Income inequality, higher education, and marriage behavior in Japan*

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1. Introduction

Birth rates have declined in many countries and Japan is no exception. Factors contributing to the decline in fertility rates are changes in marital behavior (declining marital status and late marriage), changes in couples' childbirth behavior (declining fertility rate), and a decrease in births outside marriage. In countries like Japan, where the number of births out of wedlock is low, the effects of such births are trivial. In Japan, the effect of declining fertility rates due to non-marriage is far greater than that of declining fertility rates for married couples. Particularly, about 90% of the drop in the total fertility rate from 2.01 in the 1960s to 1.38 in 2012 is explained by changes in first-marriage behavior, and about 10% by changes in couples' fertility behavior (Iwasawa 2015; Iwasawa, Kaneko, and Sato 2016).

The declining marriage rate is a major cause of Japan's declining birth rate. Between 1970 and 1974, when the first baby boomers reached the age of around 25, the number of married couples surpassed one million. The marriage rate (number of marriages per 1,000 people) during that period was more than 10. Subsequently, both the number of marriages and the marriage rate declined, and from 1978 to 2010, the number of marriages fluctuated around 700,000 per year. The annual number of marriages has fallen below 600,000 in 2018, about half the number in the first half of 1970s.

In many developed countries with declining marriage rates, income inequality is widening. Is this a coincidence? Income inequality exhibits different results depending on the measurement methods, data, comparison targets, and whether it is before or after redistribution, so it is not possible to generalize trends. However, a comprehensive review of Japan's inequality (Moriguchi 2017) states that inequality is widening due to the "impoverishment of the low-income class" that does not accompany the "enrichment of the wealthy" as shown in many developed countries. In Japan, since 2000, the ratio of non-regular workers in the working population and the unemployment rate have risen. Particularly, men have shifted from a homogeneous society in which almost all men are full-time

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employees to a society that includes a certain percentage of non-regular workers. Yokoyama and Kodama (2019) also mention the increasing polarization of income in Japan. Income polarization for men means greater uncertainty for women about who they will marry.

The aim of this study is to analyze the causes of non-marriage and late marriage in Japan. Here, we focus mainly on women's marriage behavior. Marriage is based on the will of both sexes. Therefore, assuming that there is no difference in marital preferences due to educational background, there should be no difference in changes in marriage rate due to educational attainment. However, in Japan, the marriage rate of low-educated men has declined markedly, whereas there is no significant difference in educational attainment among women. The fact that the difference in the change in marriage rate by educational background is small for women suggests that women choose whether or not to marry according to their own preferences. However, the declining marriage rate, especially among men with low educational backgrounds and low incomes, strongly suggests that it is not due to men's own will but rather that women are no longer choosing them. Therefore, this study focuses on female marriage decision making.

This study first analyzes the relationship between the widening income disparity among men and female tendency to stay married or marry later. Loughran (2002) argues that as men's income inequality widens, women will need more time to assess whether men will be able to earn higher incomes and women's age at the time of marriage will increase. Mansour and McKinnish (2022) find that income inequality among men increases income uncertainty, leading women to prefer older husbands who have more certainty about their lifetime income. In this study, income inequality is used as a proxy for uncertainty. We define the marriage market by prefecture and age group and show that male income inequality is negatively correlated with female marriage rates and could contribute to marital delays. Additionally, the negative correlation is larger for the younger generations. This result is consistent with those of previous studies.

Next, we analyze the relationship between female higher education level and late marriage. Goldin and Katz (2002) reveal that women delay marriage to pursue their careers. However, according to Goldstein and Kenney (2001), recent college graduates are more likely to marry, whereas previously in the United States more educated women were less likely to marry. In Japan, due to data limitations, not much analysis has been conducted on late marriages. This study examines the effects of late marriage using large-scale repeated cross-sectional data by dividing the age group into 5-year increments. Our evidence shows that the probability of marriage for highly educated women is low, but the effect disappears with age.

This paper is organized as follows. Section 2 describes the theoretical background of marriage, non-marriage, and late marriage. Section 3 provides a review of empirical research on the current status of non-marriage and late marriage in Japan, and the relationship between marriage rate, income disparity, and educational attainment. Section 4 explains the data and demonstration strategies, and Section 5 reports the results. Finally, the conclusions are discussed in Section 6.

2. Theory of marriage behavior

Why do people get married? Economic models explain that people get married because, for some reason, the benefits of marriage are greater than those of being single. Becker (1973, 1974) explain why people get married in terms of the division of labor within the home. In other words, if one spouse has a comparative advantage in market

production and the other has a comparative advantage in domestic production, each of them will invest in human capital to raise the productivity of market and domestic production. By concentrating on human capital investments in areas of comparative advantage, they can effectively optimize overall household productivity. However, the Becker model is applicable only when market wages differ between men and women (Mansour and McKinnish, 2018). Technological changes in domestic production and narrowing of the wage gap between male and female will reduce the actual marital benefits obtained from the division of labor within the household.

The joint consumption and shared leisure models explain why people marry, even in cases where the Becker model does not apply, as it does today. According to the joint consumption model, when a couple has common public goods (e.g., raising children and admiring flowers), it is rational for one of them to take care of it and the other to focus on market production (Lam 1988). However, in the shared leisure model, even couples who do not divide labor can benefit from each other by sharing hobbies. Mansour and McKinnish (2014) find that couples with less domestic division of labor spend more time together.

In many countries, the tendency to marry late is increasing, as is the case in Japan. The causes of late marriages have been discussed (Loughran 2002; Goldin and Katz 2002). According to Loughran (2002), as men's wage gap widens, women will need more time to assess whether men can earn higher wages and women's age at marriage will increase. Goldin and Katz (2002) show that in the 1960s and the 1970s in the United States, the prevalence of the pill encouraged women to postpone their marriages to pursue careers. They also state that delaying marriage increases assortative mating.

3. Change in marriage behavior in Japan

In 2015, 23.4% of men were unmarried at the age of 50 (National Institute of Population and Social Security Research, Japan) and the proportion of women was 14.1%. In 1970, the unmarried rate at the age of 50 was 1.7% for men and 3.3% for women. According to OECD data, Japan's marriage rate fell from 10.0 per 1,000 people in 1970 to 6.4 in 1995 and 5.0 in 2016.

The decline in marriage rate in recent years is not unique to Japan. The marriage rate per 1,000 people in the UK declined from 8.5 in 1970 to 4.4 in 2016, and in Germany from 7.4 in 1970 to 5.0 in 2016, although not as much as in Japan. The US has one of the highest marriage rates among OECD countries, although it has declined since 1970 (from 10.6 to 6.9). According to Greenwood et al. (2016), between the 1970s and 2000s, the marriage rate in the US, especially among non-college-educated women, declined significantly, and the divorce rate increased. As a result, the rate of female marriage declined by approximately 15 percentage points from 1970 to 2016. Marriage rates are declining in almost all OECD countries, driven by a combination of aging population, delays in marriage, non-marriage, and an increase in divorce rates. Among them, Japan has one of the fastest declining marriage rate in the world.

A common trend among OECD countries is not only a decline in the marriage rate but also a tendency to postpone marriage. In 1990, the age of first marriage was 28.4 for men and 25.9 for women, but in 2016 it rose to 31.1 for men and 29.4 for women. However, compared to Sweden (36.5 for men and 33.8 for women), France (34.4 for men and 32.2 for women), the UK (33.2 for men and 31.2 for women), and Germany (33.8 for men and 31.1 for women), age at first marriage in Japan is one of the lowest, and the degree of progress is rather small among OECD

countries.[1)]

Loughran (2002), Coughlin and Drewianka (2011), Mansour (2022), Sasaki (2017), and Bellou (2017) analyze marriage decisions and income inequality. Mansour (2022) uses the 1980-2018 U. S. Census and American Community Survey data to define the marriage market by state, education, and race/ethnicity. They find that in a marriage market with high income inequality for men, (1) women aged 22-30 years are more likely to marry men who have higher education and more prestigious occupations, and (2) men's income inequality increases income uncertainty, and women prefer older husbands who are more certain about their lifetime earnings.

Sasaki (2017) divides the marriage market into three age groups (20-24, 25-29, and 30-34), four education attainments, and 47 prefectures. Using a sample of males and females aged 20-34 in the Employment Status Survey, he finds that (1) income inequality for men in the 50/10 percentile increases the probability of being unmarried among women, (2) income inequality for women in the 90/50 percentile also has a large positive impact on the probability of being unmarried men, and (3) an increase in the unemployment rate for men has a positive impact on the unmarried probability of women.

Bellou (2017) finds that the divorce rate in the United States, which had been on an upward trend over the past century, leveled off in 1980, and has declined since then. The slowdown and decline in divorce rates coincided with a period of significantly greater income inequality among men. He speculates that changes in women's labor supply, widening income inequality, increased uncertainty in income fluctuations, and a decline in social capital activities, which make remarriage more difficult due to fewer encounters, may be the cause.

Loughran (2002) shows that an average increase in men's wage inequality increases women's reservation wages in the marriage market. Loughran (2002) defines the marriage market based on metropolitan area, education, and race and finds that the male wage gap decreases the proportion of married women aged 22-30 years. Gould and Paserman (2003) define the marriage market by metropolitan area and finds that wage disparity for men increases the odds that white women aged 21-30 will not marry.

Coughlin and Drewianka (2011) define the marriage market based on the state of residence and find the same relationship using the Current Population Census (CPS) data in 1977-2005. They conduct an additional analysis of the individual-level marriage hazard model using the Panel Survey on Income Dynamics (PSID) data from 1981 to 1997 and suggest that the negative impact of inequality on marital hazard was primarily for women in their 20s.

Women's higher education promotes late marriage. As mentioned in Chapter 2, in the 1960s and the 1970s, the prevalence of the pill in the United States prompted women to delay marriage to pursue careers (Goldin and Katz 2002). Goldstein and Kenney (2001) show that in the United States, more educated women were less likely to marry, whereas recent college graduates are more likely to marry. Isen and Stevenson (2011) also find that in the United States, women with a college degree are more likely to marry, remarry, and have significantly lower divorce rates than women without a college degree.

4. Data and Empirical Strategy

4.1 Data

The data used for the analysis are from the 1982-2017 Basic Survey on Employment Structure. It is a large-scale repeated cross-sectional survey conducted by the Statistics Bureau of the Ministry of Internal Affairs and Communications once in every five years. It covers approximately 1 million individuals throughout the country

each time. We use data over 35 years, from 1982 to 2017, which enables us to observe long-term changes in income inequality of men and marriage behavior of women. The survey includs marital status, educational attainment, annual income, residential area, age, and gender.

Since annual income in the survey is a categorical value, we replaced it with the median value of each category and replaced the lower limit value in the case of the top code.[2] Subsequently, annual income was divided by the consumer price index and converted into real annual income.

The summary statistics are presented in Appendix Tables 1-4. The unconditional ever-married ratio in the entire sample was 76.1% in 1982 and 72.5% in 2017 (Appendix Table 1). The average years of education were 11.5 in 1982, and 13.0 in 2017. Appendix Table 2 shows the Gini coefficients for men in each age category from 1982 to 2017. The older the age, the larger the size of the Gini coefficient each year. Appendix Table 3 displays the coefficient of variance (CV) for male by age group and year. Similar to the Gini coefficient, the older the age, the greater the CV. As shown in Appendix Table 4, the average real income of men is highest in the late 40s or early 50s each year. The average real income for men increased from the 1980s to the early 1990s and decreased from the late 1990s, as shown in Figure 5 in Chapter 4.

Appendix Table 1. Summary statistics: Propensity of ever-married and education years

	Propensity of ever-married			Education years		
year	count	mean	sd	count	mean	sd
1982	828911	0.761	0.427	823638	11.472	2.245
1987	831827	0.743	0.437	826787	11.704	2.259
1992	1053235	0.726	0.446	1045791	11.933	2.272
1997	1015306	0.728	0.445	1006946	12.141	2.297
2002	966767	0.609	0.488	961458	12.304	2.324
2007	954529	0.731	0.444	940801	12.655	2.359
2012	921942	0.735	0.441	918293	12.599	2.225
2017	903618	0.725	0.446	896856	12.998	2.350

4.2 Empirical Strategy

Our basic estimation equation is given as follows:

$$\begin{aligned} EverMarried_{ipat} &= WageInequality_{pat} + AverageWage_{pat} + FemaleRatio_{pat} + Education_{ipat} \\ &+ Year\ FE + \varepsilon_{ipat} \end{aligned} \quad \text{(eq.1)}$$

where i indexes individual, p prefecture, a age group, and t year, and the dependent variable $EverMarried_{ipat}$ is 1 if she has been married, and 0 if unmarried, divorced, or widowed.

We define the marriage market by 5-year age categories and 47 prefectures based on the stylized fact that while the homogeneity of educational backgrounds has decreased in recent years, and the homogeneity of age has increased.[3] As shown in Figures 8 and 9 in Section 4, 30% of the couples were of the same age, and nearly 80%, including couples with a one-year age difference. Additionally, marriages between people with the same

Appendix Table 2. Summary statistics: Gini coefficients

		Gini						
		Late 20s	Early 30s	Late 30s	Early 40s	Late 40s	Early 50s	Late 50s
1982	count	829599	829599	829599	829599	829599	829599	829599
	mean	0.201	0.221	0.237	0.259	0.285	0.309	0.355
	sd	0.024	0.023	0.020	0.018	0.021	0.023	0.028
1987	count	832301	832301	832301	832301	832301	832301	832301
	mean	0.199	0.215	0.237	0.250	0.269	0.298	0.343
	sd	0.021	0.024	0.023	0.023	0.024	0.028	0.030
1992	count	1054679	1054679	1054679	1054679	1054679	1054679	1054679
	mean	0.193	0.211	0.228	0.251	0.267	0.291	0.329
	sd	0.016	0.018	0.024	0.020	0.023	0.025	0.029
1997	count	1017218	1017218	1017218	1017218	1017218	1017218	1017218
	mean	0.193	0.201	0.217	0.236	0.257	0.279	0.309
	sd	0.015	0.018	0.018	0.020	0.021	0.022	0.024
2002	count	968423	968423	968423	968423	968423	968423	968423
	mean	0.214	0.224	0.240	0.258	0.278	0.304	0.332
	sd	0.019	0.019	0.018	0.021	0.019	0.023	0.021
2007	count	959744	959744	959744	959744	959744	959744	959744
	mean	0.223	0.230	0.253	0.272	0.284	0.302	0.334
	sd	0.018	0.017	0.018	0.018	0.019	0.022	0.023
2012	count	927439	927439	927439	927439	927439	927439	927439
	mean	0.232	0.241	0.255	0.275	0.290	0.301	0.327
	sd	0.020	0.024	0.022	0.018	0.019	0.021	0.023
2017	count	910880	910880	910880	910880	910880	910880	910880
	mean	0.229	0.244	0.259	0.274	0.289	0.295	0.313
	sd	0.017	0.019	0.019	0.017	0.016	0.018	0.018

Appendix Table 3. Summary statistics: CV

		CV						
		Late 20s	Early 30s	Late 30s	Early 40s	Late 40s	Early 50s	Late 50s
1982	count	829599	829599	829599	829599	829599	829599	829599
	mean	0.461	0.473	0.492	0.519	0.568	0.619	0.781
	sd	0.049	0.047	0.047	0.049	0.052	0.058	0.080
1987	count	832301	832301	832301	832301	832301	832301	832301
	mean	0.464	0.462	0.484	0.496	0.532	0.596	0.752
	sd	0.056	0.051	0.053	0.051	0.059	0.064	0.094
1992	count	1054679	1054679	1054679	1054679	1054679	1054679	1054679
	mean	0.465	0.463	0.486	0.514	0.532	0.578	0.685
	sd	0.042	0.040	0.054	0.046	0.054	0.062	0.086
1997	count	1017218	1017218	1017218	1017218	1017218	1017218	1017218
	mean	0.527	0.495	0.497	0.512	0.536	0.565	0.649
	sd	0.047	0.050	0.038	0.050	0.047	0.052	0.061
2002	count	968423	968423	968423	968423	968423	968423	968423
	mean	0.568	0.539	0.543	0.555	0.594	0.649	0.734
	sd	0.066	0.046	0.048	0.046	0.048	0.058	0.058
2007	count	959744	959744	959744	959744	959744	959744	959744
	mean	0.583	0.544	0.568	0.587	0.601	0.641	0.728
	sd	0.065	0.048	0.044	0.043	0.046	0.058	0.068
2012	count	927439	927439	927439	927439	927439	927439	927439
	mean	0.614	0.575	0.577	0.608	0.625	0.643	0.715
	sd	0.057	0.057	0.052	0.048	0.046	0.053	0.063
2017	count	910880	910880	910880	910880	910880	910880	910880
	mean	0.585	0.564	0.586	0.602	0.626	0.633	0.677
	sd	0.053	0.047	0.043	0.046	0.040	0.045	0.048

Appendix Table 4. Summary statistics: Average income

		Average income						
		Late 20s	Early 30s	Late 30s	Early 40s	Late 40s	Early 50s	Late 50s
1982	count	829599	829599	829599	829599	829599	829599	829599
	mean	277	356	418	458	469	463	392
	sd	30	44	50	64	69	73	74
1987	count	832301	832301	832301	832301	832301	832301	832301
	mean	301	384	450	501	523	506	431
	sd	36	52	66	71	77	82	84
1992	count	1054679	1054679	1054679	1054679	1054679	1054679	1054679
	mean	337	432	501	562	616	620	548
	sd	32	54	70	79	89	96	106
1997	count	1017218	1017218	1017218	1017218	1017218	1017218	1017218
	mean	319	428	511	572	608	637	581
	sd	24	42	57	70	75	78	79
2002	count	968423	968423	968423	968423	968423	968423	968423
	mean	291	387	478	545	574	573	537
	sd	26	38	54	67	72	70	65
2007	count	959744	959744	959744	959744	959744	959744	959744
	mean	284	375	445	521	569	570	517
	sd	33	44	55	69	80	87	77
2012	count	927439	927439	927439	927439	927439	927439	927439
	mean	270	351	415	472	529	553	513
	sd	28	42	51	59	72	78	73
2017	count	910880	910880	910880	910880	910880	910880	910880
	mean	285	366	417	459	500	543	534
	sd	29	51	56	58	60	68	73

educational background are less than 40% in all generations. For this reason, we assumed that the marriage market is divided by prefecture and age group and not by educational background.

$WageInequality_{pat}$ is calculated as male wages by a prefecture p, age group a, and year t. $AverageWage_{pat}$ are the average "annual income or earnings (including tax) from the main job" of men who have a job in a prefecture p, age group a, and year t. Pensions are not included in the wage. Wages for family employees, who are family members of the self-employed and help the business unpaid, are considered zero. If they receive wages, even if they are family members, they are treated as "employed persons," and their wages are recorded. The value of wages of people who do not usually work was recorded as missing in the original data, and was replaced with zero. Since income is a categorical value, we replaced it with the median value of each stratum (the lower limit in the case of the top code) and calculated the annual income converted to the CPI.

$Education_{ipat}$ refers to the years of education for individual women. We also control for year fixed effects.

5. Results

Both men and women are becoming more highly educated in Japan, as in other developed countries. Figure 1 shows the number of years of education for male and female. The increase in educational attainment among men progressed rapidly before the 1980s (Panel a), whereas women have become highly educated since the 1990s (Panel b). In 2017, the average number of years of schooling for women in their late 20s reached 14, almost the same as that for men.

Figure 1. number of years of education of male and female

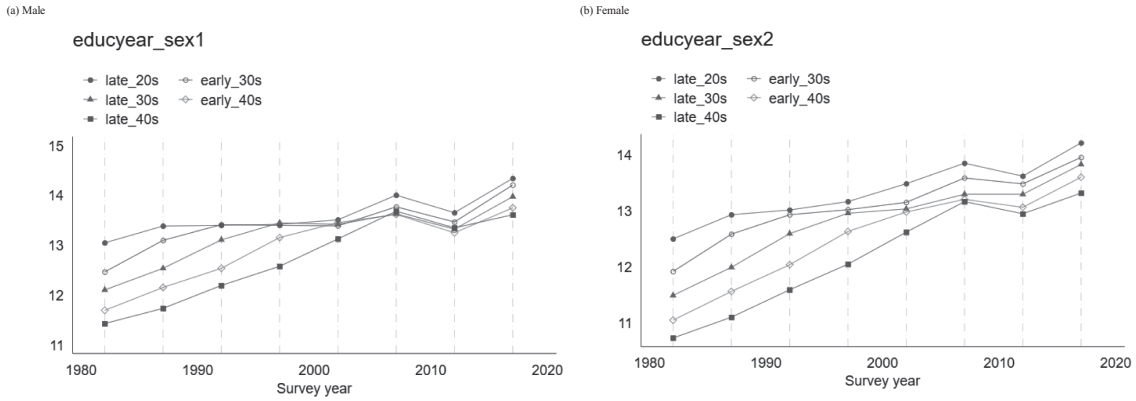


Figure 2. Average ever-married ratio by gender and age group

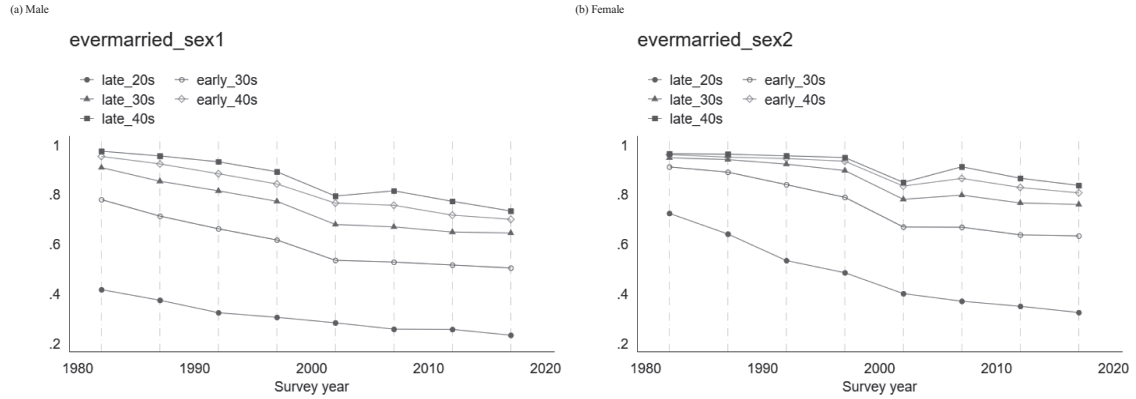


Figure 3. Ever-married ratio of male by educational background

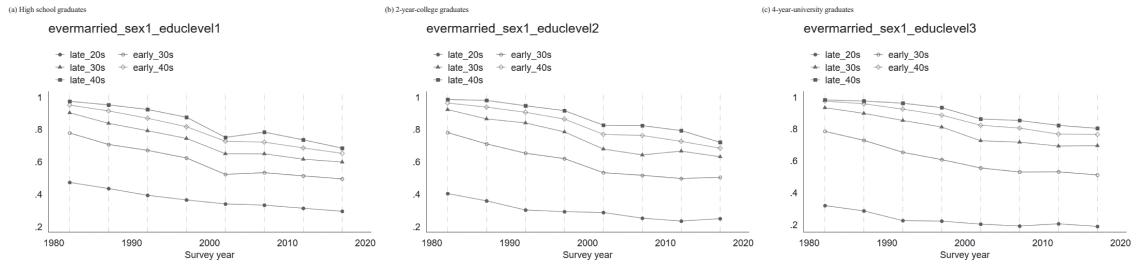


Figure 2 depicts the average ever-married ratio by gender and age group. The ever-married ratio has been declining in all age groups for both men (Panel a) and women (Panel b). Women are generally more likely to be married than men. Particularly, the ever-married ratio among women in their 20s shows a sharp decline during the 1990s and the 2000s. At the same time, the rate of women entering four-year colleges skyrocketed.

The ever-married ratio of men by educational background is presented in Figure 3. The ever-married ratio of high school graduates (Panel a) is much lower than among two-year-college graduates (Panel b) and four-year

Figure 4. Ever-married ratio of female by educational background

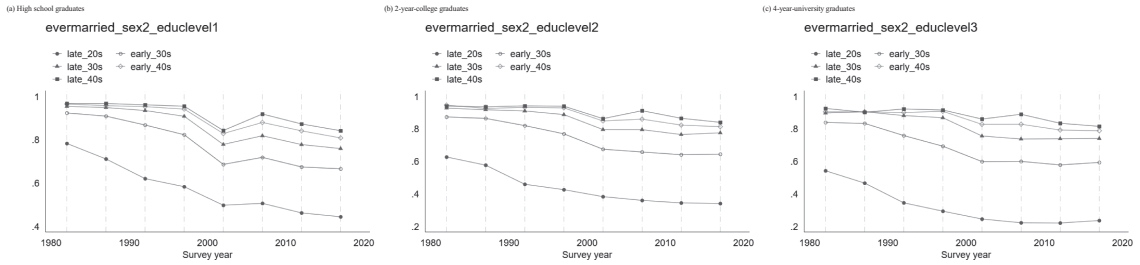
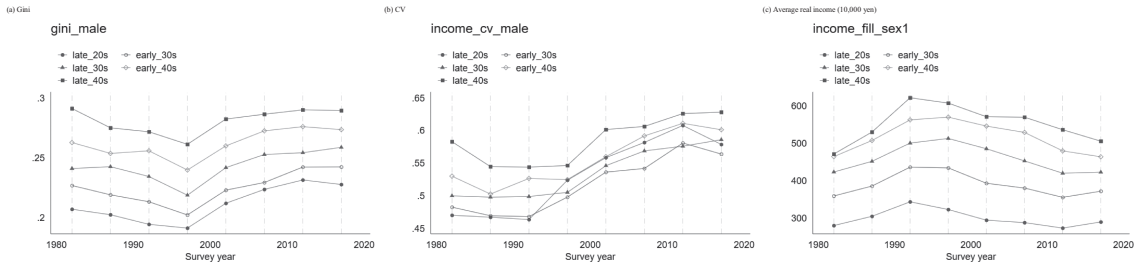


Figure 5. Male income inequality and average income by age group



university graduates (Panel c). We see that the ever-married male ratio dropped among all educational backgrounds across all age groups. Particularly, men with low educational attainment had a significantly lower marriage probability than men with high educational attainment.

Figure 4 represents the ever-married female ratio based on educational background. While the ever-married ratio of high school graduates in their late 20s was about 80% in 1982 and approximately 40% in 2017 (Panel a), the ratio of four-year-university graduates in their 20s was around 30% in 1982 and 20% in 2017 (Panel c). In 1982, the ever-married ratio among four-year-university graduates was rather lower than that among high school graduates and two-year-college graduates, however, in 2017, it is the same as that of high school and two-year-college graduates. Though ever-married ratios for women also fall among all age groups across all educational backgrounds, the differences by educational attainment are smaller than for men. In the past, the marriage rate among highly educated women was low, but as higher education for women became more popular, the difference in marriage rates across educational backgrounds narrowed.

Male income inequality among all age groups, as measured by the Gini coefficient, reduced from the 1980s to the 1990s but has widened since the 1990s, as shown in Panel a in Figure 5. The trend is the same for income inequality, as measured by the CV (Panel b). However, the average real income for men rose from the 1980s to the early 1990s and decreased since the late 1990s (Panel c). This means that men, on an average, are becoming poorer, and simultaneously, uncertainty has increased. Figure 6 presents that the probability of being a regular worker fell (Panel a) and the probability of being unemployed increased (Panel b), which drove income to fall and uncertainty to increase during the last 35 years. For a woman, there was a growing need to determine whether the man she would marry would earn a high income.

The relationship between income inequality among men and the ever-married ratio for women by prefecture is shown in Figure 7. The bubble size indicates the number of women in each age group in each prefecture. Blue and

Figure 6. Probability of being a regular worker and the probability of being unemployed

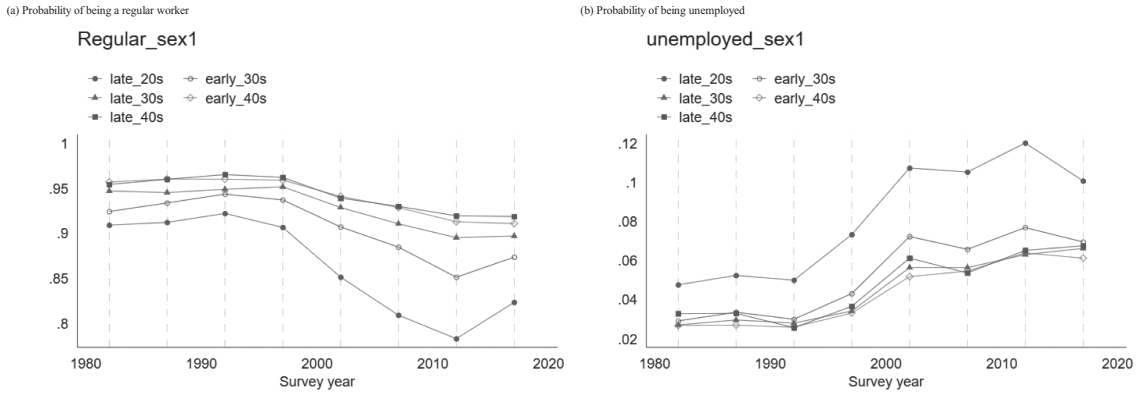


Figure 7. Relationship between income inequality among men and ever-married ration for women by prefecture

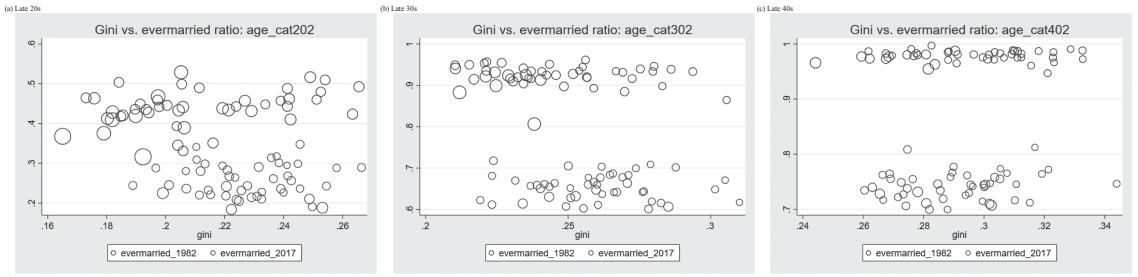
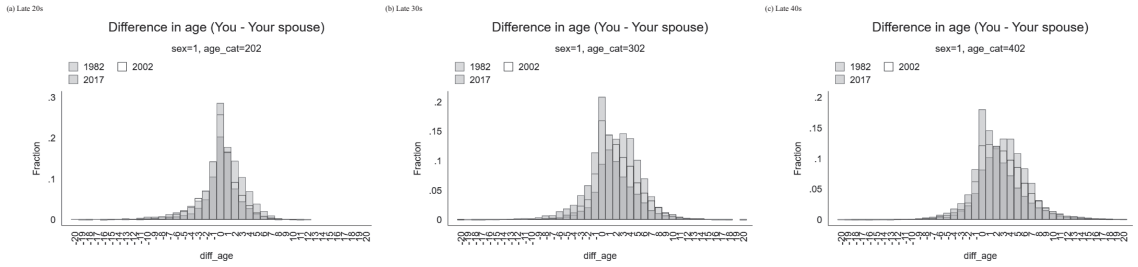


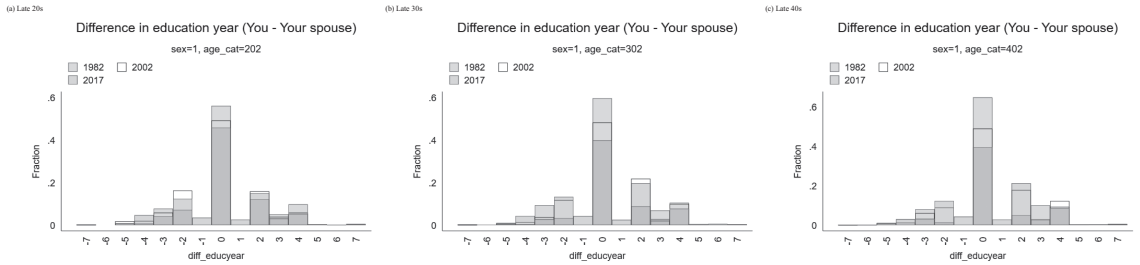
Figure 8. Distribution of age difference between husband and wife



red bubbles represent 1982 and 2017, respectively. In 1982, women in larger populated prefectures were less likely to marry in their late 20s (Panel a). The ever-married ratio in 2017 was lower than those in 1982 for all prefectures. While there were few differences in the ever-married ratios in 1982 among women in their late 30s (Panel b) and late 40s (Panel c), the average ever-married ratios fell and disparity between prefectures widened in 2017.

Next, we show how assortative mating has changed in terms of age and educational background to provide suggestions on how to define the marriage market. Figure 8 demonstrates the distribution of age differences between husbands and wives in the late 20s (Panel a), late 30s (Panel b), and late 40s (Panel c). The average age of the husband was 4-5 years more than that of his wife in the late 40s in 1982, but the age gap narrowed in 2017. This

Figure 9. Distribution of education background difference between husband and wife



trend is even more pronounced among those in their late 20s. Recently, 30% of couples are exactly the same age, and nearly 80%, including couples with a one-year age difference.

However, the number of couples with the same educational background decreases. Figure 9 depicts the distribution of differences in educational attainment between husbands and wives in the late 20s (Panel a), late 30s (Panel b), and late 40s (Panel c). Across all age groups, the percentage of married couples with no difference in years of education is declining. In the past, marriages between people with the same educational background were more common, and in many cases, the husband's educational age was two to four years more than that of the wife. However, in recent years, marriages between people with the same educational background have been about 40% or less across all generations. The proportion of couples whose wives had more years of education than their husbands also increased. In terms of educational background, assortative mating has decreased.

In the US, Loughran (2002) defined marriage markets based on metropolitan areas, education, and race; Gould and Paserman (2003) and Coughlin and Drewianka (2011) defined marriage markets based on metropolitan areas; and Mansour and McKinnish (2022) defined them by state, education, and race/ethnicity. Sasaki (2017) divided the marriage market into three age groups (20-24, 25-29, and 30-34), four educational backgrounds, and 47 prefectures. We define the marriage market by age groups with five-year increments in 47 prefectures based on the stylized fact that while the heterogeneity of educational backgrounds has increased in recent years, the homogeneity of age has also increased.

Table 1 presents the estimates of males' income inequality and female educational attainment on the female ever-married ratio. Each column shows the marginal effects of the probit model using samples from the late 20s (Column 1), early 30s (Column 2), late 30s (Column 3), early 40s (Column 4), and late 40s (Column 5). The coefficients of Gini are negative and statistically significant at the 1 percent level, suggesting that income inequality among men decreases the female marriage ratio. The older the age, the smaller is the effect. This is consistent with the theoretical hypothesis that as men's income inequality increases, women will need more time to assess whether men can earn higher incomes and women's age at marriage will increase.

The coefficients of mean income are negative and statistically significant at the 1 percent level, which suggests that the high average incomes of men lower the marriage rates of women. The negative effects of mean income can be explained by lower marriage rates in urban areas.

The coefficients of female ratio in the same prefecture are positive in the late 20s and early 30s but negative in the late 30s or older. This suggests that in the late 20s, the more women there are, the higher their marriage rate. This can be explained by the fact that younger women are more likely to marry older men, so marriage is not a

Table 1. Female's ever-married propensity

VARIABLES	(1) late 20s	(2) early 30s	(3) late 30s	(4) early 40s	(5) late 40s
gini_male late20s	-1.329***				
	(0.083)				
gini_male early30s		-1.269***			
		(0.061)			
gini_male late30s			-0.998***		
			(0.052)		
gini_male early40s				-0.954***	
				(0.048)	
gini_male late40s					-0.813***
					(0.046)
mean_income_male late20s	-0.094***				
	(0.018)				
mean_income_male early30s		-0.127***			
		(0.011)			
mean_income_male late30s			-0.114***		
			(0.009)		
mean_income_male early40s				-0.128***	
				(0.008)	
mean_income_male late40s					-0.111***
					(0.007)
female_ratio late20s	0.539***				
	(0.082)				
female_ratio early30s		0.197**			
		(0.079)			
female_ratio late30s			-0.114*		
			(0.068)		
female_ratio early40s				-0.476***	
				(0.062)	
female_ratio late40s					-0.305***
					(0.057)
education year	-0.053***	-0.015***	-0.004***	-0.002***	-0.001
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Year 1987	-0.061***	-0.027***	-0.007	-0.020***	-0.003
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
Year 1992	-0.156***	-0.086***	-0.034***	-0.015***	-0.000
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
Year 1997	-0.197***	-0.155***	-0.080***	-0.045***	-0.022***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
Year 2002	-0.239***	-0.241***	-0.168***	-0.125***	-0.104***
	(0.005)	(0.004)	(0.004)	(0.004)	(0.003)
Year 2007	-0.244***	-0.231***	-0.152***	-0.093***	-0.052***
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
Year 2012	-0.271***	-0.250***	-0.178***	-0.129***	-0.091***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.003)
Year 2017	-0.259***	-0.236***	-0.175***	-0.148***	-0.116***
	(0.006)	(0.005)	(0.004)	(0.004)	(0.003)
Observations	248,613	280,384	299,635	314,841	316,158

Sources: Basic Survey on Employment Structure

Note: Standard errors are in parentheses. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

problem, even in situations where there are many women in the same age group. However, women in their late 30s and beyond tend to have lower marriage rates when there are more women in the same marriage market. In this age group, the probability of marrying a man of the same age is high; therefore, the fewer the number of women of the same age (competitors), the higher the marriage probability of women.

We can see that the coefficients for female education years are negative and statistically significant at the 1 percent level in the late 20s to early 40s, but statistically insignificant in the late 40s. This suggests that the higher the years of education, the lower the marriage rate; however, the effect disappears with increasing age. As confirmed in Figure 2, in Japan, going to college has a negative impact on marriage probability for women in their 20s; however, it has little effect in their 30s and 40s. The regression results show that once year fixed effects are controlled for, the number of years of education has little effect on the probability of marriage.

We conducted a robustness check to change the definition of income inequality. Table 2 shows the results of estimations of Gini for the age group 10 years older, instead of the same age group, as men's income inequality, as well as the average income for the age group 10 years older, instead of the same age group. All the signs of the coefficients are the same as those in Table 1. The magnitudes of the Gini coefficients were almost the same as those listed in Table 1. The absolute size of the coefficients of the male average income is larger than that in Table 1. This may suggest that women are more concerned about male income five or ten years from now than about the income of men of the same age when they get married.

There are various inequality indicators, and the results may vary depending on these indicators. Second, to ensure that our findings are not driven by the particular measure of income inequality that we selected, we use CV instead of Gini. The magnitudes of the coefficients of average income and female ratio change, but their signs are the same. The coefficients of female years of education are mostly same in size and statistically significant.

Finally, we estimate the ratio of ever-married men. The independent variables are the same as those in Table 1. We expect a mirror-like result as Table 1. The Gini coefficients are negative and statistically significant at the 1 percent level. The greater the income disparity among men, the lower the marriage rate among men. The signs and coefficients are similar to those of the female ever-married rate. The coefficients of men's average income are negative and statistically significant at the 1 percent level. This means that men with higher average income are less likely to be married. The absolute values of the coefficients are larger than those for women, and the sizes of the coefficients are almost the same even when age increases. As is the case with women, this is thought to include the effects of lower marriage rates in urban areas in addition to the inability of men with lower incomes to marry. The coefficients of female ratio are all positive and statistically significant at the 1 percent level. In any age group, the higher the number of women, the higher the men's marriage rate. The coefficients of years of education for men are negative only in their late 20s and positive thereafter. This suggests that highly educated men are more likely to be married, but these men marry later.

6. Conclusions

In this study, we examine the relationship between men's income inequality, women's higher educational attainment, and women's propensity to stay unmarried. Based on the facts that only about 40% of marriages are between people with the same education level and about 80% of marriages are within the same age group, this study defines the market by prefecture and age group. As a result, we find a negative relationship between the

Table 2. Female's ever-married propensity on inequality for male 10 years older

VARIABLES	(1) late 20s	(2) early 30s	(3) late 30s	(4) early 40s	(5) late 40s
gini_male late30s	-1.354***				
	(0.075)				
gini_male early40s		-1.271***			
		(0.067)			
gini_male late40s			-1.043***		
			(0.059)		
gini_male early50s				-0.978***	
				(0.052)	
gini_male late50s					-0.784***
					(0.047)
mean_income_male late30s	-0.172***				
	(0.014)				
mean_income_male early40s		-0.141***			
		(0.011)			
mean_income_male late40s			-0.139***		
			(0.009)		
mean_income_male early50s				-0.166***	
				(0.009)	
mean_income_male late50s					-0.140***
					(0.008)
female_ratio late20s	0.255***				
	(0.081)				
female_ratio early30s		0.103			
		(0.078)			
female_ratio late30s			-0.148**		
			(0.070)		
female_ratio early40s				-0.466***	
				(0.062)	
female_ratio late40s					-0.369***
					(0.057)
education year	-0.052***	-0.015***	-0.004***	-0.002***	-0.001
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Year 1987	-0.055***	-0.027***	-0.017***	-0.020***	0.001
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
Year 1992	-0.146***	-0.079***	-0.027***	-0.003	0.010**
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
Year 1997	-0.194***	-0.151***	-0.075***	-0.028***	-0.009**
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
Year 2002	-0.236***	-0.232***	-0.166***	-0.116***	-0.094***
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
Year 2007	-0.245***	-0.214***	-0.148***	-0.095***	-0.051***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
Year 2012	-0.287***	-0.247***	-0.173***	-0.127***	-0.092***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
Year 2017	-0.274***	-0.248***	-0.184***	-0.150***	-0.116***
	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)
Observations	248,613	280,384	299,635	314,841	316,158

Note: Standard errors are in parentheses. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

Table 3. Women's ever-married propensity (CV)

VARIABLES	(1) late 20s	(2) early 30s	(3) late 30s	(4) early 40s	(5) late 40s
cv_male late20s	-0.519***				
	(0.027)				
cv_male early30s		-0.574***			
		(0.026)			
cv_male late30s			-0.475***		
			(0.023)		
cv_male early40s				-0.433***	
				(0.021)	
cv_male late40s					-0.388***
					(0.020)
mean_income_male late20s	-0.117***				
	(0.017)				
mean_income_male early30s		-0.144***			
		(0.011)			
mean_income_male late30s			-0.135***		
			(0.009)		
mean_income_male early40s				-0.152***	
				(0.009)	
mean_income_male late40s					-0.127***
					(0.008)
female_ratio late20s	0.448***				
	(0.083)				
female_ratio early30s		0.283***			
		(0.080)			
female_ratio late30s			-0.031		
			(0.069)		
female_ratio early40s				-0.391***	
				(0.062)	
female_ratio late40s					-0.216***
					(0.057)
education year	-0.052***	-0.015***	-0.004***	-0.002***	-0.001
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Year 1987	-0.056***	-0.023***	-0.009*	-0.019***	-0.003
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
Year 1992	-0.139***	-0.075***	-0.025***	-0.004	0.005
	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)
Year 1997	-0.150***	-0.113***	-0.053***	-0.021***	-0.007**
	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)
Year 2002	-0.201***	-0.204***	-0.144***	-0.104***	-0.084***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
Year 2007	-0.210***	-0.200***	-0.129***	-0.073***	-0.036***
	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)
Year 2012	-0.234***	-0.216***	-0.155***	-0.105***	-0.071***
	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)
Year 2017	-0.233***	-0.211***	-0.153***	-0.126***	-0.095***
	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)
Observations	248,613	280,384	299,635	314,841	316,158

Note: Standard errors are in parentheses. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

Table 4. Male's ever-married propensity

VARIABLES	(1) late 20s male	(2) early 30s male	(3) late 30s male	(4) early 40s male	(5) late 40s male
gini_male late30s	-0.951*** (0.072)				
gini_male early40s		-1.264*** (0.079)			
gini_male late40s			-0.979*** (0.071)		
gini_male early50s				-0.882*** (0.063)	
gini_male late50s					-0.711*** (0.058)
mean_income_male late30s	-0.184*** (0.014)				
mean_income_male early40s		-0.180*** (0.013)			
mean_income_male late40s			-0.169*** (0.012)		
mean_income_male early50s				-0.186*** (0.011)	
mean_income_male late50s					-0.168*** (0.010)
female_ratio late20s	0.895*** (0.078)				
female_ratio early30s		1.856*** (0.091)			
female_ratio late30s			1.461*** (0.084)		
female_ratio early40s				0.741*** (0.081)	
female_ratio late40s					0.550*** (0.072)
education year	-0.026*** (0.001)	0.006*** (0.001)	0.018*** (0.000)	0.019*** (0.000)	0.018*** (0.000)
Year 1987	-0.014*** (0.004)	-0.072*** (0.005)	-0.100*** (0.005)	-0.077*** (0.006)	-0.065*** (0.007)
Year 1992	-0.046*** (0.005)	-0.103*** (0.005)	-0.131*** (0.005)	-0.116*** (0.005)	-0.092*** (0.006)
Year 1997	-0.069*** (0.004)	-0.161*** (0.005)	-0.191*** (0.005)	-0.181*** (0.005)	-0.160*** (0.006)
Year 2002	-0.080*** (0.005)	-0.222*** (0.005)	-0.266*** (0.005)	-0.253*** (0.005)	-0.253*** (0.006)
Year 2007	-0.095*** (0.005)	-0.218*** (0.005)	-0.267*** (0.005)	-0.264*** (0.005)	-0.253*** (0.006)
Year 2012	-0.122*** (0.005)	-0.241*** (0.005)	-0.292*** (0.005)	-0.293*** (0.005)	-0.282*** (0.006)
Year 2017	-0.116*** (0.006)	-0.258*** (0.005)	-0.309*** (0.005)	-0.320*** (0.005)	-0.311*** (0.006)
Observations	239,332	270,965	292,962	306,114	306,223

Note: Standard errors are in parentheses. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

increase in income inequality for men and the probability of marriage for women. The negative effect is greater for the younger generations. The widening income disparity among men discourages women from marrying. This effect is larger in the younger generation. Few studies have used Japanese data on women's higher educational attainment and marital behavior. Our analysis reveals that the propensity of marriage for highly educated women is low, but the effect is small in the older generation. The marriage propensity of highly educated women is almost the same as that of less-educated women in their 40s. This result is consistent with that in the United States.

Our evidence shows that female's higher educational attainment has little relationship with recent trends toward non-marriage and late marriage. However, male income inequality, a proxy for income uncertainty, significantly lowers female marriage rates.

Notes

1） Cohabitation rates are high in France and Sweden. It is said that the reason cohabitation is common in those countries is that there are systems that legally protect cohabitation (for example, Pax in France and Sambo in Sweden). When the marriage rate and the cohabitation rate are added, there is no big difference between Europe, the US, and Japan.

2） The number of category is 11 (0-0.49, 0.5-0.99, 1-1.49, 1.5-1.99, 2-2.49, 2.5-2.99, 3-3.99, 4-4.99, 5-6.99, 7-9.99, and 10 or more million Yen) in 1982 and 1987, 12 (0-0.49, 0.5-0.99, 1-1.49, 1.5-1.99, 2-2.49, 2.5-2.99, 3-3.99, 4-4.99, 5-6.99, 7-9.99, 10-14.49 and 15 or more million Yen) in 1992 and 1997, 15 (0-0.49, 0.5-0.99, 1-1.49, 1.5-1.99, 2-2.49, 2.5-2.99, 3-3.99, 4-4.99, 5-5.99, 6-6.99, 7-7.99, 8-8.99, 9-9.99, 10-14.49 and 15 or more million Yen) in 2002 and 2007, and 16 (0-0.49, 0.5-0.99, 1-1.49, 1.5-1.99, 2-2.49, 2.5-2.99, 3-3.99, 4-4.99, 5-5.99, 6-6.99, 7-7.99, 8-8.99, 9-9.99, 10-12.49, 12.5-14.49 and 15 or more million Yen) in 2012 and 2017.

3） We describe the detailed examination in Chapter 4.

References

Becker, Gary S., "A Theory of Marriage: Part I," *Journal of Political Economy*, 81 (1973), 813-846 (The University of Chicago Press).

———, "A Theory of Marriage: Part II," *Journal of Political Economy*, 82 (1974), S11-S26 (The University of Chicago Press).

Bellou, Andriana, "Male wage inequality and marital dissolution: Is there a link?," Canadian Journal of Economics/Revue canadienne d'économique, 50 (2017), 40-71.

Coughlin, Tristan P., and Drewianka, Scott D., "Can Rising Inequality Explain Aggregate Trends in Marriage? Evidence from U.S. States, 1977-2005," The B.E. Journal of Economic Analysis & Policy, 11 (2011) (De Gruyter).

Goldin, Claudia, and Katz, Lawrence F., "The Power of the Pill: Oral Contraceptives and Women's Career and Marriage Decisions," *Journal of Political Economy*, 110 (2002), 730-770 (The University of Chicago Press).

Goldstein, Joshua R., and Kenney, Catherine T., "Marriage Delayed or Marriage Forgone? New Cohort Forecasts of First Marriage for U.S. Women," *American Sociological Review*, 66 (2001), 506-519 ([American Sociological Association, Sage Publications, Inc.]).

Gould, Eric D., and Paserman, M. Daniele, "Waiting for Mr. Right: rising inequality and declining marriage rates,"

Journal of Urban Economics, 53 (2003), 257-281.

Greenwood, Jeremy, Guner, Nezih, Kocharkov, Georgi, and Santos, Cezar, “Technology and the Changing Family: A Unified Model of Marriage, Divorce, Educational Attainment, and Married Female Labor-Force Participation,” American Economic Journal: Macroeconomics, 8 (2016), 1-41.

Isen, Adam, and Stevenson, Betsey, “Women’s Education and Family Behavior: Trends in Marriage, Divorce, and Fertility,” in Demography and the Economy. Edited by John B. Shoven (ed.) University of Chicago Press, 2011. Chicago Scholarship Online, 2013.

Iwasawa, Miho, “Declining Birthrate and Changes in Married Couples,” in *“Population Decline and Declining Birthrate Countermeasures” Shigesato Takahashi and Hiroshi Obuchi (ed.)* (Tokyo, Hara Shobo, 2015).

Iwasawa, Miho, Kaneko, Ryuichi, and Sato, Ryuzaburo, “Birth trends in the post-demographic transition period,” in *“Japan in the post-demographic transition period” Ryuzaburo Sato and Ryuichi Kaneko* (*ed.*), Demography Library 17 (Tokyo, Hara Shobo, 2016).

Lam, David, “Marriage Markets and Assortative Mating with Household Public Goods: Theoretical Results and Empirical Implications,” *The Journal of Human Resources*, 23 (1988), 462-487 (［University of Wisconsin Press, Board of Regents of the University of Wisconsin System］).

Loughran, David S., “The Effect of Male Wage Inequality on Female Age at First Marriage,” *The Review of Economics and Statistics*, 84 (2002), 237-250 (The MIT Press).

Mansour, Hani, and McKinnish, Terra, “Couples’ time together: complementarities in production versus complementarities in consumption,” *Journal of Population Economics*, 27 (2014), 1127-1144.

————, “Marriage-Market Search and Sorting: Explanations and Evidence,” in *The Oxford Handbook of Women and the Economy*, Susan L. Averett, Laura M. Argys, and Saul D. Hoffman, eds. (The Oxford University Press, 2018).

————, “Male wage inequality and characteristics of ‘early mover’ marriages,” *Journal of Population Economics*, (2022).

Moriguchi Chiaki, “Has Japan Became a Disparate Society?,” *Keizai Kenkyu*, 68 (2017), 169-189.

Sasaki, Shoichi, “Empirical analysis of the effects of increasing wage inequalities on marriage behaviors in Japan,” *Journal of the Japanese and International Economies*, 46 (2017), 27-42.

Yokoyama, Izumi, and Kodama, Naomi, “Why the earnings of the middle class declined: evidence from Japan,” *Applied Economics Letters*, 26 (2019), 152-156 (Routledge).