Cultural Assimilation, Peer Effects and the Evolution of the Gender Gap in Risk Preferences

Elaine M. Liu*[1] and Sharon Xuejing Zuo[2]

[1]University of Houston Department of Economics and NBER
[2]University of Houston Department of Economics

February 16, 2017

Abstract

This paper investigates the persistence of cultural and gender norms among two ethnic groups. We elicit risk preferences from elementary and middle school children belonging to Mosuo (a matrilineal society) and Han (a traditionally patriarchal society) cultures. These children attend the same schools and are taught by mostly Han (patriarchal) teachers in rural China. We find that in the lower elementary school grades, Mosuo and Han children exhibit a striking contrast in gender norms–Mosuo girls take more risks during the experiment than Mosuo boys while Han girls are more risk averse than Han boys. However, in the upper grades, Mosuo girls are more risk averse than Mosuo boys, and become more similar to their Han counterparts. Furthermore, we exploit the fact that these Han and Mosuo students attend a boarding middle school and roommates are randomly assigned. Using the random variation in roommates' ethnicity, we find that Mosuo boys who have more non-Mosuo roommates behave more similarly to Han than the ones who have fewer non-Mosuo roommates. Our findings suggest that cultural and gender norms are malleable at formative ages.

Preliminary. Please do not cite or circulate. Thanks to Martha Bailey, Daniel Chen, Manasi Deshpande, Steven Durlauf, Laura Giuliano, Mark Hoekstra, Adriana Lleras-Muney and Vikram Maheshri for helpful conversation and suggestions, and to conference participants at the SOLE, ASREC and HCEO Summer School for feedback. We also thank Yang Daba, Wu Xinhong, Chen Xiaohua, Guo Xuewen and Yang Haitao for their invaluable support in the field. Keywords: cultural assimilation, gender gap, peer effects, risk aversion. JEL Codes: J15, J16, C93

1 Introduction

Many studies suggest that cultural norms play an important role in economic decision making and economic development (see the handbook chapters by Fernandez (2011), Bisin and Verdier (2010) and Marianne (2011) for a thorough review of this broad literature). Evidence on the malleability of these cultural norms are rather mixed.[1] This study examines the evolution and persistence of cultural traits of the children of two ethnic groups-Mosuo and Han in rural China. The Mosuo and Han have distinct gender norms. Mosuo are traditionally a matrilineal society whereas Han are traditionally a patriarchal society.[2] In rural Yunnan, Mosuo and Han reside in the same area. Their children attend the same set of schools and are taught by the same teachers. The Mosuo children interact with Han children on a daily basis. This setting provides a unique opportunity to study how cultural norms evolve when children of these two ethnic groups mingle. In particular, we can observe cultural assimilation and the shift of cultural norms by observing the gender norms among these children.

To study these questions, we conducted artefactual field experiments to elicit risk preferences and collect survey data from a total of approximately 400 Mosuo and Han elementary-school and middle-school children each year in Yongning County, China in 2015 and 2016. A subset of 268 students were surveyed in both years. We choose risk preference as our key outcome and as a marker to capture gender norm for the following reasons. First, many studies have found that women are more risk averse than men in most societies.[3] A paper by (Gong and Yang, 2012) conducted in the same region as our study finds that Mosuo adults

[1] Papers by Nunn and Wantchekon (2011), Tabellini (2010), Alesina et al. (2013) and Fernández et al. (2004) find evidence of the resilience of the social norms. Other works suggesting that social norms evolve over time slowly (Bisin and Verdier, 2000; Fernández and Fogli, 2009; Almond et al., 2013).

[2] Matriarchal societies are those where authorities are headed by females, and matrilineal society involves tracing kinship through the mother's line. We use the term matrilineal instead of matriarchal since sociologists argue that a truly matriarchal society does not exist any more (Campbell, 2013). Anthropologists who study the life of Mosuo also refer to Mosuo as matrilineal society Shih (2009).

[3] See Croson and Gneezy (2009), Eckel and Grossman (2008b) and Niederle (2014) for thorough literature reviews on gender differences in preferences.

have a narrower gender gap in risk preference compared to adults from other ethnic groups. In other words, the preferences of women in a matrilineal society are more similar to men in a patriarchal society.[4] Second, risk preference measured by experiments is an objective measure, which could be less biased compared to other self-reported gender-related survey questions. Third, studies suggest that risk preference is an important predictor for economic decision (Chetty and Szeidl, 2007; Dohmen and Falk, 2011; Marianne, 2011; Liu, 2013) and gender gap in risk preference could possibly explain gender gap in labor market outcome (Fortin, 2008). Lastly, since our subjects are of a young age, we opt to use extremely simple protocols for experiments that have been previously used on subjects of similar age group (Harbaugh et al., 2002; Cárdenas et al., 2012; Levin and Hart, 2003; Eckel et al., 2012).

Our findings are as follows: In the lower elementary school grades (first to third grades), Han girls behave in a more risk averse manner than Han boys, while Musuo girls behave in a more risk loving manner than Mosuo boys. The striking contrast in gender norms for Mosuo is driven by both boys and girls. Mosuo boys are more risk averse than Han boys while Mosuo girls are more risk loving than Han girls. Interestingly, by the upper grades (fourth to fifth grade), Mosuo girls also become more risk averse than Mosuo boys.[5] This reversal of gender gap during upper elementary school grades is mostly driven by the change of behaviors in Mosuo girls who now have more similar in risk attitudes to their Han counterparts. It is not clear what causes the changes in behavior among Mosuo girls. It can be driven by teachers, peers, or other factors. For example, it is possible that teachers treat boys and girls differently in class or that an increasing exposure to mainstream media as one ages could reinforce Han's gender norms on Mosuo students. To further investigate the importance of peer effects, we take advantage of the fact that most Mosuo and Han students in this township attend the same middle school, which is a boarding school. Roommates

[4]This finding is also supported by Gneezy et al. (2009).

[5]Among the five schools we visited, four elementary schools include first to fifth grades. The middle school ranges from seventh to ninth grade.

are randomly assigned in this school, and each room consists of 8-16 students. We exploit the variation in the share of non-Mosuo roommates. We find that Mosuo boys who have a higher share of non-Mosuo roommates behave more similarly to Han than the ones who have a lower share of non-Mosuo roommates.

Our analysis makes contributions to several literatures. First, our work speaks to the literature on cultural and social norms. There is a vast literature on the economic importance of culture and how it affects decision making and economic outcomes (e.g, Luttmer and Singhal, 2011, Tabellini, 2010). Our work provides empirical evidence that social norms are malleable. Consider our finding that sharing a room with more Han roommates or having Han classmates for a few years would possibly change the social norm of Mosuo students. This finding suggests that social norms may be more malleable than previously thought, especially at the formative ages.

Our paper is also related to the literature focused on the development of individual risk preferences and the gender gap in risk preferences. In a series of papers, Booth and Nolan (2012b; 2012a) find that girls attending single-sex schools or in an all-girls experimental environment are more likely to take risks and compete than their co-ed counterparts. They suggest that a gender gap in preferences can be due to social learning rather than inherent gender traits. Our paper echoes their findings that social learning, in our particular context, is critical. In the literature on the development of risk preferences Dohmen et al. (2011) find that risk attitudes among females experience the most rapid decline starting from the late teens to thirties. Andersen et al. (2013) also conducted field experiments on school children in matrilineal and patriarchal villages. Although the subject age groups are similar to ours, the focus of this work is to examine how the gender norms within a given culture evolve over one's lifetime, and they do not discuss the issue of assimilation.

Lastly, to the best of our knowledge, in the peer-effect literature, while many had exploited similar identification strategies such as random roommate assignment or random

cohort variation to study the impact of peer characteristics on various outcomes (Sacerdote 2001; Carrell et al. 2009; Lavy and Schlosser 2011; and Lavy et al. 2012), none had studied how peers from different ethnic groups affect each other's cultural norms. The one that is closest to our study is the one by Carrell et al. (2015), which examines how being randomly assigned a black roommate affects one's view on blacks.

This paper is organized as follows. In section 2, we provide the background of these two ethnic groups and our hypotheses. In section 3, we describe the experimental method, survey and the dataset. Section 4 presents empirical specification and findings. Section 5 discusses robustness checks and additional analysis. Section 6 concludes.

2 Background and Hypotheses

2.1 Background on Mosuo and Han societies

Mosuo Society The population of China consists of 56 ethnic groups, among which Mosuo is the only one that maintains a matrilineal culture. The total Mosuo population is about 45,000 (Hua, 2001; Shih, 2009). They reside at the border of Yunnan Province and Sichuan Province. Yongning township we visited for this survey which is located in Ninglang County, Yunnan Province has the largest Mosuo population, despite that they only consist of 9% of the entire county population.

Mosuo maintains an unique family structure compared to other ethnic groups. A Mosuo family only includes members bound by the ties of the maternal kin, with the grandmother generally being the household head. Grandmothers, grand maternal uncles, mothers, mother's brothers, mother's sisters, and the children live in the same household (Hua and Stainton, 2003; Shih, 1993).[6] Their marriage system is not monogamous and children are

[6]Matriarchal societies are those where authorities are headed by females whereas the definition of matrilineal society involves tracing kinship through the mother's line. As criticized in **?**'s book, earlier reports and documentaries about the Mosuo often used the terms "matriarchal" and "matrilineal" interchangeably.

raised by mothers' households, and often, the father of the children is excluded from the household (Shih, 1993). In Mosuo society, women not only have the freedom to choose their partners or end the relationship on their own, but also play an important role in the family decision making, which includes household labor arrangement, spending decision and religious activities. According to Shih (1993), women enjoy higher or equal social status as men in this society .

On the contrary, Han Chinese are known to have been influenced by Confucianism for thousands of years. The traditional family system of Han is patriarchal and patrilineal. The household head of the family is typically the oldest male in a family, who is responsible for major decisions within the household. Kinship in Han families is passed down through the male descent line–sons and their male offsprings continue the family name and they are expected to support their aging parents (Kung and Ma, 2014; , n.d.; Hill and Diehl, 2001). On the other hand, daughters are only considered as transient members of this household. A daughter will be married into another family and bear sons for her husband's family. Even though contemporary Chinese families have undergone tremendous changes, the male dominance in Han culture has persisted (Almond et al., 2013; Ebrey, 2003). For example, sons are preferred over daughters and the prevalence of sex-selected abortion is one of evidence that patriarchal and patrilineal influences are ingrained in Han culture (Johnson, 2009; Ebrey, 2003; Eagly et al., 2000).

2.2 Experimental Setting

The Yongning township we visited is located in Ninglang, Yunnan. The local annual average income per capita was $481 in 2011(Yunnan Province Statistical Yearbook, 2012). It is

"Matrilineal" is the term used in more recent anthropological work to describe the Mosuo, and we will follow this norm (Shih, 2009). There is variety in marriage practices and household configurations even among the Mosuo across different region (Walsh, 2005). The customs and the norms we describe are the norms of the Mosuo from Yongning township, where we visited.

the home of Mosuo, Han, Yi and 22 other ethnic groups. The largest ethnic group in this county is Yi. They are also patriarchal in nature.(Hill and Diehl, 2001) Children from these distinctive ethnic groups go to the same set of schools, and are taught by the same set of teachers who are predominantly Han.

Elementary School In Yongning township, there are 10 elementary schools, but due to budget constraints, we only selected four elementary schools with the greatest number of Mosuo students to conduct our experiments. Despite the fact that Yi is the largest ethic group in the county, we decide to exclude Yi from our analysis since two out of four schools we visited had no Yi students during the academic years we visited. These schools are usually small with about 10-30 students per grade, and one class per grade. The share of Mosuo students varied between 10% to 65% at school-grade level. All of these schools include first to fifth grades. [7] Some might worry that there could be endogenous sorting where parents sending their children to schools with students from their own ethnic groups. In this context, sorting is unlikely because school assignment is based on the children's *hukou*(household registration), which is determined by the parents' permanent residency. It is extremely difficult to change one's *hukou*.

Middle School There is only one middle school located in this township. The middle school ranges from seventh to ninth grade. The compulsory schooling is 9 years. However, not all students continue on to middle school after graduating from elementary school. According to the local government report, the enrollment rate for middle school is about 98% of the eligible population. Because of the location of the school and the distance from the students' home, about 80% of students board in this middle school and they only go home on the weekend. This school has more than 600 students, and each grade has about 200 students

[7] Only one of the four schools we visited has sixth grade, and students from adjacent villages would attend this school during the sixth grade. For consistency, we surveyed only first to fifth graders in all four schools.

divided into four classes. 28% of students in this middle school are Mosuo. Students are randomly assigned roommates upon entering middle school. The median size of the room is 12 students. People stay with the same roommates throughout one academic year. At the end of one academic year, classes will be reorganized along with the dorms. Since we only have administrative information of their current year's roommates, we would not be able to accurately account for the previous exposure to other cultures for eighth and ninth graders. Therefore, our analysis would focus on seventh grade students only. Our final sample consisted of 157 seventh grade students, among whom 127 live on campus.

Han and Mosuo are the juxtaposition of matrilineal and patrilineal family system and gender roles. Existing studies have shown that individuals' preferences vary across cultures, but few studies demonstrate the development of individual preferences in a cross-cultural context. Since Mosuo are so distinctively different from Han, this setting in Yongning provides us a unique opportunity to observe and examine whether and how culture assimilation affects individuals' preferences. In this study, we focus on risk preferences since the artefactual experiment to elicit risk attitudes is easy to understand even for young children. Furthermore, in the work by Gong and Yang (2012), they find differences gender gap in risk preferences are smaller among matrilineal adults than patriarchal adults.[8]

To understand the origin of risk preferences in two distinctly different cultures and how cultural assimilation affects the gender gap in risk preferences, we recruited children from four elementary schools and a middle school to conduct field experiments and post-experiment surveys. We propose three hypotheses as below.

Hypothesis 1: *Gender gap in risk preference could be different for Mosuo and Han children at a very young age.*

A study done by Gong and Yang (2012) find that while Mosuo adult females are also

[8]An alternative choice of experimental design would be the competition game. However, a paper by **?**zhang2013can) had conducted competition game among middle school students. She does not find a gender gap in competitive inclination among either Han or Mosuo.

more risk averse than Mosuo males, the gender gap is smaller than that of patriarchal ethnic groups (Gong and Yang, 2012). One possibility is that the preferences of young Mosuo may be first shaped by family cultures, but these preferences evolve over time due to increasing interactions with patriarchal groups. This is consistent with the theory that preferences are shaped both by ethnic heritage (vertical transmission) and social environment(horizontal transmission)(Bisin and Verdier, 2010).

Hypothesis 2: *Gender gap in risk preference could converge between Mosuo and Han children as they age.*

We are interested in understanding how malleable the gender gap in risk preferences is. Mosuo children interact with children and teachers from Han and other patriarchal ethnic groups at schools. At home, Mosuo children could be influenced by the mainstream (predominantly Han) media. We hypothesize that Mosuo might become more similar to their Han counterparts. It is also possible that the preferences of Han students might be affected by their Mosuo classmates as well.

Hypothesis 3: *The intensity of exposure to another culture could affect individual preferences. Peer effect is important.*

There are many environmental factors (e.g. TV, news, neighbors, classmates) that could affect one's preferences. Does the intensity of exposure to another culture matter? The intensity exposure is endogeneous for most factors, for example, the Mosuo who have more affinity to Han culture could watch more mainstream TV. Therefore, the causality would not be clear. We take advantage of the fact that more than 80% of middle school students live on campus and they are randomly assigned to room with 8-12 students. We study the intensity of exposure using the share of roommates from other cultures.

3 Experiment and Data

3.1 Experimental Design and Procedures

The experimental design follows the design by from Eckel and Grossman (2002) and Eckel and Grossman (2008a). The advantage of the experimental design is its simplicity: it has been tested widely with less educated populations in developing countries. Figure 1 depicts the choices presented to students. Each person can choose only one out of the six lotteries presented. Each lottery has a 50/50 chance of winning higher versus lower awards. The safest choice is Lottery #1 indicating one will always win 3 yuan regardless of the color of ball they draw. The riskiest choice is Lottery #6, indicating a 50/50 chance of winning either zero yuan or 10 yuan.[9] Students are instructed that this is an incentivtized choice experiment and at the end of the experiment, they will be paid based on their choice and the color of the ball they draw. The detailed experimental instructions are provided in the Appendix.

The experiment and the survey were conducted in the winter of 2015 and 2016. In the four elementary schools, we invited all Mosuo and Han students to participate in the survey. At the middle school, we randomly drew similar number of Mosuo and Han students, stratified by gender and grade. Several days before the survey, we asked principals/teachers to distribute parental consent forms to the invited students. At the beginning of the survey and experiment, we asked for their permission once again and those who did not wish to participate could leave. All of the students invited agreed to participate. All the students who participated in the survey received stationery as a reward for participation.

At the elementary school, on average we have 2 to 3 sessions per school with 15-30 students per session. The experiment usually took place in a classroom during lunch recess or immediately after the classes ended. The survey and the experiment took about 40

[9]The cost of a school lunch is about 5 yuan (85 cents).

minutes to one hour to conduct. We had a total of 185 and 167 students who participated in our experiments and filled out the survey in 2015 and in 2016, respectively. 121 participated in the experiment in both years. 61.36% of the students who participated are Mosuo. Our survey design is very simple since it needs to be understood even by first graders. For those students who cannot read our survey, we had enumerators reading them the questions. Students cannot talk nor can they see each other's response during the experiment.

For the middle school students, the survey and experiment took place during evening study between 7 and 9pm in a classroom.[10] Each session had about 50 students and lasted about 40 minutes.

3.2 Data

Panel A and Panel B in Table 1 present the summary statistics for the elementary and middle school students, respectively. On average, Mosuo students live in a bigger family and mothers have a little bit higher educational attainment than Han students. 80% of elementary school students reported monthly allowance and among those who reported, Mosuo children received more allowance than Han children. Similar patterns are observed in middle school as well.

For the middle school students, we obtain roommate assignment from the administration. We calculated the share of patriarchal (non-Mosuo) roommates in each room. The density distribution of the share of patriarchal roommates among our surveyed sample is presented in Figure 2. The share of patriarchal roommates ranges from 44% to 100%, and the mean and the median are both around 73% .

In Table 2, we present the lottery choices and the corresponding ranges of coefficient of relative risk aversion. The last two columns present the distribution of students for the

[10]Evening self-study period is extremely typical and almost compulsory for all students in middle school in China.

lottery choices. Surprisingly, the seventh grade middle school students make more risk averse choices than elementary school students, despite having higher allowance.

Figure 3 presents cumulative density function (CDF) of lottery choices (ranging from 1 to 6) by gender-ethnicity and by grades for elementary students. The top panel compares the distribution of choices by gender by ethnicity in the lower grades (first to third grades). The bottom panel shows the CDF in the upper grades (fourth and fifth grades). The red dotted line represents the CDF of females while the blue solid line shows the CDF of males. There are several noteworthy points from this figure. First, we observe that Mosuo boys are more risk averse than Mosuo girls, and Han boys are more risk loving than Han girls in the lower grades. Second, if we compare the blue/red lines in the top two figures, it would appear that Mosuo boys are more risk averse than Han boys, and Mosuo girls are more risk loving than Han girls in lower grades. Third, in the upper grade, Mosuo females become more risk averse than Mosuo boys. On the other hand, the CDF distribution of Han boys and Han girls becomes more similar in the upper grades than in the lower grades. Although the figure is interesting, it is not clear whether these differences in risk preferences we observe from the figure are statistically significant or not, thus in the next section, we present the regression results.

4 Empirical Results

4.1 Elementary School Students

We first hypothesize that children are more influenced by their own ethnic cultures and that the gender gap in risk preferences is different between Mosuo and Han at younger age. To be more specific, the hypothesis is that Han females are more risk averse than Han males, but Mosuo females are more risk tolerant than Mosuo males in lower grades in elementary schools. The primary specification which is used to test this hypothesis is as follows:

For each student i in lower grade(1st to 3rd) g at school s in year t,

$$Y_{igst} = \alpha + \beta_1 Mosuo_i + \beta_2 Female_i + \beta_3 Mosuo_i * Female_i + \varepsilon_{igst} \quad (1)$$

Y_{igst} indicates the student's choice in the experiment. It ranges from 1 to 6, with the bigger number indicating the more risky choice. $Mosuo$ and $Female$ are two dummy variables. The result from 1 is presented in Column 1 of Table 3. In Column 2, we include age fixed effects, year fixed effects and school fixed effects.[11] It is difficult to interpret the size of coefficients in this regression since the dependent variable is ordinal, thus our discussion would be focused on the signs of coefficients. β_2 reflects the gender gap of Han. $\beta_1 + \beta_2$ reflects the gender difference in Mosuo. We find that β_2 is negative and significant, which suggests Han girls are more risk averse than Han boys. This is somewhat surprising since the literature on the development of gender gaps among young children is quite mixed. Some papers find the existence of gender gaps in preferences at early age (see Cárdenas et al. (2012); Gneezy and Rustichini (2004), while others suggest that a gender gap does not exist among young children, or it is developed during puberty (Andersen et al., 2013; Ginsburg and Miller, 1982). In contrast, $\beta_1 + \beta_2$ is positive, which suggests that Mosuo girls are more risk tolerant than Mosuo boys. The coefficient on Mosuo, β_3 is negative, which suggests that Mosuo boys are more risk averse than Han boy, and a positive β_1 indicates that Mosuo girls are more risk tolerant than Han girls. The bottom line is that Mosuo and Han exhibit distinctive risk preferences and reversal of gender gap at a very young age.

Using the same specification, we next examine the gender gap in risk preferences in the upper grades (fourth and fifth grades), and the results are presented in Column 3 and Column 4 in Table 3. Interestingly, the gender gap for Han, β_2 is negative but insignificant.

[11] The regression results are robust when we add more controls, such as number of family members, mother's education attainment and average monthly allowance, but we lose nearly a quarter of samples due to missing reports. These regression results are available upon request.

However, the gender gap for Mosuo, $\beta_1 + \beta_2$ reverse the sign compared to the lower grades results. This suggests that Mosuo girls are now more risk averse than Mosuo boys. This reversal of gender gaps is driven by a change of behaviors for both genders since we observe that both β_1 and β_3 change sign in upper grades. These coefficients suggest that Mosuo girls are more risk averse than Han girls in upper grades.

Table 3 clearly indicates the difference of gender gap between two ethnic groups in lower and upper grades, but how the gender gap evolves over time is unclear. In order to show a complete picture of the development of gender gap of these two ethnic groups, we estimate the following equation:

For individual i at grade g in year t,

$$Y_{igt} = \alpha + \sum_{g=1}^{5} \beta_g Female_i * g + \tau_g + \delta_t + \varepsilon_{igt} \tag{2}$$

We run this regression separately for Mosuo and for Han. We present the coefficients, β_g in Figure 4. Each dot in this figure shows the coefficient β_g for a given grade and a given ethnicity. A positive number suggests females are more risk loving than males. We find that the gender differences in risk preferences significantly vary between the two ethnic groups. Second, during the first grade, Mosuo girls are significantly more risk loving than Mosuo boys, but this gender gap narrows and eventually reverses the sign by the fourth and fifth grades. In contrast, we find that Han girls are significantly more likely to avoid risky choices than Han boys among first to third grade, and then such a gender gap becomes insignificant in fourth and fifth grade. This figure provides suggestive evidence that among elementary school students from two distinct gender norms societies converge in their risk preferences as they spend more and more time together.

Although we may expect Mosuo to be reshaped because they are a minority and are surrounded by all other patriarchal groups at school, a reflection problem may exist and

Han may be changed too. On the other hand, convergence in risk preferences between two groups does not necessarily convey why such a change happens. For example, it could be the case that Mosuo boys are becoming more risk loving because they are more likely to hangout with other patriarchal students than Mosuo girls. Mosuo girls might have stronger self−consciousness of their own culture. Looking at the elementary school results cannot explain which group has been influenced and what is the magnitude of changes.

4.2 Middle School Students

We have shown that children from two distinctly different cultures converge in risk preferences overtime in elementary schools. It could be a number of potential reasons that contribute to the emergence of this pattern. For example, we do not know how exposure to other cultures affects individuals' risk attitudes. By exploiting the change of share of patriarchal roommates in each dorm in the local boarding middle school, we will be able to identify the extent to which ethnic or gender groups are affected more because of interactions with the other culture. The random roommate assignment setting provides us a good opportunity to examine peer effects. Furthermore, the post-experiment survey gives us the information of the ethnic composition of each student's three best friends. By studying whether a student has Mosuo in his/her best friends'(same sex) list, we can infer whether their risk preferences are more likely to change.

The main specification we use to examine which groups are influenced because of the exposure to the other culture is as follows:

For a student i,

$$Y_i = \alpha + \beta_1 Female_i * Mosuo_i * \Delta_i + \beta_2 Female_i * \Delta_i + \beta_3 Mosuo_i * \Delta_i + \beta_4 Female_i * Mosuo_i + \beta_5 \Delta_i + \beta_6 Female_i + \beta_7 Mosuo_i + \varepsilon_i \quad (3)$$

Δ is either the share of the patriarchal roommates in each dorm, which is imputed as the number of patriarchal roommates divided by the total number of roommates or it equals to 1 if the student i 's three best friends are all patriarchal. When Δ is the share of the patriarchal roommates, it has been demeaned for the ease of interpreting coefficients for other dummy variables. (Balli and Sørensen, 2013).Since the school will rearrange the room assignment every academic year and only keep one year's roommate list, we restrict our analysis to the seventh grade students. We conducted two rounds of experiments in two sequential years, but we only collected the best friends' information in the first round. Results from Equation 3 are reported in Table 4 panel A. In order to ease the interpretations of the results, we present the effects of change of patriarchal share in each dorm on four groups in panel B. First column shows the peer effects results. Overall, if the share of patriarchal roommates increases by 15%, Mosuo males would become more risk loving by 0.93. We do not find significant effects on Han or Mosuo females, but this does not necessarily suggest that Han are not influenced by Mosuo. Our results might be suggestive because when we conducted our experiments, students only spent four months together and we have limited samples. The last column shows the effects of having all three patriarchal best friends. We find that Mosuo males are more likely to become risk loving if they are making friends with students from patriarchal groups.[12]

[12]We also find a higher share of patriarchal roommates is significantly associated with more likely to have patriarchal best friends. The p-value is 0.014.

Although we have limited middle school samples, our results indicate even only a relatively short period of interactions(four months) with other cultures would impact individuals' preferences. The greater the exposure to patriarch cultures, the greater the change of Mosuo students in risk preferences. The more likely a student is to have a best friend from the same culture, the more likely a Mosuo students to keep their own culture traits. The bottom line here is that Mosuo would be definitely be influenced by Han culture.

4.3 Panel Analysis

Up until now, we have shown that risk preferences could be reshaped by the environment and we provide some evidence that the greater exposure to a distinctly different culture would lead the minority group to change more. These findings align with existing literature (Carrell et al., 2015; Booth et al., 2014; **?**). Another advantage of our study is that we conducted two rounds of the same experiments in two sequential years, our goal is to track the same individuals across two years. With this short panel dataset, we can count for individual heterogeneity by using individual fixed effects model and very few existing studies have shown how risk preferences of the same individuals form across years. In four elementary schools, we were be able to track 121 students across two years, among whom Mosuo make up 61.36% and females account for 54.55%. Our object is to examine whether these students become more risk averse or risk loving across two years. The main equation we estimate is as follows:

For a student i,

$$Y_i = \alpha + \beta_1 Mosuo_i + \beta_2 Female_i + \beta_3 Mosuo_i * Female_i + \gamma_s + X_s'\pi + \varepsilon_i \quad (4)$$

We define our dependent variable Y_i as an ordinal indicator, which equals 1 if the game

choice of individual i in 2016 is bigger than his/her choice in 2015. It is equal to 0 if the individual's choice is the same across two years and -1 if the later year's choice is bigger than the previous year's. A negative β_2 would indicate Han females are becoming more risk loving than Han males and vice versa. Meanwhile, if $\beta_1 + \beta_3$ is positive, it suggests that Mosuo females are becoming more risk averse than Mosuo males. γ_s is school fixed effects. X_s' include age, number of family members and average monthly allowance in last year.

The regression results from Equation are displayed in Table **??**. We find that $\beta_1 + \beta_3$ is significantly positive, which indicates Mosuo females are becoming more risk averse than Mosuo males over two years. β_2 is negative suggesting Han females are becoming more risk loving than Han males, but it is not significant.

Our panel analysis results are consistent with our previous findings. Cultural assimilation plays an important role in forming individuals' preferences.

5 Conclusion

We investigate whether a gender gap in risk preference is present for children from a matrilineal society (Mosuo). We find that in the lower grades of elementary school, Mosuo girls take more risks during the experiment than boys while Han girls are more risk averse than Han boys. We further examine situations when Mosuo students interact with Han students more, observing whether they become more similar to their Han counterparts. Our findings indicate that in the upper grades, Mosuo girls also become more risk averse than Mosuo boys. Furthermore, we exploit the fact that Han and Mosuo students both attend a boarding middle school and roommates are randomly assigned. Using the random variation in roommate ethnicity, we find that Mosuo girls who have a higher share of patriarchal roommates behave in a more risk averse manner than the ones who have a lower share of patriarchal roommates. Our findings suggest that gender norms are malleable at formative

ages, and that the environment could alter gender gaps.

Our findings are important since they suggest that gender norms and cultural norms are fluid. Most recently there have been a lot of public discussions on immigrants and whether they can assimilate into the culture of receiving countries (e.g., Muslim immigrants in France, Syrian refugees in Greece and immigrants in the United States).[13] Our findings suggest that environment can change the gender norms and social norms in a matter of a few years, especially when subjects are at the formative period. Unfortunately, our work also highlights the difficulty faced by minority groups, such as Mosuo, in preserving their cultural norms when they are integrated in Han society.

[13]Although in our setting that Mosuo are not immigrants, but they are still the ethnic minority in China.

References

, 13 Confucian Classics-Yi Li.

Alesina, Alberto, Paola Giuliano, and Nathan Nunn, *"On the Origins of Gender Roles: Women and the Plough*.," Quarterly Journal of Economics, 2013, 128 (2).*

Almond, Douglas, Lena Edlund, and Kevin Milligan, *"Son preference and the persistence of culture: evidence from South and East Asian immigrants to Canada," Population and Development Review, 2013, 39 (1), 75–95.*

Andersen, Steffen, Seda Ertac, Uri Gneezy, John A List, and Sandra Maximiano, *"Gender, competitiveness, and socialization at a young age: Evidence from a matrilineal and a patriarchal society," Review of Economics and Statistics, 2013, 95 (4), 1438–1443.*

Balli, Hatice Ozer and Bent E Sørensen, *"Interaction effects in econometrics," Empirical Economics, 2013, 45 (1), 583–603.*

Bisin, Alberto and Thierry Verdier, *"" Beyond The Melting Pot": Cultural Transmission, Marriage, And The Evolution Of Ethnic And Religious Traits," Quarterly Journal of Economics, 2000, pp. 955–988.*

_ and _, *"The Economics of Cultural Transmission and Socialization," Handbook of Social Economics, 2010, p. nc.*

Booth, Alison and Patrick Nolen, *"Choosing to compete: How different are girls and boys?," Journal of Economic Behavior & Organization, 2012, 81 (2), 542–555.*

Booth, Alison L and Patrick Nolen, *"Gender differences in risk behaviour: does nurture matter?*," The Economic Journal, 2012, 122 (558), F56–F78.*

Booth, Alison, Lina Cardona-Sosa, and Patrick Nolen, *"Gender differences in risk aversion: do single-sex environments affect their development?," Journal of economic behavior & organization, 2014, 99, 126–154.*

Campbell, Anne, *A mind of her own: The evolutionary psychology of women, OUP Oxford, 2013.*

Cárdenas, Juan-Camilo, Anna Dreber, Emma Von Essen, and Eva Ranehill, *"Gender differences in competitiveness and risk taking: Comparing children in Colombia and Sweden," Journal of Economic Behavior & Organization, 2012, 83 (1), 11–23.*

Carrell, Scott E., Mark Hoekstra, and James E. West, *"The Impact of Intergroup Contact on Racial Attitudes and Revealed Preferences," Working Paper 20940, National Bureau of Economic Research February 2015.*

Carrell, Scott E, Richard L Fullerton, and James E West, *"Does Your Cohort Matter? Measuring Peer Effects in College Achievement," Journal of Labor Economics, 2009, 27 (3).*

Chetty, Raj and Adam Szeidl, *"CONSUMPTION COMMITMENTS AND RISK PREFERENCES.," Quarterly Journal of Economics, 2007, 122 (2).*

Croson, Rachel and Uri Gneezy, *"Gender differences in preferences," Journal of Economic literature, 2009, pp. 448–474.*

Dohmen, Thomas and Armin Falk, *"Performance pay and multidimensional sorting: Productivity, preferences, and gender," The American Economic Review, 2011, pp. 556–590.*

_ , _ , **David Huffman, Uwe Sunde, Jürgen Schupp, and Gert G Wagner**, *"Individual risk attitudes: Measurement, determinants, and behavioral consequences," Journal of the European Economic Association, 2011, 9 (3), 522–550.*

Eagly, Alice H, Wendy Wood, and Amanda B Diekman, *"Social role theory of sex differences and similarities: A current appraisal," The developmental social psychology of gender, 2000, pp. 123–174.*

Ebrey, Patricia, *Women and the family in Chinese history, Routledge, 2003.*

Eckel, Catherine C and Philip J Grossman, *"Sex differences and statistical stereotyping in attitudes toward financial risk," Evolution and human behavior, 2002, 23 (4), 281–295.*

_ **and** _ , *"Forecasting risk attitudes: An experimental study using actual and forecast gamble choices," Journal of Economic Behavior & Organization, 2008, 68 (1), 1–17.*

_ **and** _ , *"Men, women and risk aversion: Experimental evidence," Handbook of experimental economics results, 2008, 1, 1061–1073.*

Eckel, Catherine, Philip Grossman, Cathleen Johnson, Angela Oliveira, Christian Rojas, and Rick Wilson, *"School environment and risk preferences: Experimental evidence," Journal of Risk and Uncertainty, December 2012, 45 (3), 265–292.*

Fernandez, Raquel, *"Does Cultural Matter?," Handbook of Social Economics, 2011, p. nc.*

Fernández, Raquel, Alessandra Fogli, and Claudia Olivetti, *"Mothers and sons: Preference formation and female labor force dynamics," The Quarterly Journal of Economics, 2004, pp. 1249–1299.*

_ **and** _ , *"Culture: An Empirical Investigation of Beliefs, Work, and Fertility," American Economic Journal: Macroeconomics, 2009, 1 (1), 146–177.*

Fortin, Nicole M, *"The gender wage gap among young adults in the united states the importance of money versus people," Journal of Human Resources, 2008, 43 (4), 884–918.*

Ginsburg, Harvey J and Shirley M Miller, *"Sex differences in children's risk-taking behavior," Child development, 1982, pp. 426–428.*

Gneezy, Uri and Aldo Rustichini, *"Gender and competition at a young age," The American Economic Review, 2004, 94 (2), 377–381.*

_ , Kenneth L Leonard, and John A List, *"Gender Differences in Competition: Evidence From a Matrilineal and a Patriarchal Society," Econometrica, 2009, 77 (5), 1637–1664.*

Gong, Binglin and Chun-Lei Yang, *"Gender differences in risk attitudes: Field experiments on the matrilineal Mosuo and the patriarchal Yi," Journal of Economic Behavior & Organization, 2012, 83 (1), 59–65.*

Harbaugh, William T, Kate Krause, and Lise Vesterlund, *"Risk attitudes of children and adults: Choices over small and large probability gains and losses," Experimental Economics, 2002, 5 (1), 53–84.*

Hill, Ann Maxwell and Eric Diehl, *"A comparative approach to lineages among the Xiao Liangshan Nuosu and Han," Perspectives on the Yi of Southwest China, 2001, pp. 51–67.*

Hua, Cai, *"A Society without Fathers or Husbands," Zone Books, 2001.*

_ and Michael Stainton, *"A society without fathers or husbands: the Na of China," Anthropologica, 2003, 45 (1).*

Johnson, Kay Ann, *Women, the family, and peasant revolution in China, University of Chicago Press, 2009.*

kang Shih, Chuan, *"The Yongning Moso: Sexual Union, Household Organization, Gender and Ethnicity in a Matrilineal Duolocal Society in Southwest China," Ph.D. thesis, Stanford University, Stanford, California, 1993.*

_ , *Quest for Harmony: The Moso Traditions of Sexual Union and Family Life., Stanford University Press, 2009.*

Lavy, Victor and Analia Schlosser, *"Mechanisms and impacts of gender peer effects at school," American Economic Journal: Applied Economics, 2011, pp. 1–33.*

_ **, M Daniele Paserman, and Analia Schlosser**, *"Inside the black box of ability peer effects: Evidence from variation in the proportion of low achievers in the classroom*," The Economic Journal, 2012, 122 (559), 208–237.*

Levin, Irwin P and Stephanie S Hart, *"Risk preferences in young children: Early evidence of individual differences in reaction to potential gains and losses," Journal of Behavioral Decision Making, 2003, 16 (5), 397–413.*

Liu, Elaine M, *"Time to change what to sow: Risk preferences and technology adoption decisions of cotton farmers in China," Review of Economics and Statistics, 2013, 95 (4), 1386–1403.*

Luttmer, Erzo FP and Monica Singhal, *"Culture, context, and the taste for redistribution," American Economic Journal: Economic Policy, 2011, 3 (1), 157–179.*

Marianne, Bertrand, *"New perspectives on gender," Handbook of labor economics, 2011, 4, 1543–1590.*

Niederle, Muriel, *"Gender," Working Paper 20788, National Bureau of Economic Research December 2014.*

Nunn, Nathan and Leonard Wantchekon, *"The Slave Trade and the Origins of Mistrust in Africa," American Economic Review, 2011, 101 (7), 3221–52.*

Sacerdote, Bruce, *"Peer Effects with Random Assignment: Results for Dartmouth Roommates," Quarterly Journal of Economics, 2001, pp. 681–704.*

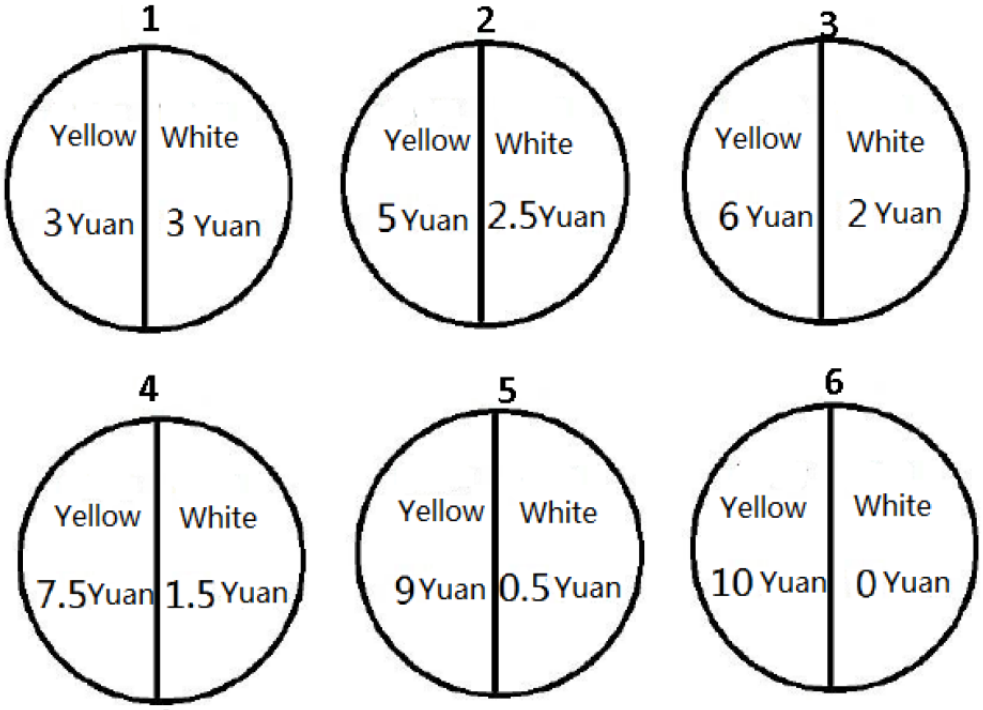
sing Kung, James Kai and Chicheng Ma, *"Can cultural norms reduce conflicts? Confucianism and peasant rebellions in Qing China," Journal of Development Economics, 2014, 111, 132–149.*

Tabellini, Guido, *"Culture and institutions: economic development in the regions of Europe," Journal of the European Economic Association, 2010, 8 (4), 677–716.*

Walsh, Eileen Rose, *"From Nü Guo to Nüer Guo Negotiating Desire in the Land of the Mosuo," Modern China, 2005, 31 (4), 448–486.*

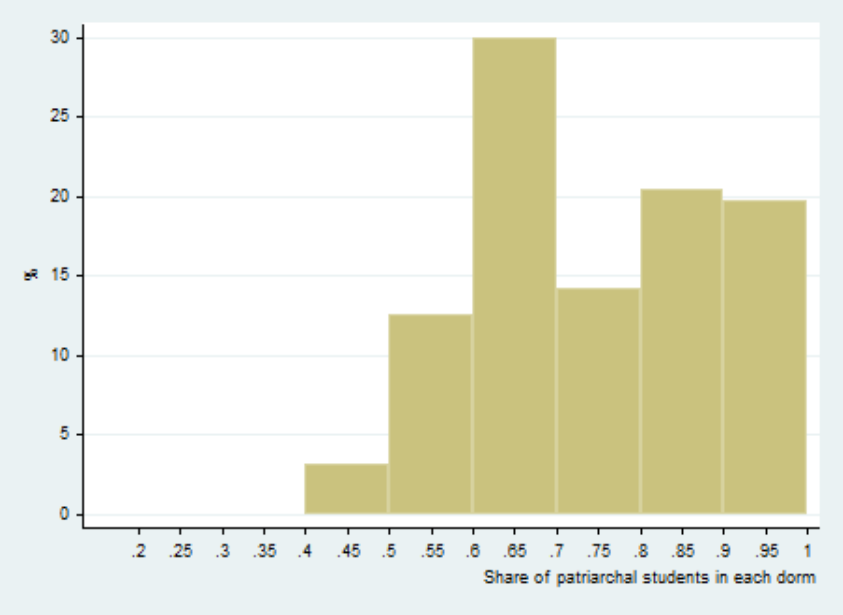
6 Figures and Tables

Figure 1: Binswanger Lottery Risk Game



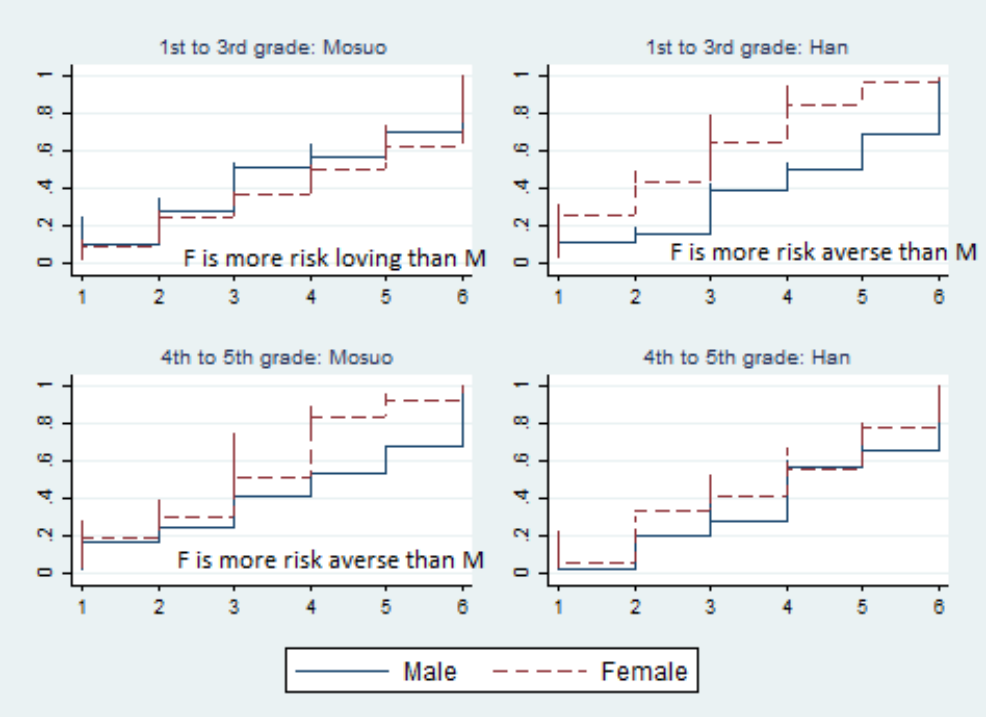
Notes: Subjects are asked to choose one of these six lotteries. For each lottery, there is 50/50 chance to win each payoff. 1 USD = 6.4 RMB (Yuan). The cost of a lunch in elementary school is about 5 Yuan (85 cents).

Figure 2: Probability Distribution of Share of Patriarchal Roommates



Notes: Bin width is 0.1. When calculating the share of patriarchal students in each dorm, we exclude the subject himself/herself. The mean share is 0.74 with standard deviation 0.15.

Figure 3: Cumulative Distribution of Bingswanger Lottery Choices



Notes: X-axis represents six lotteries (1 to 6). Red dotted line shows the CDF of females while blue dotted line is CDF of males. The left two panels represent Mosuo subjects and the right two panels indicate Han subjects.

Table 1: Summary Statistics

	Han	Mosuo	Han=Mosuo (p-values)
Panel A: Elementary Schools			
Female	0.55	0.54	0.86
	(0.50)	(0.50)	
Age	9.97	9.23	0.00
	(1.66)	(1.49)	
Number of family members	5.07	6.49	0.00
	(1.84)	(2.45)	
Average monthly allowance (RMB)	36.29	49.56	0.24
	(57.89)	(109.02)	
Mother′s education attainment(primary or lower)	0.73	0.62	0.03
	(0.45)	(0.49)	
Observations	136	216	
Panel B: Middle School			
Female	0.53	0.53	0.99
	(0.50)	(0.50)	
Age	13.33	13.38	0.81
	(1.06)	(0.92)	
Number of family members	4.54	5.69	0.00
	(1.02)	(2.37)	
Average monthly allowance (RMB)	134.93	164.15	0.42
	(216.82)	(172.80)	
Mother′ education is primary or lower	0.85	0.79	0.39
	(0.36)	(0.41)	
Observations	74	53	

Notes: The last column report the p-values of the two-way tests of the equality of the means between two groups as indicated. Middle school sample only include those who were in the seventh grade in 2015 and in 2015.

Table 2: Distribution of Incentivized Lottery Choices

50/50 Gamble	Payout				CRRA range	Distribution %	
	Low Payout	High Payout	Expected payout	S.D of payout		Elementary	Middle
1	3	3	3	0	$r > 4.17$	19.89	25.98
2	2.5	5	3.75	1.25	$0.99 < r < 4.17$	12.50	22.83
3	2	6	4	2	$0.81 < r < 0.99$	20.45	33.86
4	1.5	7.5	4.5	3	$0.32 < r < 0.81$	13.35	5.51
5	0.5	9	4.75	4.25	$0 < r < 0.32$	12.22	3.15
6	0	10	5	5	$r < 0$	21.59	8.66

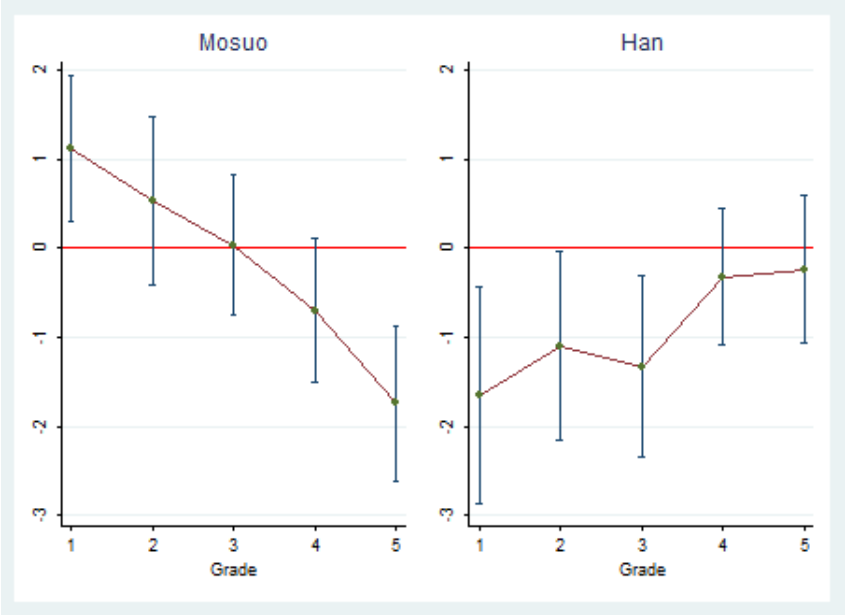
Notes: CRRA coefficient calculated as the range of r in the function: $u = x^{1-r}/(1-r)$ for which the subject chooses each gamble.

Table 3: Regression Results of Elementary School Students

	Lower Grade		Upper Grade	
	(1)	(2)	(3)	(4)
Mosuo*Female, β_1	2.322***	2.104**	0.095	-0.232
	(0.420)	(0.701)	(0.439)	(0.482)
Female, β_2	-1.498**	-1.144	-0.827**	-0.597**
	(0.289)	(0.633)	(0.270)	(0.244)
Mosuo, β_3	-0.658	-0.913**	-0.105	0.249
	(0.361)	(0.324)	(0.363)	(0.228)
N	116	115	236	236
Additional Controls	No	Yes	No	Yes
$\beta_1 + \beta_2$	.823 *	.96*	-.732*	-.829*

Notes: Dependent Variable is the choice in the risk game (ranging from 1 to 6), with 1 being most risk averse and 6 being most risk loving. Columns 1 and 2 restrict analysis to only first to third graders. Columns 3 and 4 restrict analysis to only fourth and fifth graders. Columns 2 and 4 include age fixed effects, year fixed effects and school fixed effects. Standard errors are clustered at the school level. * significant at 10%, ** significant at 5%, *** significant at 1%.

Figure 4: The Evolution of the Gender Gap in Risk Preferences by Ethnicity: Elementary School



Notes: Regression estimates from Equation 2 are plotted. Positive indicates females have higher attitudes toward risk loving than males. The dot and the bar correspond to the coefficient estimates with 90% confidence intervals.

Table 4: Regression Results of Middle School

Panel A

	Δ: Share of Patriarchal Roommates	Δ: All three Best Friends are Patriarchal
	All	1st Round
Δ *Mosuo*Female, β_1	-0.574	-0.413
	(0.503)	(0.905)
Δ*Female, β_2	-0.164	-0.150
	(0.305)	(0.735)
Δ*Mosuo, β_3	0.942**	1.100
	(0.366)	(0.689)
Δ, β_4	-0.011	-0.350
	(0.248)	(0.552)
Mosuo*Female, β_5	0.055	-0.354
	(0.525)	(0.688)
Female, β_6	-0.697**	-0.417
	(0.310)	(0.528)
Mosuo, β_7	0.200	-0.167
	(0.322)	(0.530)
R-squared	0.0881	0.1275
N	127	67

Panel B: Interpretation the Results from Panel A

	Share of Patriarchal Roommates goes up by One Standard Deviation(15%)	All three Best Friends are Patriarchal
	All	1st Round
Mosuo Female, $\beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5$	0.19	0.17
Mosuo Male, $\beta_3 + \beta_4$	0.93**	0.75*
Han Female, $\beta_2 + \beta_4$	-0.17	-0.5
Han Male , β_4	-0.01	-0.35

Notes: Dependent Variable is the choice in the risk game (ranging from 1 to 6), with 1 being most risk averse, and 6 being most risk loving. *Delta* represents the share of patriarchal roommates in a given dorm room in Column 1 and *Delta* represents a dummy variable indicating all three reported best friends are from patriarchal ethnic groups in Column 2. Panel B present the effects of *Delta* changes from 0 to 1 for each of the given gender-ethnic group. In Column 1, robust standard errors are clustered at the dorm room level. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 5: Panel Analysis: Elementary Schools

	(1)	(2)
Mosuo*Female, β_1	0.229	0.279
	(0.310)	(0.315)
Female, β_2	-0.048	-0.099
	(0.250)	(0.265)
Mosuo, β_3	0.181	0.142
	(0.227)	(0.254)
N	121	121
Additional Controls	No	Yes
$\beta_1 + \beta_3$	.41 *	.42 *

Notes: Dependent variable equals either one of the three numbers: -1, 0 or 1, with the greater number represents the more risk averse attitude. All regressions include school fixed effects. Robust standard errors are clustered at the school level. Additional controls include age fixed effects and school fixed effects. * significant at 10%, ** significant at 5%, *** significant at 1%.