Title	Educational assortative mating of international marriage in Japan
Sub Title	
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Publisher	慶應義塾大学大学院社会学研究科
Publication year	2023
Jtitle	慶応義塾大学大学院社会学研究科紀要 : 社会学心理学教育学 : 人間と社会の探究 (Studies in sociology, psychology and education : inquiries into humans and societies). No.96 (2023.) ,p.[49]- 68
JaLC DOI	
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Notes	論文
Genre	Departmental Bulletin Paper
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=AN0006957X-00000096-0049

Educational Assortative Mating of International Marriage in Japan

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Studies on educational assortative mating in international marriage are scarce compared with those in homo-ethnic marriage. By comparing international (between a Japanese and non-Japanese national) with Japanese (between two native Japanese) and immigrant (between two immigrants) marriages, this study analyzes the patterns of international marriages in Japan. It uses log-linear models to determine whether or not the strength of educational assortative mating varies across marital types by levels of education. Results indicate that Japanese individuals with low and high levels of education in homo-ethnic marriages exhibit an extremely high rate of educational assortative mating. Although statistically nonsignificant, immigrant couples display a similar pattern in terms of the strength of educational association. However, international marriages demonstrate the absence of educational homogamy among highly educated couples even after controlling for marginal distribution. Furthermore, the result of international marriages indicates that no difference exists between the patterns of female educational hypergamy and hypogamy. In summary, the result does not support the educational assortative mating and status exchange hypotheses in explaining international marriage patterns in Japan.

Key words：educational assortative mating, international marriage, status exchange hypothesis, log-linear model

1. Introduction

International marriage plays a pivotal role in social stratification systems and reflects immigrants' level of assimilation and integration. It often leads to fuller integration for minority spouses married to natives of a given country. As many immigration scholars posit, international marriage rates are viewed as a proxy measure for integrating immigrant groups (Davis 1941; Gordon 1964; Nagayoshi, Osanami and Takenoshita 2023). Previous literature also highlights the outcomes of international marriage and how it may help immigrants integrate into the host society in several dimensions (socioeconomic, cultural, etc.).

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However, less is known concerning the mechanisms by which immigrants and natives in international marriages are sorted; in other words, the question of who marries whom in an international marriage remains unclear.

When zooming into Japan, more and more foreigners come to reside in Japan as workers, students, and technical interns due to globalization. However, Japanese citizenship and welfare policies exacerbate the marginalization of the socioeconomic situations of immigrants because the Japanese government and society does not accept foreigners as immigrants but rather as temporary workers who will eventually return to their country of origin (Takenoshita 2013). For the same reason, it is hard to fully define immigrants in the Japanese context. For the purposes of this paper, the definition of immigrant is equal to a foreign resident, based on the definition of migrant from the OECD[1)] and UN[2)]. According to the Ministry of Health, Labor and Welfare's 2015 Vital Statistics Survey, of the total number of marriages in Japan, approximately 3% are international marriages, and the rate of such marriages has been quite stable in recent years. Thus, international marriage is a key factor in resource accessibility for immigrants, along with their integration into Japanese society.

However, mate selection is not random. There are mainly three marriage patterns: hypergamy, hypogamy, and homogamy. Hypergamy commonly refers to "marrying up" (e.g. socioeconomic status, class, and educational level). If hypergamy means marrying up, then hypogamy means "marrying down." Homogamy refers to marriage between individuals who are similar in sociodemographic and human capital characteristics. Homogamy is a notable form of assortative mating, more simply described as a mating pattern or sexual selection (Becker 2009; Schwartz 2013). Assortative mating by educational background, among various traits, is a widely observed pattern in many societies. Over the past few decades, this pattern has received much attention from sociologists because educational homogamy can generate greater societal inequality (Schwartz and Mare 2005; Uchikoshi 2016; Furuta 2018; Lichter and Qian 2019). However, most research on educational homogamy mainly focuses on native couples and less is known about the educational assortative mating patterns among international marriages.

Moreover, with educational expansion across the globe, many scholars point out that educational homogamy has become common in international marriage as well (Guo 2020; Nagayoshi et al. 2023). Meanwhile, another hypothesis for international marriage is the "status exchange hypothesis." This hypothesis assumes that the nativity status is valuable, and foreign-ness can operate as a social boundary in couple formation. Foreign-born immigrants usually have more significant disadvantages in access to jobs and entitlement to welfare than native-born populations. Accordingly, natives view immigrants as less desirable in the marriage market. Under such a status hierarchy, immigrants may need to trade their achieved status, such as a good education or higher socioeconomic status, to overcome status disadvantages that come from being foreign. This leads to more heterogeneous international marriage in terms of educational combination (Davis 1941; Merton 1941). In this case, the status exchange hypothesis is a counterhypothesis to the educational assortative mating hypothesis. These two hypotheses suggest different marriage preferences and motivations among immigrants. The quality of these hypotheses is unclear because only a few prior studies focused on testing both hypotheses in international marriage.

The purpose of this study is to clarify the marriage patterns of current international marriages in Japan. The status exchange hypothesis indicates that immigrants need to marry natives with lower educational attainment for some social benefits that means immigrants need to trade their education in marriage with Japanese. This can be considered as a kind of inequality of international marriage compared with co-ethnic marriage. It could be argued that despite its heterogeneity, marriage types where status is traded result in the immigrant getting a raw deal at the hands of unequal formal and informal social structures. This theoretical perspective informs the research question: what role does education play in the sorting mechanism of international marriage in Japan? To find an answer,marriages between two Japanese natives and marriages between two foreigners are set up for comparison. By comparing international marriages with Japanese marriages, we can clarify how international marriage may vary from the other marriage types and specify the particularities of bi-national marriages in Japan. In addition, making foreign marriages the subject of comparison provides potential insight into the circumstances of immigrants who do not intermarry.

However, only a few previous pieces of literature discuss educational assortative mating within the range of international marriage in Japan (Nagayoshi et al. 2023). The contribution of this paper is to attempt to fill the gaps in knowledge of educational homogamy in international marriages in the Japanese context by testing whether immigrants marry Japanese with similar educational levels (educational homogamy hypothesis) or Japanese with lower educational attainment than themselves (status exchange hypothesis).

2. Previous literature

Educational assortative mating and international marriage

In sociology, many studies have pointed out that social class, occupational prestige, and education level are often similar between couples (Blossfeld 2009; Uchikoshi 2016; Fukuda et al. 2021). In the past, mate selection was based on attributed status, such as race, parental religion, or parental caste, but in developed countries nowadays, assortative mating is based on achieved status, such as educational background (Kalmijn 1998). In modern society, individuals obtain employment through the educational system (Furuta 2018). Education now plays an increasingly key role in determining socioeconomic outcomes, structuring marriage markets, and the intergenerational transmission of social status (Mare 1991; Smits, Ultee, and Lammers 1998; Kalmijn and Flap 2001; Schwartz 2013; Zhou 2016). Thus, educational assortative mating has received attention not only as a measure of openness in society but also as a cause of increasing inequality (Kalmijn 1998; Schwartz and Mare 2005; Blossfeld 2009; Uchikoshi 2016). In the United States, the percentage of educational homogamy increased from roughly 45% in 1950 to 55% in 2003 (Lichter and Qian 2019).

Previous research has proposed “status attainment hypothesis” to explain why educational homogamy is so commonly observed. It states that when meritocracy permeates a society in the process of industrialization, the importance of educational attainment in the marriage market increases (Smits, Ultee, and Lammers 1998; Zhou 2016; Furuta 2018). Thus, there is an increase in the symmetry of men’s

and women's preferences for partners. The number of men seeking financial contributions from their partners increases, which strengthens their preference for educational assortative mating (Blossfeld 2009; Fukuda et al. 2021). Despite the significance of educational homogamy, previous studies are largely concentrated in the United States. Though Japan has long been characterized by a high degree of educational homogamy.

International marriage provides tangible evidence of the integration of immigrants into the host society. As more foreign students study and receive higher degrees in Japan, we can see that educational expansion is occuring at a large scale among immigrants (Liu-Farrer 2009). With immigrants pursuing longer programs, enrollment at Japanese educational institutions increases along with contact between immigrants and natives, and this may subsequently lead to educational homogamy in some international marriages. Moreover, education is correlated with other characteristics that are also important in selecting a partner, for example, attitudes, preferences, and lifestyles shared by individuals with the same educational background (Blossfeld 2009). If international marriage in Japan follows the trend of a majority of marriages, immigrants may marry a Japanese spouse with a similar educational level to their own, and the school system may function as an agency for partner searching, ultimately leading to an increase in educational assortative mating. Even though research on educational homogamy usually focuses on ethnic endogamy, a few researchers have begun to investigate whether this mechanism also works in cross-border and international marriages.

Bleakley and Chin (2010) in their empirical research argued that the marriage market for immigrants in America is characterized by strongly assortative mating by English proficiency and education. Furthermore, in her qualitative research on intermarried Chinese women in Japan (married to Japanese men), Guo (2020) found that with the increasing population of young foreign students, they are more likely to marry a native Japanese spouse with a similar educational level and settle down in Japan. This indicates that educational assortative mating can be quite common among highly educated immigrants. Nagayoshi and her colleagues (2023) also discussed educational assortative mating among international marriages in Japan using 2010 Japanese census data. The descriptive statistics from the patterns of educational assortative mating show that there are no clear differences between Japanese couples and international married couples; the educational homogamy rates are about 60% for all marriage types in Japan.

As discussed above, the potential change in mate selection preferences, namely the trend of men and women desiring an educated and economically generative partner (as described by the "status attainment hypothesis"), together with structural changes in globalized educational opportunities increases the incedence of educational homogamy not only among most Japanese couples but also among international married couples.

Status exchange hypothesis and international marriage

Previous studies also indicate another notable pattern of international marriages. Serving as a potential alternative to the educational assortative mating hypothesis is the previously introduced status

exchange hypothesis. Some research has observed this marriage pattern among international marriages. Davis (1941) coined the concept of caste-status exchange in intermarriage based on studies of the caste system in India whereby individuals compensate for the lack of one trait (lower caste) by offering other desirable traits to potential mates in a competitive marriage market. As a counterhypothesis to the educational assortative mating hypothesis, status exchange in mate selection looks at people "balancing" unequal traits through an exchange in a way that a relative disadvantage in one domain is exchanged for a relative advantage in another domain (Davis 1941; Merton 1941). For example, it argues that immigrants and non-citizens may trade their educational attainment as a resource in marriage with a native with less education or older age to acquire the social status of the majority (Zhou 2016; Lichter and Qian 2019). In this study education is the indicator of intermarriage, and educational hypogamy would be the "status exchange." However, educational hypergamy is slightly more complicated, if the results point to immigrant women marrying up educationally, the assortative mating hypothesis is refuted. However, this result would also sit squarely outside the bounds of the status exchange hypothesis. In sum, the violation of educational homogamy does not necessarily support the status exchange hypothesis. Another difference between these two hypotheses is that status exchange includes the subjectivity of subjects while the assortative mating hypothesis focuses more on the static state of marriage pattern.

Since the status exchange hypothesis was put forward approximately 80 years ago, it has been tested by many empirical studies in different societies, and the results have not always been consistent. Some studies find evidence for it in interracial and international marriages (Alba and Golden 1986; Qian and Lichter 2001; Gullickson and Torche 2014; Zhou 2016). In the empirical study by Zhou (2016), cross-border marriage among Hong Kongese and Chinese mainlanders indicated that there is a substantive decline in educational homogamy for women immigrants from mainland China in recent years. Immigrants from mainland China are more likely to exchange education for Hong Kong permanent residency by marrying spouses with less education. Furthermore, in Nagayoshi and her colleagues' research (2023) about international marriage in Japan, the results show that the status of Japanese nationality can be exchanged when Japanese men marry younger and better educated immigrant women from other Asian countries. In sum, these results indicate that international marriage patterns act counter to the Japanese mainstream marriage norm of female educational hypergamy and homogamy.

Hypotheses

Based on the discussion above, the following hypotheses can be established. Hypothesis 1a is based on the assortative mating hypothesis: the strength of educational homogamy in international marriage should be the same as other marriage types. The educational background of the husband and wife must be homogeneous across different marital types for Hypothesis 1a to be supported. This would identify the strength of the husband and wife's education association; higher association means there is a stronger tendency of educational homogamy. We can review and compare the educational assortative status of each marital type. The theoretical implication of hypothesis 1a is: if it is supported, we can conclude that there is no notable difference between international marriage and other marriages,

meaning that intermarriage in Japan is relatively "fair" for immigrants. This would also reject the status exchange hypothesis, showing that immigrants do not need to marry down to benefit from international marriage. Hypothesis 1b is the counter hypothesis of hypothesis 1a, indicating that compared with ethnic endogamous marriages, there are fewer educational assortative marriages in international marriage. If hypothesis 1b is supported, it indicates that immigrants may marry upward or downward regarding educational attainment. If the results show more educational hypogamy, the status exchange hypothesis is supported in explaining international marriage in Japan. On the other hand, if the results show more marrying up or split half-half data, either educational assortative mating or educational homogamy theory could potentially describe the situation of intermarriage in Japan. In this case, we may need to develop new theoretical frameworks to describe international marriages in Japan.

Another important note is that in most previous studies the strength of educational assortative mating by different educational levels was not taken into consideration (Fukuda et al. 2021). The rigidity of social boundaries of different education groups may not function at the same level (Park and Smits 2005; Blossfeld 2009; Zhou 2016; Fukuda et al. 2021). With limited studies on educational homogamy among Japan's international marriages, we know little about whether differences by educational levels in assortative mating work in the same way. Educational homogamy may indicate the same pattern among international marriage and Japanese endogamous marriage. However, considering the status exchange hypothesis, immigrants may "marry down" in education with a Japanese spouse and gain a spousal visa as a way to gain long-term and permanent residence in Japan. Thus, international marriage may happen among highly-educated immigrants with middle- or low-educated Japanese spouses, middle-educated immigrants with low-educated Japanese spouses, and low-educated immigrants and Japanese marry each other. In other words, if the status exchange hypothesis holds true in predicting international marriage in Japan, educational homogamy may concentrate only on the bottom of the educational gradient. With a particular focus on how assortative mating levels differ by educational background, hypothesis 2 posits that the strength in educational homogamy differs across different educational levels and different marital types.

3. Data and measurement

Data from the Shizuoka Prefecture Multicultural Survey – Survey of Foreign Residents (hereafter Shizuoka data) conducted in 2009 and the Japanese General Social Survey (hereafter JGSS data) conducted in 2012 are employed in this study to examine educational assortative mating for different marriage types in Japan. The purpose of the Shizuoka survey was to explore the actual situations and attitudes concerning multicultural coexistence among foreigners of various nationalities and Japanese citizens in the prefecture. It also aimed to assess the extent to which immigrants in Shizuoka were integrated into Japanese society. As to the Shizuoka data, only immigrants' data are used for statistical analyses. Samples are randomly selected from both male and female foreigners (Brazilian, Chinese, Filipino, Peruvian, South and North Korean, Indonesian, and Vietnamese nationals) who registered in 12 cities in Shizuoka Prefecture. The Shizuoka data has 2,185 responses, the response rate was 25.1%.

The education of respondents and their spouses are measured in the Shizuoka survey with seven categories: without education, primary school, middle school, high school (general education curriculum), high school (other than general education curriculum), junior college and vocational school, and university and graduate school. Regarding the educational background classification, it was manipulated into three categories: Low (less than high school), Middle (high school), and High (more than high school). We did this categorization because if the education categories are too finely divided, interpretation of the cross-tabulation may be limited if the numbers in the cells are too small. The Shizuoka data does not contain information about the timing or span of marriage, thus the subjects may include a mixture of both those who were married before coming to Japan and those who got married after coming to Japan. Since we cannot identify marriages, predating coming to Japan nor those beginning after coming to Japan, we analyze all marriages, despite the imprecision. The JGSS data examines various social attitudes and socioeconomic characteristics of men and women 20–89 years of age living in Japan (which means that it targets people of Japanese nationality), with a response rate of 59.1%. The sampling method is two-stage stratified random sampling, stratified by regional block and population size.

The Shizuoka survey targets a population aged 16 and above, while JGSS 2012 targets a population that includes people in their 20s through 80s, the age range of the target population of both data is wide. The Shizuoka data has a slightly wider age range of the target population. Since the research topic is about the marriage patterns of different marriage types, the analysis is restricted to those who were married at the time of the survey (with single, separated, or bereaved persons excluded). To make the results more comparable, we restricted the age range of the analyzed population to 20–59. As a result of processing these data and so that no missing values appear in all the variables used, Table 1 presents the descriptive statistics of the two data sets. The number of cases used for analysis was 973 and 1492, respectively. The mean age of subjects in JGSS data is about 5 years older than subjects in the Shizuoka data, though there is no significant difference in the age distribution. It is resonable because Japan is a highly aged society, while at the same time the immigrant population usually is highly selective and relatively young. Furthermore, we did analyses for age range 20-69 and all age range and the results are robust and do not change the conclusion. As to the educational level, Japanese nationals are more educated than immigrants. It is worth noting that the Japanese citizens' annual household income is nearly double that of immigrants', thereby indicating an inadequate socioeconomic integration of immigrants as well as great inequality in Japanese society. Finally, it also needs to be noted that JGSS is targeting nationwide populations, while the Shizuoka data only collected information on foreign residents in Shizuoka Prefecture. Thus, we need caution when interpreting the empirical results conducted from the Shizuoka data set.

Table 1 Descriptive statistics of the Shizuoka data and the JGSS data

	Shizuoka data (N = 973)				JGSS data (N = 1492)			
Variable	Min.	Max.	Mean	S.D.	Min.	Max.	Mean	S.D.
Age	20.00	59.00	39.21	9.19	20	59	44.08	9.30
Education of respondent								
Low	0	1	0.18	0.38	0	1	0.04	0.19
Middle	0	1	0.44	0.50	0	1	0.51	0.50
High	0	1	0.38	0.49	0	1	0.45	0.50
Annual household income	0	1600	350.40	266.47	0	1600	687.6	320.12

S.D. indicates standard deviation; Unit for annual household income: 10,000 yen.

To understand the difference between men and women, the cases where the person or spouse is a man are defined as "education of husband", and the cases where the spouse is a woman are defined as "education of wife". In the log-linear model, three variables are futher recoded for analysis: the wives' education, the husbands' education, and marital type. Married co-ethnic Japanese couples defined in the JGSS are labeled as Japanese couples. As to Shizuoka data, three marital types can be divided according to the self-reported nationality information; migrants who married migrants from the same origin country are coded as immigrant couples, migrants who married other migrants from different origin country are excluded from the analysis due to the small sample cases, and immigrants who married Japanese natives are coded as international married couples. As to the education variable, it should be noted that a two-year college graduate who married a four-year university graduate is considered to be in educational homogamy in this study. This is because the case number in each cell can be too small if those people are distinguished into detailed educational classifications; thus, we need to keep in mind that the homogamy rate can be higher than in other studies using different educational classifications. However, since two-year colleges only account for around 10% of the total sample size, the impact should be very minor. Three-way contingency tables are made according to the husband's education, the wife's education, and marital types.

Method

The procedure for analysis is first to depict the distribution of the couple's educational background by marital type, then use the log-linear model to examine how patterns of association between husbands' education and wives' education differ by marital type. We compared the different models using several goodness-of-fit statistics such as the log-likelihood ratio of Chi-square statistics, AIC (Akaike Information Criterion), BIC (Bayesian Information Criterion), and index of dissimilarity (I.D.). The I.D. denotes the proportion of differences between the actual values of the cross-table and the expected values estimated by the log-linear model. We selected the appropriate model based on these statistics. The main advantage of the log-linear model is to estimate the level of educational homogamy while controlling for the marginal distributions of husbands' and wives' educational levels. The goal of the log-linear model is to

identify a parsimonious model that provides the best fit to the observed data (Erikson and Goldthorpe 1992; Xie 1992; Takenoshita 2007). We start with the conditional independence model in which no significant association exists between husbands' and wives' education. After checking the extent to which this model can be fitted to the observed cross-tables, we further look at whether the patterns of association between husbands' and wives' education vary by marital type. Ideally, the best-fit model with the fewest number of parameters is expected. If several models are compared, the one with the lowest AIC/ BIC value should be preferred (a smaller AIC/ BIC value means a better model fit).

Following is the formula of the baseline model (the conditional independence model):

$$\mathrm{Log}(F_{RCL}) = \mu + \mu_R + \mu_C + \mu_L + \mu_{RL} + \mu_{CL} \quad (1)$$

F_{RCL}denotes the expected frequency in the Rth row, the Cth column, and the Lth layer. In this study, R, C, and L denote husbands' education (low, middle and high), wives' education (low, middle and high), and marital types (between Japanese, between foreigners, and international marriage), respectively. Equation 1 denotes that there is no husbands' and wives' education association. Usually, we assume that the baseline model would be rejected since it is hard to imagine that a wife's education is completely independent of the husband's education.

We then add the educational association between husbands and wives to the baseline model. In equation 2, a design matrix is set to test whether the level of educational homogamy is the same across different educational levels regardless of marital type. In this model, the diagonal cells of the three cross-tables are all set to 1 (Diag1) while other cells off the diagonals are all set to 0 as a reference category. We named it the Common Homogamy Model (CHM) 1:

$$\mathrm{Log}(F_{RCL}) = \mu + \mu_R + \mu_C + \mu_L + \mu_{RL} + \mu_{CL} + \mathrm{Diag1} \quad (2)$$

The difference between equation 2 and equation 3 is that we changed the design matrix where the diagonal cells of the cross-tables are set to 1, 2, and 3 (Diag2) while other cells are all set to 0 as a reference group. It assumes that the level of educational homogamy is different across all three educational levels. The formula for the Common Homogamy Model (CHM) 2 is:

$$\mathrm{Log}(F_{RCL}) = \mu + \mu_R + \mu_C + \mu_L + \mu_{RL} + \mu_{CL} + \mathrm{Diag2} \quad (3)$$

This research's interest mainly centers on the variation of the RC association across L layers. Thus, to grasp how the strength of association between husbands' and wives' education differs by marital type, we test whether the parameters of Diag1 and Diag2 would differ significantly across different marriage types. To do so the following models are added. We added the term $\mathrm{Diag1}_L/\mathrm{Diag2}_L$to Equation 3 and it is named theDifferent Homogamy Model (DHM) 1/2. These interaction terms denote that the strength of educational homogamy differs by marital type.

Moreover, whether the models of female educational hypergamy or hypogamy can be better fit than those of educational homogamy are also examined with the FHP design matrix. This design matrix set

the diagonal cells of the cross-tables to 0 and the upper right cells to 1 (female educational hypogamy) and the bottom left cells to 2 (female educational hypergamy). In other words, we assume that the cells on the diagonals are set to the reference category, and the cells of female educational hypergamy and hypogamy are estimated separately. Please refer to the formula for female educational hypergamy, hypogamy and all design matrices are shown in the Appendix.

4. Results

Table 2 shows the frequency of the three-way cross-table of the educational background of husband and wife by marriage type; percentages by row are shown in the parentheses. The prevalence of educational homogamy is calculated by the percentage shares of couples located on the diagonal cells and of educational hypergamy or educational hypogamy by those off diagonals. Diagonal cells of Table 2, in which the wife and husband share the same educational level, occupy the highest percentage; this indicates that the marriage pattern is heavily dominated by educational homogamy. Educational assortative mating rates are 67%, 53%, and 45% for Japanese couples, immigrant couples, and international marriage, respectively. International marriage is less educationally homogenous compared to other marriage types. Also, the high proportion of educational homogamy among Japanese couples echoes the status attainment hypothesis (Zhou 2016). The female hypergamy rates are higher than the female hypogamy rates across all marital types, but the difference is less evident among immigrants marraiges.

Table 2 Three-way table of the combination of marital type and educational background of the husband and wife

Japanese couples					
		Education of wife			
		Low	Middle	High	Sum
Education of husband	Low	22	44	6	72
		(0.31)	(0.61)	(0.08)	(1)
	Middle	26	540	184	750
		(0.03)	(0.72)	(0.25)	(1)
	High	4	232	434	670
		(0.01)	(0.35)	(0.64)	(1)
	Sum	52	816	624	1492
		(0.03)	(0.55)	(0.42)	1
	Educational homogamy rate:				0.67
	Female hypergamy rate:				0.18
	Female hypogamy rate:				0.15
Immigrant couples					
		Education of wife			
		Low	Middle	High	Sum
Education of husband	Low	41	75	18	134
		(0.31)	(0.56)	(0.13)	(1)
	Middle	61	168	61	290
		(0.21)	(0.58)	(0.21)	(1)

	High	24	71	147	242
		(0.10)	(0.29)	(0.61)	(1)
	Sum	126	314	226	666
		(0.19)	(0.47)	(0.34)	1
	Educational homogamy rate:				0.53
	Female hypergamy rate:				0.24
	Female hypogamy rate:				0.23

Intermarried couples

		Education of wife			
		Low	Middle	High	Sum
Education of husband	Low	7	15	16	38
		(0.19)	(0.39)	(0.42)	(1)
	Middle	15	72	50	137
		(0.11)	(0.53)	(0.36)	(1)
	High	15	58	59	132
		(0.11)	(0.44)	(0.45)	(1)
	Sum	37	145	125	307
		(0.12)	(0.47)	(0.41)	1
	Educational homogamy rate:				0.45
	Female hypergamy rate:				0.29
	Female hypogamy rate:				0.26

Note: Based on both the JGSS data and the Shizuoka data, with sample size restricted to 1,492 and 973 respectively; Percentage by row in the parentheses.

Table 3 further looks into the detailed patterns of international marriage. We divided intermarried couples into couples made up of immigrant husbands and Japanese wives and those with Japanese husbands and immigrant wives. There is no difference for the homogamy/hypergamy and hypogamy rate for both categories.

Table 3 Cross table of the combination of the husband and wife in international marriage

Japanese wife and foreign husband

		Education of wife			
		Low	Middle	High	Sum
Education of husband	Low	2	6	1	9
		(0.22)	(0.67)	(0.11)	(1)
	Middle	1	17	12	30
		(0.03)	(0.57)	(0.40)	(1)
	High	2	18	14	34
		(0.06)	(0.53)	(0.41)	(1)
	Sum	5	41	27	73
		(0.07)	(0.56)	(0.37)	1
	Homogamy rate:				0.45
	Immigrant hypogamy rate:				0.29
	Immigrant hypergamy rate:				0.26

Japanese husband and foreign wife					
		Education of wife			
		Low	Middle	High	Sum
Education of husband	Low	5	9	15	29
		(0.17)	(0.31)	(0.52)	(1)
	Middle	14	55	38	107
		(0.13)	(0.51)	(0.36)	(1)
	High	13	40	45	98
		(0.14)	(0.40)	(0.46)	(1)
	Sum	32	104	98	234
		(0.14)	(0.44)	(0.42)	1
	Homogamy rate:				0.45
	Immigrant hypogamy rate:				0.29
	Immigrant hypergamy rate:				0.26

Note: Based on the Shizuoka data, with sample size restricted to 973; Percentage by row are in parentheses;

In sum, it is noted that more than half of marriages are educational homogamous in Japanese couples and foreign couples, and less than half of marriages are homogamous in international marriages. The strength in association of couples' education is slightly weaker in international marriage. However, the above percentage of the descriptive statistics should be interpreted with caution because these results may be highly influenced by differences in educational level across couples. The gender gap in education may differ between immigrants and natives by marital type. It is necessary to examine this pattern in detail after controlling the marginal distributions of education across couples using the log-linear model.

The identification process of the log-linear model usually starts with the model of conditional independence. This baseline model assumes no association between the educational level of the husband and wife. It is equivalent to a Chi-squared test of independence, assuming random matching across educational levels, subject to the marginal distributions of husbands' and wives' educational attainment. This model serves as a baseline model when additional models, which relax assumptions of random matching, are created. After running this model, we added several parameters to the interaction between husbands' and wives' education. The Common Homogamy Model 1 estimated the parameters on the main diagonals, and all parameters were set equally across the different educational levels. This model also assumed no difference in the strength of homogamy by marital type. In Common Homogamy Model 2, we changed the assumption of the homogamy parameters. This model assumes that the strength of homogamy differs by educational level, while the homogamy parameters were set equally regardless of different marital types. These two models also assume that random matching exists among couples with different educational levels.

Table 4 Goodness-of-fit statistics for log-linear models

Model	G^2	d.f.	p	BIC	AIC	D.I.
Baseline Model	472.30	12	0.000	673.77	654.33	0.18
Common Homogamy Model 1	139.41	11	0.000	344.17	323.44	0.07
Common Homogamy Model 2	81.27	9	0.000	292.63	269.30	0.05
Different Homogamy Model 2	0.93	3	0.82	232.05	200.95	0.00

Note: G^2 indicates log-likelihood ratio of the chi-square statistic; D.I. indicates index of dissimilarity.

Table 4 represents the result of goodness-of-fit statistics for the models estimated. As expected, the baseline model yields a large log-likelihood ratio and large BIC value, indicating a poor fit for the data and that from a substantive standpoint spousal matching regarding education is not random. Next, we calculated the goodness-of-fit statistics of CHM 1. Compared to the baseline model, its log-likelihood ratio of the Chi-square statistics is much smaller, and it also leads to a huge reduction in the index of dissimilarity, AIC, and BIC values. We suggest that CHM 1 significantly improves the fitness to the data.

However, CHM 1 assumes that the strength of educational homogamy is the same for different educational levels; as suggested in previous literature, it is reasonable to assume that the strength of educational homogamy may vary for different educational levels. Thus, to test this assumption and to further improve the model fitness, CHM 2 was introduced. Because all values of the goodness-of-fit statistics declined significantly, CHM 2 is preferable to CHM 1. In other words, this indicates that the parameters of the diagonal cells should be estimated separately for better model fit. In summary, the results indicates that educational homogamy strength is not the same among different educational levels. According to CHM 2 (parameters not shown), the parameters for the diagonal are 1.13 (Exp(1.13)=3.1) for low educational level, −0.18 (Exp(−0.18)=0.8) for middle educational level, and 1.72 (Exp(1.72)=5.6) for high educational level. This result means that in general homogamy in low education is 3 times more likely to occur than heterogamy, and homogamy in high education is approximately 5.6 times more likely to occur than heterogamy. Thus, when educational hypogamy and hypergamy are set as reference groups, educational homogamy is more likely to happen at both ends of the educational distribution while middle-educated people are more heterogeneous.

The CHM 1 and CHM 2 did not account for the differences in the strength of educational homogamy by marital type. To further look at how educational homogamy differs across marital types, the Different Homogamy Model (DHM) 2 was applied. In this model, we allowed all homogamy parameters to differ by marital type. Compared to CHM 2, this model is adopted for the smaller BIC statistics, and the dissimilarity index shrinks to almost 0, which indicates a great model fit. The result shows that the strength of homogamy do differ by marital type.

Table 5 Parameters estimated for the DHM 2

	The additive effect of Diag2 Japanese Couples	The interaction effect of Diag2 Immigrant couples	The interaction effect of Diag2 Intermarried couples
Low educational level	3.305***	−2.669***	−2.820***
Middle educational level	−0.961**	0.728	1.285**
High educational level	2.664***	−0.684	−2.607***

Sig. codes: *** p<.001, ** p<.01, *p<.05

Furthermore, to clarify how educational homogamy differs across the three marriage groups, we estimated the homogamy parameters based on the DHM 2. Table 5 shows this result. In Table 5, the parameters for Japanese couples indicate the main effect but interaction effect for immigrant and international married couples. The additive effect of Diag2 is the result of Japanese couples. The main effect of Japanese couples is positive for low and high educational levels while negative for middle educational levels. This indicates that educational assortative mating is more likely to happen at both ends of educational distribution among Japanese couples (in low education is 27 times more likely to occur than heterogamy, and homogamy in high education is approximately 14 times more likely to occur than heterogamy). The interaction effect of Diag2 among immigrant couples shows that the strength of homogamy among the low educated was significantly weakened compared with Japanese couples; while the result of midlle and high educated is not significant anymore. In addition, the interaction parameters of Diag2 show that homogamy was further weakened across intermarried couples. As to the marginal effect of international marriage, compared with hypergamy/ hypogamy marriages, educational homogamy in low and middle educational distribution is 1.6 (exp (3.305–2.820)) and 1.4 (exp (1.285–0.961)) times more likely to happen, while there is no difference among high educational distribution (the parameters of homogamy in high education among intermarried couples was 2.664–2.607, yielding to 0.057). In other words, this means that homogamy among the highly educated was almost as likely to occur as heterogamy in international marriages.

In sum, international marriage is much less homogamous and we can learn from Table 5 that the result of CHM 2 mainly reflects the patterns of educational homogamy among Japanese couples, not other two marriage types. However, we do not know whether immigrants are more like to marry down in education, as the status exchange hypothesis indicates, or marry up. To paint a fuller picture, the next section focuses on the parameters off the diagonal cells.

Table 6 shows the model selection statistics of Female Hypergamy and Hypogamy Models (FHHM). The FHHM 1 assumes there is no difference across marital types, the FHHM 2, on the contrary includes the interaction term. The lower BIC value indicates better model fitness for FHHM 2.

Table 6 Goodness-of-fit statistics for model selection

Model	G^2	d.f.	p	BIC	AIC	D.I.
Female Hypergamy and Hypogamy Model 1	138.54	10	0.000	346.60	324.57	0.07
Female Hypergamy and Hypogamy Model 2	109.16	6	0.000	330.40	303.19	0.05

G^2:Likelihood ratio statistic; D.I.: Index of dissimilarity.

To further interpret the result, Table 7 shows the parameters estimated for FHHM 2. The additive effect of FHP is the result for Japanese couples. The parameters are all negative, which indicates that compared with educational assortative mating, Japanese women are 2.2 times less likely to marry up in education and 3 times less likely to marry down. The interaction effects of FHP among immigrant couples shows that there was no significant difference in the strength of female hypergamy and hypogamy between Japanese couples and immigrant couples. Finally, when it comes to the interaction parameters of FHP among intermarried couples, the strengths of female hypogamy were further increased, whereas there was no significant interaction effect of female hypergamy. The parameters of female hypogamy among intermarried couples were −0.11. Thus, in international marriages female educational hypogamy is as likely to happen as educational assortative mating.

Table 7 Parameters estimated for FHHM 2

	The additive effect of FHP Japanese Couples	The interaction effect of FHP Immigrant couples	The interaction effect of FHP Intermarried couples
Female educational hypergamy	−0.774***	0.206	0.444
Female educational hypogamy	−1.084***	0.180	0.971***

Sig. codes: *** p<.001, ** p<.01, *p<.05

5. Discussion and conclusion

This study displays the status of educational assortative mating in Japan's international marriage by comparing international marriage with two other groups of ethnic endogamous marriages. Based on the hypotheses derived from theoretical frameworks, we consider different mating mechanisms among different marital types in Japan. The results of the log-linear models show that international marriage tends to be more heterogeneous, and the results of female educational hypergamy and hypogamy model shows there is almost no difference in rate of educational hypergamy and hypogamy compared with homogamy. According to the Ministry of Health, Labor, and Welfare (2015), the composition ratio of Japanese husband-foreign wife to Japanese wife-foreign husband out of all international marriages in Japan is around 70% to 30%, which is mirrored in the data used in this study. Table 3 also shows the

same homogamy, female hypergamy and hypogamy rate for different intermarried groups. In other words, 70% of the sample cases in international marriage had gone through educational hypergamy and education hypogamy at the same rates, it is difficult to conclude that immigrants trade their educational attainment with Japanese spouses in international marriage in Japan. We also compared the log-linear analysis results with all international married couple samples and female immigrant-Japanese husband couple samples, the results are robust (results not shown).

The conclusion is that both hypothesis 1a and hypothesis 1b are rejected. From a theoretical perspective, this indicates that neither the educational assortative mating hypothesis nor the status exchange hypothesis do work well in predicting the patterns of association between husband and wife's education in international marriage in Japan. This differs signifcantly from Nagayoshi and her colleagues' (2023) research, their results claim that rather than educational homogamy, status exchange hypotheses better interpret international marriage in Japan. Even immigrant females need to trade their educational attainment and younger age to marry a Japanese husband. However, it should be noted that the different results may also be because of different sample sizes as well as different statistical methods applied.

In addition, the results also show that different educational backgrounds have different strengths of educational homogamy across marital types, thus hypothesis 2 is supported. As to Japanese couples, the educational homogamy is generated by the rigidity of education barriers at both ends of the educational distribution. This result is consistent with previous studies which state that educational assortative marriage in Japan is composed of marriage between junior college and university graduates (Zhou 2016; Fukuta et al. 2021) and marriage among those with less than a high school education (Schwartz and Mare 2005). All in all, the results show how opportunity and individual preferences interact in mate selection among Japanese couples. Foreign ethnic endogamous marriages shows similar patterns with Japanese natives but to a much lesser extent.

On the other hand, international marriage depicts a different story. We did not find that immigrant women traded their education for lower-educated Japanese husbands. Therefore, we conclude that partners in international marriage do not view education as important in mate selection, their match is less related to educational attainment and can be explained by marginal distribution. This conclusion is quite important to previous literature using qualitative data which emphasize the increasing tendencies of educational homogamy in international marriage in Japan. The integration of foreign workers and people of foreign origin into Japanese society by international marriage may change over time. However, lacking emprical evidence, the process of change is not clearly captured by previous studies. On the one hand, Nagayoshi and her colleagues support the status exchange hypothesis using 2010 census data; on the other hand, Guo in her 2020 work indicates intermarriages with similar educational backgrounds, which can be considered the result subsequently as integration progresses. Based on our results, these highly educated couples in international marriage exist, but these are not necessarily distinctive patterns of mate selection in this type of marriage. Therefore, in international marriage, the three types of marriage exist to a relatively equal extent: educational assortative mating, female educational hypergamy, and female educational hypogamy. The result of this paper may assume the intermediate stage

between those two. Future studies should consider the three types of couples in greater detail and how these couples differ in terms of the process of mate selection and their experiences of marital life, using both quantitative and qualitative data. Future studies also need to investigate if the similar marriage patterns have continued to modern day using newer data with larger sample sizes.

Educational assortative mating can be observed at low and middle educational gradients in international marriage in Japan, but the strength of these trends is weak. Immigrants with high educational levels show no difference in the rate of educational assortative mating or any other marriage patterns. It should be noted that this may be caused by the overall lower educational attainment of sampled immigrants in this study. Importantly, in the prefectures where this data was gathered, manufacturing industries, especially export-oriented industries that produce automobiles and electronic appliances, are widespread (Takenoshita 2013). The demand for temporary workers in these local labor markets attract many immigrants with low and middle educational backgrounds. As such, the overall educational attainment of immigrants in this dataset may be lower than the true average because they are mainly semi-skilled manual workers.

This is one of several issues we could not address in this study. The Shizuoka data is regional data. The gender distribution of Shizuoka data is only slightly different from JGSS, but the educational level is much lower. This means that the results of this research are hard to generalize out to all migrants in Japan, especially highly educated immigrants living in mega cities like Tokyo. Future research should use larger and nationally representative data to retest the results and to see how educational homogamy changes over time. Additionally, the mechanisms of the status exchange hypothesis in international marriage should be analyzed in more detail in the future.

Japan is currently facing a declining birthrate and aging population. In order to cope with the relative shortage of labor that is predicted in the near future, policies for accepting international students are being devised and implemented at the national policy level. In May of 2008, the "300,000 International Students Plan" was launched as one of the national strategies as a policy (Okada et al. 2011). Though neither educational homogamy hypothesis nor status exchange hypothesis was supported in this paper, with those immigration policy change, more high educated immigrants are selected and more educational homogamy among international marriage is expected to increase.

Notes

1) According to the OECD, nationality and place of birth are the two criteria most commonly used to define the immigrant population. The foreign-born population covers all persons who have ever migrated from their country of birth to their current country of residence. The foreign population consists of persons who still have the nationality of their home country. It may include persons born in the host country (https://www.oecd-ilibrary.org/docserver/factbook-2013-6-en.pdf?expires=1695180097&id=id&accname=guest&checksum=94CBE31C8216CB1E0B66BBCFFC2B0B22).
2) The definition of migrant according to the UN: The UN Migration Agency, International Organiza-

tion for Migration (IOM), defines a migrant as any person who is moving or has moved across an international border or within a State away from his/her habitual place of residence, regardless of the person's legal status, whether the movement is voluntary or involuntary, what the causes for the movement are, and what the length of the stay is (https://www.un.org/en/fight-racism/vulnerable-groups/migrants).

Acknowledgements

This study is funded by the JST Program, Grant number MKHQ2126. As for the 2009 Shizuoka Prefecture Multicultural Coexistence Survey, I am grateful to the Shizuoka Prefecture government for conducting the survey and, I am grateful to the Shizuoka Prefecture government for allowing us to use the survey data. My appreciation also goes to the Inter-university Consortium for Political and Social Research (ICPSR) at the University of Michigan for the usage of JGSS2012 data.

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Appendix

The formula for Different Homogamy Model (DHM) 1/2:

$$\mathrm{Log}(\mathrm{F_{RCL}}) = \mu + \mu_{\mathrm{R}} + \mu_{\mathrm{C}} + \mu_{\mathrm{L}} + \mu_{\mathrm{RL}} + \mu_{\mathrm{CL}} + \mathrm{Diag1} + \mathrm{Diag1_L} \tag{4}$$

$$\mathrm{Log}(F_{RCL}) = \mu + \mu_R + \mu_C + \mu_L + \mu_{RL} + \mu_{CL} + \mathrm{Diag2} + \mathrm{Diag2}_L \tag{5}$$

The formula for female hypergamy and hypogamy:

$$\mathrm{Log}(F_{RCL}) = \mu + \mu_R + \mu_C + \mu_L + \mu_{RL} + \mu_{CL} + \mathrm{FHP} \tag{6}$$

$$\mathrm{Log}(F_{RCL}) = \mu + \mu_R + \mu_C + \mu_L + \mu_{RL} + \mu_{CL} + \mathrm{FHP} + \mathrm{FHP}_L \tag{7}$$

Table 8 Design matrixes for all models

Diag1		Education of wife		
		Low	Middle	High
Education of husband	Low	1	0	0
	Middle	0	1	0
	High	0	0	1

Diag2		Education of wife		
		Low	Middle	High
Education of husband	Low	1	0	0
	Middle	0	2	0
	High	0	0	3

FHP		Education of wife		
		Low	Middle	High
Education of husband	Low	0	1	1
	Middle	2	0	1
	High	2	2	0