An investigation into the positive effect of an educated wife on her husband's earnings: the case of Japan in the period between 2000 and 2003.

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Abstract

We analyze the effect of a wife's human capital on her husband's earnings, using individual-level data for Japan in the period 2000–2003. We find a positive association between a wife's education and her husband's earnings, which can be attributed to the assortative mating effect as well as the positive effect of an educated wife on her husband's productivity. We divide the sample into those couples with non-working wives and those with working wives, and also employ an estimation strategy proposed by Jepsen (2005), attempting to control for the assortative mating effect. Our regression analysis provides suggestive evidence that educated wives increase their husbands' productivity and earnings only when they are non-workers and have sufficient time to support their husbands. (120 words)

Key Words: earnings, human capital, marriage, the family, assortative mating, cross-productivity effect within marriage.

JEL classification: D13, J22, J24, J31

Introduction

It is widely recognized that human capital is accumulated through costly investment, such as formal education and working experience (Becker 1964). Human capital is also highly influenced by interaction with surrounding people through sophisticated conversations and the like, and thus economic outcomes such as one's earnings are often associated with family and community backgrounds (e.g., Behrman and Wolf 1984; Boulier and Rosenzweig 1984; Hauser and Sewell 1986; Corcoran *et al.* , 1990, 1992).[1] Specifically, Benham (1974) was the first to argue that an educated wife improves her husband's productivity and thus increases his earnings; the so-called "cross-productivity effect within marriage."[2] Using United States census data from 1960 to 2000, Jepsen (2005) finds that a wife's education is positively associated with her husband's earnings, but the magnitude of the effect declines over time.[3] Jepsen conjectured that the rapid increase in a wife's labor participation reduced her time to improve husband's productivity, but no direct evidence was provided. Loh (1996) and Gray (1997) find that a wife's labor participation is negatively associated with her

[1] As an example of social learning, Yamamura (2008) reports a case study from Japan in which people learned how to use computers from neighbors that already owned one.

[2] Their parents' schooling is also found to be positively associated with his earnings (e.g., Heckman and Holtz 1986; Lam and Shoeni, 1993, 1994).

[3] It is widely observed that a wife's human capital positively influences a husband's earnings; for instance, in Israel (Neuman and Ziderman 1992), Iran (Scully 1979), the Philippines (Boulier and Rosenzweig 1984), Malaysia (Amin and Jepsen, L., 2005), and Brazil (Lam and Shoeni, 1993, 1994; Tiefenthaler, 1997).

husband's earnings, but they do not pay direct attention to the wife's educational level. Therefore, little is known about how much a wife's labor participation reduces the positive effect of her education on her husband's productivity and earnings.

This paper uses individual level data from Japan from 2000 to 2003 to examine whether and how much a wife's labor participation influences the effect of her education on her husband's productivity and earnings. We found that an educated wife improves her husband's productivity and earnings only when she is a non-working wife and has sufficient time to support her husband.

Empirical strategy

This paper uses Japanese General Social Survey (hereafter, JGSS) data.[4] JGSSs adopt a two-step stratified sampling method and were conducted throughout Japan between 2000 and 2003. The surveys included standard questions about an individual's and his/her family characteristics through face-to-face interviews. These data cover information related to marital and demographic (age and gender) status, annual income, years of schooling, age, and size of residential area. Spouses' demographics (age and gender) status, job categories, and years of schooling were also obtained.

Table 1 presents the definitions of the variables we use below and their mean

[4] Data for this secondary analysis, "Japanese General Social Surveys (JGSS), Ichiro Tanioka," were provided by the Social Science Japan Data Archive, Information Center for Social Science Research on Japan, Institute of Social Science, The University of Tokyo.

values. All the observations in our sample (n=5,200) were of married couples. The sample was divided into two groups by the wife's labor participation status; working in one group and not working in the other group. There was no statistical difference in the mean values of any observed characteristics between the two groups. A husband's annual income (*INCOMH*) in the working-wife group (around 5.6 million yen) was almost the same as that of the non-working-wife group[5]. On average, husbands were 50 years old and had 13 years of schooling. Wives were around 47 years old and had 12 years of education.

From Table 2, we can see that not only *EDUH* (husband's years of schooling) but also EDUW (wife's years of schooling) is positively correlated with *INCOMH*, which is consistent with the cross-productivity effect within marriage (Benham 1974). We also find that the correlation between *EDUH* and *EDUW* is 0.65, and that between *AGEH* (husband's age) and *AGEW* (wife's age) is 0.95, suggesting that people tend to marry partners of a similar age and educational level. This finding is congruent to the assortative mating in education and age (Becker 1975). That is, productive males tend to marry well educated females, leading to a wife's education being positively associated with her husband's earnings.

In line with Benham (1974) and Jepsen (2005), the regression model takes the following form:

$$\ln(INCOMH)_i = \alpha_0 + \alpha_1 EDUH_i + \alpha_2 EDUH_i + \alpha_3 AGEH_i + \alpha_4 AGEW_i + Z_i \beta + u_i ,$$

[5] It is possible that a husband's earnings are more appropriate than income in this context. However, for this paper, a husband's income is not used, as this data was not available.

where subscript *i* denotes married couple *i*, and the logarithm of $INCOMH_i$ is the dependent variable. Regression parameter α's are to be estimated, and u_i is the error term. Since the data on years of work experience is not available, husband's age is incorporated to capture his work experience. In addition, to control for general market conditions and macro-level shocks, large city and medium size city dummies (size of residential area) and year dummies are incorporated in *Z*, the vector of control variables, with β as the vector of corresponding coefficients.

Our major focus in this paper is to find out whether the cross-productivity effect is at work; that is, whether an educated wife improves her husband's productivity and earnings (see, e.g., Benham, 1974; Scully, 1979; Kenny, 1983; Wong, 1986; Lam and Schoeni, 1993; Lefgren and McIntyre, 2006; Huang *et al*., 2009). If an educated non-working wife spends a certain amount of time to support her husband and consequently raises her husband's productivity whereas a working wife does not have enough time to do so, the coefficient on *EDUW* is expected to take a positive sign only in a sub-sample of couples with non-working wives but not in a sub-sample of couples with working wives. The assortative mating hypothesis, however, also predicts a positive association between a wife's human capital and her husband's earnings, regardless of the wife's labor participation status (Welch, 1974; Liu and Zhang, 1999; Lefgren and McIntyre, 2006; Huang *et al*., 2009). We are concerned that this assortative mating effect could be sufficiently strong, and the cross-productivity effect might be masked and our hypothesis testing may not work.

In order to alleviate this identification problem between the cross-productivity effect within marriage and the assortative mating effect, we will make our best effort to control for the assortative mating effect. Including husband's own education as a

covariate in the regression function is considered as a good way to at least partially control for the mating effect (Huang *et al*., 2009). Furthermore, Jepsen (2005) proposes controlling for the assortative mating effect by using a sub-sample containing only husbands and wives who have an age difference of more than 5 years, while she claims that "this sample represents couples who are less likely to have met each other either in high school or college" (Jepsen 2005, p.204).[6] By minimizing the assortative mating effect, this estimation strategy helps to isolate the cross-productivity effect. As a result, it is expected that a sub-sample of couples with non-working wives will exhibit a significantly positive coefficient on EDUW that is not present in a sub-sample of couples with working wives.[7] Such an estimation result would imply that it takes a certain amount of time of an educated wife for her human capital to improve her husband's productivity and earnings. By contrast, a working wife does not have sufficient time to do so, and this newly-discovered foregone increase in husband's earnings should be considered as an additional component of opportunity cost to a working wife, though it has never been explicitly taken into account in the existing literature.

Estimation results

[6] Admittedly, this argument is not entirely convincing, as one does not have to meet in school to mate assortatively.

[7] Precisely speaking, the decision making process of a wife's labor participation should be considered to control for self-selection. This is, however, beyond the scope of this note and is an issue to be addressed in a future study.

Table 3 presents our estimation results. The results in Columns (1)-(3) are based on the original sample of married couples, whereas the results in columns (4)-(6) are of the sample that excludes couples with an age difference of less than 5 years. The results using the sample of non-working wives are in columns (2) and (5), while the results using the sample of working wives are in columns (3) and (6). As shown in the first row, the coefficient on *EDUH* takes a positive sign with 1% statistical significance in all estimations, consistent with the standard theory of human capital. In Columns (1) to (3) the estimated coefficient on *EDUW* is positive and statistically significant; its magnitude indicates that an additional year of a wife's education increases her husband's annual earnings by 4 to 6 percentage points, which is slightly below the effect of a husband's education but economically significant. This estimation result that the coefficient on *EDUW* is significantly positive irrespective of the wife's labor participation status implies the assortative mating. When this assortative mating effect is controlled for (Columns 4 to 6), the coefficient on *EDUW* still remains significantly positive in the sub-sample of the non-working wives (Column 5), whereas the coefficient on *EDUW* becomes insignificant in the sub-sample of the working wives (Column 6). This estimation result suggests that an educated non-working wife supports her husband and raises his productivity, whereas a working wife does not have sufficient time to support her husband as much. In other words, the cross-productivity effect works only when the wife devotes sufficient time to support her husband.

One would expect that age, acting as a proxy for experience, would have a positive effect on income. However, as shown in AGEH in Table 3, it has a negative effect, significantly so in two cases. I interpret this result as suggesting that the

relationship between a husband's age and his income is non-linear. For the purpose of examining this, in addition to AGEH and AGEW, I also incorporate their squares, $AGEH^2$ and $AGEW^2$, as independent variables. The results of the alternative specification are in Table 4. Furthermore, AGEH and $AGEH^2$ take positive and negative signs, respectively, and show statistical significance in all estimations. It follows from this that a husband's income increases with his age up to a certain level, but then decreases thereafter. Hence, the relationship between a husband's age and his income is considered non-linear. In respect to the main variables in Table 4, the results of EDUH and EDUW do not change in the alternative specification.

Conclusion

Jepsen (2005) finds that, using data from 1960 to 2000 in the United States, an educated non-working wife increases her husband's earnings, but this effect declined over time, and she conjectures that this is likely due to the secular increase in labor participation by married women.

The current paper directly examined whether and how much a wife's labor participation changes the effect of her education on her husband's earnings, using individual-level data from Japan. We found that a wife's human capital has a positive association with her husband's earnings, for both working and non-working wives. After restricting the sample to married couples with an age difference greater than 5 years to partly control for the assortative mating effect, however, the positive effect of a wife's education continues to be observed only in the sub-sample of non-working wives

whereas the effect becomes insignificant in the sub-sample of working wives.

Our statistical analysis, therefore, provides the suggestive evidence for both the assortative mating effect and the cross-productivity effect within marriage. Moreover, the cross-productivity mechanism is time-consuming, as Jepsen (2005) rightly conjectured. To our best knowledge, this has a new and important implication in considering the labor participation of married women, since the existing literature has not explicitly taken into account this cross-productivity effect within marriage as one component of the opportunity cost to working women.

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Table1. Variable definitions and means.

Variables	Definition	Non-working wife	Working wife	All
INCOMH	Husband's annual income (in ten thousand yen)	565	561	563
EDUH	Husband's years of schooling	12.9	12.7	12.8
EDUW	Wife's years of schooling	12.2	12.3	12.3
AGEH	Husband's age	49.5	49.6	49.5
AGEW	Wife's age	46.7	47.0	46.9
Obs.		2283	2659	5200

Notes: Values are simple averages of yearly values over the period 2000-2003. The total sample of "non-working wife" and "working wife" is 4942, which is smaller than the "all" sample, 5200. Observations without data about a wife's work status lead to this difference.

Table2. Correlation matrix.

Variables	INCOMH	EDUH	EDUW	AGEH	AGEW
INCOMH	1	---	---	---	---
EDUH	0.35***	1	---	---	---
	(0.00)				
EDUW	0.31***	0.65***	1	---	---
	(0.00)	(0.00)			
AGEH	-0.05***	-0.31***	-0.39***	1	---
	(0.00)	(0.00)	(0.00)		
AGEW	-0.06***	-0.31***	-0.40***	0.95***	1
	(0.00)	(0.00)	(0.00)	(0.00)	

Note: As the correlation matrix is symmetric, --- indicates the omitted elements to avoid redundancies. Numbers in parentheses are *p*-statistics. *** indicates statistical significance at the 1 per cent level.

Table. 3. *Regression results on husband's annual income.*

Variables	All currently married.			Difference in age between husband and wife > 5 years.		
	(1)	(2)	(3)	(4)	(5)	(6)
	All	Non-worker wife	Worker wife	All	Non-worker wife	Worker wife
EDUH	0.06***	0.08***	0.04***	0.07***	0.07***	0.07***
	(13.9)	(12.2)	(7.12)	(6.90)	(4.66)	(4.53)
EDUW	0.05***	0.06***	0.04***	0.05***	0.07***	0.02
	(8.57)	(6.70)	(5.38)	(3.01)	(3.31)	(1.11)
AGEH	-0.002	-0.002	-0.002	-0.008*	-0.01**	-0.005
	(-0.85)	(-0.64)	(-0.79)	(-1.70)	(-2.01)	(-0.85)
AGEW	-0.003	-0.003	-0.001	-0.005	0.002	-0.007
	(-1.15)	(-0.91)	(-0.36)	(-1.19)	(0.35)	(-1.16)
Constant	4.97***	4.68***	5.19***	5.34***	5.16***	5.56***
	(50.1)	(34.6)	(34.3)	(20.7)	(14.3)	(13.8)
Obs.	5200	2283	2659	901	389	473
Adj R^2	0.16	0.24	0.10	0.21	0.28	0.14

Notes: The dependent variable is the logarithm of the husband's annual income. Numbers in parentheses are *t*-statistics obtained by robust standard errors. *, **, and *** indicate statistical significance at the 10, 5, and 1 per cent levels, respectively. Although not reported here, large and medium-sized city, and year dummies are also controlled for.

Table 4. *Regression results on husband's annual income.*

Variables	All currently married.			Difference in age between husband and wife > 5 years.		
	(1)	(2)	(3)	(4)	(5)	(6)
	All	Non-worker wife	Worker wife	All	Non-worker wife	Worker wife
EDUH	0.05***	0.06***	0.04***	0.06***	0.07***	0.07***
	(12.1)	(10.3)	(6.17)	(6.65)	(4.44)	(4.29)
EDUW	0.04***	0.04***	0.04***	0.04***	0.06***	0.01
	(6.08)	(4.42)	(4.31)	(2.59)	(2.86)	(0.81)
AGEH	0.11***	0.09***	0.12***	0.12***	0.08**	0.15***
	(10.1)	(5.62)	(8.34)	(6.23)	(2.20)	(5.33)
$AGEH^2$	-0.001***	-0.001***	-0.001***	-0.001***	-0.001**	-0.001***
	(-10.4)	(-5.46)	(-8.56)	(-6.54)	(-2.40)	(-5.44)
AGEW	0.02**	0.05***	0.008	0.003	0.03	-0.02
	(2.05)	(3.14)	(0.52)	(0.21)	(1.15)	(-1.07)
$AGEW^2$	-0.0002	-0.0005***	-0.00004	-0.00001	-0.0003	0.000
	(-1.64)	(-2.68)	(-0.27)	(-0.09)	(-0.77)	(1.17)
Constant	2.11***	1.83***	2.19***	2.03***	2.02***	2.05***
	(15.7)	(10.1)	(9.85)	(4.71)	(2.98)	(3.09)
Obs.	5200	2283	2659	901	389	473
Adj R^2	0.29	0.38	0.22	0.29	0.36	0.21

Notes: The dependent variable is the logarithm of the husband's annual income. Numbers in parentheses are *t*-statistics obtained by robust standard errors. *, **, and *** indicate statistical significance at the 10, 5, and 1 per cent levels, respectively. Although not reported here, large and medium-sized city, and year dummies are also controlled for.