MARRIAGE INSTITUTIONS AND SIBLING COMPETITION REVISITED: EVIDENCE FROM INDONESIA

February 28, 2015

Abstract: Parental involvement in many marriage markets plays a key role in female's marriage timing and spousal choice. The prevalence of arranged marriage limits a girl's decision on to whom and when to marry. The objective of this paper is to analyze how the arranged marriage markets cultivate competition among the same gender siblings and arise cross sister effects which have long lasting consequences in a girl's adulthood life. Using data from Indonesia, this paper estimates sibling structure effects on early marriage, educational attainment and groom quality. The results suggest that impact on marriage age is statistically significant, while on education and spousal quality are less robust.

Keywords: Marriage, Next-Youngest Sibling, Age at First Marriage, Indonesia

JEL Codes: J1, I25, O15

INTRODUCTION

At what age young people get married is widely discussed among economists as it has serious implications for the society. For example, marriage is known to reduce female labor participation rate (Korenman and Neumark, 2002). Married men have been found to have higher earnings than single ones in the labor market (Loe, 1996). Age at first marriage is viewed as an important determinant of fertility in most developed countries (Coale, 1971). Marriage has been documented to have positive health effect for males who, upon marriage, tend to give up risky and unhealthy habits, such as drinking and smoking (Gardner and Oswald, 2004). Thus, a significant body of literature has emerged in economics that analyses socio-economic factors, such as education, religion, occupation, wealth and place of residence, affecting age at first marriage (Ayiga and Rampagane, 2013; Goni and Rahman, 2012).

As in the developing world, marriage involves active participation of the families of the groom and bride, parameters of those families can be instrumental for the timing of marriage. In a recent paper, Vogl (2013) argues that in countries where arranged marriage with parental involvement is a norm, presence of younger siblings of the same gender affects when young people get married. Specifically, parents prefer to marry their daughters in order of birth, therefore, presence of a younger daughter rushes marriage of her older sister, while delaying marriage of the younger one. Based on household survey data from South Asian countries (Bangladesh, India, Nepal and Pakistan),the paper also reports that because of the trade-off between schooling and early marriage, presence of a younger sister in the family lowers human capital attainment of the older sister and decreases the quality of the grooms to be selected for her older sister.

However, in the developing world, children are viewed as assets and provide substantial contribution to the intra-household labour force. Therefore, if there is a demand for additional pair of hands within the household, parents should postpone marriage of their daughter. Empirical evidence supporting this view is provided in Mbiti (2008) which estimates rainfall shocks in India across rice farming and wheat farming households to find out how female labour productivity influences the marriage market. He has evaluated the effect of growth in women labour productivity on the marriage timing and dowry payments. Mbiti (2008) found that after positive rainfall shocks Indian families in rice villages prefer to delay the marriage of their daughters in order to increase benefits of daughters' labour for at least another year. In other words,

parents tend to keep intra-household labour suppliers, their daughters, at home during high productive periods.

In this paper, we match these two results and hypothesize that if the next younger sibling of a daughter is much younger and is not in the position to quickly substitute for her, then parents will be delaying marriage of that daughter even if the next youngest child is female. In other words, we argue that the relationship between the age at marriage for female children and existence of younger sisters depends on the age gap between the two in a non-monotonic way (daughters with younger sisters are married earlier if the age gap between them is relatively small, and they are married later if the age difference is substantial). Thus, we extend the analytical framework of Vogl (2013) to account for the age gap between sisters.

To that end, we use data provided by the Demographic and Health Survey from Indonesia. The choice of Indonesia is conscious. It is the largest Muslim country, where more than 85% of population follows the Islamic faith (UNDP, 2015) and where parental involvement in marriage arrangements are common (Net Industries, 2015) and parents tend to have their daughters marry in the exact birth order. Our results suggest that, in Indonesia, girls with next-youngest sisters are 2.3 % more likely to have left parental home than females with next-youngest brothers. Also, in line with Vogl (2013), we find that human capital attainment and grooms' quality for daughters suffers in the presence of younger sisters. However, our key result is in contrast to Vogl (2013) – we find that there is a threshold value of age gap between siblings, around 9-10 years, beyond which age marriage for daughters starts to increase.

Section 2 provides an account of previous empirical evidence on cross-sister pressure on marriage age and educational attainment. Section 3 presents data and empirical strategy with the specification of the model. Section 4 discusses the results of the research. The final section concludes the paper and provides suggestions on implication of the results and on further development of this research.

LITERATURE REVIEW

Most of research is based on analyzing the competition among siblings for restricted resources within the household. A range of human-capital investment theories state that increasing number of children in the family decreases available resources for every individual child. Therefore, under the budget constraint parents cannot hold quality of children when quantity is increasing. To reduce the cost of

raising the quality of children, parents try to decline the quantity of their children by marrying their daughters. As a result of this negative trade - offbetween child quality and quantity in the household, siblings are observed as rivals for parents' limited resources (Becker and Lewis, 1973).But sibling rivalry also arises in the fields that are not explained by the theory of budget constraintand marriage market is one of these arenas. The same gender siblings participate in the same marriage market and share a pool of potential spouses. Their membership in the same family develops special restrictions on their marriages. Particularly, in societies with arranged marriage, where parentstry to marry their children of the same sex only in order of birth, these constraints are very strict.When it becomes difficult to find a suitable spouse, the same sex siblings constrain each other's marriage (Vogl, 2013).

In his empirical work, Vogl (2013) examines how arranged marriage develops rivalry among sisters in four South Asian countries: Nepal, India, Bangladesh and Pakistan. Using data from the Demographic and Health Surveys (DHS), the paper analyses how the family's impact on marriage arrangements creates trade - offs among siblings, such that one sibling's presence in the family affects another sibling's marriage and human capital outcomes. It predicts that the presence of older sisters delays the marriages of their younger sisters, the presence of younger sisters rushes the marriages of their older sisters and the presence of any sisters decreases expected groom quality. The analysis has two parts, the first of which uses data on the fertility histories of all four countries and the second one employs the sibling histories of Nepal, as only in this country this type of survey was conducted. For a girl of family *i* and older sibling composition *j*, the following basic regression model is applied:

$$Y_{ij} = \delta_j + \beta sisters_{ij} + X_{ij}^{'}\boldsymbol{\gamma} + \boldsymbol{\varepsilon_{ij}}$$

"The central variables are y_{ij}, a marriage or human capital outcome, and $sisters_{ij}$, the number of girls born in a subsequent pregnancy (first- or second-subsequent, depending on the analysis). The fixed effect $\delta_j$is unique to each permutation of older siblings, the covariates in X_{ij}vary by sample[1]" (Vogl, 2013).

The results show that across four large South Asian countries, parents rush a daughter's marriage search if she has younger sisters and delay her marriage search if she has older sisters, at the expense of spousal quality. In Nepal, where sibling history

[1]For the Fertility Histories, X_{ij}includes the birth interval, mother's and father's education, and maternal age, as well as indicators for the girl's age or birth year, the mother's place of residence, religion, and survey. For the Sibling Histories, X_{ij}includes the birth interval and indicators for birth year, the decade that the woman's mother initiated childbearing, religion, and survey.

data is available, the presence of younger sisters results a girl's earlier school-leaving, lower educational level, lower spousal educational and occupational level and lower adult household economic status. (Vogl, 2013).

Besides Vogl, other researchers have also examined female siblings' effect on female educational attainment. Butcher and Case (1994) have stated the hypothesis that women with sisters get less education than females who have only brothers. While Hauser and Kuo (1998) and Shields and Hanneke (2008) have also estimated the same hypothesis, but found insignificant coefficients for relationship between female siblings and educational attainment. In addition to siblings gender effect, family size and birth order also influence human capital. Black *et al.* (2005) explored the effect of family size and birth order on educational attainment, occupation, income and early childbearing. They found out that the number of siblings negatively impacts on this set of variables, but controlling for birth order reduces the effect and makes it insignificant. Also, they showed that educational level declines with the amount of older siblings because of the negative and significant effect of birth order on education. Another estimation of birth order effect on educational level was done by Härkönen (2013). The research found that this impact is stronger in larger families than in small ones, and that females are less effected than males.

Concerning to the marriage timing, Mbiti (2008) states that as children have considerable role in the intra-household labour force, some parents postpone marriage of their daughters when they need additional labour supply in the household. He has estimated how exogenous shock in female labour demand affects marriage timing of women in India. Mbiti (2008) explored that when positive rainfall shocks cultivate rice in villages, the demand for female labour increases and during these period rice farmers are less likely to accept a marriage proposal and willing to delay the marriage of their daughters.

This paper focuses on siblings gender effects on marriage characteristics and following Vogl's empirical strategy evaluates these hypothesis:

- the presence of younger sisters hastens the marriages of their older sisters
- the presence of older sisters delays the marriages of their younger sisters
- the presence of any sisters reduces expected groom quality

METHODOLOGY

DATA

The study uses the Demographic and Health Surveys (DHS) done for Indonesia in 1994, 1997, 2002-2003, 2007 and 2012. The DHS individual women respondent recode provides data on females' live births by sex and year of birth. For every live birth, women list survival status, age at death, current parental coresidence, school attendance and health. Also the cross-sectional data contains information about respondents' husbands and siblings. DHS represent a sample of about 165000 female individuals for 5 waves: women aged 15-49.

The paper uses two cohorts for analysis: younger and older ones. Older cohort is a group of respondents who filled the DHS surveys. They are females aged 15-49, who were born between 1944 and 1995. While younger cohort is their children, born between 1967 and 2000. The descriptive statistics (See Appendix 1) show that about 70% of respondents' daughters are unmarried and live at natal homes. About 49% of their next youngest siblings is female. On average the oldest child is 15 years old, while age of the respondents' at their first birth is 20 years old. Respondents' and their husbands' highest achieved grade, on average, is primary educational level. More than 60% of girls in rural areas of Indonesia. The oldest female child has on average 2 siblings. Usually respondents first got married at 19 years old. Half of them has next-youngest sister (49.7%). On average respondents have more than 2 older siblings. Mean age gap, the difference between respondent's age and age of her next-youngest sibling is more than 3 years. 80% of respondents is Muslim.

EMPIRICAL STRATEGY

The theoretical foundation of regression analysis follows Vogl's model of search for grooms, which explains the effect of marrying daughters in exact birth order on marriage timing and choice of grooms. The model adopts three assumptions, such as parents prefer to marry their daughters at young age, attributes of a groom matters and spouses who have acceptable quality arrive at a slow rate. Vogl (2013) shows the optimal behavior of parents with *one daughter*:

$$q_0(a) - q_0(a+1) = \lambda\pi(q_0(a+1))$$

where: a - age of the daughter

q_0- the quality of a groom

$\lambda \in (0;1)$ - the probability of groom arrival

$\pi(q_0(a+1)$- the expected excess of groom quality

When a groom's representatives arrive, parents decide, whether to offer a bride or not, based on the reservation quality ($q_0(a)$) of their daughter. If parents offer their daughter and the groom's representative accept an offer, they obtain payoff q, otherwise the process repeats in the next period. When the daughter's age reaches ā (until which the daughter is marriageable), parents become indifferent between zero quality groom and unmarried daughter:

$$q(\bar{a}) = 0$$

The equation changes when the family has *two daughters*:

$$q_2(a,\Delta) - q_2(a+1,\Delta) = \lambda\pi\big(q_2(a+1,\Delta)\big) - \big(q_1(a-\Delta) - q_1(a-\Delta+1)\big)$$

$$q_2(\bar{a},\Delta) = 0$$

where: $q_2(a,\Delta)$- the reservation quality for an elder daughter aged a with younger sister aged $a-\Delta$

$q_1(a-\Delta) - q_1(a-\Delta+1)$- the cost of postponing younger daughter's marriage

This cost is always positive, so the reservation quality of an elder daughter is less than that of a younger one. Therefore, parents prefer to marry their elder daughter first for $a < \bar{a}$. After marriage of the elder daughter, the optimal behavior of parents reduces to the only daughter problem.

From this model, Vogl (2013) concludes that reservation quality of an elder daughter is always less than that of an only daughter, so she enters the married life earlier within a lower quality husband than an only daughter. Meanwhile, a younger daughter in a two-daughter family has the same reservation quality as an only daughter and marries later than only one, but as reservation quality decreases with age, her late entry to the marriage market implies lower expected groom quality than an only daughter.

By applying above model the paper formulates all hypothesis concerning timing of marriage and spousal quality. As the basic regression model, the study uses Vogl's above mentioned OLS regression function and estimates the data on Indonesia by applying variables which are stated in the literature review part:

$$Y_{ij} = \delta_j + \beta sisters_{ij} + X'_{ij}\boldsymbol{\gamma} + \boldsymbol{\varepsilon_{ij}}$$

The fertility history presents a variation in data on the younger sibling's gender. If a girl has at least x younger siblings, the gender of her xth younger (ever-born)

sibling is taken as random. Therefore, comparing girls who have next-youngest sisters with those who have next-youngest brothers allows a causal interpretation. Still, this approach has antecedent and most of existing research on the effects of sibling sex structure regresses a person's outcomes on some measure of the gender composition of all siblings (Chen et al. 2010).

RESULTS

Estimation results for hypothesis that younger sisters rush the marriage of older sisters are reported in Appendix 2. To avoid omitted variable bias we use vary specifications. As results suggest the effect of next-youngest sibling gender is typically significant and changes in range between 1.9 and 2.5% points. Relative to their counterparts with next-youngest brothers, females with next-youngest sisters are about 2% points more likely to have left home (to get married). Age of the girl is statistically significant at 0.1% and presents that 1 year increase in age of the girl rises probability of leaving natal home by roughly 5.2% points, holding other variables constant.

Appendix 3 also evaluates the hypothesis about next-youngest sister effect on older sister's marriage time. The relationship between age at first marriage and next youngest sibling gender appears to be significant at 99% of confidence level. It presents that a girl with next youngest sister gets married in range of 0.08- 0.10 years earlier than her counterparts with next youngest brother. The effect of older siblings and all siblings apart from the respondent is positive and statistically significant.

The division to rural and urban areas brings the expected results (See Appendix 4), as we assume that the effect of next-youngest sibling is stronger in rural areas according to the hypothesis developed in Vogl (2013). The results imply that women with next youngest sisters get married earlier by 0.115 years than females with next youngest brothers in rural regions.

By adding constrains on age gap we have found that on average Indonesian women with next youngest sisters get married earlier than ones with next youngest brothers, only when the age gap between them and their next youngest sibling is reasonably narrow, equals to 2 years or less. It states that respondents with next youngest sisters get married earlier by 0.14 years than women with next youngest brothers when age gap is less than 3 years.

In Appendix 5 we assume that age gap follows non-monotonic way and add square of age gap into the estimation. We suppose that if the next youngest sibling is much younger than a girl, her marriage, despite the gender of the next youngest child, will be postponed. As results suggest there is a threshold value of age gap between siblings, about 10-11 years, further than this interval marriage age of daughters starts to raise. In other words, U shaped form of relationship between age gap and age at first marriage says that the birth interval of 10-11 years reduces the effect of next youngest sister on older sister's marriage age. Also we believe that the convex relationship may appear because of parents willingness to postpone their daughters marriage, as there is a demand for intra household labour (Mbiti, 2008).

We expect that a younger sister has a negative impact on the probability of schooling for teenage girls, as girls with next youngest sisters are more likely to get married early and leave school to prepare for their wedding (Vogl, 2013). The relationship seems to be significant, however, it disappears when we add control variables (See Appendix 6). Also our estimation on the relationship between next youngest sibling gender and groom's occupation has not given statistically significant results (See Appendix 7).

CONCLUSION

Arranged marriage arises trade-offs among sisters and develops sibling structure effects on characteristics of marriage. Across Indonesia parents hasten daughter's marriage if she has younger sisters, at the expense of early school leaving and lower spousal quality. Cross sister effects are especially strong in rural areas of Indonesia where grooms are scarce and arrival rate of spouses is slow. Our findings suggest that younger sisters cause earlier marriage, which may bring long lasting effects in a girl's future life, such as lower educational attainment and lower spousal occupational status. On the other hand, we have also found out that age gap and the next-youngest sibling is interrelated non monotonically and assumed that this U-shaped relationship may arise because of parents preferences not to marry their daughters and take benefits from intra-household labour supply.

Taking into consideration the nature of Indonesian marriage market, we suggest to develop family planning policies which increase the spacing between daughters, because it is discovered that the theory which states that the presence of any sister, older or younger, reduces expected groom quality, partially describes the marriage

market of Indonesia. In the future there is a possibility of that great quantity of daughters arises aggregate mis-match in the marriage market.

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APPENDIX

Appendix1. Descriptive Statistics

Variable	Obs	Mean	St. Dev	Definition
Home1	46814	.699	.459	*Parental Coresidence*, proxy for marriage, equals to 1 for girls, who are the oldest child in their families and still live with their parents, and to 0 for those, who live elsewhere.
gender of sibling	46814	.484	.499	Dummy variable equals to 1 for girls, who are the oldest child in their families and whose next-youngest sibling is female, and to 0 for those, whose is male.
age	46814	15.43	7.572	Variable equal to age of the oldest child in a family
mother_1stbirthage	46814	20.26	3.87	Variable equal to age of the girl's mother at her first birth.
mother_edu	46814	1.35	.736	Variable equal to 0 for girls, whose mother/father has no education, 1 for those, whose mother's/father's highest achieved grade is primary education, 2 for secondary education and 3 for higher education.
father_edu	46700	1.49	.727	
residence	46814	.622	. 485	Dummy variable equal to 1 for girls, whose mother lives in rural area, and to 0 for those, whose mother lives in urban area
siblings	46814	2.47	1.739	Variable equal to total number of children ever born to the girl's mother, apart from the girl
age 1st Marriage	119356	18.99	4.152	Variable equal to age, at which the respondent first got married
next youngest sibling	92926	.497	.499	Dummy variable equal to 1 for respondents, whose next-youngest sibling is female, and to 0 for those, whose is male.
birth_ year	119356	1970.5	11.41	Variable equal to year, in which the respondent was born
siblings2	113901	4.810	2.474	Variable equal to total number of children ever born to the respondent's mother, apart from the respondent
older siblings	86491	2.918	1.935	Variable equal to total number of children born to the respondent's mother before the respondent
age gap	83351	3.261	2.442	Variable equal to the difference between respondent's age and age of her next-youngest sibling
number of sisters	101113	2.63	1.497	Variable equal to the total number of sisters, the respondent has.
Islam	119136	.802	.398	Yes-1, otherwise 0
ChristianProtestant	119136	.091	.287	Yes-1, otherwise 0
Other	119136	.107	.309	Hindu, Catholic, Budhist, Confucian, Other-1, otherwise-0
Year 1994	164963	.171	.376	Year of survey, yes-1 otherwise-0
Year 1997	164963	.175	.379	
Year 2002-2003	164963	.179	.383	
Year 2007	164963	.199	.399	
Year 2012	164963	.276	.447	

Appendix2. Next-youngest sister effect on parental coresidence

	(1)	(2)	(3)	(4)	(5)
	Home1	Home1	Home1	Home1	Home1
gender of sib.	-0.0235***	-0.0217**	-0.0201**	-0.0196**	-0.0226**
	(-3.30)	(-2.92)	(-2.71)	(-2.66)	(-3.21)
age	-0.0535***				-0.0522***
	(-42.33)				(-40.77)
medu	0.0498***	0.0422***		0.0152*	0.0156*
	(10.09)	(6.43)		(2.29)	(2.44)
fedu		0.0135*		-0.00283	-0.00311
		(2.22)		(-0.47)	(-0.54)
mage		0.0115***		0.00948***	0.00594***
		(10.43)		(8.67)	(5.67)
resid			-0.143***	-0.128***	-0.145***
			(-18.54)	(-15.66)	(-18.54)
siblings			-0.0280***	-0.0248***	-0.0118***
			(-12.97)	(-11.29)	(-5.40)
year97					-0.0241*
					(-2.09)
year20022003					-0.00830
					(-0.71)
year2007					-0.0471***
					(-4.03)
year2012					-0.0704***
					(-6.01)
Constant	1.543***	0.280***	0.753***	0.529***	1.603***
	(59.60)	(12.67)	(84.81)	(20.97)	(44.79)
Observations	17348	17331	17348	17331	17331

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix3. Next-youngest sister effect on age at 1st marriage

	(1)	(2)	(3)	(4)	(5)
	age1stmarriage	age1stmarriage	age1stmarriage	age1stmarriage	age1stmarriage
nextyoungestgen	-0.159***	-0.0963***	-0.0817**	-0.0985**	-0.103***
	(-6.12)	(-3.51)	(-2.74)	(-3.14)	(-3.33)
numberofsisters	0.0741***	0.0118	0.00889	0.0126	0.0144
	(9.38)	(0.99)	(0.69)	(0.92)	(1.06)
oldersiblings		0.124***	0.0927***	0.104***	0.106***
		(15.60)	(10.76)	(11.18)	(11.53)
siblings2		-0.00588	0.0376***	0.0289**	0.0270**
		(-0.69)	(4.06)	(2.86)	(2.70)
islam			-1.594***	-1.593***	-1.628***
			(-35.72)	(-33.87)	(-34.87)
christianprotestantism			0.275***	0.243***	0.148*
			(4.46)	(3.78)	(2.31)
birth year				-0.00256	-0.0328***
				(-1.69)	(-19.24)
gap				-0.0268***	-0.0312***
				(-4.50)	(-5.28)
year97					0.392***
					(9.60)
year20022003					0.998***
					(23.77)
year2007					1.563***
					(35.56)
Constant	19.17***	19.08***	19.96***	25.15***	83.82***
	(828.11)	(605.74)	(382.20)	(8.43)	(25.09)
Observations	120170	120170	92759	84299	84299

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix4. Next-youngest sister effect on age at 1st marriage, selected sub-samples

	(1)	(2)	(3)	(4)	(5)
	age1stmarriage	age1stmarriage rural	age1stmarriage urban	age1stmarriage age gap<3	age1stmarriage age gap>2
nextyoungest	-0.103***	-0.115**	-0.0776	-0.141**	-0.0749
	(-3.33)	(-3.12)	(-1.45)	(-3.24)	(-1.68)
numberofsisters	0.0144	0.0288	-0.00462	-0.00883	0.0478*
	(1.06)	(1.78)	(-0.20)	(-0.49)	(2.30)
oldersiblings	0.106***	0.0690***	0.139***	0.101***	0.120***
	(11.53)	(6.27)	(8.95)	(8.28)	(8.46)
siblings2	0.0270**	0.0235*	0.00308	0.0267*	0.0145
	(2.70)	(1.97)	(0.18)	(2.01)	(0.94)
islam	-1.628***	-1.599***	-1.898***	-1.572***	-1.686***
	(-34.87)	(-29.79)	(-22.35)	(-25.69)	(-23.11)
christianprotestantism	0.148*	0.155*	0.346**	0.230**	0.0325
	(2.31)	(2.13)	(2.91)	(2.73)	(0.33)
Birth year	-0.0328***	-0.0316***	-0.0173***	-0.0433***	-0.0229***
	(-19.24)	(-16.12)	(-5.56)	(-17.60)	(-9.69)
gap	-0.0312***	-0.00263	-0.0663***	-0.127**	-0.0128
	(-5.28)	(-0.38)	(-6.22)	(-3.23)	(-1.70)
year97	0.392***	0.404***	0.329***	0.449***	0.335***
	(9.60)	(8.80)	(4.19)	(7.85)	(5.73)
year20022003	0.998***	0.754***	0.690***	1.088***	0.900***
	(23.77)	(15.20)	(9.27)	(18.42)	(15.09)
year2007	1.563***	1.270***	1.313***	1.684***	1.421***
	(35.56)	(24.66)	(16.66)	(27.22)	(22.75)
Constant	83.82***	80.98***	55.10***	104.7***	64.33***
	(25.09)	(21.06)	(9.03)	(21.67)	(13.89)
Observations	84299	54174	30125	43279	41020

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix5. Next-youngest sister effect on age at 1st marriage, checking for non-monotonity

	(1)	(2)	(3)	(4)	(5)
	age1stmarriage	age1stmarriage	age1stmarriage	age1stmarriage	age1stmarriage
nextyoungest	-0.0950***	-0.114***	-0.0880**	-0.100**	-0.105***
	(-3.68)	(-3.97)	(-3.14)	(-3.20)	(-3.37)
gap	-0.132***	-0.131***	-0.0869***	-0.0871***	-0.0782***
	(-10.57)	(-10.23)	(-6.09)	(-6.10)	(-5.52)
gap square	0.00602***	0.00615***	0.00459***	0.00457***	0.00356***
	(6.88)	(7.00)	(4.66)	(4.64)	(3.65)
oldersiblings		0.140***	0.104***	0.106***	0.108***
		(16.53)	(11.27)	(11.41)	(11.72)
siblings2		-0.0296**	0.0341***	0.0254*	0.0243*
		(-3.17)	(4.50)	(2.51)	(2.42)
numberofsisters		0.0178		0.0126	0.0144
		(1.40)		(0.92)	(1.06)
islam			-1.704***	-1.585***	-1.622***
			(-47.51)	(-33.69)	(-34.72)
Birth year				-0.00247	-0.0326***
				(-1.63)	(-19.15)
christianprotestantism				0.243***	0.148*
				(3.78)	(2.31)
year97					0.392***
					(9.59)
year20022003					0.996***
					(23.74)
year2007					1.559***
					(35.45)
Constant	19.70***	19.54***	20.35***	25.11***	83.63***
	(585.55)	(398.74)	(344.54)	(8.42)	(25.03)
Observations	108825	108825	84299	84299	84299

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix6. Next-youngest sister effect on educational attainment

	(1)	(2)	(3)	(4)	(5)
	schooling	schooling	schooling	schooling	schooling
nextyoungest	-0.0186	-0.0113	-0.111***	-0.113***	-0.0393
	(-0.77)	(-0.42)	(-3.71)	(-3.80)	(-1.25)
oldersiblings	0.157***				0.0493***
	(19.82)				(5.31)
siblings2	-0.164***				0.0416***
	(-26.09)				(4.12)
birth year		0.114***	0.115***	0.0992***	0.0990***
		(80.06)	(76.13)	(58.15)	(57.60)
islam		0.388***	0.302***	0.278***	0.275***
		(8.64)	(6.40)	(5.89)	(5.84)
christianprotestantism		1.694***	1.611***	1.564***	1.557***
		(27.39)	(24.89)	(24.19)	(24.10)
numberofsisters			0.0836***	0.0849***	0.0116
			(8.92)	(9.08)	(0.85)
gap			-0.0493***	-0.0510***	-0.0467***
			(-8.39)	(-8.70)	(-7.82)
year97				0.209***	0.213***
				(5.06)	(5.17)
year20022003				0.659***	0.664***
				(15.54)	(15.66)
year2007				0.776***	0.778***
				(17.48)	(17.53)
Constant	7.915***	-218.1***	-219.3***	-189.1***	-188.9***
	(262.14)	(-77.87)	(-73.97)	(-56.50)	(-55.98)
Observations	127874	92721	84265	84265	84265

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix7. Next-youngest sister effect on groom quality

	(1)	(2)	(3)	(4)	(5)
	partnerhigh skilled	partnerhigh skilled	partnerhigh skilled	partnerhigh skilled	partnerhigh skilled

nextyoungest	-0.00359	-0.00340	0.000495	-0.000753	-0.000822
	(-1.20)	(-0.98)	(0.15)	(-0.20)	(-0.22)
numberofsisters	0.00424***	0.00463***		0.000953	0.000944
	(4.66)	(4.00)		(0.57)	(0.57)
oldersiblings		0.00927***		0.00606***	0.00609***
		(9.88)		(5.39)	(5.42)
islam		0.0657***	0.0293***	0.0266***	0.0261***
		(15.82)	(5.13)	(4.66)	(4.58)
christianprotestantism			-0.0561***	-0.0590***	-0.0605***
			(-7.17)	(-7.54)	(-7.73)
Birth year			0.00370***	0.00385***	0.00341***
			(20.39)	(20.96)	(16.39)
gap			-0.00243***	-0.000293	-0.000334
			(-3.49)	(-0.41)	(-0.46)
siblings2				0.00662***	0.00664***
				(5.40)	(5.42)
year97					0.0209***
					(4.17)
year20022003					0.0182***
					(3.54)
year2007					0.0284***
					(5.29)
Constant	0.581***	0.474***	-6.738***	-7.081***	-6.231***
	(217.36)	(102.42)	(-18.87)	(-19.58)	(-15.25)
Observations	119999	92651	84211	84211	84211

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$