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Article

Returns to Women's Education in the Marriage Market: A Comparative Analysis of Japan, Korea, and Taiwan*

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Much research has tried to find the association between women's schooling and their husband's wages. This association has been referred to as returns to women's education in the marriage market, or simply as marriage returns to education. This article compared marriage returns in Japan, Korea, and Taiwan with each other, and contrasted these returns with their wage returns in each country. Analyzing General Social Survey data from each country, which were collected in the late 2000s, it also compared the estimates from several statistical models such as OLS regression, Heckman's selection regression, instrumental variables regression, and conditional mixed process model. The findings were these: first, marriage returns did not seem to be much different from country to country. Second, marriage returns in Japan were much higher than wage returns, whereas the two returns were similar to one another in both Korea and Taiwan. This means that Japanese women might be more concerned about their marriage prospects than Korean and Taiwanese women, when deciding the level of education they will pursue.

Keywords: *women's education, returns to education, marriage returns to education, wage returns to education*

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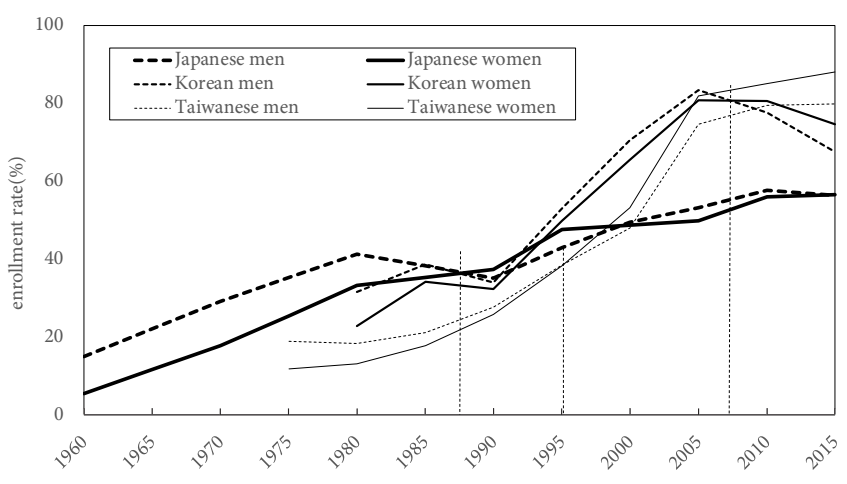
Introduction

Women have already exceeded men in enrollment in higher education in many of the more economically developed countries of the world, including America (DiPrete and Buchmann 2013; Goldin 2006; Goldin, Katz, and Kuziemko 2006). The same trends are currently being observed in East Asian countries, such as Japan, Korea, and Taiwan. Japanese women began to outnumber men in enrollment in tertiary education in the late 1980s, though this trend seemed to be temporarily reversed during the 2000s and early 2010s. Taiwanese and Korean women overtook men in the mid-1990s and in the late 2000s, respectively (*see* Figure 1).

Why have women surpassed men in educational attainment? Failing to explain it as changes in the benefits of education, a few recent investigations have paid attention to gender differences in non-cognitive skills (Becker, Hubbard and Murphy 2010; Buchmann and DiPrete 2006; Goldin et. al. 2006; Jacob 2002). However, this article does not pay attention to cost-side factors like non-cognitive skills but to incentive-side ones. More specifically,



Sources.—www.mext.go.jp/english for Japan, english.moe.gov.tw for Taiwan, www.index.go.kr for Korea.

Fig. 1.—Trends in Enrollment Rates in Tertiary Education in Japan, Korea, and Taiwan

it covers the monetary gains a woman acquires through the marriage by increasing her years of education. The reasons are two: first, incentives have always been the impelling force in women's desire to become better educated (Goldin et al. 2006; Jacob 2002). Second, the monetary benefits that educated women expect to acquire in marriage were known to be a vital cause of the increase in their educational attainment (Ge 2011).

Much research has tried to find the association between a woman's schooling and her husband's income. Such an association has been referred to as *returns to women's education in the marriage market,* or simply as *marriage returns to education*. This article concerns itself with such marriage returns. However, it is different from previous studies in the several following ways.

First, this article compares marriage returns in Japan, Korea, and Taiwan with each other. Despite the similarities in historical backgrounds, there are major differences among the three countries regarding women's work and wages. It is widely known that women have exhibited low labor force participation rates in Japan and Korea, and that their labor force participation rates across age groups still exhibit the so-called M-shaped curve in Japan and Korea as well. In addition, the wage gap between men and women has remained considerably larger in these two countries than in other developed countries including Taiwan (Brinton 2001; OECD 2011). Under these circumstances, women in these two countries have been quite likely to rely on their husbands for their livelihoods and economic well-being. If this is true, then marriage returns to education would have been very important for women in these countries. This article will reveal whether marriage returns were truly substantial in Japan and Korea, and whether they were less significant in Taiwan.

Second, this article contrasts marriage returns with wage returns in each country. Although *wage returns to education* will not be fully discussed here, these will be compared with marriage returns. If marriage returns were larger than wage returns in any country, it could be said that the increase of women's educational attainment in that country has been more strongly driven by marriage prospects than by the expectation of benefits obtainable in the labor market. Several studies have estimated the relative weight of marriage returns against wage returns, finding that marriage returns of Danish and American women were almost the same as wage returns, or that the former was slightly larger than the latter (Bruze 2015; Goldin 1992; Lefgren and McIntyre 2006). How do these returns unfold in the context of East Asian countries? Were marriage returns larger than wage returns in Japan and Korea, where women have been disadvantaged both in labor force

participation and in wages? Was it not true for Taiwan, where women have faced less discrimination in the labor market? This article will answer these questions.

Third, it will estimate marriage returns in various ways and will compare these estimates with each other. Previous research has usually used one or two estimation methods, such as ordinary least squares (OLS) regression, Heckman(1979)'s selection model, or instrumental variable(IV) regression, when estimating both wage returns and marriage returns. Most research has not aggregated the multiple types of available estimates. This article simultaneously presents the estimates derived from several competing estimation models and compares them with each other.

Theories and Hypotheses

Traditionally, women have spent less time in the labor market than men. Thus, it was considered quite normal that women's earnings in the labor market were lower than those of men. However, there has been another way for women to reap economic benefits from being more highly educated. They have utilized their educations as a means to select the most prospective mate, one who will earn a higher income in the labor market. This kind of economic benefit has been one of the most important sources of value that a woman has access to outside the labor market. As a natural result, the positive association between a woman's education and her husband's earnings has been so common as to have been observed in countries such as Brazil (Lam and Schoeni 1993; Tiefenhaler 1997), China (Huang et al. 2009), Hong Kong (Wong 1986), Israel (Grossbard-Schechtman and Neuman 1991; Neuman and Ziderman 1992), Korea (Lee 1998), the Philippines (DeSilva and Bakhtiar 2011), Taiwan (Zhang and Liu 2003), and the United States of America (Benham 1974; Jepsen 2005; Lefgren and McIntyre 2006).

Why is such an association so common? Prior research has presented two different answers. The first answer emphasized cross-productivity between a man and his wife, whereas the second paid more attention to educational homogamy rather than to productivity. The logic of stressing cross-productivity began in an exchange theory that was proposed in the early 1970s as a theory of marriage and family by Becker (1973, 1974). When explaining mate selection, this theory emphasizes that husbands and wives exchange their respective resources, which are usually different from but complementary to each other's. For example, a man having higher skills in

the labor market may be coupled with a woman who is efficiently able to build a family by exchanging his economic ability for her reproductive labor. In this exchange, a woman's resources are subsidiary but conducive to reinforcing a husband's human capital. A wife's resources contribute to the enhancement of her husband's labor productivity by heightening the non-market productivity of the household. Taking charge of the reproductive labor at home, a wife is able to improve her husband's labor productivity by increasing amount of time and effort he spends in the labor market. This kind of increase in productivity has already been proven in the field of labor economics; a married man receives a more significant wage premium than an unmarried one (Kenny 1983; Loh 1996).

A seminal work that attempted to show and explain the close association between a woman's education and her husband's earnings elaborated the above logic by introducing several concepts, such as the *intra-family division of labor*, the *allocative effect of education*, and the *transaction cost of information exchange* (Benham 1974). In a household, as in a firm, a husband and a wife divide their labor on the basis of gender roles in order to maximize their family's production. A husband earns an income outside the home, and a wife performs the reproductive labor, such as housekeeping and child rearing at home. According to this *family-firm hypothesis*, education contributes to maximizing a family's output in two ways. First, a husband's formal schooling raises his productivity both by providing him with the specific skills necessary to the firm for which he works and by improving his ability to acquire information, to understand technological and economic changes, and to properly cope with such changes (Benham 1974). Second, a wife's education is also a way for a husband to increase his productivity. Human associations, such as families and friends, influence the productivity of a worker by transforming the human capital of his associates into a type of ability. Among the various forms of human associations, marriage is the most efficient because transaction cost is the lowest in this association. A husband shares the allocative effect of his wife's education to maximize their household's productivity. As a result, the husband of a highly educated woman tends to earn a higher income, because his wife is more able to understand and take care of everyday matters than a less educated woman (Benham 1974; Goldin 1992).

From the standpoint of this version of exchange theory, it is no wonder that a married woman's education is associated with higher productivity and income for her husband, regardless of whether such an association comes from a more efficient specialization in a household or from the increase of

shared allocative effects. Most empirical studies have preferred to estimate this cross-productivity of women's education, regardless of whether they confirmed the existence of such an effect (Huang et. al. 2009; Jepsen 2005; Lam and Schoeni 1993; Lee 1998; Neuman and Ziderman 1992; Tiefenhaler 1997; Wong 1986; Zhang and Liu 2003).

The *selective mating hypothesis* refuted the abovementioned version of exchange theory. According to this refutation, it is an excessive exaggeration to say that cross-productivity of a couple's education is the only cause of the association between a wife's education and her husband's earnings. Homogamy based on social network or an assortative-mating frame of reference could be another force bringing about the association (Welch 1974). Homogamy is contradictory in form to the marriage expected by Becker's exchange theory. In fact, Becker's version of exchange theory is no longer accepted as an influential theory of mate selection. It is hardly persuasive to postulate that a man would exchange his labor market outcomes for a woman's reproductive labor at home in societies where many couples are made up of two partners, each working in the labor market (Oppenheimer 1997; Rosenfeld 2005).

Homogamy is prevalent in today's world. Educational homogamy is especially widespread (Blossfeld 2009; Mare 1991, 2016; Pencavel 1998; Schwartz and Mare, 2005). Theories of homogamy have mostly paid attention to an individual's preference, commonly underscoring two mechanisms: exchange and affinity (Kalmijn 1998; Rosenfeld 2005). These theories can also be regarded as a kind of exchange theory in that they focused on exchanges between a man and a woman, although they are clearly different in several ways from the above version of exchange theory on which many labor economists have relied. This new version of exchange theory speculates that people searching for spouses compete with each other on the basis of the resources they have in the marriage market (Coltrane and Collins 2000; Mare 1991; Schoen and Wooldridge 1989). A man who has much of any kind of resources tends to exclude women who have fewer resources from candidacy as his future partner. This *vertical exclusion* strategy in a widespread competition finally results in homogamy; a man is more likely to marry a woman of the same or similar social status, education, occupation, ethnicity, religion, and even sexual or physical attractiveness (Kalmijn 1998; Stevens, Owens and Schaefer 1990).

However, such competition is not the only mechanism giving rise to homogamy. Research which has concentrated on concepts such as socialization, gender roles, and self-identity has been inclined to emphasize

that a man usually marries a woman who has traits and tastes similar to his because of the selective affinity between them. They regard '*a common universe of discourse or arena of interaction*' as a driving force for forming an intimate relationship. They say, in other words, that people tends to use the strategy of *self-elimination* in forming groups, which means that individuals actively try to avoid heterogeneous partners in order to conform to his/her own values, norms, and tastes (DiMaggio and Mohr 1985; Kerckhoff and Davis 1962; Lamont and Lareau 1988).

If educational homogamy is driven both by competitive exchange and by selective affinity, the close association between a wife's education and her husband's earnings should be differently interpreted. Such an association should not be assumed to result from the fact that a woman's education enhances her husband's productivity in the labor market. Rather, it comes simply from the fact that highly educated women marry highly educated men, ones who are likely to have an increased chance of earning a higher income in the labor market. In other words, the association between a wife's education and her husband's earnings is said to be simply a derivative of homogamy.

This article has hitherto compared two competing hypotheses, family-firm hypothesis and the selective mating hypothesis, for explaining the close association between a wife's education and her husband's earnings. Although both hypotheses sound plausible in their own way, it is not easy to empirically judge whether such an association comes from cross-productivity or from selective mating. It is nearly impossible to discern between the effects of cross-productivity and the effects of selective mating, because there has been no consensus on how to separately estimate these effects. Most research favoring cross-productivity has used the following regression model, which was originally proposed by Benham (1974),

$$\ln R^H = a_0 + a_1 S^H + a_2 S^W + a_3 X + a_4 X^2 + \zeta \quad (1)$$

where R^H, S^H, S^W, and X represent a husband's hourly wage, a husband's schooling years, a wife's schooling years, and a husband's potential work experience, respectively. In this regression model, the coefficient of a wife's schooling (a_2) indicates the degree of contribution of a wife's schooling to her husband's earnings, which has been referred to as returns to education in the marriage market (Benham 1974; Jepsen 2005). However, research relying on the selective mating hypothesis has estimated marriage returns through equation (2), in which R^H, S^W, and A represent a husband's hourly wage, a

wife's schooling years, and a wife's age, respectively (DeSilva and Bakhtiar 2011; Lefgren and McIntyre 2006).

$$\ln R^H = b_0 + b_1 S^W + b_2 A + b_3 A^2 + \varepsilon \quad (2)$$

The coefficient of a wife's schooling (b_1) in equation (2) simply indicates the percentage increase of a husband's earnings resulting from an additional year of a wife's schooling. Under the condition that unobservable variables affecting a husband's earnings, such as ability and family background, are not controlled, the coefficient of a wife's schooling includes both the cross-productivity effect and the mating effect (Huang et al. 2009).

This article is interested in the degree of association between a wife's education and her husband's earnings, but it does not try to show whether such an association stems from cross-productivity of a woman's education or not. It does not seek to calculate the exact size of the mating effect, either. This means that it will use equation (2) to estimate marriage returns to education.

Data and Variables

This article used General Social Survey data from Japan, Korea, and Taiwan for its analysis. It used data collected by the Japanese General Social Survey (JGSS) in 2005, 2006, 2008, and 2010, and utilized data from the Korean General Social Survey (KGSS) collected in each year from 2006 to 2010.[1] It also used data collected through the Taiwanese Social Change Survey (TSCS) in 2006, 2008, and 2011.[2]

It is almost pointless to try to show trends by using data that were collected over a three- or five-year period. Therefore, the yearly data of each country were pooled together as if they were collected in a single year. Sample sizes of these pooled data in each country were 5,063, 2,955, and 2,321, respectively. However, final sample sizes were much smaller than these because of several sample restrictions: both respondents who were younger than 20 years old and those who were older than 60 in the survey year were

[1] The KGSS data from 2005 were excluded for consistency. A respondent's and his/her spouse's income or wage were measured by tens of categories in the 2005 data, while these were measured in real amounts of money in the data of 2006-2010.

[2] The 2011 TSCS data were included because these were in fact a substitute for the data, which should have been collected in 2010.

discarded. Non-wage earners were excluded, and missing cases were also deleted. Varying sample sizes will be noted where necessary.

As mentioned above, no standard method for estimating marriage returns has been established. This article will use equation (2) both because this equation is sufficiently generic in that it does not distinguish between the cross-productivity effect and the mating effect, and because it has been commonly used in previous empirical studies (DeSilva and Bakhtiar 2011; Goldin 1992; Lefgren and McIntyre 2006).

Equation (2) presupposes that the coefficients will be estimated by ordinary least squares (OLS) regression. However, as is widely acknowledged in studies on returns to education in the labor market, OLS estimates for returns to education may be limited by several biases that have arisen from either sample selectivity or problems of endogeneity (Willis 1987). It is also well known that these biases can be avoided or corrected: sample selection bias can be remedied by Heckman's selection model, and endogeneity bias can be corrected by IV regression (Cameron and Trivedi 2005; Wooldridge 2010). The selection model can be represented as equations (2) and (3), and the IV regression model can be written as equations (2) and (4). Each one of these two models correct biases one by one, but a recent study has developed a way to solve both of these problems at once. It does this with the conditional mixed process (CMP) model, which can be represented as multi-equations (2), (3), and (4).

$$\Pr(D = 1) = e_0 + e_1 S + e_2 A + e_3 A^2 + e_{4i} \Sigma F_i + \mu \tag{3}$$

$$S = f_0 + \Sigma f_{1i} Z_i + f_2 A + f_3 A^2 + \nu \tag{4}$$

In equation (3), D is a dummy variable that will be 1 when an observation is sampled, and F_i represents the ith exogenous variable which is considered to influence sample selection. In equation (4), Z_i shows the ith instrumental variable for women's schooling (S). Based on the assumption that the errors of each equation (ε, μ, and ν) are normally distributed and correlated with each other, the CMP model simultaneously estimates the coefficients of multi-equations (2), (3) and (4) (Roodman, 2011). The estimates of this model would be particularly useful, when the biases of selection model and IV regression move in the opposite direction. At any rate, the coefficient of women's schooling (b_1) in these multi-equations is the estimate of marriage returns to education which might be free from both endogeneity and selection bias. This article compares the estimates of Heckman's selection

model, IV regression, and CMP model with the baseline OLS estimates.

As shown above, the dependent variable is the logged value of a husband's wage rate. Originally, wages were measured in the currency of each country. For the convenience of comparison, these currencies were transformed into a common unit, which was equal to 1,000 US dollars. The results of these transformations were divided again by monthly working hours, and these were finally logged. Let's take an example. Suppose that the monthly wage of a Japanese man amounted to 1 million yen. This was first divided by 100 in order to change Japanese yen into the US dollars (the exchange rate in the late 2000s was approximately 100 yen per 1 US dollar). These 10,000 dollars were arranged into 10 units of 1,000 US dollars. If he worked for an average of 40 hours a month, his hourly wage was .25 thousand dollars. This was transformed into -1.386, which is the logged value of .25.

The monthly wages of Korean and Taiwanese husbands were also transformed in the same manner. The only differences from the case of Japan were the exchange rates. The exchange rates of Korean won and Taiwanese dollar in the years between 2006 and 2010 were approximately 1000 and 30 per 1 U.S. dollar, respectively. These approximate transformations of currencies mean that the comparison between countries are literally approximate. Ample caution should be observed when comparing the coefficients of these countries.

Let us look into the independent variables. In equation (2), the independent variables were a woman's schooling, her age, and age squared. Women's schooling was measured by the sum of schooling years of all schools that they had already completed. When schooling was translated into a categorical variable, it was placed in one of three categories: 1) less than graduation from high school, 2) graduation from junior college, and 3) more than graduation from a four-year university. Age was measured by the difference between survey year and birth year.

As can be seen in equations (3) and (4), several variables were added in selection model, IV regression, and the CMP model. In equation (3), the dependent variable was the probability that a woman married to a man who was a wage earner. Independent variables were the respondent's schooling, age, and age squared. Two categorical variables were added as the independent variables in equation (3). One measured whether or not a woman had a job, and the other indicated whether or not she was a wage-earner. Having no job and being a non-wage earner were reference categories in these variables.

In IV regression, two instrumental variables for a women's schooling

were introduced: her father's schooling and her mother's schooling. These two variables were measured in the same way as a woman's schooling. Even though there has been some research that rejects the attempt to use parental education as instrumental variables, especially in the studies on returns to education (Card 1999), other research has justified using them as instrumental variables (Hoogerheide, Block and Thurik 2012; Lemke and Rischall 2003; Trostel, Walker and Woolley 2002). One of the studies on marriage returns also supported the idea that parental education could be a useful instrumental variable (DeSilva and Bakhtiar, 2011).

Results

Descriptive Statistics

Let us first take an overview of women's education, work, and wages in each country by summarizing the descriptive statistics. The first row of Table 1 shows the percentages of the married among women between the ages of 20 and 59 in Japan, Korea, and Taiwan: 75, 79, and 66, respectively. The next five rows show the education of married men and women in the three countries. The average schooling years of married women in Japan, Korea, and Taiwan were 13.5, 12.9, and 11.6 years, and those of their spouses were 14.0, 13.7, and 12.2 years, respectively. The percentages of married women who completed higher education were 39, 43, and 34, whereas those of their spouses were 44, 56, and 41, respectively. As for the degree of association between women's schooling years and their husbands', though not shown in Table 1, the correlation coefficients were .54, .69, and .72 in these countries. The association was stronger in Korea and Taiwan than in Japan.

Labor force participation rates of married women in Japan, Korea, and Taiwan were 63, 50, and 68, respectively. Note that the rates were higher in Taiwan and Japan, and much lower in Korea. Although highly educated women in Taiwan had a higher rate of participation in the labor force than less educated women, this tendency was not noteworthy in Japan or Korea.

Rates of women's labor force participation across age range are another topic that has attracted our concern, and deserve to be presented here. As shown in Figure 2, participation rates by age were different from country to country. Although the women's labor force participation rate in Taiwan was lower than that of men for all ages, the participation by age was similar in shape to that of men. However, women's participation in the labor force was

TABLE 1
Summary Statistics

Country	Japan		Korea		Taiwan	
Gender / Variables	Women	Husband	Women	Husband	Women	Husband
Marriage rate (%)[1]	75.4	-	79.3	-	66.1	-
Average schooling years (yrs)[2]	13.5	14.0	12.9	13.7	11.6	12.2
Educational level (%)[2]						
Less than high school graduation	60.8	56.3	57.0	44.4	65.9	59.1
Junior college graduation	26.2	8.9	14.4	14.0	16.5	18.6
More than univ. graduation	13.1	34.8	28.6	41.6	17.7	22.4
Labor force participation rate (%)[3]	63.4	92.2	49.6	94.1	67.9	72.2
Participation rate by educ. level (%)[3]						
Less than high school graduation	64.8	90.9	49.3	91.3	63.9	68.0
Junior college graduation	60.8	93.7	44.0	97.6	74.2	81.6
More than university graduation	62.7	95.1	53.1	97.9	76.9	78.5
Ratio of wage earners (%)[4]	85.0	84.2	68.2	66.9	71.4	65.0
Ratio of wage-earners by educ. level (%)[4]						
Less than high school graduation	83.7	81.9	63.9	63.9	65.0	60.3
Junior college graduation	87.2	87.0	78.4	67.7	76.6	70.0
More than university graduation	86.8	89.4	71.8	72.0	88.1	76.8
Average monthly wage($1,000)[5]	1.6	4.7	1.6	3.0	1.1	1.6
(Standard deviation)	(1.5)	(2.5)	(1.1)	(1.6)	(1.5)	(0.9)
Monthly wage by educ. level ($1,000)[5]						
Less than high school graduation	1.4	4.2	1.2	2.4	0.7	1.3
Junior college graduation	1.6	5.1	1.6	3.0	1.5	1.8
More than university graduation	2.7	5.8	2.4	3.9	1.8	2.1

1. The sizes of samples including women aged from 20 to 59 are respectively 5,063, 2,955, and 2,321 in order of Japan, Korea, and Taiwan. The order of countries is the same below.
2. Average among married women. Sample sizes are 3,668, 2,338, and 1,491.
3. (Participants in the labor market/sample size)*100. Sample sizes are 3,729, 2,337, and 1,465.
4. (Wage-earners/participants in the labor market)*100. Sample sizes for women are 2,443, 1,160, and 1,252, and sample sizes for husbands are 3,475, 2,197, and 1,374.
5. Sample sizes for women are 1,718, 783, and 774, and sample sizes for husbands are 2,192, 1,430, and 494.

clearly different from those of men in Japan and Korea. First, women's participation rates were much lower than those of men for all ages. Second, those participation rates rose when women were in their 20s, declined during their 30s, and resurged in their 40s. Such ups and downs finally resulted in the so-called M-shaped curves, from which it is easily assumed that Japanese and Korean women had very peculiar experiences in their economic lives.

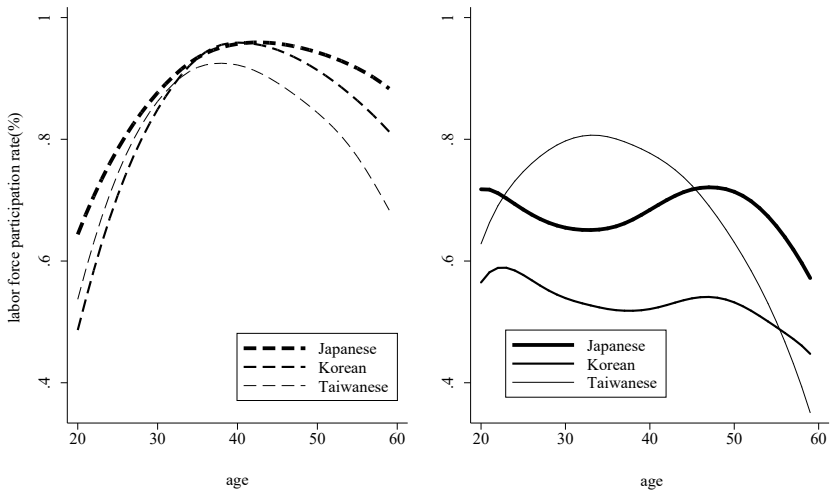


Fig. 2. - Labor Market Participation Rates in East Asia

Now, let us look into wages. The average wages of married women in Japan and Korea were comparable, amounting to about 1.6 thousand dollars a month. Taiwanese women earned 1.1 thousand dollars a month on average, which was about 30 percent less than those of Japanese and Korean women. However, more interesting were not these wage differentials across the countries but the wage gaps between women and their husbands in each country. In the late 2000s, the monthly wages of married women in Japan, Korea, and Taiwan were no more than about 34 percent, 53 percent, and 69 percent of their husband's, respectively.

However, these ratios of wages between men and women in our sample are not consistent with official statistics. The gender wage ratios in the same period were said to be around 67-71 percent, 61-62 percent, and 79-80 percent respectively in these countries, in which the ratio of Japan was not smaller than that of Korea.[3] This will be taken into special consideration shortly.

How much did the monthly wages increase across educational levels?

[3] See http://www.oecd.org/gender/data/genderwagegap.htm for Japan and Korea, and http://ebas1.ebas.gov.tw for Taiwan. Note that the gender wage gap in our data was represented by the ratios of the mean wages, while the ratios in the official statistics were calculated with the median values.

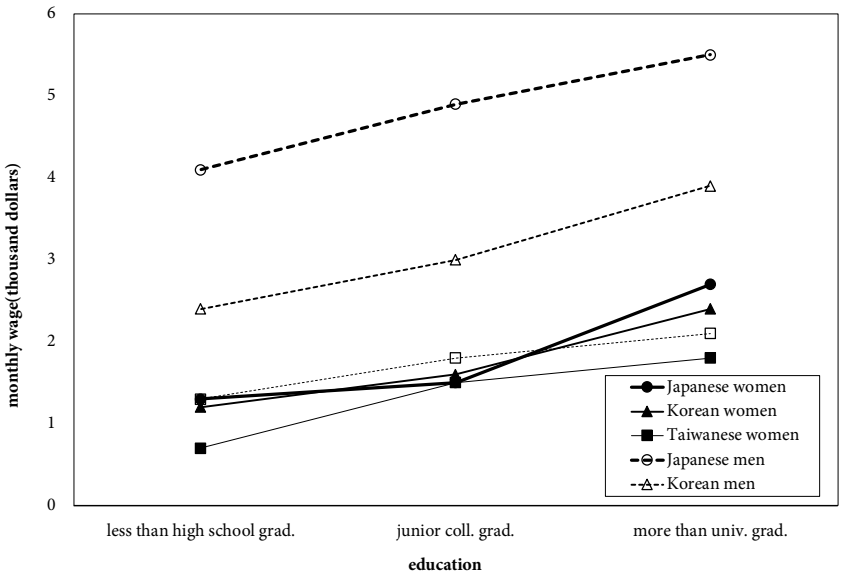


Fig. 3. - Average Monthly Wages by Educational Level in East Asia

This is shown in Figure 3. Several points are notable in this figure. First, the slopes of lines seemed to be at a similar level in each country. Second, the gaps in husbands' wages across countries were visibly wide, but those in wives' wages were not so remarkable. Third, as was described in the previous paragraph, wives' monthly wages were much lower than those of their husbands in Japan and Korea, but this gender gap was relatively modest in Taiwan.

Returns to Education in the Marriage Market

So far, we have browsed the summary statistics, finding several basic similarities and differences in education, work, and wages among Japanese, Korean, and Taiwanese women. Now, let us turn our eyes to marriage returns to education.

First of all, this article estimated the OLS coefficients of women's schooling by using equation (2) for each country. As shown in Table 2, the estimates for coefficients of women's schooling were 0.053, 0.105, 0.080 in Japan, Korea, and Taiwan, respectively. These numeric values mean that a husband's hourly wage in each country increased by 5.3 percent, 10.5 percent,

TABLE 2
The OLS Estimates for Marriage Returns

Variables	Japan	Korea	Taiwan	East Asia
Spouse's logged wage rate				
Schooling	0.053***	0.105***	0.080***	0.052***
	(.005)	(.006)	(.007)	(.005)
Age	0.096***	0.123***	0.044	0.094***
	(.012)	(.018)	(.026)	(.009)
Age squared	−0.001***	−0.001***	−0.000	0.001***
	(.000)	(.000)	(.000)	(.000)
Country				
Korea	-	-	-	−1.189***
				(.099)
Taiwan	-	-	-	−1.280***
				(.106)
Country*Schooling		-	-	
Korea*Schooling	-	-	-	0.060***
				(.007)
Taiwan*Schooling	-	-	-	0.024**
				(.008)
Constant	−6.975	−8.476	−7.211	−6.885
Adjusted R-squared	.098	.171	.186	.337
N	2,549	1,989	740	5,278

1. * p < .05 ** p < .01 *** p < .001
2. The numbers in parentheses are standard errors.
3. The dependent variable is represented with the bold letters in the first row.
4. The reference category of the variable 'Country' in the fourth column is Japan.

and 8.0 percent, respectively, when a woman's schooling rose by a year.

Are these differences across countries really significant? In order to answer this question, we introduced an interaction term between country and women's schooling into equation (2). As shown in the fourth column of Table 2, these interaction terms were all significant at the 95 percent confidence level. Therefore, it can be tentatively argued that women's marriage returns were significantly larger in Korea and Taiwan than in Japan.

The OLS estimates might be biased due to either the sample selection or the omitted variables. These potential biases could be remedied by using Heckman's selection model and instrumental variable regression, respectively. As mentioned above, however, these biases can be corrected all at once by using the CMP model. Due to this, the estimates of the selection model and

IV regression model will not be reported here, although these estimates will be roughly represented in Figure 4. The estimates of the CMP model were instead shown in Table 3. The estimates of the coefficients for women's schooling in this model were .120, .124, .111 in Japan, Korea, and Taiwan, respectively. As is shown in Table 3, the standard errors of these coefficients were 0.015, 0.018, and 0.015, respectively. Based on these estimates and their standard errors, we can say that marriage returns were not so much different from country to country.[4] This result is clearly different from that that of OLS regression.

Let us summarize the scattered findings. The estimates of all the models are collected in the left-most graph of Figure 4. There are several notable points in this graph. First, the estimates of the selection model were not so different from the OLS estimates in any country. This means that the selection biases were not as serious in the three East Asian countries as in other countries (Lefgren and McIntyre 2006). Second, the IV estimates were clearly larger than the OLS ones in all of the three countries. It was particularly larger in Japan. Therefore, we can say that as the IV estimates for wage returns tended to be much larger, for various reasons, than the OLS ones (Card 2001), the IV estimates for marriage returns tended to be much larger than the OLS ones in Japan, Korea, and Taiwan. This means that the OLS estimates for marriage returns tended to have a downward bias due to the omitted variables in these countries. Third, the estimates of the CMP model were not so different from those of the IV regression in each country. This is a natural result of the first finding that the selection biases were negligible in all of the three countries. Fourth, marriage returns in the CMP model were apparently larger in Japan and Korea than in Taiwan. However, their differences between countries were not significant at a 95 percent confidence level. This means that marriage returns of these countries were at

[4] The difference between two regression coefficients ($b_1 - b_2$) obtained in two independent groups can be statistically tested with the following z (Clogg et al. 1995).

$$Z = \frac{b_1 - b_2}{\sqrt{se_1^2 + se_2^2}},$$

where *se* stands for standard error of each regression coefficient

Since z is normally distributed,

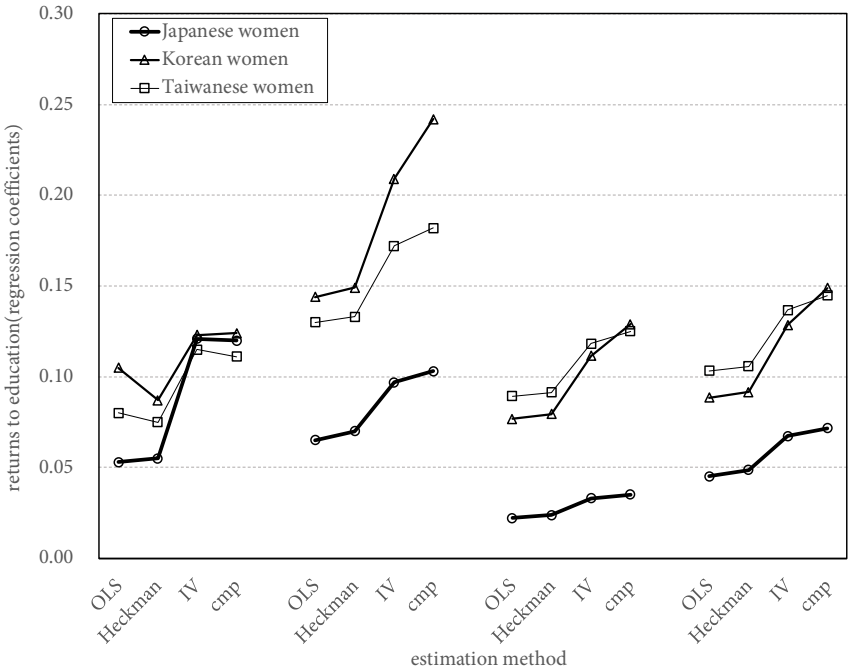
$$z \sim N(0, \sqrt{se_1^2 + se_2^2}),$$

the hypothesis that two coefficients are different from each other would be accepted only when the absolute value of the above z is greater than 1.96. However, no difference between two coefficients of women's schooling in Table 3 is statistically significant.

TABLE 3
The Estimates of Conditional Mixed Models for Marriage Returns

Variables	Japan	Korea	Taiwan
Spouse's logged wage rate			
Schooling	0.120***	0.124***	0.111***
	(.015)	(.018)	(.015)
Age	0.003	0.056*	–0.043
	(.018)	(.022)	(.051)
Age squared	0.000	–0.000	0.001
	(.000)	(.000)	(.001)
Constant	–5.641	–7.362	–5.566
Married*Employed			
Schooling	–0.021	–0.004	0.023
	(.020)	(.032)	(.018)
Age	0.235***	0.463***	0.340***
	(.017)	(.026)	(.025)
Age squared	–0.003***	–0.006***	–0.004***
	(.000)	(.000)	(.000)
Job			
Having a job	–0.176*	–0.516***	–0.196**
	(.076)	(.080)	(.076)
Employed			
Wage earner	–0.201**	–0.011	–0.184**
	(.068)	(.078)	(.069)
Constant	–4.306	–8.257	–7.394
Schooling years			
Father's education	0.197***	0.144***	0.287***
	(.016)	(.016)	(.020)
Mother's education	0.220***	0.099***	0.155***
	(.020)	(.018)	(.022)
Age	0.180***	0.378***	0.441***
	(.027)	(.039)	(.046)
Age squared	–0.002***	–0.006***	–0.007***
	(.000)	(.000)	(.001)
Constant	5.524	6.017	3.122
N	3,889	2,713	2,158

1. * p < .05 ** p < .01 *** p < .001
2. The numbers in parentheses are standard errors.
3. The dependent variables are represented with the bold letters in the first row of each panel.
4. The reference categories of the variable 'Job' and 'Employed' in the second panel are respectively 'Having no job' and 'Non-wage earner'.



1. The first (left-most) graph shows the estimates of marriage returns to education for women in each country.
2. The second graph represents the estimates of wage returns to education for women in each country.
3. The third graph depicts the actual wage returns to education, which contrasts the increase of actual or real amount of money that women receive in the labor market against the amount of money that women reap through their husband's incomes.
4. The fourth graph denotes the corrected actual wage returns to education.

Fig. 4.—Marriage Returns and Wage Returns for Women in East Asia

a similar level. This result is clearly different from the one given by OLS.

It is interesting to compare the estimates of various competing models with the OLS ones, and it is also fascinating to contrast the estimates of the three East Asian countries with each other. However, more stimulating are the contrasts between marriage returns and wage returns for women in each country.

Wage returns to education were estimated using the same data in each country. Needless to say, the model specification for estimating wage returns was quite different from that used for estimating marriage returns. This

means that there were serious changes in the relevant three equations. Wage returns estimated under different model specification were shown in the second graph of Figure 4 (Among these estimates, Table A in the Appendix shows the estimates of the CMP model).

Which is larger between wage returns and marriage returns in each country? Comparing the second graph with the first one in Figure 4, we can easily see that wage returns were much larger than marriage returns in both Korea and Taiwan, whereas in Japan, both returns were similar to one another. Because of this, it is quite tempting to say that when advancing their educational career, Korean and Taiwanese women might consider wage returns more important than marriage returns, whereas Japanese women might regard both returns as equal in significance. It is too soon to declare this conclusion, however, because it can be misleading to directly compare wage returns with marriage returns. It is necessary to take one more step before reaching a final conclusion.

As shown in Table 1 and Figure 3, women earned lower wages on average than their husbands in all of the three East Asian countries under consideration. On average, women's wages were two fifths of their husband's in Japan, three fifths in Korea, and three quarters in Taiwan. This means that despite apparently high wage returns, women's wage increases in real money might be not so large in Japan and Korea. Let us take an example. Wage returns were 10.3 percent for Japanese women when estimated using the CMP model. The level of these returns was only a little bit lower than that of marriage returns, at 12.0 percent. If we translate these growth ratios into the real amount of money that a woman receives in the labor market and in the marriage market, however, the result is quite different. The above wage returns result in merely an increase of 0.165 (=1.6*0.103) thousand dollars near the average of Japanese women's wages, whereas the previous marriage returns result in an increase of 0.564 (=4.7*0.120) thousand dollars near the average of Japanese husbands' wages. In other words, a woman receives an additional 165 dollars and 564 dollars in the labor market and in the marriage market, respectively, when she increases her educational level by one year. This additional money earned in the labor market, 165 dollars, is no more than .035 (=0.165/4.7) of Japanese husbands' average wage. A 10.3 percent in wage returns is equivalent in real money to 3.5 percent in marriage returns. It is therefore highly probable that wage returns in apparent values would not be so attractive to Japanese women, no matter how high those are, because the actual increase in their income is likely to be small. On the contrary, Japanese women would be attracted to marriage returns, no matter

how low those are, because the increase in actual amount of money is not likely to be negligible.

If we transform women's wage returns into the increase in real money women receive in the labor market, and then calculate the ratio of this increased money to the average of husband's wages, we can make a new index that represents an actual increase rate in a woman's earnings. This index will be referred to as the *actual wage returns* hereafter, and these will be clearly contrasted with the apparent wage returns.

Such indices are shown in the third graph in Figure 4. Which is larger between actual wage returns and marriage returns now? Actual wage returns were very close to marriage returns in Korea and Taiwan, regardless of the estimation methods, although apparent wage returns were much higher than marriage returns in these countries. However, actual wage returns were much lower than marriage returns in Japan, regardless of the estimation methods, although apparent wage returns were at a level very similar to marriage returns.

One thing should be noted before concluding our analysis. In an earlier section, the possibility of sampling error was noted: the gender wage gap in Japan might be narrower in the population than in our sample. Assuming that a woman does not receive a wage amounted to 34 percent but instead about 70 percent of a man's wage in Japan, and assuming further that women earn a wage amounted about 62 percent and 80 percent of a man's wage instead of 53 percent and 69 percent in Korea and Taiwan respectively, what will the actual wage returns look like? The fourth graph in Figure 4 answers this question. Compared with the third graph, the actual wage returns were shifted slightly upward. However, they are still lower, especially in Japan, than the marriage returns represented in the first graph.

To sum up, we can summarize the above findings like this: marriage returns in Japan were much higher than wage returns. On the contrary, we can say that in Korea and Taiwan, marriage returns were at a level similar to or slightly lower than wage returns.

Conclusion

Highly educated men are likely to receive higher earnings than less educated men. This positive association between education and income is also true even for non-working women. Highly educated women tend to enjoy a higher economic well-being due to the higher earnings of their husbands.

How much did women's economic well-being improve in Japan, Korea, and Taiwan as their schooling increased by a single year, when we measure their economic well-being by their husband's wages? Were marriage returns for women actually substantial in Japan and Korea, where women's labor force participation has been more limited in their thirties and early forties and their wages have been much lower than those of men? Was it true that marriage returns were not much higher in Taiwan, where women have been less discriminated against in the labor market? These were the first research questions of this article. The next questions regarded comparisons between marriage returns and wage returns in each country. Which of these returns was larger in Japan, Korea, and Taiwan? Were marriage returns larger than wage returns in Japan and Korea, but not in Taiwan?

Analyzing the GSS data from each country collected in the late 2000s, this article answered these questions: first, the OLS estimates for marriage returns were larger in descending order of Korea, Taiwan, and Japan. However, according to the estimates of the CMP model, marriage returns did not seem to be significantly different from country to country. Therefore, we cannot strongly argue that marriage returns were larger in Japan and Korea than in Taiwan. This result is clearly different from our initial expectation.

Second, when seen from apparent values of regression coefficients, marriage returns were lower than wage returns in Korea and Taiwan. The reverse seemed to be true in Japan. However, from the viewpoint of an increase in actual or real amount of money, marriage returns in Japan were much higher than wage returns. On the contrary, two returns were at a similar level in both Korea and Taiwan. The implication of this finding is notable: if the total returns to education for women could be regarded as the sum of marriage returns and wage returns (Lefgren and McIntyre 2006), marriage returns were about a half of the total returns in Korea and Taiwan. Therefore, we can say that both wage returns and marriage returns have equally been the driving forces behind the rising in levels of educational attainment of women in Korea and Taiwan. On the other hand, the proportion of marriage returns to the total returns were over 50 percent for Japanese women. This means that it might not be wage returns but marriage returns that have hitherto driven Japanese women to advance their educational careers.

Why were marriage returns larger than wage returns, especially in Japan? We can logically infer two reasons from our data: low wage returns and the wide gender wage gap. However, the second reason in particular seemed to be responsible for the fact that marriage returns of Japanese

women were larger than those of Korean and Taiwanese women. Why then were marriage returns not larger than wage returns in Korea, where the gender wage gap has been similar to that in Japan? It seemed to be because women's wage returns were higher in Korea than in Japan. To boldly generalize this, we can say that marriage returns for women tend to be larger in a society where gender discrimination in the labor market is higher and women's wage returns are lower. However, this inference should be tested in subsequent research.

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Appendix

TABLE A
The Estimates of Conditional Mixed Models for Wage Returns

Variables	Japan	Korea	Taiwan
Logged wage rate			
Schooling	0.103***	0.242***	0.182***
Experience	0.019***	0.011	0.025***
Experience squared	-0.000	0.000	-0.000
Constant	-6.226	-8.400	-8.183
Labor market participation			
Schooling	–0.039	0.032	0.071**
Age	-0.012***	-0.011	-0.009
Marriage	-0.377***	-0.666***	-0.166
Number of children	-0.104*	-0.165**	-0.053
Having children(1-6 years old)	-0.562***	-0.284**	-0.027
Having children(6-18 years old)	0.309***	0.414***	0.126
Constant	1.657	0.607	0.120
Schooling years			
Father's education	0.174***	0.117***	0.169***
Mother's education	0.125***	0.035*	0.066**
Age	0.015	0.075***	0.090***
Age squared	-0.001***	-0.005***	-0.006***
Constant	11.023	13.005	12.342
N	3,889	2,712	1,398

1. * $p < .05$ ** $p < .01$ *** $p < .001$
2. The dependent variables are represented with the bold letters in the first row of each panel.
3. The reference categories of 'Marriage', 'Having children(1-6 years)' and 'Having children(7-18 years old)' in the second panel are respectively 'Married', 'Yes', and 'Yes'.