market as part-time employees for married women in the i-th prefecture; $F(\cdot)$ is the cumulative logistic probability function; and X_i is a vector of right-hand-side variables.

Equation (1) is rewritten after substituting $PARTLFP_i$ for P_i as follows (Neter and Wasserman 1974):

$$PTLFP_i^* = \log\left(\frac{PARTLFP_i}{1 - PARTLFP_i} \right) = A X_i + e_i^* , \quad \ldots\ldots (2)$$

where e_i^* is asymptotically distributed with mean zero and variance $(1/(TOTMAR_i \times P_i \times (1-P_i)))$. $TOTMAR_i$ is the total number of married women over age 15 in cities ("Shi" in Jpaneses) in the i-th prefecture.

The following simultaneous-equation model is estimated:

$$PTLFP_i^* = g(LNPATW_i, LNHINC_i, FERTI_i, UNEMP_i, INDMI_i, EDUCA_i, KIND5_i), \ldots\ldots (3)$$

$$FERTI_i = h(LNPATW_i, LNHINC_i, PTLFP_i^*, UNEMP_i, EDUCA_i, CHILQ_i), \ldots\ldots (4)$$

where the variables in the model are defined in Table 1. Equations (3) and (4) are estimated with the weights, $WGT_i = (TOTMAR_i \times PARTLFP_i \times (1-PARTLFP_i))^{1/2}$ and $(TOTMAR_i)^{1/2}$, in the above simultaneous-equation model, respectively.

Tables 1 and 2 present the difinitions of the variables and their statistics in the model. The theoretical reasons for including the variables in each equation and their expected signs are extensively discussed in the literature (Ben-Porath 1973, Cain and Dooley 1976, Cain and Weininger 1973, De Tray 1973, Fields 1976, Fleisher and Rhodes 1976 and 1979a,

Long and Jones 1980, Michael 1973b, and Willis 1973). We will, therefore, comment on only some of the variables in each equation.

Concerning equation (3), a labor supply equation, women's part-time market wage rate ($LNPATW_i$ in natural logarithm) will have a positive effect on married women's part-time labor force participation because the higher market wage rate will cover more individuals with different reservation wages, ceteris paribus (Ben-Porath 1973). The bearing and raising of children are women's time-intensive nonmarket activities, which will inhibit market work by married women (Cain and Dooley 1976). Therefore, an increase in the fertility rate ($FERTI_i$) is expected to have a negative effect on married women's labor supply. The effect of market unemployment rate ($UNEMP_i$) on married women's labor supply is ambiguous, although a negative discouraged worker effect seems to dominate a positive added worker effect in Japan (Furugori 1980) and in the United States (Bowen and Finegan 1969, Cain and Dooley 1976, Dooley 1982, Fields 1976, and Fleisher and Rhodes 1976 and 1979b). An industry mix variable ($INDMI_i$) represents employment opportunities for women and its effect should be positive (Bowen and Finegan 1969, Cain and Dooley 1976, Fields 1976, and Fleisher and Rhodes 1976 and 1979b).[10]

The sign of female education ($EDUCA_i$) is expected to be negative, based on previous works (Hill 1984, and Yamada and Yamada 1984). Shapiro and Shaw (1983) argue, whether or not higher educational attainment for married women increases their labor supply depends on the relative strength of a higher market wage and a greater shadow price of time. In a married women's labor supply equation with their market wage rate and education as the explanatory variables, the coefficient of their education reflects the shadow price of time and the sign is, therefore, expected to be negative. On the other hand, female education may reflect their tastes for market work and/or access to jobs with nonpecuniary benefits (Cain and Dooley 1976). Also this may have a nonneutral effect on the productivity of time in the labor market more than that of time spent in household production (Leibowitz 1974). These hypotheses, therefore, predict a positive effect of $EDUCA_i$ on women's labor supply. Recent empirical work with United States data shows that the sign is significantly positive for married women, e.g., Dooley (1982) and Fleisher and Rhodes (1976), whereas Cogan (1981), Long and Jones (1980) and Shapiro and Shaw (1983) find a negative association.[11] The proportion of children who go to either nursery schools or kindergartens ($KIND5_i$) will have a positive effect because those available facilities will provide a good opportunity for married women to

substitute for their own time-inputs into childrearing (Schultz 1978).

With respect to the fertility equation (4), women's part-time wage rate ($LNPATW_i$) and married women's part-time labor supply ($PTLFP_i^*$) are expected to have a negative effect on married women's fertility ($FERTI_i$) because they will reflect the opportunity costs of bearing and raising children (Cain and Dooley 1976, Cain and Weininger 1973, Link and Settle 1981, and Schultz 1974). The negative sign on $LNPATW_i$ is expected on the basis of the assumption that the negative substitution effect dominates the positive income effect on fertility. The effect of the husband's income ($LNHINC_i$ in natural logarithm) is expected to be positive, ceteris paribus. Female education ($EDUCA_i$) is used as a proxy variable for effective contraceptive knowledge and the expected sign, therefore, will be negative (Cain and Dooley 1976, Cain and Weininger 1973, Hashimoto 1974, and Michael 1973b). The quality of children ($CHILQ_i$) is included to observe "the" proper coefficient of $LNHINC_i$ and the coefficient of $CHILQ_i$ will be negative because of the substitution of the quality and quantity of children (Becker and Lewis 1973).[12]

Finally, both labor supply and fertility equations are estimated by a method of two-stage least squares (2SLS).[13] Since the both equations in the model are not exactly identified,

we use asymptotic t-statistics to evaluate the second-stage estimates (Fleisher and Rhodes 1976, and Maddala 1974). As mentioned earlier, since the labor supply equation is the logit transformation, its F-statistic is reported for evaluation rather than R-square (Hill 1984).

TABLE 1

Definitions of Variables

Variable Name	Definition
PARTLFP	Proportion of married women over age 15 in cities ("Shi" in Japanese) whose employment status is "worked beside doing housework" in 1980.
TOTMAR	Number of married women over age 15 with spouse present in cities in 1980.
FERTI	Number of live births per 1,000 married women over age 15 in cities in 1980.
LNPATW	Ln (natural logarithm) women part-timer's average normal cash earnings per hour in industries for all sizes of enterprises in 1980 (in 1,000 yen), which is deflated by the cost-of-living index of cities with prefectural government in 1980.
LNHINC	Ln (natural logarithm) monthly income by husband living in prefectural government in 1980 (in 1,000 yen), which is deflated by the cost-of-living index of cities with prefectural government in 1980.
UNEMP	Proportion of total unemployment over age 15 in cities in 1980.
INDMI	Index of industrial structure, defined as $\sum K_i IND_i$, where K_i is the proportion of female employees of industry i in all cities in Japan and IND_i is the percentage of employees in industry i in all cities in prefecture in 1980.
EDUCA	Proportion of females over age 15 in cities, who completed at least senior high school in 1980.
KIND5	Proportion of children 5 years of age in cities, who go to either nursery schools or kindergartens in 1980.

(continued on next page)

TABLE 1 (continued)

Variable Name	Definition
CHILQ	Sum of prefectural educational expenditures of elementary schools, junior high schools, and senior high schools per pupil in the 1979 fiscal year (in 1,000 yen), which is deflated by the cost-of-living index of cities with prefectural government in 1979.
EMPCH	Proportion of employment change 1978-1980, defined as $(EMP_{1980} - EMP_{1979})/EMP_{1979}$, where EMP_t is number of employees in prefecture in year t.
CHILD	Number of children aged between 1 and 5 per married women over age 15 in cities in 1980.
PRIC8	Index of the cost-of-living of cities with prefectural government in 1980 (Japan=100).
PRIC7	Index of the cost-of-living of cities with prefectural government in 1979 (Japan=100).
PRELFP	Proportion of married women over age 15 in prefecture whose employment status is "worked beside doing housework" in 1980.
PREMAR	Number of married women over age 15 with spouse present in prefecture in 1980.
LNMALE	Ln (natural logarithm) male average monthly cash earnings per regular employee in all industries in prefecture in 1980 (in 1,000 yen), which is deflated by the cost-of-living index of cities with prefectural government in 1980.
PREUNP	Proportion of total unemployment over age 15 in prefecture in 1980.
PREIND	Index of industrial structure, defined as $\sum H_i INDST_i$, where H_i is the proportion of female employees of industry i in Japan and $INDST_i$ is the percentage of employees in industry i in prefecture in 1980.
PREEDU	Proportion of females over age 15 in prefecture, who completed at least senior high school in 1980.
PREKIN	Proportion of children 5 years of age in prefecture, who go to either nursery schools or kindergartens in 1980.

TABLE 2

Statistics and Sources

Variable Name	Mean	Standard deviation	Source
Urban Prefecture			
PARTLFP	0.229	0.028	... 1980 Population Sensus of Japan (1980 Census)
TOTMAR	470.6	530.1	... 1980 Census (in 1,000)
FERTI	55.17	6.205	... 1980 Census, and Vital Statistics 1980
LNPATW[a]	0.486	0.031	... Wage Census (in 1,000 yen)
LNHINC[a]	294.9	24.05	... Annual Report on the Family Income and Expenditure Survey 1980 (in 1,000 yen)
UNEMP	0.027	0.010	... 1980 Census
INDMI	33.24	0.573	... 1980 Census
EDUCA	0.503	0.062	... 1980 Census
KIND5	0.944	0.049	... 1980 Census
CHILQ	1492.	124.2	... Japan Statistical Yearbook 1980 (in 1,000 yen)
EMPCH	0.274	0.158	... 1980 Census
CHILD	0.307	0.031	... 1980 Census
PRIC8	101.1	2.348	... Japan Statistical Yearbook 1982
PRIC7	101.4	2.496	... Japan Statistical Yearbook 1982
All Prefecture			
PRELFP	0.242	0.028	... 1980 Census
PREMAR	627.1	541.9	... 1980 Census (in 1,000)
LNMALE[a]	232.7	19.75	... Year Book of Labor Statistics 1980 (in 1,000 yen)
PREUNP	0.025	0.010	... 1980 Census
PREIND	33.53	0.769	... 1980 Census
PREEDU	0.465	0.071	... 1980 Census
PREKIN	0.945	0.045	... 1980 Census

Note. [a]Statistics are not natural logarithmic values.

III. EMPIRICAL RESULTS

The model of simultaneous equations discussed in the previous section was applied to the urban areas from 47 prefectures in 1980. The model was estimated with weighted data by a method of two-stage least squares (2SLS). Table 3 reports the estimates of the structural coefficients obtained by 2SLS. Model I consists of the logit equation of married women's labor supply as part-time employees (I-(1)) and the fertility equation (I-(2)). Model II is the same specification as Model I but the labor supply is measured by the proportion of married women who are part-time employees, PARTLFP, which is, therefore, not the logit transformation. Table 4 reports the empirical results under the assumption that the behavior of married women's part-time labor supply is not simultaneous but independent of their fertility behavior. Equations (3) and (4) in Table 4 are a single-equation logit model estimated by a method of generalized least squares (GLS) for the urban areas and all (urban and rural together) areas from 47 prefectures in Japan, respectively. Table 5 summarizes our recent findings of the wage and income elasticities of married women's labor supply.

3-1. Labor Supply

The estimates of the labor supply equations are generally consistent with the economic hypotheses and statistically significant at the various significance levels. Since most of the estimates in elasticity terms change little in Model I-(1) and Model II-(1) in Table 3 and equation (3) in Table 4, our following discussion is made mainly about the results of Model I-(1).

The logit model of the married women's part-time labor supply (Model I-(1) in Table 3) is statistically significant at the 1% significance level (F-statistic=10.70). The estimated coefficient of the women's part-time wage variable (LNPATW) is significantly positive. To recover the partial derivative of LNPATW, we multiply the coefficient, 0.904, by 0.177 (=0.229x(1-0.229)) where 0.229 is the sample mean of the proportion of married women as part-time employees (PARTLFP). Since LNPATW is in a natural logarithmic form, the point estimate of the elasticity of PARTLFP with respect to LNPATW will be obtained by dividing the value of the partial derivative, 0.160 (=0.904x0.177), by 0.229, which results in about 0.7 at the sample mean. This wage elasticity is more than three times as large as that of urban full-time employed married women's, 0.2 as shown in Table 5, although the former is slightly larger than the wage elasticity of female, 0.44 (Hill 1984).

Among previous work with U.S. data which rarely differentiates married women's part-time employment from their full-time employment, Long and Jones (1980) specifically focuses on part-time married women workers and finds the wage elasticity, 0.25, with the National Longitudinal Survey (NLS) of women 30-40. Therefore, the wage elasticity of married women's part-time labor supply in Japan is much larger than that for U.S. married women. On the other hand, the part-time wage elasticity in Japan, 0.7, is generally smaller than those reported in recent U.S. studies which do no differentiate part-time from full-time workers: 2.0 (Cain and Dooley 1976), 0.44 and 3.4 (Dooley 1982), 4.2 (Fleisher and Rhodes 1979a), 1.28 for a mean of eleven studies (Keeley 1981), and 2.2 and 3.5 (Shapiro and Shaw 1983).

The effect of husband's income (LNHINC) is negative and statistically significant (-0.642 in Model I-(1) in Table 3). The income elasticity is about -0.5 at the sample mean, which is less than one third of that of urban married women's full-time employment (-1.8 in Table 5). However, the income elasticity, -0.5, is rougly equal to that for female employees for 1970, -0.52 (Hill 1984). The part-time income elasticity is significantly larger than that of U.S. married women in absolute value, -0.068 (Long and Jones 1980), while, in similar simultaneous-equation models, the part-time income elasticity in urban Japan is nearly half or a third of that of U.S. married women (-1.2 in Cain and Dooley 1976, and -1.4 in Fleisher and Rhodes 1979a).

The variables of unemployment rate (UNEMP) and female education (EDUCA) are most significant in the labor supply equation. With respect to the negative coefficient of UNEMP, the discouraged worker effect dominates the added worker effect among the part-time employed married women. The elasticity with respect to UNEMP at the sample mean, -0.25, indicates that a one percent increase in UNEMP reduces the probability of choosing part-time paid jobs for married women by 0.25 percent. The effect of female education (EDUCA) is significantly negative and the elasticity is -0.51 at the sample mean. Married women's education in urban Japan, therefore, increases their shadow price of time, inhibiting them from joining labor markets rather than their education reflecting a taste for market work.

The effects of an industry mix variable (INDMI) is significantly positive, 0.052. That is, an increase in relative availability of jobs for women encourages more married women to join to labor force. Similarly, the significantly positive effect of the enrollment of children in nursery schools or kindergartens (KIND5) indicates that an availability of day-care centers and nursery schools encourages married women with pre-school children to join the labor market. However, with higher labor force participation for married women, the demand

for day-care centers and nursery schools will increase. Therefore, the causality between KIND5 and married women's part-time labor supply may be dual.

For comparative purposes, Model II-(1) is reported when the labor supply of part-time employed married women as the dependent variable is measured by the proportion of married women over age 15 who are part-time employees in urban Japan. The labor supply equation in a simultaneous-equation model explains 65 percent of the married women's labor supply behavior as part-time employees in urban Japan. In Table 4, equations (3) and (4) are a single-equation logit model of labor supply separately for urban areas and all (urban and rural together) areas from 47 prefectures, respectively. Concerning the GLS estimates of equation (3), the elasticities of LNHINC and UNEMP becomes -0.46 and -0.22 from -0.49 and -0.25 in Model I-(1), respectively, while other elasticities show virtually no changes and INDMI becomes marginally insignificant.

For a summary, our findings support Hill's contributions about female labor supply in Japan (Hill 1982 and 1984): in our terms, a logit model of married women's part-time labor supply explains their behavior for grouped data well; and a proportion of married women over age 15 who are part-time employees is a suitable measure for their part-time labor force

participation rate. The basic socioeconomic variables in our simultaneous-equation model are significantly robust. The elasticities of married women's part-time labor supply with respect to their part-time wage rate and husband's income are about 0.7 and -0.5 for 1980 in urban Japan, respectively.

3-2. Fertility

The fertility equations are listed as Model I-(2) and Model II-(2) in Table 3. Both equations are statistically significant at the 1% significance level. We focus only on the results of Model I-(2) as a pair of Model I-(1) because of no significant changes with their results in terms of elasticity.

The women's part-time wage rate (LNPATW), husband's income (LNHINC) and married women's part-time labor supply (PTLFP*), all are insignificant. The unexpected insignificant coefficients of LNPATW and PTLFP* in addition to that of FERTI in Model I-(1) indicate that there is little simultaneous interdependency between married women's fertility and their decisions to work as part-time employees.[14] Married women probably enter the labor force as part-time employees at a different stage of their life cycle than their full-time counterparts. That is, part-time employed married women might already complete their desired fertilities and, while sending their children to day-care centers or nursery schools, join the labor markets.

The variables of unemployment (UNEMP), female education (EDUCA), and the quality of children (CHILQ) have their expected signs and all are statistically significant. The elasticities are about 0.2 for UNEMP, -0.4 for EDUCA, and -1.3 for CHILQ.

The positive coefficient on UNEMP indicates that married women tend to give birth when the opportunity costs are low. The same result is also found with U.S. married women (Cain and Weininger 1973). On the other hand, the negative effect of EDUCA on FERTI agrees with the view that married women's education is a proxy for their knowledge of birth control techniques. The effect of child quality (CHILQ) is the most significant variable in the fertility equation. The negative sign shows the substitution of the quality and quantity of children, whose elasticity, -1.3, in urban Japan is larger than -0.92 with U.S. married women in absolute value (Fleisher and Rhodes 1979a).

Finally, as a brief summary, the specification on the fertility equation is satisfactory but the R-square (0.39) and F-statistic (4.30) are much smaller than those of the labor supply equation. Furthermore, we suspect that there is a simultaneous interdependency between married women's decisions to work as part-time employees and their fertility in urban Japan.

TABLE 3

Empirical Results for Married Women's Part-time Labor Force Participation and Fertility

Urban Prefectural Data in 1980

The 2nd Stage's Results of 2SLS

Independent Variable	Model I		Model II	
	I-(1)[a]	I-(2)	II-(1)	II-(2)
	PTLFP*	FERTI	PARTLFP	FERTI
Intercept	1.039	60.85	0.626*	98.71
	(0.509)	(0.807)	(1.758)	(1.111)
LNPATW	0.904***	10.80	0.153***	10.94
	(2.724)	(0.633)	(2.669)	(0.628)
LNHINC	-0.642**	12.35	-0.113**	12.47
	(-2.062)	(0.941)	(-2.073)	(0.935)
FERTI	0.005	---	0.001	---
	(1.044)		(1.052)	
PTLFP*	---	-14.21	---	---
		(-1.392)		
PARTLFP	---	---	---	-83.09
				(-1.374)
UNEMP	-12.11***	342.4**	-2.118***	346.1**
	(-4.107)	(2.117)	(-4.087)	(2.129)
INDMI	0.052*	---	0.009*	---
	(1.837)		(1.814)	
EDUCA	-1.308***	-44.82**	-0.227***	-46.06**
	(-3.988)	(-2.238)	(-3.950)	(-2.199)
KIND5	1.069***	---	0.186***	---
	(2.821)		(2.844)	
CHILQ	---	-0.049***	---	-0.050***
		(-4.001)		(-3.929)
F-statistic	10.70	4.30	10.57	4.15
R^2	---	0.39	0.65	0.38
N	47	47	47	47

(continued on next page)

TABLE 3 (continued)

Note. [a]PTLFP* = log(PARTLFP/(1 - PARTLFP)). Logit coefficients are reported. To recover partial derivatives at the sample mean, one may multiply each logit coefficient by 0.177 (=0.229x(1-0.229)) since the sample mean of PARTLFP=0.229.
Asymptotic t-statistics are reported in parentheses.
The F-statistics are significant at the 1 percent level for equations I-(1) and (2) and II-(1) and (2).
*** Significant at α = 1%
** Significant at α = 5%
* Significant at α = 10%

TABLE 4

Empirical Results for Married Women's
Part-time Labor Force Participation

Results of A Single Equation Model by GLS
Equation (3): Urban Prefectural Data in 1980
Equation (4): All Prefectural Data in 1980

Independent Variable	(3)[a] PTLFP*	Independent Variable	(4)[b] PREPTLFP*
Intercept	1.276 (0.63)	Intercept	-0.895 (-0.34)
LNPATW	0.920*** (2.79)	LNPATW	0.601 (1.18)
LNHINC	-0.596* (-1.94)	LNMALE	-0.327 (-0.72)
UNEMP	-10.60*** (-4.15)	PREUNP	-5.746** (-2.25)
INDMI	0.046 (1.67)	PREIND	0.063* (1.76)
EDUCA	-1.343*** (-4.14)	PREEDU	-1.224*** (-2.88)
KIND5	1.055*** (2.80)	PREKIN	0.595 (1.23)
F-statistic	12.44	F-statistic	7.54
N	47	N	47

Note. [a]See Note in Table 3. [b]PREPTLFP*=log(PRELFP/(1-PRELFP)) where PRELFP is a proportion of married women over age 15 in prefecture whose employment status is "worked beside doing housework." Logit coefficients are reported. To recover partial derivatives at the sample mean, one may multiply each logit coefficient by 0.183 (=0.242x(1-0.242)) since the sample mean of PRELFP=0.242. The F-statistics are significant at the 1 percent level for equations (3) and (4)
*** Significant at α = 1% ** Significant at α = 5%
* Significant at α = 10%

TABLE 5

Elasticities of Married Women's Labor Supply in Japan

With Respect To	Urban Prefecture Elasticities		All Prefecture Elasticities	
	Full-time[a]	Part-time	Full-time[a]	Part-time
Married Women's (or Female) Wage	0.2*	0.7*	0.1	0.5
Husband's (or Male) Wage	-1.8*	-0.5*	-1.6*	-0.3

Note. [a]The original source is Yamada and Yamada (1984).
* Statistically significant.

IV. SUMMARY

In this paper, we have estimated a logit model of married women's part-time employment and a fertility equation in a simultaneous-equation model. The model is applied to the urban areas from 47 prefectures in 1980, using the prefectural grouped data in the 1980 Population Ceusus of Japan.

By specifically differentiating part-time employed married women from full-time employed, we find that the structural coefficients of the part-time labor supply significantly differ from those of the full-time labor supply in terms of elasticity. The major factors influencing married women's part-time labor supply are their part-time wage rate, husband's income, total unemployment rate, women's education, and the availability of nursery schools and kindergartens. The elasticities of their labor supply with respect to women's part-time wage rate and husband's income are about 0.7 and -0.5, respectively.

The specification on the fertility equation in a simultaneous-equation model is satisfactory, but the variables pertaining to married women's part-time work, e.g., women's part-time wage rate and their part-time labor force participation, are statistically insignificant. Other socioeconomic variables, e.g., total unemployment rate, women's education, and child quality, are

found to be significantly strong factors influencing marital fertility.

As a concluding remark, contrary to the result of our previous study on married women's full-time employment, we find little interdependency between married women's decisions to work as part-time employees and their fertility in urban Japan.

FOOTNOTES

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[1]Japan (1982): Actual Conditions of Women's Labor, p.82. Fujin Roudo No Jitsujou (in Japanese).

[2]Japan (1982): Actual Conditions of Women's Labor, p.83, and Takahashi (1983), p.103. Part-time employees refer to the employees who either work for shorter daily hours or work for shorter weekly or monthly hours for a certain period, e.g., 35 hours or less per week, irrespective of their daily work hours than regular full-time employees. According to Takahashi (1983), about 86 percent of female part-time employees were married women with spouse present, 10 percent were either widows or divorced, and only about 4 percent were unmarried single women in 1981.

[3]In 1980, 52.3 percent of female part-time employees in non-agricultural and forestory industries were employed in firms employing 1-29 employees, 12.9 percent in firms employing 30-99 employees. 9.8 percent in firms employing 100-499 employees, 16.4 percent in firms employing 500 or more employees, and 9.4 percent in the government. Source: Japan (1982), Actual Conditions of Women's Labor, Table 28 in p.89.
In 1980, the wage rates per hour for female part-time employees in manufacturing, wholesale and retail trade, and service industries were 558 yen, 624 yen, and 705 yen, respectively. Those wage rates were about 83.5 percent, 78.5 percent, and 80.4 percent of the female full-time employees' wage rates in each respective industry. The ratio of hourly wage rate of female part-time employees to that of the full-time employees varied according to the size of the firms. The part-time employees earned 63.4 percent of the full-time employees' wage rate in firms which employed 1,000 or more employees, in firms which employed 100-999 the ratio was 78.4 percent, and in firms which employed 10-99 the ratio was 84.6 percent. Source: Japan (1982), Actual Conditions of Women's Labor, Table 62 in p.125.

[4]In 1970, 57 percent of female part-time employees were employed in the manufacturing industry, 27.7 percent in the wholesale and retail trade industry, and 8.1 percent in the service industry. In 1980, those figures became 37.0 percent, 45.5 percent, and 14.1 percent in each respective industry. Source: Japan (1982), Actual Conditions of Women's Labor, Table 36 in p.100.

[5]In 1980, 36 percent of the female labor force was self-employed or family workers.

[6]To my knowledge, there are only a few recent studies on part-time employed married women even in the United States, e.g., Gramm (1973) and Long and Jones (1980).

[7]Takahashi (1983), Supplementary Table 7 in p.265.
Female part-time employees in non-agricultural and forestry industries gave the following reasons to work in 1981:
60.3 percent of the female part-time employees worked to help pay household expenses; 12.6 percent worked to help pay their own school-enpenses or their children's school-expenses; 7.9 percent worked for the purpose of efficiently utilizing their leisure hours; and 5.9 percent worked to help pay housing loans.
Source: Japan (1982), Actual Conditions of Women's Labor, Table 67 in p.130.

[8]Source: Japan (1982), Actual Conditions of Women's Labor, Table 29 in pp.90-91.

[9]There are numerous studies on women's labor force participation using disaggregated data rather than grouped data and dealing with the selectivity bias in the labor supply model. Gronau (1974) and Heckman (1974 and 1979) are some of the early theoretical works, while Smith (1980) and Heckman et al. (1981) are the comprehensive survey of the recent development of the labor supply.
Hill (1983) used Heckman's estimation procedures for the sample selection bias applied a trichotomous logit model to a 1975 survey data of married women between the ages of 20 to 59 in the Tokyo Metropolitan area.

[10]The industry mix variable is constructed by using these following industries: agriculture, forestry and hunting, fishery and aquaculture, mining, construction, manufacturing, wholesale and retail trade, finance and insurance, real estate, transportation and communication, utilities (electricity, water and steam), services, and government.

[11]Leibowitz (1974) finds more educated women spending more of their time in child care and gives the following explanations: child care has the low substitution elasticity with other inputs; and more educated women have a greater productivity in child care in household production. p.249.

[12]De Tray (1974) uses expected public school investment per child in dollars for the quality per child, while Fleisher and Rhodes (1979a) uses wage on current or last job for out-of-school youth as the child quality. In our study, we follow De Tray (1974) because of the availability of data although this sort of reasoning may be vulnerable. In the fertility equation (4), CHILQ is listed as if the variable were one of the exogenous variables in the model. Although we do not explicitly specify the child-quality equation because the estimation is not our primary concern, the estimated CHILQ is included as one of the explanatory variables in the fertility equation.

[13]In the first stage of 2SLS, we regress PTLFP*, FERTI, and CHILQ on LNPATW, LNHINC, UNEMP, INDMI, EDUCA, KIND5, CHILD, and EMPCH.

[14]Yamada and Yamada (1984) finds a significant interdependency between full-time employed married women and marital fertility in urban Japan. The elasticity of married women's fertility with respect to their labor supply is about -0.3.

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