A Panel Data Analysis of Married Women's Decisions to Work in Beijin, China

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Abstract The purpose of this paper is to statistically investigate the factors influencing the decision of married women in urban China to work using panel data. This is novel in that it is the first known study to employ panel data on Chinese households.

We obtain the following results. First, by limiting our household sample to Chinese urban areas and comparing the labor force participation rate with that of Japan, we find that the participation rate in China falls earlier than in Japan, mainly because the Chinese retirement age is relatively younger. Further, this tendency is stronger for women than men, especially in China, thereby opening up a significant gender gap at retirement age. However, comparing China with Japan, it is clear that the shapes of the labor force participation rates for both women and men in both countries are very similar. Second, we also conclude that the estimation of married women's decision to work using our panel data is superior to either cross-sectional or pooled data. Finally, we identify a decrease in the probability of mothers working for women living with children aged between 0 to 12 years old. On this basis, we conclude that family variables greatly influence the probability of married women working in Beijing and possibly other urban areas in China.

Keywords Urban China, Panel Data, Married Women, Decision to Work

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1. Introduction

The People's Republic of China was founded in October 1949 with subsequent "gender equality employment policies" in the planned economy based on a socialist ideology. In December 1978, the Reform and Open Policy was introduced with the aim of implementing a market economy open to foreign enterprises. Today, China is ranked second globally in terms of GDP and the Chinese labor market has changed markedly in the intervening three decades.

The actual conditions governing Chinese women working have long been wrapped in a veil under the influence of the prevailing gender equality employment policies and the planned economy, though it would appear that working conditions for Chinese women in urban areas are largely consistent with those for men. Other developments include the All-China Women's Federation as a substructure of the Communist Party and its role in the vocational training of women. A number of universities having a center attached focusing on the employment of women. However, few existing studies have focused on working conditions for Chinese women using an econometrics approach [Meng (2000); Ishizuka (2010a)].

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The remainder of the paper is organized as follows. Section 2 discusses the labor force participation rate of women in urban China and Japan, and the history of the economic and social systems encompassing working by Chinese women. Section 3 reviews the existing studies on married women working in China. In Section 4, we explain in detail the F-GENS Beijing/China data, the empirical models, and variables used in our panel data analysis. Section 5 provides the empirical results. Section 6 summarizes the main findings.

2. Women's Work in China

2.1 Labor Force Participation Rate in Urban China and Japan

Figure 1 depicts the labor force participation rate in urban China and Japan. The panel on the left is the participation rate for women while the panel on the right is for men, with a solid line representing the participation rate for urban China and a dashed line for Japan. In China, the retirement age is generally 50 years of age for women, with men retiring later at age 55. In Japan, the retirement age for both women and men has gradually increased from 60 years to 65 years. The reason why we only consider the labor force participation rate in urban China is that there are many farmers in nonurban areas, and the participation rate

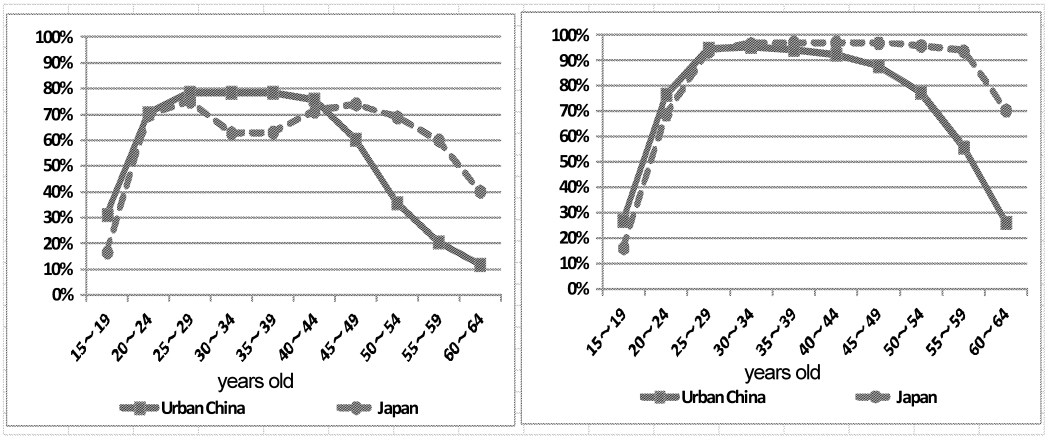
is much higher.

Comparing the shape of the participation rates in China and Japan, we can see that the shapes of the labor force participation rates for both women and men are quite similar. We can see that for the most part, men continue to work from their 20s until retirement age, with the participation rate remaining above 80% until men are in their 50s. As for the participation rate for women, in Japan it decreases when women are in their 30s and remains at about 70% from their 40s to early 50s, while in China, the participation rate is approximately 80% until their early 40s, and then decreases suddenly after their late 40s. Put differently, and following Ishizuka (2003), the difference of approximately 20% in the participation rate between women and men is caused by a way of working that is largely unstable, and the labor market is therefore unbalanced by the burdens placed on women of marriage, childbirth, childcare, and housework.

2.2 History of Chinese Women's Work [1)]

We examine how Chinese economic and social systems govern the working lives of Chinese women by identifying four periods during the 55 years following the establishment of the People's Republic of China in 1949 and a period before 1949. We then use these periods to investigate how Chinese economic and social systems

FIGURE 1. Labor Force Participation Rate in Urban China and Japan (Left Panel: Women, Right Panel: Men)



Data source: National Bureau of Statistics, "The 2005 National 1% Population Sample Survey" in China. Ministry of Internal Affairs and Communications Statistics Bureau, "The Labour Force Survey 2005" in Japan.

Note 1) I calculated the labor force rate in urban area of China that I added a worker and "the person who looked for work".

influence the respective labor activities of women and men at three different levels: namely, the market level, the workplace (labor demand) level, and the household (labor supply) level.

In the first period (Pre-1949: Differential between Principle of Equal Rights for Women and Men and Reality), though the idea of equal rights for women and men was evident, women in China were expected to play the role of bearing and caring for children (especially boys). In addition, women in tenant farmer families were obliged to engage in labor, even hard agricultural work. Thus, Chinese women during this period were merely supplemental workers.

The second period (1949–1978: "Dualistic Society" and "Policy of Gender Equality of Employment") saw that despite the increased participation rate of Chinese women in the labor force under the socialist ideology, the government managed personnel affairs in a rigid dualistic society according to family registration law. This system encouraged economically self-reliant continuous working at the market, workplace, and household levels. However the retirement age of women was lower than that of men, and urban women worked under protected employment rules. At the same time, the labor force participation rate for rural women was on the rise, and women often continued working because their spouses were forced to move to other areas. Supplemental worker women became increasingly self-reliant at the household level with the changing regulation of marital law.

The government moved the Chinese economy to a market economy in the third period (1978–1984: Market Economy and Reinforcement of "Birth Control Policy"). The working rate of women continued to increase slightly. However, amendments to the law lowered the walls in this dualistic society, with both women and men flowing into cities from rural areas. Capital companies were newly accepted at a workplace level, along with the appearance of contract workers with relatively more unstable workplace conditions. During this period, legal systems encouraging continuous working were in force through birth control policies at the household level.

In the fourth period (1984–1991: "Protection Rule of Women" and Gender Gap), the protection rule for women was established with successive birth control policies. The special protection rule for women and equal employment opportunity were considered as policies encouraging continuous working. As the idea of gender equality in working conditions became more popular, legal systems came into force to eliminate inequality in the treatment of women and men in terms of wages and civil rights. National companies also introduced more unstable types of working

such as contracted workers. The number of unemployed women increased, and there was ongoing controversy regarding whether "women should go back home." During this time, women also appeared to play the role of subsidiary workers, as in most market economies. Thus, a gender gap began to appear in the labor force participation rate. At the household level, some externalities in housework arose through the spread of household appliances. The nine years of compulsory education brought about the accumulation of human capital in general, and was likewise considered to be favorable to continuous working.

In the fifth period (1992–present: "Gender Equality Rule System" and Problems of State-Owned Enterprises' Reform), the Chinese market economy changed even further. At the market level, there was the full-scale reform of state-owned enterprises, with many women workers shifting into tertiary industry. At a workplace level, measures to deal with the increasing number of unemployed and laid-off workers began to be considered. At the household level, the foundation of social insurance and the introduction of community services became evident. The legal systems governing gender equality were successively implemented and the registration of women's rights was actually established during this period, substantiating the existing ideology. These changes in the legal system also encouraged the move to continuous working by women, with the labor force participation rate gradually increasing.

Based on these trends, we suggest that as continuous working by women is now well established, it will be mostly stable in the future. However, income gaps continue to increase across geographic areas and by the type of job, and so the economic independence of women may be challenged in the future. Full-time housewives are already found in many urban areas, with another 20% of urban women, so-called latent housewives, possibly joining them in the future[2]. However, housewives may never represent the majority of women in China, as discussed in Sechiyama (1986).

3. Survey : Married Women's Decision to Work in China

Only women in China have held the conventional double burden of playing the role of "a good wife and a wise mother" at home and in the workplace [Yang (1995)]. When the high-level role at home began to include the cultivation of aesthetic sensitivity in children from the 1980s, the burden increased, and some women desired to become full-time housewives.

There are many extant empirical analyses of the decision by women to work. For example, using individual data from the China Population General Survey in

1982, 1990, and 2000, Maurer-Fazio et al. (2011) argued that the labor force participation rate of Chinese women had decreased. Maurer-Fazio et al. (2011) also analyzed the decision to work for urban women and female migrant workers in light of domestic factors. They found that the probability of a married woman working decreased when living with their parents and increased with the number of adults in the household, when 45 years of age and over, and when 40 years of age and over living with a child. Using the 1982 data, they found that the probability of working increased for married women 30 years of age and under and when living with a child 0 to 15 years of age, and decreased when living with a person aged 75 years and over. As for the 1990 and 2000 surveys, the probability of a married women working fell when living with children aged 0 to 5 years and increased when living with a person aged 75 years and over.

In other work, Ishizuka (2010b) estimated the probability of full-time housewives working using the F-GENS Beijing/China data from 2004. The main finding was that the probability of working increased when living with children aged 0 to 3 years and decreased when living with parents. In the case of Japanese married women, Ishizuka (2003) and other studies found that although the probability of full-time housewives working was uncorrelated with the number of years in schooling, it did increase when living with children aged six years and under and with the husband's wage.

4. Data, Model, and Variables

4.1 The F-GENS Beijin/China Panel Data

The data in this analysis are based on the Beijing/China urban household survey conducted every June to August from 2004 to 2007 by the Frontier of Gender Studies (F-GENS) Project at Ochanomizu University in Japan. This panel data is first in the world that investigated Chinese households. This research provides detailed information on household, employment, income, consumption, and decision making by wives and husbands, satisfaction with working, and so on. The informants are women and men aged 25–54 years in 2004 living in the eight central districts of Beijing, China. From these data, we used a three-step method to extract data on districts, households, and individuals. The survey produced responses from 2,550 individuals, comprising 1,307 women and 1,243 men, of whom 397 were unmarried and 2,153 were married.

The data sets used in this paper are the 2004 and 2007 cross sections (from Waves 1 and 4, respectively) and the four years of pooled data and panel data from 2004 to 2007 (Waves 1 to 4). For this analysis, we only use the data for married women,

TABLE 1. Summary Statistics of the F-GENS Beijin/China Panel Data (Married Women)

		Data set		wave1 & wave2 & wave3 & wave4				wave1		wave2		wave3		wave4	
		Year		2004-2007				2004		2005		2006		2007	
	Independent Variables	Description		Minimum	Maximum	Mean	Standard Deviation	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Theory	(Dependent variable)	Work dummy (=1)	−	0	1	0.666	0.472	0.647	0.478	0.689	0.463	0.677	0.468	0.652	0.477
①Human Capital Theory	age	Age	years old	25	57	42.015	8.012	40.518	7.882	41.632	7.898	42.600	7.991	43.632	7.960
	d_college	College dummy (=1)	−	0	1	0.177	0.382	0.174	0.379	0.182	0.386	0.178	0.383	0.175	0.380
	d_university	University dummy (=1)	−	0	1	0.106	0.308	0.111	0.314	0.103	0.305	0.106	0.308	0.103	0.305
②Budget Constraint	spouse wage	Spouse's wage	yuan	0	720000	24114	33930	19840	26481	23609	32684	25579	32095	28266	41224
	couple_income	Couple's income except their wages	yuan	0	486000	6117	19332	4583	9723	6556	21288	6637	21837	6724	21765
③Time - allocation Model	d_ch0	0 year-old child dummy (=1)	−	0	1	0.010	0.098	0.013	0.114	0.009	0.093	0.009	0.095	0.007	0.086
	d_ch1_2	1-2 years child dummy (=1)	−	0	1	0.036	0.187	0.051	0.220	0.033	0.179	0.032	0.175	0.026	0.161
	d_ch3_6	3-6 years child dummy (=1)	−	0	1	0.091	0.288	0.100	0.300	0.094	0.292	0.091	0.287	0.077	0.267
	d_ch7_12	7-12 years child dummy (=1)	−	0	1	0.135	0.342	0.047	0.213	0.166	0.372	0.173	0.379	0.168	0.374
	Number of observations			3919				997		1011		975		936	

Source: Author's estimations.

Data source: The F-GENS Beijing/China panel-data 2004, 2005, 2006, and2007.

yielding 3,919 person-year observations. Table 1 provides details and selected descriptive statistics of the variables used in the analysis. As discussed, the originality of this paper lies in the use of the F-GENS Beijing/China panel data whereby we can investigate the behavior of the same person over time.

4.2 The Panel Data Analysis Model

Panel data is appropriate when we obtain a suitable panel of information. For the most part, panel data is superior to either cross-sectional or pooled data. The proportion of the total variance contributed by the panel-level variance component ρ ("rho" in Table 2) is given by:

$$\rho = \frac{\sigma_u^2}{\sigma_u^2 + 1} \qquad (1)$$

where $\ln(\sigma^2)$ is the log of the variance and σ_u is the standard deviation. When ρ is zero, the panel estimator is identical to that of the pooled estimator.

We choose the model used for the panel data analysis using two econometric tests. First, we use a test for individual dummies to indicate the existence of an individual effect. Second, a specification test indicates whether the individual effect is random. When it is random, we fit a random-effects

regression model[3] as fixed-effects probit estimates are in this case biased [Neuhaus (1991); Baltagi (2005)]. We can use the approximation of the random-effects probit estimators to check for this given the number of integration points. Because we calculate the random-effects probit model using quadrature, we calculated the random-effects probit estimator for a range of observations. We found the random-effects probit model to be appropriate for our analysis [Stewart (2006)].

A population-averaged probit model, also called an equal-correlation probit [Neuhaus (1991)], may also serve as a substitute for a fixed-effects model. When the standard errors of a random-effects probit model are similar to those of a population-averaged probit model, the variance estimators are robust. Finally, the probability of this paper's random-effects probit model is:

$$\Pr(y_{it} \neq 0 \mid \boldsymbol{x}_{it}) = \delta(\boldsymbol{x}_{it}\beta + u_i) \qquad (2)$$

for i =1,2,3,4 panels, where t =1,2,…,n_i, and u_i are i.i.d., N(0, σ_u^2), and δ is the standard normal cumulative distribution function. The econometric model is:

$$y_{it} \neq 0 \quad \Leftrightarrow \quad \boldsymbol{x}_{it}\beta + u_i + \varepsilon_{it} > 0 \qquad (3)$$

where ε_{it} are i.i.d., N(0, σ_ε^2), and independent of u_i.

4.3 Variables and Theories

The independent variable in equation (3) is the decision by the married woman to work, i.e. "working married woman = 1," and "not working married woman (which we refer to as a full-time housewife) = 0." The dependent variable x in equation (3) depends on human capital theory, the budget constraint, and the time-allocation model, as shown in Table 1. For human capital theory, following Becker(1964), general skills, for example, age and education, increase human capital. For the budget constraint equation:

$$C \leqq wh + R \qquad (4)$$

where w is the real hourly wage, h is working time (for example, in hours), and R is potential income (for example, spouse's wage, couple's income excluding wages, investment income, or transfer income). We designate the set of these resources as being expressed by the single scalar R. The family variables follow the time-allocation theory[Gronaw(1977)] and the household production function theory[Becker(1981)]. We use "age of couple's child" as a proxy for "time of housework." The presence of breast-fed infants is associated with an increased probability of a married woman working in the US but an increased probability of being a full-time housewife in Japan [Ishizuka (2003)].

Table 1 provides details of all the variables specified in the analysis.

5. Empirical Results

We estimate five different probit models. Model (1) is a probit regression model with cross-sectional data (Wave 1 in 2004), Model (2) is a probit regression model with cross-sectional data (Wave 4 in 2007), Model (3) is a probit regression model with pooled data (Waves 1 to 4 from 2004 to 2007), and Model (4) is a random-effects probit regression model with panel data (Waves 1 to 4 from 2004 to 2007). Although Model (1) is basically the same as Model (2), information gradually becomes more detailed as we move from Model (3) to Model (4). As discussed in Section 4.2, we estimate Model (5) as a comparison for Model (4).

Table 2 provides the estimated results. We judge the effectiveness of each model using the value of the log likelihood and the level of statistical significance [Stewart (2006)]. Our interpretation of each independent variable is limited to whether the estimated coefficient is statistically significant and of the correct sign. We indicate our findings and provide an estimate of "marginal effect" in Table 2. Calculation of the marginal effect helps to compare the results across the models, where the marginal effect is:

$$\frac{\partial p_i}{\partial x_i} = p_j[\boldsymbol{\beta}_j - p_k\boldsymbol{\beta}_k] \qquad (5)$$

When each continuous independent variable increases by one unit, the marginal effect is the change in the probability of the dependent variable. The marginal effect for the binary variables is for discrete change of the dummy variable from zero to one.

We first compare the five models. In general, Models (1) and (2) are inferior to the other models given their smaller number of observations. There are also few statistically significant independent variables in these models. Much of the information in Model (4) is also superior to that in Model (3), even though the log likelihood of Model (3) is almost the same as Model (4). In addition, the rho of equation (1) of 0.009 is close to zero. Model (3) then follows Model (4) but is still reliable. When we compare the standard errors of each independent variable in Model (5) with Model (4) according to the procedure discussed in Section 4.2, the numerical values do not accord.

Therefore, we only discuss the marginal effects of each independent variable in Model (4). The independent variables for human capital theory are statistically significant in all models. "Age" is negative and "d_college" and "d_university" are positive. In Model (4), there is a 2.1% decrease in the probability of working when age increases by a year. The probability of working also increases for married women who are junior college graduates and university graduates. In China, the retirement age of women is

TABLE 2. Result of Various Probit Regression Model with Panel data

Model number	(1)			(2)			(3)			(4)				(5)			
Regression model	Probit			Probit			Probit			Random-effects probit				Population-averaged probit			
Data set	wave1			wave4			Pooled data (wave1&2&3&4)			Panel data (wave1&2&3&4)				Panel data (wave1&2&3&4)			
	Coefficient		Marginal effect	Coefficient		Marginal effect	Coefficient		Marginal effect	Coefficient		Standard errors	Marginal effect	Coefficient		Standard errors	Marginal effect
age	-0.031	†	-0.011	-0.085	†	-0.030	-0.058	†	-0.020	-0.061	†	0.004	**-0.021**	-0.045	†	0.005	-0.016
d_college	1.033	†	0.292	0.733	†	0.221	0.815	†	0.235	0.815	†	0.069	**0.235**	0.797	†	0.109	0.232
d_university	1.444	†	0.330	0.867	†	0.241	1.075	†	0.270	1.073	†	0.109	**0.269**	1.046	†	0.169	0.267
spouse_wage	0.00000370	*	0.00000131	-0.00000009		-0.00000003	0.00000196	**	0.00000068	0.00000179	**	0.00000083	**0.00000062**	0.00000092		0.00000085	0.00000032
couple_income	-0.00002150	†	-0.00000763	-0.00000498	***	-0.00000176	-0.00000502	†	-0.00000174	-0.00000517	†	0.00000110	**-0.00000179**	-0.00000164	*	0.00000087	-0.00000057
d_ch0	-0.556		-0.214	(omitted)			-0.659	**	-0.253	-0.706	***	0.295	**-0.271**	-0.343		0.220	-0.128
d_ch1_2	-0.324		-0.122	-1.049	***	-0.400	-0.776	†	-0.298	-0.799	†	0.142	**-0.307**	-0.327	***	0.127	-0.121
d_ch3_6	-0.118		-0.043	-0.354		-0.132	-0.283	***	-0.104	-0.314	***	0.101	**-0.115**	0.018		0.106	0.006
d_ch7_12	0.111		0.038	-0.462	***	-0.173	-0.274	†	-0.100	-0.334	†	0.077	**-0.122**	0.044		0.072	0.015
constant	1.444	†		4.187	†		2.798	†		2.937	†	0.193		2.166	†	0.232	
Log likelihood	-543.24	†		-484.13	†		-2118.36	†		-2113.41	†						
Number of obs	997			929			3919			3919				3919			
										lnsig2u		0.879	-4.758				
										sigma_u		0.041	0.093				
										rho		0.007	**0.009**				

Source: Author's estimations.

Data source: Same as Table 1.

Note 1) †, ***, ** and * denote the estimated coefficients are statistically significant at the 0.1%, 1%, 5% and 10% levels, respectively.

Note 2) The right of Log likelihood is a result of the Chi2 test.

earlier than men, being generally 50 years of age for women and 55 years for men (see Section 2.1). The result by estimate accords with the fact that a person from a high academic background continues to work [Ishizuka (2010b)].

The numerical values of the independent variables concerning the budget constraint are small. The estimated coefficient for "spouse_wage" is positive, whereas that for "couple_income" is negative. The "law of Douglas and Arisawa" that the probability of the wife working falls as the husband's wage increases is not established in urban China (in this case, Beijing). However, we do find that a higher couple's income except their wages reduces the probability of the wife working.

When I discuss that the estimator of the living together with infant influence the probability of mother's working, the effectiveness of panel-data analysis is confirmed. The information of cross-section data of model(1) and model(2) is not enough. The number of observations, information of panel data, and panel-data analysis are effective. In general, living with children aged from 0 to 12 years old reduces the probability of a mother working. Although the probability of a mother working decreases by 30.7% in the presence of 3-year-old children and by 27.1% for 0- to 1-year-old children, the probability remains at approximately 10% for 3- to 7-year-old children. For the panel data, we found that the marginal effects of the time-allocation model were more significant statistically than those for human capital theory and the budget constraint. On this basis, we conclude that family variables greatly influence the probability of married women working in urban China (Beijing).

6. Conclusion

The following results were obtained in this analysis. First, by limiting our household sample to Chinese urban areas and comparing the labor force participation rate with that of Japan, we found that the participation rate in China falls earlier than in Japan, mainly because the Chinese retirement age is relatively younger. Further, this tendency is stronger for women than men, especially in China, thereby opening up a significant gender gap at retirement age. However, comparing China with Japan, it is clear that the shapes of the labor force participation rates for both men and women in both countries are very similar. Second, we also found from the results of the estimation of married women's decision to work using our panel data is superior to either cross-sectional or pooled data. The reason is that panel data provides abundant information and is statistically effective. Finally, living with children aged from 0 to 12 years old reduced the probability of the mother working. On this basis, we

conclude that family variables greatly influence the probability of married women working in Beijing and possibly other urban areas in China.

The findings in this paper are limited given that the panel data covers only the four years from 2004 to 2007 and only includes married women in Beijing. A possible research extension would then be to investigate the situation for married women across the whole of China using the most recently available data.

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Notes

1. Refer to Ishizuka(2004) for the details.
2. In the research on "Women in China" (conducted in 1990), the question, "If the social value of the housework were to be evaluated and be compensated in any way, which would you choose?" is asked, and the answer is chosen from either returning to work or returning home. Women (including those unmarried) who answered "work" were 80.0% in urban areas, and 65% in rural areas where most of them are farmers. Rate of married women of all the women answered was 84.0% in urban areas and 85.4% in rural areas. If those who answered "return home" that followed Sechiyama (1996) are considered as a potential "full-time housewife", there should be about 20.0% who would "return home" in urban areas.
3. As a result of the Hausman test, a fixed-effects model was rejected, and a random-effects model was actually adopted.

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