Assortative mating by sibship position in Japan:
An evaluation of low fertility, family norms, and declining first marriage rates

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Introduction

The question of who marries whom is one of great interest to family scholars and stratification researchers and a large number of studies have examined patterns of assortative mating by education, occupation, race, and other socio-economic traits (e.g., Kalmijn 1998; Blossfeld 2009; Schwartz 2013). Because spouse pairing is not random with respect to a wide range of characteristics, changes in the supply of important spouse selection criteria within the marriage market can result in marriage squeezes or marriage market mismatches. Among the most widely studied examples are baby booms that result in marriage squeezes detrimental to women (given typical age differences between husbands and wives) (Akers 1967) and rising unemployment and incarceration that contributes to a "shortage of marriageable men," especially for less-educated Black women in the U.S. (Lichter et al. 1992; Western 2007). Similarly, in societies characterized by strong preferences for female status hypergamy, relative improvements in women's education results in marriage market mismatches detrimental to both highly-educated women and less-educated men (Raymo and Iwasawa 2005; Raymo and Park 2018).

In this study, we focus on an another understudied, but potentially important, dimension of assortative mating in low-fertility, "strong family" countries – sibship position. Declining fertility has obvious implications for both sibship size and composition. In low-fertility populations, the prevalence of only-children and eldest children, and single-sex sibships is higher, by definition, than in higher-fertility settings. To the extent that sibship position is a relevant dimension of spouse selection (i.e., pairing with respect to sibship position is nonrandom), changes in marriage market composition produced by declining fertility may have implications for marriage behavior.

This question may be particularly important in East Asian societies such as Japan where different sibship positions are associated with specific, well-established normative expectations and obligations. In particular, eldest sons have long been expected to live with their parents after marriage, in order to maintain the family lineage. The wives of eldest sons are thus more likely than women married to second and third sons to coreside with their parents-in-law. While coresidence with parents-in-law is advantageous in some ways (e.g., access to housing, financial support, and childcare), an abundance of anecdotal evidence also highlights its potential disadvantages for women, including lack of privacy, lack of autonomy, onerous domestic work obligations, and expectations of caregiving for aging, frail parents-in-law (Lebra 1984; Jenike 2003; Traphagan 2003). Ethnographic research, survey data, and media reports all suggest that women in Japan are increasingly wary of marriage to men who expect to live with parents at some point following marriage (Long et al. 2009; NIPSSR 1989, 1994). One compelling recent example is Yu and Hertog's (2018) analyses of online dating records from the late 2000s showing that women are less likely to accept a date request from men who are eldest sons.

Because declining fertility increases the proportion of men who are eldest sons, women's desire to avoid marriage to men who are normatively expected to coreside with parents may be a part of the explanation for the dramatic decline in marriage rates in Japan. The potential relevance of marriage market mismatches with respect to sibship position may be even more pronounced if women (especially those without brothers) are increasingly expected to provide care to their own aging parents and if women are increasingly eager to avoid marriage with eldest sons (Ochiai 1994).

Research Questions and Hypotheses

Examining trends in patterns of assortative mating by sibship position in Japan may provide new and valuable insights into how demographic change, in combination with "traditional" family norms and expectations, affects marriage rates. Have preferences for marriages that involve potentially competing family obligations declined over time? Have structural changes in sibship composition created marriage market mismatches in Japan? Alternatively, have pairing preferences adjusted to changing market composition? To what extent has changing marriage market composition with respect to sibship position contributed to the overall decline in marriage between 1960 and 2010? Past studies on intergenerational family relations in Japan have examined how sibship position is related to intergenerational coresidence after marriage (Kamo 1990; Kurosu 1994; Park et al. 1999; Rindfuss et al. 2004) and to marriage timing (Kojima 1994; Yasutake 2010), but this is the first empirical study of spouse pairing patterns by sibship position.

Based on the well-established normative expectations associated with sibship position (especially that of eldest son) and the anecdotal evidence referenced above, we propose and evaluate the following hypotheses regarding patterns of pairing by sibship position. First, we hypothesize that women without male siblings are less likely to marry eldest sons (including men without any siblings) (hypothesis 1). The assumption underlying this hypothesis is that the perceived disadvantages of marrying an eldest son are strongest for women who may also expect to coreside with and/or provide care to their own parents (i.e., women who do not have brothers). Second, we hypothesize that the posited pattern in hypothesis 1 is strongest for eldest daughters (hypothesis 2). Normative expectations for daughters are less closely linked to sibship position than for sons, but there is some evidence that eldest daughters are more likely to coreside with their parents than non-eldest daughters (Martin and Tsuya 1991), suggesting that expectations of care are thought to be stronger for the eldest daughters.

In terms of trends in spouse pairing by sibship position, we propose and evaluate the following hypotheses. First, the propensity for women without brothers, especially eldest daughters, to marry eldest sons has decreased over time (hypothesis 3). This is motivated by evidence that the prospect of coresidence and provision of care to in-laws is increasingly unappealing to women for a variety of reasons, including changing attitudes, increasing education, and economic independence (Tsuya and Choe 1991; Tsuya and Mason 1995). Second, it is possible that young Japanese men and women have adjusted their pairing behavior to new realities of the marriage market. In particular, we posit that the propensity to marry eldest sons has increased over time (hypothesis 4). We expect that evidence consistent with this hypothesis may be stronger for women who are not themselves eldest daughters and who have brothers. Because there is no existing empirical research on spouse pairing with respect to sibship position, we also propose the alternative null hypothesis that sibship position has never been a particularly meaningful dimension of spouse pairing (hypothesis 5).

Data and Methods

In this study, we use pooled data across the 8th through 15th National Fertility Surveys (JNFS), which were conducted in 1982, 1987, 1992, 1997, 2002, 2005, 2010, and 2015. These surveys provide information on the marriage timing of married women aged 18-49. Importantly, these surveys also provide information on the sibship size and composition of both respondents and their husbands. Pooling data from the eight surveys results in a total sample of 53,668 women who married between 1960 and 2010. We restricted the sample to the couples in which both wife and husband are first married. Using sibship status information, we classified wives into (1) only child, (2) eldest daughter with no brothers, (3) eldest daughter with brothers, (4) not eldest daughter with no brothers, (5) not eldest daughter with brothers. Also, we classified husbands into (1) only child, (2) eldest son with no brothers, (3) eldest son with brothers, (4) not oldest son with one brother, (5) not oldest son with more than one brother.

To examine the prevalence of different sibship pairings net of changes in marriage market composition, we estimated log-linear models in these preliminary analyses. The basic model can be written as:

$$\ln F_{ijk} = \lambda + \lambda_i^W + \lambda_j^H + \lambda_k^C + \lambda_{ik}^{WC} + \lambda_{jk}^{HC}$$

where F_{ijk} is the predicted number of marriages between women of sibship position i to men of sibship position j (i,j=1,2,3,4,5), in 5-year marriage cohort k (1=1960-69, 2=1970-79, 3=1980-89, 4=1990-99, 5=2000-2010).

To test hypothesis 1, we add ${\gamma_1}_{ij}^{WH}$, using the following design matrix:

[Table 1 about here]

where we expect that daughters without brothers marrying eldest sons (${\gamma_1}_{ij}^{WH} = 1$), is less likely to occur than other type of pairings.

Also, in testing hypothesis 2, we also add ${\gamma_2}_{ij}^{WH}$, using the following design matrix.

[Table 2 about here]

where we expect that there is an additional negative association of marriage between eldest daughters and eldest sons (${\gamma_2}_{ij}^{WH} = 1$).

To evaluate the hypotheses regarding trends over time, we also use the following log-multiplicative layer effect model (Xie 1992), where δ_k^C denotes the log-multiplicative parameter. The δ of the oldest cohort is set to be 1, and if δ of a given cohort is less (or more) than 1, this indicates that the association in the cohort is weaker (or stronger) than that of the oldest cohort.

$$\ln F_{ijk} = \lambda + \lambda_i^W + \lambda_j^H + \lambda_k^C + \lambda_{ik}^{WC} + \lambda_{jk}^{HC} + \gamma_{ij}^{WH} + \delta_k^C \gamma_{ij}^{WH}$$

<u>**Preliminary Results and Discussion**</u>

Table 3 presents goodness of fit statistics for the models: the degree of freedom (df), the log-likelihood ratio chi-square statistic (G^2), and the Bayesian information criterion ($BIC = G^2 - \log n \times \mathrm{df}$). More negative BIC statistics mean a better model in terms of model fit and parsimony. While Model 1, which assumes independence between wife's and husband's sibship positions conditional on marginal distributions, does not fit the data well, Models 2 and 3 show much better fits. Comparing those models, Model 3 shows a relatively better fit than Model 2, and we thus use this model to illustrate the patterns of assortative mating by sibship position.

[Table 3 about here]

Table 4 presents estimated coefficients from the Model 3, showing that the likelihood of marriage depends on sibship positions. In particular, we see that marriages between eldest daughters without brothers and eldest sons are 26% less likely (1.00 – exp(-.30) = .74) than all pairings involving men who are not eldest sons and/or women with brothers. The relative likelihood of marriage between not eldest daughters without brothers and eldest sons falls in between these two groups.

[Table 4 about here]

This evidence that some marriages involving eldest sons are relatively less common is consistent with our first hypothesis. The relative magnitude of coefficients for pairings with eldest sons of eldest and not eldest daughters with no brothers is consistent with our second hypothesis. We next examined whether there is any cohort change in the degree of assortative mating by sibship position. Table 5 presents fit statistics for two models – one that assumes that uniform cohort change in the degree of assortative mating (i.e., UNIDIFF model), and one in which the trend depends on specific type of assortative mating. Both models use the design matrices from Model 3. The fit statistics show that the UNIDIFF model fits the data better. Using the results of Model 4, we present estimated trends in marriage among three types of pairing in Figure 1. These figures show that the association between wife's and husband's sibship position has weakened over time for each pairing. For example, although the marriage between eldest women without brothers with eldest sons is less likely to occur, the propensity for these marriages (net of marginal distributions) has increased dramatically. While the coefficient for the 1960-69 cohort was -0.600, it approaches zero (-0.045) in the latest marriage cohort. These results generally support hypotheses 1, 2, and 4, but are not consistent with hypotheses 3 and 5.

[Table 4 about here]

[Figure 1 about here]

Next Steps

In subsequent extensions of these preliminary analyses, we will supplement log-linear models with harmonic-mean models of marriage similar to those employed by Fukuda and Raymo (2018), Raymo and Iwasawa (2005), and Raymo and Park (2018). By incorporating the population at risk of first marriage (rather than only married couples), these models allow for straightforward evaluation of the role of both marriage market composition and pairing preferences (forces of attraction) in shaping marriage rates (the measure that we are ultimately interested in). The use of counterfactual analyses will allow us to quantify the extent to which changes in marriage market composition with respect to sibship position have contribute to the decline in marriage rates. They will also allow us to evaluate the extent to which changes in pairing preferences may have mitigated the impact of changing market composition on marriage rates.

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Table 1. Design matrix (1)

Wife's status / husband's status	(1)	(2)	(3)	(4)	(5)
(1)Only child	1	1	1	0	0
(2)Eldest daughter, no brothers	1	1	1	0	0
(3)Eldest daughter, brothers	0	0	0	0	0
(4)Not oldest daughter, no brothers	1	1	1	0	0
(5)Not oldest daughter, brothers	0	0	0	0	0

Table 2. Design matrix (2)

Wife's status / husband's status	(1)	(2)	(3)	(4)	(5)
(1)Only child	1	1	1	0	0
(2)Eldest daughter, no brothers	1	1	1	0	0
(3)Eldest daughter, brothers	0	0	0	0	0
(4)Not oldest daughter, no brothers	0	0	0	0	0
(5)Not oldest daughter, brothers	0	0	0	0	0

Table 3. Model comparison (Models 1-3)

No	Model	df	G2	BIC
1	Conditional independence	80	399.5779	-471.6679
2	WH association (without brothers)	79	278.3978	-581.9574
3	WH association (without brothers+eldest daughters)	78	243.5795	-605.8851

Table 4. Estimated coefficients from Model 3

Wife's status / husband's status	(1)	(2)	(3)	(4)	(5)
(1)Only child	-0.300	-0.300	-0.300	0	0
(2)Eldest daughter, no brothers	-0.300	-0.300	-0.300	0	0
(3)Eldest daughter, brothers	0	0	0	0	0
(4)Not oldest daughter, no brothers	-0.115	-0.115	-0.115	0	0
(5)Not oldest daughter, brothers	0	0	0	0	0

Table 5. Model comparison (Models 4-5)

No	Model	df	G2	BIC
4	Cohort change (simple heterogeneous, UNIDIFF)	74	191.8474	-614.0549
5	Cohort change (heterogeneous, UNIDIFF)	70	187.4511	-574.8889

Fig 1. Estimated trends for WH and cohort interaction from Model 4