Woman's Education, Sibling Composition, and Wage Differentials

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Keywords: *Sibling composition, education, wage differentials, gender*

EXTENDED ABSTRACT

This paper investigates the effect of sibling composition and gender wage differentials on the higher education of women in Japan using a micro data set, the 1998 and 2003 "National Survey on Families ". In Japan, the female enrolment rate at four-year universities is 47.5%, much lower than its male counterpart of 66.5%. So, parents possibly take different educational strategies between their sons and daughters. We focus on female higher education because 96% of students in Japan enroll high school, so it is important which way parents choose after their children's graduation of high school. There are two types of school in higher education in Japan, one is two-year college, junior college and the other is four-year college, university. University graduates are likely to earn more than junior college graduates, so we analyze junior college and university separately.

In Japan, compulsory education is under the 6-3 school system (six-years elementary school and three-years junior high school), and is up to age 15. From 1975, the enrolment rate at high school has been about 96%, so most students continue studying beyond the compulsory level. Parents may decide whether they have their children entered the labor market or attended school after their children's graduation of high school. In detail, there are three options; entering the labor market, attending a junior college or vocational college, or attending a university.

Attendance at both university and junior college are included in higher education, but they are very different. Junior college means two-year course, and university means four-year course, and both junior college and university are regarded as higher education. However, it should note that university graduates rather than junior college graduates are provided access to "career" job. Because junior colleges offer only non-vocational subjects and universities offer broader curricula and vocational subjects. Thus, most firms recruit junior college graduates and university graduates separately and university graduates are likely to earn more than junior college graduates (Edwards *et al.* , 1993).

This paper makes three contributions. First, using detailed information of sibling composition, we investigate the effect of sibling composition on educational achievement in Japan. Second, gender wage differentials are considered. In theoretical models discussed earlier, when making their allocations parents consider the expected rate of return or lifetime income of their children. Thus, differences in the expected wages between sons and daughters may influence the resources allocated to them by their parents. Third, we use a more recent birth cohort to examine rapid increase of the female enrolment rate of university.

The results show that: (1) being female increases the probability of junior college enrolment, while decreases the probability of university enrolment. Parents may regard junior college and university as different things and take different strategies according to sex of their children. However, having brothers have no effect on female educational achievement. Parents might decide their resource allocation according to sex of their children, but do not care sibling composition; (2) the wage differentials variables have no relationship with the probability of junior college enrolment or university enrolment. Only exception is wage differentials of aged 50-54, and wage differentials of aged 50-54 decrease the probability of university of both sexes; (3) the income and educational level of parents have important roles in influencing the educational levels. The high income of fathers has positive impact on the years of educational level and the possibility of university attendance. The educational levels of parents are also important determinant of attending a junior college or a university. Having a mother who was a university graduate decreases the probability of junior college enrolment, while having a father who was a university graduate increases the probability of junior college enrolment. Having parents who were high school graduates and university graduates increase the probability of university enrolment.

1. INTRODUCTION

This paper examines the effect of sibling composition and gender wage differentials on the level of female educational in Japan. In Japan, the female enrolment rate at four-year universities is 47.5%, much lower than its male counterpart of 66.5%. The female enrolment rate at junior college and university are almost same as its counterpart of male. However, the female enrolment rate of university is lower than its counterpart of male. It is possibly that parents take different educational strategies between their sons and daughters. We investigate whether the educational strategies of parents for their children can explain this difference in the enrolment rate between men and women. Furthermore, the effects of gender wage differentials on educational achievement are examined.

In Japan, compulsory education is under the 6-3 school system (six-years elementary school and three-years junior high school), and is up to age 15. From 1975, the enrolment rate at high school has been about 96%, so most students continue studying beyond the compulsory level. Parents may decide whether they have their children entered the labor market or attended school after their children's graduation of high school. In detail, there are three options; entering the labor market, attending a junior college or vocational college, or attending a university.

Attendance at both university and junior college are included in higher education, but they are very different. Junior college means two-year course, and university means four-year course, and both junior college and university are regarded as higher education. However, it should note that university graduates rather than junior college graduates are provided access to "career" job. Because junior colleges offer only non-vocational subjects and universities offer broader curricula and vocational subjects. Thus, most firms recruit junior college graduates and university graduates separately and university graduates are likely to earn more than junior college graduates (Edwards *et al.* , 1993).

Becker *et al.* (1986) assume that parents are concerned about the welfare of their children. When parents can freely access the capital market, they invest in their children in order to maximize the welfare of their children. As a result, parents invest their resources so as to equalize the marginal rate of return across their children. Given the parents' budget constraint, parents allocate their resources to their children according to the expected rate of return of the investment of resources in their children. In this case, children that are expected to earn more receive many resources from their parents given that parents face a budget constraint. As in many other countries, men earn more than women in Japan, so under Becker *et al.* (1986) model, sons tend to have higher educational levels than that of daughters.

Butcher *et al.* (1994) analyze the impact of sibling composition on the years of education. They show that women with brothers have more years of education than women without brothers. Using data on a more recent birth cohort, Kaestner (1997) replicates the study of Butcher et al. (1994). He finds basically no effect of sibling sex composition on the years of education or educational achievement.

There are few studies that have examined the relationship between sibling composition and educational level in Japan. Edwards *et al.* (2003) analyze the effect of the number of siblings and having brothers on educational achievement using Japanese micro data. They find that the number of siblings has negative effect on female educational achievement, and that having brothers has no effect on female educational achievement. Due to data limitation, they analyze only middle aged cohorts (age 34-44 in 2003), so younger cohorts with higher enrolment rate of university are not analyzed. This paper seems to be similar to Edwards *et al.* (2003), two big differences are analyzing more recent cohorts, including men, and using more detail sibling composition information.

Ono (2004) analyzes the effect of sibling composition on educational achievement using Japanese micro data, and finds that daughters with brothers receive less education than daughters without brothers. In his analysis, due to data limitations, the number of brothers and sisters are estimated rather than being observed. So, the measurement errors in the estimated number of brothers and sisters are possibly large.

This paper makes three contributions. First, using detailed information of sibling composition, we investigate the effect of sibling composition on educational achievement in Japan. Second, gender wage differentials are considered. In theoretical models discussed earlier, when making their allocations parents consider the expected rate of return or lifetime income of their children. Thus, differences in the expected wages between sons and daughters may influence the resources allocated to them by their parents. Third, we use a more recent birth cohort to examine rapid increase of the female enrolment rate of university.

The rest of this paper is organized as follows. Section 2 explains the empirical model, while section 3 explains the data. Section 4 reports and discusses the results, and section 5 concludes.

2. EMPIRICAL MODEL

The model estimated in this paper take the form;

$$P(y = j \mid W) = \exp(W\alpha_j)/[1 + \sum_{h=1}^{3} \exp(W\alpha_h)], (1)$$

$$P(y = j \mid Z) = \exp(Z\beta_j)/[1 + \sum_{h=1}^{3} \exp(Z\beta_h)], (2)$$

j = *High School, Junior College, University*,

where y is a random variable taking on the values one if the individual attended a high school, two if the individual attended a junior college, and three if the individual attended a university, W and Z are sets of explanatory variables. W is vector of sex taking on the values one if the individual is female, and zero otherwise, sibling variables, wage differentials, the interaction of wage differentials and having brothers, and a set of other control variables and Z is vector of sibling variables, wage differentials, the interaction of wage differentials and having brother, and a set of other control variables. Equation (1) is for both sexes, and equation (2) is for only women. Equations (1) and (2) are estimated by multinomial logit models.

There are a variable to be explained, a random variable indicating high school attendance, junior college attendance, and university attendance. Although attendance at both university and junior college are included in higher education, the average wage of university graduates is much higher than that of junior college university graduates. So we analyze junior college attendance and university attendance separately. If women achieve lower educational levels than men, the coefficient of sex is expected to be negative. We also include dummy variables for having brothers, having sisters, being the first-born child, and variables for birth order and the number of siblings.

If women with brothers achieve lower educational levels than women without brothers, the coefficient of having brothers in equation (2) is expected to be negative. Assuming that the abilities of children are the same, this means parents invest in their sons more heavily than in their daughters. Having sisters means that parents can compare their daughters, and may mean that daughters have to compete with other sisters. Thus, having sisters may have a negative impact on the educational level of women. In Japan, the first-born child tends to be treated as a progeny, so it is possible that the first-born child regardless of gender receives a higher education than other siblings. If the number of siblings leads to sibling rivalry, the expected sign of its coefficient is negative.

If parents decide their resource allocation according to the expected rate of return of their children, a reduction in the gap between the rate of return for men and women means that daughters would receive more investment in education. As a result of that, parents become invest daughters heavier than before. It is assumed that parents know their children's expected rate of return.

A change of wage differentials between men and women would seriously affect the decision making of parents with daughters and sons because they have to decide whether to treat their sons and daughters differently or equally. If parents decide their resource allocation between sons and daughters according to their expected income, the coefficient on interaction of wage differentials and having brothers is expected to be negative.

We use wages at the time of graduation from university as a proxy for the rate of return of women's higher education. The wage differentials between women who are high school graduates and women who are university graduates are larger compared to men's wage differentials, and this leads to a higher rate of return of women's higher education(Economic Planning Agency, 1996). Middle aged female university graduate workers tend to work longer than female high school graduate workers, so the average wage of university graduate workers is estimated higher than that of workers who are high school graduates.

As control variables, the age of the individual (and age squared, age cubed), family background variables, and regional variables are included. Family background variables include the dummy variables for the current annual income of the individual's father and mother as a proxy for the household income when they decide educational investment of each child. Information on parental income is only available as categorical data, with the categories of income being: under one million yen (about 10,0000 U.S. dollars), 1-1.29 million yen, 1.3-1.99 million yen, 2-3.99 million yen, 4-5.99 million yen, 6-7.99 million yen, 8-9.99 million yen, 10-11.99 yen, and more than 12 million yen. An income under one million yen are used as the base level. If the current annual income of an individual's father and mother is under 1 million yen, all these dummies are zero.

In addition, in order to control for the ability of individuals, we control for educational level of

their fathers and mothers. Dummy variables indicating whether the individual's father (mother) graduated from a high school or a university are included. If the parent's educational level is secondary school graduate, all these dummies are zero.

To control for the cohort effect of parents, the ages of the individual's father and mother are also included. Furthermore, city size dummy variables for individuals living in a large city, a medium-sized city, and small city that indicate that the individual's parents live in large, middle or small city now are used proxies for the price of educational investment goods. If the individual's parents live in a small town or a village, all these dummy variables are zero.

It is assumed that the education decisions are made entirely by parents. In Japan, parents pay for 66% of their children's tuition and living expenses. Thus, the assumption might be accepted naturally. Given compulsory education, at least until age fifteen, parents make decisions for each of their children.

3. DATA

This study uses the 1998 and 2003 "National Survey on Families" collected by the Japan Society of Family Sociology. This surveys collects detailed information on respondents (hereafter, we refer to these individuals as parents (fathers and mothers)) and their children (hereafter, we call children (sons and daughters)).

The surveys have been implemented between January-February, 1999 and 2004. In the 1988 survey, a stratified multistage random sample of 10,500 households with respondents who born between 1st of January, 1921 and 31st of December, 1970 from throughout Japan was surveyed by the drop-off, pick-up method, resulting in 6,985 responses (a response rate of 66.5%) . In the 2003 survey, a stratified multistage random sample of 10,000 households with respondents who born between 1st of January, 1926 and 31st of December, 1975 from throughout Japan was surveyed by the drop-off, pick-up method, resulting in 6,302 responses (a response rate of 63 %). We pooled 1998 survey and 2003 surveys.

The information of wage differentials was obtained from the Basic Wage Survey that is published every year. We use wage differentials as proxies for the rate of return of men and women's higher education. One measure is,

log (the average wage of university-graduate men of all ages) − *log* (the average wage of university-graduate women of all ages),

and the other measure is

log(the average wage of university-graduate men aged 50−54)−*log*(the average wage of university-graduate women aged 50−54).

We use wage differentials for the age group 50-54 because the gender wage differentials are the largest for this age group.

The sample we used in our analysis is obtained as follows: first, the number of children is 19,991 (of whom 9,620 are female). The analysis was restricted to a sample of parents who have not experienced loss of a partner, which reduces the number of children reduce to 16,899 (of whom 8,125 are female). To ensure that the parent's investment decisions in their children was complete, the analysis was further restricted to a sample of children who are over 19, this further restricted the number of children to 11,758 (of whom 5,636 are females). For parents who have four or more children, the survey design means they only provide information on the older three children, so we are forced to drop these respondents from the sample which causes the sample size to decline to 11,476 (of whom 5,496 are females).

Furthermore, we excluded children born in 1966 and 1967 because there was a large drop in the number of births in 1966 because of the Japanese superstition of the Fire-Horse year. Japanese people have a superstition that women born in the Fire-Horse year are hot tempered and unmarriageable. Since 1966 was the Fire-Horse year, people tried to avoid having babies in that year. In 1967, the year following the Fire-Horse year, the fertility rate increased sharply by 5.7% points. So, people who entered university in 1985, could enter university more easily than people born in other years, and people born in 1967, who enter university in 1986, faced more difficulty in entering university. Due to exclusion of individuals born in 1966 and 1967, the sample size further declines to 10,718 (of whom 5,137 are females). Finally, we dropped all the observations for which all of the necessary information is not available.

The university enrolment rate of women with brothers (10.95 %) is higher than that of women without brothers (7.96%). So, women with brothers might achieve higher educational levels than women without brothers. On the other hand,

the university enrolment rates of women with sisters and without sisters are similar (9.4%, 9.5%, respectively). So having sisters seems to have no effect on the female university enrolment. For two-year college, the enrolment rate of women with brothers (14.5%) is higher than women without brothers (10.1%). The enrolment rate of women with sisters (13.1%) is similar to women without sisters (11.5%). The enrolment rates at university and two-year college seems to be higher if women have brothers. The descriptive statistics are presented in Table 1.

Table 1. The descriptive statistics

Observations:6890

	Mean	Std.Dev
years of education	13.76	1.88
sex(female=1)	0.48	0.50
having brothers	0.63	0.48
having sisiters	0.55	0.50
first-born child	0.49	0.50
birth order	1.62	0.68
the number of siblings	2.36	0.67
wage differentials(all ages)	0.40	0.03
wage differentials(all ages)*having brothers	0.25	0.19
wage differentials(aged 50-54)	0.32	0.04
wage differentials(aged 50-54)*having brothers	0.20	0.16
income of fathers(1-1.29million yen)	0.04	0.20
income of fathers(1.3-1.99million yen)	0.08	0.28
income of fathers(2-3.99million yen)	0.30	0.46
income of fathers(4-5.99million yen)	0.18	0.38
income of fathers(6-7.99million yen)	0.14	0.34
income of fathers(8-9.99million yen)	0.11	0.31
income of fathers(10-11.99million yen)	0.05	0.21
income of fathers(over 12million yen)	0.04	0.21
income of mothers(1-1.29million yen)	0.06	0.23
income of mothers(1.3-1.99million yen)	0.09	0.28
income of mothers(2-3.99million yen)	0.22	0.42
income of mothers(4-5.99million yen)	0.14	0.35
income of mothers(6-7.99million yen)	0.11	0.31
income of mothers(8-9.99million yen)	0.09	0.28
income of mothers(10-11.99million yen)	0.04	0.19
income of mothers(over 12million yen)	0.03	0.17
mother's working status	0.17	0.37
having a mother who was high school graduate	0.36	0.48
having a mother who was a university graduate	0.04	0.20
having a father who was high school graduate	0.26	0.44
having a father who was a university graduate	0.21	0.41

4. RESULTS

The results of multinomial logit estimation show up in Table 2. The partial effects are shown in columns (1) to (8) in Table 2. Being female is associated with increase in the predicted probability that s/he attends a junior college. Having brothers, having sisters, being the first-born child, and the number of children have no relationship with the predicted probability of a junior college enrolment.

The wage differentials of all age and that of aged 50-54, and the interaction of wage differentials and having brothers have no relationship with the predicted probability of junior college enrolment.

Middle incomes of fathers (6-7.99million yen) are associated with increase in the predicted probability of junior college enrolment. Having a mother who was a university graduate is associated with decrease in the predicted probability that s/he attends junior college, but having a father who was a university graduate is associated with increase in the predicted probability that she attends a junior college. Other variables related to income and parents' educational level have no relationship with the predicted probability that s/he attends a junior college.

Being female is associated with decrease in the predicted probability that s/he attends a university. Having brothers, having sisters, and birth order have no relationship with the predicted probability of university enrolment. On the other hand, being the first-born child is associated with increase in the predicted probability that s/he attends a university. The number of siblings is associated with decrease in the predicted probability that s/he attends university, but has no relationship with university enrolment of women.

Wage differentials of all age have no relationship with the predicted probability of university enrolment, but wage differentials aged 50-54 are associated with decrease in the predicted probability of a university enrolment of both sexes. The interaction of the wage differentials and having brothers has no relationship with the predicted probability of university enrolment.

The higher incomes of fathers (over four million yen) are associated with increase in the predicted probability of university enrolment of both sexes, but only the highest incomes of fathers (12 million yen) are associated with increase in the predicted probability university enrolment of women. Furthermore, educational level of parents is associated with increase in the predicted probability of university enrolment. The magnitudes of the effects of university graduate parents are larger than that of the effects of high school graduate parents.

To sum up, being female increases the probability of junior college enrolment, while decreases the probability of university enrolment. Parents may regard junior college and university as different things and take different strategies according to sex of their children. However, having brothers have no effect on female educational achievement. Parents might decide their resource allocation according to sex of their children, but do not care sibling composition.

Table 2. The results of multinomial logit estimates of higher education choice. Robust standard errors are in parentheses. Dependent variable; 1=high school and vocational school (comparison group, total =3533, women=1733); 2=junior college (total=1008, women=869); 3=university (total=2349, women=709). Age, city size dummy variables, and a constant are included, but their results are not reported in the tables. Values that are shaded are significant coefficients.

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	years of education							
	men and women		men and women		women		women	
	junior college	university	junior college	university	junior college	university	junior college	university
sex(female=1)	0.233	-0.263	0.235	-0.268				
	(0.009)	(0.012)	(0.009)	(0.012)				
having brothers	0.079	0.068	0.089	-0.194	0.103	-0.116	0.107	-0.101
	(0.108)	(0.211)	(0.055)	(0.113)	(0.266)	(0.276)	(0.134)	(0.139)
having sisiters	0.001	0.036	0.001	0.038	-0.020	-0.001	-0.019	0.000
	(0.013)	(0.023)	(0.013)	(0.024)	(0.029)	(0.026)	(0.029)	(0.026)
first-born child	-0.013	0.057	-0.016	0.060	-0.014	0.075	-0.018	0.078
	(0.016)	(0.028)	(0.016)	(0.028)	(0.037)	(0.034)	(0.037)	(0.034)
birth order	-0.016	-0.024	-0.018	-0.019	-0.030	0.002	-0.033	0.006
	(0.013)	(0.023)	(0.013)	(0.023)	(0.030)	(0.028)	(0.030)	(0.028)
the number of siblings	-0.014	-0.056	-0.013	-0.059	-0.025	-0.032	-0.023	-0.030
	(0.009)	(0.020)	(0.010)	(0.020)	(0.021)	(0.020)	(0.021)	(0.020)
wage differentials(all ages)	-0.124	-0.503			-0.875	-0.781		
	(0.347)	(0.606)			(0.766)	(0.720)		
wage differentials(all ages)*having brothers	-0.208	-0.121			-0.297	0.293		
	(0.309)	(0.546)			(0.708)	(0.642)		
wage differentials(aged 50-54)			0.361	-0.633			0.399	-0.161
			(0.160)	(0.284)			(0.352)	(0.331)
wage differentials(aged 50-54)*having brothers			-0.291	0.660			-0.376	0.320
			(0.194)	(0.337)			(0.435)	(0.398)
income of fathers (1-1.29million yen)	0.032	0.040	0.037	0.026	0.079	0.040	0.087	0.025
	(0.038)	(0.053)	(0.040)	(0.053)	(0.078)	(0.064)	(0.079)	(0.061)
income of fathers (1.3-1.99million yen)	0.017	0.018	0.021	0.012	0.074	-0.028	0.080	-0.037
	(0.032)	(0.046)	(0.033)	(0.046)	(0.072)	(0.049)	(0.073)	(0.047)
income of fathers (2-3.99million yen)	0.032	0.067	0.032	0.066	0.113	0.018	0.111	0.012
	(0.025)	(0.037)	(0.025)	(0.037)	(0.053)	(0.042)	(0.054)	(0.042)
income of fathers (4-5.99million yen)	0.035	0.092	0.034	0.090	0.129	0.029	0.127	0.021
	(0.029)	(0.043)	(0.029)	(0.043)	(0.063)	(0.049)	(0.063)	(0.047)
income of fathers (6-7.99million yen)	0.071	0.125	0.070	0.121	0.212	0.052	0.211	0.049
	(0.035)	(0.047)	(0.035)	(0.047)	(0.068)	(0.054)	(0.068)	(0.053)
income of fathers (8-9.99million yen)	0.049	0.152	0.048	0.156	0.170	0.073	0.168	0.080
	(0.035)	(0.049)	(0.035)	(0.049)	(0.073)	(0.061)	(0.074)	(0.061)
income of fathers (10-11.99million yen)	0.045	0.148	0.044	0.151	0.112	0.156	0.114	0.149
	(0.051)	(0.068)	(0.051)	(0.068)	(0.096)	(0.098)	(0.095)	(0.097)
income of fathers (over 12 million yen)	0.019	0.296	0.018	0.295	0.069	0.212	0.070	0.204
	(0.039)	(0.062)	(0.039)	(0.063)	(0.084)	(0.088)	(0.084)	(0.087)
income of mothers (1-1.29million yen)	-0.022	-0.058	-0.023	-0.056	-0.045	0.011	-0.047	0.014
	(0.019)	(0.035)	(0.019)	(0.035)	(0.046)	(0.042)	(0.046)	(0.042)
income of mothers (1.3-1.99million yen)	-0.007	0.035	-0.007	0.037	-0.005	0.028	-0.005	0.033
	(0.020)	(0.037)	(0.020)	(0.037)	(0.046)	(0.044)	(0.046)	(0.045)
income of mothers (2-3.99million yen)	0.014	0.025	0.016	0.024	0.031	0.020	0.034	0.022
	(0.015)	(0.026)	(0.015)	(0.026)	(0.032)	(0.030)	(0.032)	(0.030)
income of mothers (4-5.99million yen)	0.019	0.000	0.022	0.000	0.016	0.031	0.023	0.034
	(0.019)	(0.033)	(0.020)	(0.033)	(0.041)	(0.038)	(0.041)	(0.038)
income of mothers (6-7.99million yen)	-0.007	0.024	-0.006	0.031	-0.042	0.071	-0.039	0.067
	(0.018)	(0.038)	(0.018)	(0.038)	(0.039)	(0.044)	(0.039)	(0.043)
income of mothers (8-9.99million yen)	0.019	0.048	0.024	0.040	0.033	0.041	0.042	0.024
	(0.024)	(0.040)	(0.025)	(0.040)	(0.052)	(0.045)	(0.053)	(0.041)
income of mothers (10-11.99million yen)	-0.025	0.166	-0.025	0.164	-0.005	0.090	-0.006	0.093
	(0.029)	(0.062)	(0.029)	(0.063)	(0.074)	(0.081)	(0.074)	(0.081)
income of mothers (over 12 million yen)	0.020	0.056	0.017	0.050	0.089	0.035	0.083	0.033
	(0.038)	(0.067)	(0.038)	(0.068)	(0.082)	(0.064)	(0.082)	(0.063)
mother's working status(at work=1)	-0.003	0.023	-0.003	0.022	-0.008	0.038	-0.006	0.036
	(0.011)	(0.022)	(0.011)	(0.022)	(0.024)	(0.024)	(0.024)	(0.024)
having a mother who was a high school graduate	-0.004	0.096	-0.004	0.101	-0.003	0.063	-0.001	0.070
	(0.008)	(0.016)	(0.008)	(0.016)	(0.019)	(0.018)	(0.019)	(0.018)
having a mother who was a university graduate	-0.066	0.411	-0.066	0.409	-0.124	0.464	-0.123	0.458
	(0.011)	(0.037)	(0.011)	(0.038)	(0.034)	(0.052)	(0.035)	(0.052)
having a father who was a high school graduate	0.005	0.071	0.003	0.073	0.023	0.040	0.017	0.045
	(0.010)	(0.019)	(0.010)	(0.019)	(0.022)	(0.022)	(0.022)	(0.022)
having a father who was a university graduate	0.019	0.287	0.017	0.292	0.092	0.192	0.092	0.189
	(0.011)	(0.021)	(0.011)	(0.022)	(0.026)	(0.027)	(0.026)	(0.027)
Number of Observations	6921		6818		3328		3274	
Pseudo R-squared	0.155		0.157		0.102		0.100	

Being the first-born child is increase the probability of university enrolment. In Japanese social norms and traditions, parents regard their first-born child as being different from the other children. Parents may invest their resources heavily on their first-born child, which might lead to a higher educational level for their first-born child.

The number of siblings has no relationship with junior college enrolment, while decreases the probability of university enrolment of both sexes. Total tuition of university is higher than that of junior college, so a child may compete with other siblings in order to get more resources of parents. As for university enrolment, the higher the incomes of fathers, the higher the probability of university enrolment of all sexes, but only the highest income of fathers increases the probability of female university enrolment.

The wage differentials variables have no relationship with the probability of junior college enrolment or university enrolment. Only exception is wage differentials of aged 50-54, and wage differentials of aged 50-54 decrease the probability of university of both sexes. The measurement errors of wage differentials of aged 50-54 might lead to these results.

The educational levels of parents are important determinant of attending a junior college or a university. Having a mother who was a university graduate decreases the probability of junior college enrolment, while having a father who was a university graduate increases the probability of junior college enrolment. Having parents who were high school graduates and university graduates increase the probability of university enrolment.

5. CONCLUSION

In this paper, the effect of sibling composition and gender wage differentials on the higher education of women have been investigated using a Japanese micro data set. There are three important findings. First, it is found that children's sex is important determinant of educational level. Compare to male, female increases the probability of junior college enrolment, but decreases the probability of university enrolment. Whether daughters have brothers or not has no effect on female educational level, and whether daughters have sisters or not has no effect on educational level. These results suggest that parents do care about the sex of their children and whether the child is first-born or not, but do not care about sibling sex composition in making decisions about their investments in the children's education. Second, wage differentials do not have any effect on the educational level of females. Becker and Tomes (1986) suggest that parents care about the expected rate of return of their children, but no evidence is found to suggest that parents care about gender wage gap. Finally, it is found that the income and educational level of parents have important roles in influencing the educational levels. The high income of fathers has positive impact on the probability of university enrolment.

Several problems remain. First, the variable used to measure wage differentials may be not appropriate. If available, a more accurate estimate of wage differentials is needed. Second, an analysis of taking into consideration the quality of university education is needed. In Japan, the quality of university is important because high quality university graduates get jobs at firms that offer higher wage easily, but low quality university graduates have difficulties to enter such firms due to discrimination. Third, the ability of each child needs to be considered to test for the possibility that parents decide their resource allocations according to their children's ability.

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