Do Women in China Compete Just As Much As Men?

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Abstract

Recent experimental economics research documents substantial gender differences in the willingness to compete in a tournament, which may explain gender inequalities in the labor market. This paper examines whether cultural norms can influence the gender gap in competitive inclination. Building on the cross-cultural research design of Gneezy et al. (2009), I exploit a cultural shock resulting from radical communist gender egalitarian reforms in China to compare gender differences in competitive inclination among the majority Han Chinese to that in two minority ethnic groups, who were exempted from important aspects of the reforms for political reasons. Confounds with culture that vary across large geographical regions are minimized by mostly recruiting subjects within the same high school. The majority Han Chinese exhibited no statistically significant gender differences in competitive inclination while women from a patrilineal minority were significantly less competitively inclined than the men and less competitively inclined than Han Chinese women. Women from a matrilineal minority were as competitively inclined as the Han Chinese women, but the matrilineal men were the most competitively inclined group, which may be due to the institution of non-exclusive marriage in this culture. These findings suggest that as the norms around men and women's economic roles become more similar, gender differences in competitive inclination will shrink.

Keywords: competition, female labor force participation, matrilineal and patrilineal societies, field experiment

JEL classifications: C93, J16, J24, O1, P2

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1 Introduction

Gneezy et al. (2009) shows that among the patrilineal Maasai in Tanzania, men are more competitively inclined than women, whereas in a matrilineal society in India, where men take on a large role in childcare, the gender gap is reversed. This important result was the first to establish that the gender gap in competitive inclination is not universal across all cultures. Building on the Gneezy et al. (2009) cross-cultural research design, I exploit a cultural shock to norms around work and marriage resulting from radical communist gender egalitarian reforms in China to compare gender differences in competitive inclination among the majority Han Chinese ethnic group to that in two minority ethnic groups, which were exempted from important aspects of the reforms for political reasons.

Han Chinese women were secluded from every sphere of public life according to Confucian philosophy for thousands of years. When the communist party came into power, collectivized labor and radical gender egalitarian reforms pushed women in unprecedented numbers into the paid labor force. Women in China, like women in other formerly planned economies, were *expected* to work outside the home. In 1980, at the height of communism, prime age female labor force participation in China was 81%.[3] Even today, after decades of market reforms, female labor force participation of the population 15 and over remains higher than that in every OECD country, with the exception of Iceland (ILO).

The Yi minority is patrilineal like the pre-reform Han Chinese, and share similar cultural norms around women's role in society. To the extent that gender differences in

address this challenge, the current study compares competitive inclination across different cultures in a county approximately one-third the size of the San Francisco Bay Area among students mostly attending the same high school, so that confounds with culture that vary across countries and larger geographical regions are held constant.[4] The geographical concentration essentially constitutes a "cultural laboratory," and addresses four main potential confounds with culture (see Camerer (2003) for an exposition of each confound). First, experimental payouts do not require adjustment for purchasing power as they would across different countries. Second, the same set of instructions was used because the language of instruction, Mandarin Chinese, is the same across the studied cultures. Third, I was able to conduct all experiments and thus minimize experimenter variation. Fourth, other potential confounds that vary across larger geographical regions such as macroeconomic characteristics or economic institutions are held constant, and any background variables that differ across individuals can be directly controlled for, without having to translate, say, the level of educational attainment in one region into its equivalent in another.

Borrowing the Niederle and Vesterlund (2007) experimental design, I conducted experiments with 296 high school students in November and December 2009. A post-experiment survey was administered to all subjects to capture demographic and socioeconomic background characteristics and academic performance data was collected from the school administration. Individual risk aversion data were collected separately using an ordered lottery instrument.

I find no statistically significant gender difference in competitive inclination among the Han Chinese subjects. These findings are especially striking given the long history of female subordination and seclusion in Han Chinese culture, and given that culturally western countries document 20 to 50 percentage point gender gaps from almost identical experiments. The Yi, the patrilineal minority, have a statistically significant gender difference of 24 percentage points, with the women being less competitively inclined than the men and the men being equally competitively inclined as the Han Chinese men and women. Women from the matrilineal minority, the Mosuo, are equally competitively inclined as the Han Chinese men and women. In contrast to previous literature, Mosuo men have even higher competitive inclination. This may be explained by the unique non-exclusive nature of Mosuo unions, which, by an evolutionary argument, gives men in

[4] Flory et al. (2011) also take advantage of within-country cultural diversity to study competitive inclination in matrilineal and patrilineal societies in 12 villages in Malawi.

this society higher returns to competitive behavior.

The paper proceeds in Section 2 to discuss the experimental setting. Section 3 gives an overview of each culture. Section 4 describes the data collection procedures. Section 5 presents results for individual ethnic groups. Section 6 pools data from the three ethnic groups. Section 7 checks the interpretation given for the patterns seen in the data. Section 8 examines some alternative explanations. Section 9 concludes.

2 Experimental Setting

All subjects are recruited from the two high schools of Ninglang county, both located in the county seat, about a mile apart.[5] Most of the participants were students from one of the two high schools, with expansion to the second school made necessary by the scarcity of Mosuo subjects. Ninglang is a mountainous county located in the border province of Yunnan, which contains the highest number of nationally designated "poor" counties and the most number of ethnic minority groups.[6] Ninglang itself has been on the register of poor counties since 1986, the year the criteria for the designation were first established. In 2008, GDP per capita was $630 (China County Statistics, 2008).[7]

With a population of 230,000, Ninglang's three main ethnic groups are the Yi, the Han Chinese, and the Mosuo, comprising 62%, 20%, and 9% of the population, respectively (China Census, 2000). Ethnicity in modern China is rigidly defined. In the 1950s, the Chinese government

Although Han Chinese presence in minority regions such as Tibet and Xinjiang has increased in recent years, contributing to ethnic tensions, in Ninglang County, the ethnic composition has remained stable for at least the past 50 years. The Han Chinese actually make up a somewhat lower percentage of the county population than they did in 1956.[9] Of the three ethnic groups, the Mosuo have the longest recorded history in Ninglang, followed by the Han Chinese and the Yi. Records show that the three ethnic groups have coexisted in the region for at least 150 years. The origins of the three ethnic groups are detailed in Appendix I.

Prior to the 1950s, the few schools in Ninglang were all locally administered (NLYZZZXJYJ, 1997). When the Communist government came into power, local schools were either closed or absorbed into a centralized public schooling system. These schools were open to all students, regardless of ethnicity and the language of instruction was Mandarin, a dialect of Han Chinese. Today, the only two high schools in Ninglang are both located in the county seat, and students of all ethnic backgrounds attend the same classes and live in the same dormitories.

3 Cultural distinctions

The following sections detail anthropoloical evidence supporting the argument that Han Chinese society resembled the Yi society with regard to women's position relative to men (and were in some ways more unequal than Yi society), prior to the massive communist gender egalitarian reforms, from which minorities were tood0tytent lod0sood0asferences in competitive inclination tracks social gender inequalities (as seen in Gneezy et al. (2009) and Flory et al. (2011)), sothat the traditional Han Chinese would have had at least as large a gender gap in competitive inclination as the Yi, the current observedferences in the gender gap between the Han Chinese and the Yi may be interpreted as the result of cultural change, or a lower bound on the effect.

With respect to the Mosuo, because we do not understand how the their society came to be matrilineal (oremained matrilineal other became patrilineal, if matriliny the original state), a direct comparison of the Mosuo and the Yi data does not yield a causal interpretation. However, the inclusion of data from the Mosuo matrilineal society, in which women always

[9] The ethnic composition in Ninglang County in 1956 was 50% Yi, 25% Han, and 8% Mosuo (NLYZZZXZBJWYH: 259).

enjoyed high status and autonomy, provides a point of reference for interpreting the magnitudes of Han Chinese and Yi female competitive inclination.

3.1 Han Chinese

Traditional Han Chinese society was structured around the patrilineal family according to Confucian principles (e.g. Stacey 1983), which most simply stated that parents were superior to children and men were superior to women (e.g., Fairbank and Goldman 1998: 51). The family was the most important unit of organization in both agricultural production and business operations (Yang 1965: 5, 138). The head of the household, almost always male, had authority over "who worked where, when and at what; who spent what and how; and when and whom [family] members would marry (Stacey 1983: 32)." The purpose of marriage was to produce male heirs and to acquire a daughter-in-law "for the service and comfort of the parents," rather than to fulfill any desires of the individuals joined in matrimony (Yang 1965: 23). Marriage, arranged by and for the groom's family, was essentially "an exchange of women (Stacey 1983: 34)." Once married, a woman belonged to her husband's family and had no grounds for divorce (Stacey 1983: 34; Yang 1965: 64). To the extent possible, she was confined to the domestic sphere and excluded from all forms of public life (Stacey 1983: 39). Any income she may generate, mostly through domestic sidelines although in southern China women also worked in agriculture, was controlled by the head of the household (Yang 1965: 140).

When the Communist Party assumed power in China, one of the first orders of business was to bring women into the paid labor force. Elisabeth Croll writes that the participation of women in the work force was "identified as the precondition of women's emancipation and the crucial factor in winning equality for women (Croll 1983: 2)." Other scholars point out that, aside from rhetoric, the state found it economically necessary to mobilize all labor, including women's, to achieve its goals of rapid industrialization and infrastructure development (Wolf 1985: 81; Yang 1965).

The Marriage Law of 1950 was promulgated to achieve these policy objectives. It abolished arranged marriage, established minimum ages for marriage, and granted both men and women the right to divorce, which weakened the claims of the household head on women's labor, thus freeing women to work for pay outside of the home (Hershatter 2004: 999). The right for a wife

to members who break customary laws (Hill and Diehl 2001).

Marriages are arranged by the clan leaders according to clan law, with the purpose of making alliances between clans (Harrell 2001a: 91). A girl is typically betrothed shortly after she is born (Wu 1997: 207). Those who defy clan marriage laws such as caste endogamy and clan exogamy faced horrific consequences (Wu 1997: 223, 343). A survey conducted by the Women's Federation, a national NGO, in a county in the Greater Cool Mountains Yi Autonomous Prefecture in 1984 and 1987 found that deaths due to clan interference in marriage decisions accounted for 27-35% of all deaths from unnatural causes (Yuan 1992).

Agricultural collectivization and, with it, the implementation of the workpoint system, was carried out in Ninglang just as it was in the rest of China, although Ninglang had a later start. However, in an effort to win over minority ethnic groups and avoid upsetting their existing power structures, the Chinese government exempted minorities from provisions in the national Marriage Law of 1950 such as the minimum marriage age and the right to divorce (Dreyer 1976: 119). For the Yi it meant a majority continued to follow customary clan laws regarding marriage despite the existence of local courts. Piecemeal efforts to reform Yi marriage customs came to Ninglang county in the late fifties and early sixties and were met with little success (Wu 1997: Ch 4). It was not until the economic reform era, in 1981, that a marriage law for Ninglang was passed. It was less strict than the national Marriage Law, categorizing practices such as child betrothal and early marriage as merely "backward customs (Wu 1997: 209)" rather than "forbidden (Wu 1997: 206)," and stipulated a lower minimum marriage age (Wu 1997: 204). The education campaign

labor force. According to the 2000 China Census, in Ninglang County, Yi women's employment in the non-agricultural occupations, relative to their population proportion, was 37% that of men's non-agricultural employment (see Table 1). The same figure for Han Chinese women was 73%.

Interestingly, the Yi scholar Stevan Harrell notes that pre-1949, ethnologists always compared the position of Yi women favorably to that of their "foot- and house- bound Han counterparts." However, by his estimation, women's status in Yi society today is relatively lower than that of women in Han Chinese society. For example, Yi males are better educated on average than Han Chinese males, but Yi females have the least schooling. Yi women did not become cadres or teachers as Han Chinese women and women of other ethnic minority groups did. And in everyday interaction, women serve men, eat after them, and do most of the housework while men "sit, talk and drink (Harrell 2001a: 99)."

agricultural employment in 2000 (see Table 1).

A unique feature of the Mosuo matrilineal society is their sexual visitation system called the "walking marriage," where the man travels to visit the woman in the evenings but returns to his own matrilineal home by the next morning. It normally does not involve cohabitation and is "nonexclusive, noncontractual, and nonobligatory (e.g. Shih 1993)." A Mosuo man or woman is free to engage in a "walking marriage" with no explicit limitation related to "age, generation, rank, or ethnic identity (Shih 2010: 77)." There was also no "moral, legal, economic, or other conditions" that prevented either partner from being involved in multiple "walking marriages" at the same time (Shih 2010: 81) or to terminate a relationship for whatever reason (Shih 2010: 79). Both men and women can have a number of "walking marriage" relationships, whether over a course of a lifetime or of one evening (Cai 2001: 202). Mosuo society, then, is functionally a polygamous society. Cohabitation may take place between partners in more stable relationships, but cohabitation itself does not signify greater commitment or obligations; the moved-in partner

3.4 Descriptive statistics

A short written survey was administered to the experimental subjects after the experimental session, with the purpose of understanding what key socioeconomic or demographic factors may vary across ethnic groups, and also as a check on the anthropological evidence. The questions were written to correspond to the 2000 China Census whenever possible to maximize clarity.[12] Selected survey results are presented in the top panel of Table 1. It appears that in this uniquely controlled setting, there were no statistically significant differences in socioeconomic or demographic variables across the three ethnic groups. All three groups had similar levels of household income, educational attainment of household heads, propensity to have a head of household working in the non-agricultural sector, and number of siblings. By design, the subjects were drawn from the same grades and, as expected, there was no differences in age across the three ethnic groups. On the other hand, the ethnic correlates corresponded to the anthropological evidence, with the Mosuo most likely to have a female head of household and to have parents participating in a

Mosuo, males and females are equally likely to be in high school, conditional on being alive in the year 2000. On the other hand, Yi females are much less likely to be in high school than Yi males, even relative to their already smaller proportion in the population. Assuming that the probability of enrolling in high school increases with competitive inclination, the gender difference in competitive inclination in high school is an underestimate of the population gender difference. A formal proof is available from the author upon request.

4 Data collection

4.2 Experimental design

The task used throughout the experiment was to add sets of five two-digit numbers and to do as many as possible in five minutes.[14] The number of problems correctly solved is the subject's "score" in the subsequent discussion. See below for a sample problem.

12	34	41	87	64	

The experiment consists of three main rounds, throughout which subjects were randomly seated in groups of four (two males and two females) and were not allowed communication although they could see one another. The order of Round 1 and Round 2 was randomly assigned to sessions and balanced across ethnic groups. Round 3 always followed Round 1 and 2.

Round 1: Piece-rate - subjects are compensated 0.5 Yuan for each problem solved.[15]

Round 2: Compulsory tournament - The subject who solves the most problems in his or her group of 4 receives 2 Yuan for each correctly solved problem, while the others receive no payment.[16]

Round 3: Discretionary tournament - subjects first choose which of the two types of compensation schemes (piece-rate or tournament) they would like to apply to their performance in this round. If they choose piece-rate, they are paid 0.5 Yuan per problem solved. If they choose to enter their performance in a tournament, they receive 2 Yuan per problem if they score highest in their group of four, and nothing if there is someone in their group who scores higher than they do.

Following Niederle and Vesterlund (2007), if the subject chooses tournament in round 3, their score is compared to the scores of the other three group members in round 2 (the compulsory tournament round), rather than their score in round 3. This ensures that participants choosing the tournament option are competing against the scores of others also performing -241e1iu268(sterlunthe)-241(sc

Subjects receive their scores from the previous round before they begin the next round. However, they do not know their relative ranking within their group. After the third round, subjects are asked to guess their rank in the compulsory tournament. This information will be used in the analysis to assess the accuracy of their beliefs toward their relative performance.

The order in which the piece-rate round and the compulsory tournament round was conducted was randomized across sessions of each ethnicity such that half of the sessions for each ethnic group were conducted with the piece-rate round occurring first and half of the sessions with the compulsory tournament round occurring first. The discretionary tournament round always occurred last.

Following standard experimental practice, one unpaid practice round was administered before the first round to familiarize subjects with the task. At the end of the experiment, one of the rounds was randomly chosen for payout, to minimize wealth effects across the rounds. A written survey was distributed as students waited for their payment. The show up fee was 2 Yuan and average payout not including the show up fee was 7.5 Yuan.

5 Experimental Factors Determining Tournament Entry

Raw rates of tournament entry from this study are shown in context with two of the most influential studies in the literature (see Table 2). Substantial gender differences in tournament entry exist among the Yi and the Mosuo, with the men more likely to choose the tournament. The Han Chinese have a smaller gender difference, which is not statistically significant at conventional levels.[17] These gender differences are smaller than that found in Niederle and Vesterlund (2007), and are similar in size to the gender differences in Gneezy et al (2009), also conducted in developing regions.

In column 1 of each panel of Table 3, the raw rates of tournament entry are regressed on gender using a probit regression, clustered by session. As expected, the coefficient on gender is large and significant for both the Yi and the Mosuo. The gender coefficient for the Han Chinese in this analysis is also statistically significant, although it is smaller in size than that of either the Yi or the Mosuo. Note, however, that tournament entry is not equivalent to competitive inclination.

[17] A one-sided t-test is significant at the 10% level (p-value = 0.07).

In order to tease apart gender differences in competitive inclination from other factors within the experimental context that can influence a subject's tournament entry decision, I follow the literature in successively controlling for each individual subject's probability of winning the tournament, risk aversion, and overconfidence using the following empirical model:

$$y_i = \alpha_0 + \alpha_1 male_i$$

winning in a group g is:

$$p_i = \Pr(s_{pi} > s_{pj},\ j \neq i) = \frac{\exp(ks_{ri})}{\sum_{j \in g,\, j \neq i} \exp(ks_{rj}) + \exp(ks_{ri})} \tag{3}$$

Since winning in the discretionary tournament is defined as scoring higher than the other three group members did in the compulsory tournament round, s_{ri} denotes the score in the discretionary tournament round and s_{rj}, $j \neq i$, denotes the scores in the compulsory tournament round. k, the non-linear scale parameter was estimated separately in Zhang (2011).

Figure 1 shows the empirical cdfs of performance in the compulsory tournament round by gender for each ethnic group. Visual inspection shows that the Mosuo and the Yi have no gender differences in performance. Mann-Whitney tests confirm this observation (p-value=0.78 for the Mosuo and 0.73 for the Yi). The Han Chinese men appear to have done better than the women, although the difference is insignificant at conventional levels in a Mann-Whitney test (p-value=0.12). The lack of significant gender differences in the performance in the compulsory tournament is consistent with the literature (e.g. Niederle and Vesterlund (2007)).

Since the tournament entry decision depends not only on the probability of winning the tournament, but also on the payout in the case of choosing the piece-rate, another piece of information that will be relevant for subjects is the effect that the tournament incentive has on their performance itself. In the literature this has been measured by the improvement in scores between the piece-rate and compulsory tournament rounds (Gneezy et al. 2003). Experiments following the Niederle and Vesterlund (2007) design has elements of the Gneezy et al. (2003) experiment but because the compulsory tournament round is played after the piece-rate round, the effect of the tournament incentive on performance is confounded with any learning effects. An innovation in this study was to randomize the order of the piece-rate and tournament rounds, so the improvement between the piece-rate round and the tournament round indicates the degree to which performances respond to tournament incentives, net of any learning effects. In essence the first two rounds replicate the design of Gneezy et al. (2003), although in that experiment each participant only performed under one incentive scheme.[18] Comparisons across gender and ethnic group

[18]The performance in the first chronological round is equivalent to performances of subjects who only participated under one incentive scheme. Results from an analysis of this round alone are consistent with results from analyzing the combined first two rounds.

show no gender or ethnic differences in performance improvement from piece-rate to tournament and, in fact, there are no improvements in performance on average (see Figure 2). This is consistent with other studies that use a short task (Niederle and Vesterlund 2011). This could also be due to the fact that the students were primed by the environment of test-taking and performed to their true ability in each round.

Figure 3 shows distributions of the probabilities of winning the tournament, calculated using Equation 3, by gender across ethnic group. The overlap by gender is substantial, and Mann-Whitney tests reveal no significant gender differences, at the 10% level or greater, across any of the ethnic groups. This is consistent with the above analysis of performance on the tasks.

The coefficient on male in Column 2 of each of the three panels in Table 3 shows the gender difference in each ethnic group in tournament entry, controlling for the probability of winning. The inclusion of this control variable does not reduce the gender differences in the Yi and Mosuo, although the male coefficient is now slightly smaller for the Han Chinese, consistent with the fact that the Han Chinese men performed slightly better than the Han Chinese women.

5.2 Overconfidence

Using the guessed rank for the compulsory tournament, I construct a proxy for overconfidence by subtracting the guessed rank from the actual rank, with the best rank being 4 and the worst 1. This proxy takes on integer values between -3 and 3, with positive values signifying overconfidence, negative values signifying underconfidence, and zero representing a correct guess. The distribution of this proxy variable is symmetric about zero, implying that subjects in my sample are on average correct about their rank, despite the fact the guesses were not monetarily incentivized (see Figure 4). Figure 5 breaks the sample up by ethnicity and gender. The average value of the proxy for overconfidence for each ethnic group is statistically indistinguishable from zero, with no differences in distribution by gender detected in Mann-Whitney tests for each ethnic group (p-values>0.10). Both results are contrary to the typical findings of overconfidence, with males more overconfident than females (e.g., Niederle and Vesterlund (2007); Balafoutas and Sutter (2010), Niederle et al. (2010), Sutter and Rützler (2010), Healy and Pate (2011)). The fact that the subjects

contributes to the accuracy of their guessed ranks.

Controlling for overconfidence in addition to the probability of winning the tournament in Column 3 of Table 3 does not reduce gender differences in tournament entry among the Yi or the Mosuo, but the coefficient on gender for the Han Chinese is now smaller and insignificant.

5.3 Risk aversion

Because payoffs are uncertain under the tournament payment scheme given performance, the decision to enter the tournament could depend on one's risk preferences. I measure risk aversion using an ordered lottery selection instrument, where each subject is asked to choose one of six lotteries, with the first lottery offering a certain amount and all other alternatives offering higher expected payoff along with higher variance. The size of the stakes was designed to be roughly comparable to the stakes in the competition experiment. Each choice along with its corresponding expected value and standard deviation is shown in Table 4. This instrument was first developed for studying risk aversion in rural India (Binswanger, 1980; 1981), and is similar to the independently developed instrument used in Eckel and Grossman (2002; 2008).[19] For a detailed survey of studies using variants of this instrument, see Harrison and Rutström (2008). The main advantage of this instrument is its simplicity, which has been shown to generate less noise and more time-consistency, especially for subjects with low cognitive ability, as compared with finer but more complex risk instruments Dave et al. (2010).

Table 4 shows, for each gamble, the expected payout, the standard deviation of the payout, the implied range of CRRA coefficients, and the percentage of participants who chose the gamble. The bottom panel of Table 4 shows the same data from two other studies using similar instruments for comparison. The distribution of choices in the current study appear most similar to the Binswanger (1980) data using small stakes (Rs. 5 level). 9.9% (9.8%) of subjects in the current study (in Binswanger (1980)) chose the two safest choices. 23.7% (23.9%) of subjects in the current

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developing countries are more risk averse than the populations in developed countries. However, a clean cross country comparison would need to fix the stake sizes, relative to purchasing power.

Figure 6 shows the subjects' choices in a histogram, along with the associated lotteries.[20] Figure 7 breaks the sample up by ethnicity and gender. Casual observation shows that for the most part, the female distributions are right-skewed, whereas the male distributions are left-skewed, implying that females are more risk averse than males, as is consistent with the literature on risk preferences (see, for example, Croson and Gneezy (2009), and Eckel and Grossman (2008b)). Mann-Whitney tests confirm that the gender differences are significant for all three ethnic groups (all p-values<0.05).

The risk instrument was presented after the Chinese New Year, which occurred two to three months after the competition experiment, in order to minimize wealth effects from earnings in the experiment.[21] Because of the lapse in time, not all subjects were present for the risk measurement. In order to explicitly address any selection effects this may cause, column 4 of Table 3 shows the gender differences across ethnic groups in tournament entry, controlling for the probability of winning the tournament and overconfidence for only those subjects for whom I observe risk aversion. The coefficients differ somewhat from column 3 to column 4, indicating that some selection effects are present, although none of the results are substantively affected. Next, in column 5, I add controls for risk aversion.

The coefficient on risk aversion is small and insignificant for the Han Chinese and the Mosuo. For the Yi, the coefficient is larger and marginally significant. Including the measure of risk aversion has left the coefficient on gender for all three ethnic groups virtually unchanged. This is consistent with the other studies in the literature that have found risk aversion to either play no role in explaining tournament entry, or, if it does play a significant role (as in Sutter and Rützler (2010)), to leave the significant gender gap in tournament entry intact.[22] See Niederle and Vesterlund (2011), section 2.2, for a survey of the literature on this point.

Following the studies in this literature, such as Niederle and Vesterlund (2007), having in-

[20] The distribution corresponds remarkably well to the distribution of comparable choices from the small stakes game in Binswanger (1980).

[21] Due to time constraints imposed by the high schools, the risk instrument could not be presented in the same session as the competition experiment.

[22] Unfortunately, the magnitudes of the coefficients cannot be directly compared across studies, since the measures of risk aversion differed across studies.

cluded all three controls, I interpret any residual gender differences in tournament entry as gender differences in competitive inclination per se. Given the high labor force participation of Han Chinese females post-1949, and the forces in Yi society such as arranged and early marriage and strong clan control over women that impede on the ability and perhaps incentive for Yi women to participate in the labor force, it is not surprising to find that the results indicate no statistically significant gender differences in competitive inclination among the Han Chinese, while Yi women are 23 percentage points less competitively inclined than Yi men, significant at the 1% level. What is unexpected, however, is that despite the lack of impediments in Mosuo society for women to participate in the labor force, Mosuo men are significantly more competitively inclined than Mosuo women. Possible explanations for this unexpected result are discussed in the next section.

6 Group differences in competitive inclination

This section contains the evidence for the main arguments of the paper. I estimate a regression equation that interacts gender with ethnicity which allows me to compare the gender differences in competitive inclination across ethnic groups in one model, and also to compare the levels of competitive inclination across ethnicity-gender groups:

$$y_i = \beta_0 + \beta_1 male_i + \sum_{j=2}^{3} \beta_j ethn_{ji} \quad male_i + \sum_{j=1}^{3} \beta_{j+3} ethn_{ji} + \tau\gamma_i + \delta p_i + \lambda q_i + X_i'B + \epsilon_i \qquad (4)$$

where $y_i = 1$ if the subject chooses tournament and 0 if the subject chooses piece-rate. p_i and γ_i are measured as above. q_i is the proxy for overconfidence. $ethn_{1i}$, $ethn_{2i}$, and $ethn_{3i}$ are indicator variables for Han Chinese, Mosuo and Yi, respectively. $male_i$ is an indicator variable taking the value of 1 for males and 0 for females. X_i represents a vector of background characteristics that include age, age squared, number of brothers, number of sisters, education of the household head, and family income. The coefficients of interest are $\beta_2(\beta_3)$ which indicates the gender difference in the Mosuo (Yi), as compared with the Han Chinese, the omitted group.

Table 5 reports the results from this estimation. Consistent with the results in Table 3, the Han Chinese exhibit no statistical gender difference, but the matrilineal Mosuo and patrilineal

Yi each have about a 20 percentage point gender gap in the willingness to compete in the tournament. Controlling for demographics and socioeconomic status leaves the result substantively unchanged.

If the expectation for Han Chinese women to work in the paid labor force, as indicated by high levels of labor force participation and high levels of participation in the non-agricultural occupations relative to men, helped to equalized competitive inclination between the genders for the Han Chinese, then there should be a larger gender difference in competitive inclination for the Yi, whose culture kept the traditions, such as arranged and early marriage and strong clan control over women, that impede on the ability and perhaps incentive for women to participate in the formal labor force. Moreover, one would expect to see that the Yi women are less competitively inclined than Han Chinese women. The estimation results indicate that the gender differences in competitive inclination is large and significantly higher among the Yi, compared with the Han Chinese. Additionally, the coefficient on Yi, -0.18, indicates that this difference is almost entirely due to Yi women being less competitively inclined than the Han Chinese women, with Yi men and Han Chinese men about equally competitively inclined.

Also in line with expectations was the finding that the Mosuo women are significantly more competitively inclined than the Yi women. Interestingly, the Mosuo women are no more competitively inclined than the Han Chinese women, despite the vast differences in their traditional cultures. It appears that despite enjoying more autonomy than their traditional Chinese counterparts, the Mosuo women of today are no more competitively inclined than their modern Chinese counterparts, who grew up in a society that had undergone radical gender egalitarian reforms.

The Yi men, the Han Chinese men, the Han Chinese women, and the Mosuo women all have about equal levels of competitive inclination. Compared to this benchmark, the gender difference in the Yi results from the Yi females being less competitively inclined than the males, whereas the gender differences in the Mosuo is driven by Mosuo men being more competitively inclined than the Mosuo women. The matrilineal Mosuo as a whole, then, is more competitively inclined than

the Khasi of India or the Chewa of Malawi. A presumption of evolutionary biology is that polygamous mating systems exert more competitive pressure on the males than do monogamous mating systems. This derives from the Trivers parental investment theory, which states that since females invest heavily physiologically in reproduction, they are limited in how many offspring they can produce in a lifetime, but males can be incredibly reproductively successful under the right conditions (Trivers 1972). So males are driven to compete for mating opportunities, which often entails competing for resources that are attractive to females, and females allocate their energy to care for their offspring rather than to competing for resources. In other words, the marginal bene8e (ts)]TJ 0 -21.922 T

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are in the agricultural sector; α_2 indicates the difference in competitive inclination for females who come from non-agricultural families compared to those females from agricultural families; α_3 indicates the difference in the gender difference in competitive inclination between the two sectors.

The results from this estimation are presented in Table 7 in three panels, one for each ethnic group. Columns 1, 2, and 3 in each panel explicitly highlight any changes to the coefficients of interest that result from a reduced and potentially selected sample of subjects who were observed for risk aversion. For all three panels, it appears that the inclusion of risk aversion in column 3 has a negligible effect on the gender, sector, and gender-sector interaction terms. In comparison, excluding the observations that could not be measured for risk aversion has a larger effect on these coefficients, as seen in the difference in the coefficients of interest between column 1 and column 2. Including additional controls for grades, education of household head, and household income in columns 4 and 5 does not change the coefficients of interest substantively, with the exception that the effect of coming from a non-agricultural family on competitive inclination is now positive for Han Chinese women, although this effect is insignificant across all specifications. In the following discussion, I will refer to the first columns of each panel when evaluating model predictions.

For the Yi, the entire gender difference in competitive inclination is driven by those from agricultural families, where women are 40.5 percentage points less likely to choose tournament, conditional on the probability of winning and on overconfidence. There is no difference in male competitive inclination across the two sectors, as predicted. For the Han Chinese, very little gender difference is observed for those from agricultural families, and an insignificant increase in gender difference is observed when moving from the agricultural to the non-agricultural sector. The data are consistent with the predictions and support the main interpretations.

Cultural change imposed on the Mosuo consisted of policies that required cadres and state

with the inherent difficulty in enforcing monogamy (Cai 2001: 403) and the prediction become much less obvious. The results in Table 7 show that while Mosuo men from both agricultural and non-agricultural families are more competitive than the women, those from the non-agricultural families exhibit more gender difference than those from agricultural families. It is hard to draw conclusions from this peculiar pattern, although it is probably safe to say that government legislated monogamy for a subsector of society does not appear to decrease male competitive inclination in that sector.

8 Alternative explanations

In this section I explore the implications of several alternative explanations for gender and ethnic differences in competitive inclination, and take these explanations individually to the data.

8.1 One Child Policy

The well-known One Child Policy also exempted minorities to a large extent, thus an alternative interpretation of the results is that it is the experience of growing up as an only child rather than any cultural factors that caused Han Chinese men and women to have equal competitive inclination. It is not clear, however, how growing up as an only child would affect one's competitive inclination. On the one hand, an only child does not have to compete with siblings for the family's scarce resources and could develop lower competitive inclination (see, for example, Blake (1981)). On the other hand, parents may have higher expectations of only children, which could cause them to be more competitively inclined (see, for example, Brill (1922), Fenton (1928)). Empirical studies on the outcomes of only children typically suffer from self-selection problems but in a notable exception using adult experimental subjects in Beijing and the timing of the One Child Policy as an instrument, Cameron et al. (2011) finds no causal effect of growing up as only child on competitive inclination, once risk aversion has been taken into account.[23] Only children were found to be more risk averse, however.

In any case, the prevalence of only children in the current study is uniformly low across all three ethnic groups (see Table 1). Of the Han Chinese subjects, only 2 females (one non-

[23] Incidentally, no gender differences were found in competitive inclination.

agricultural) and 1 male (non-agricultural) are only children. The prevalence of only children

reer could increase the competitive inclination of Han Chinese women compared to the Yi women. This is fully consistent with the main interpretation of the results, which is that government policy changed Han Chinese women's competitive inclination through changing their expectations of the future. The equality in competitive inclination between Mosuo women and Han Chinese women is also consistent with this interpretation, given the low fertility rates of the Mosuo.

8.2 Matriliny versus patriliny

Establishing property rights for women is considered by many to be instrumental to women's empowerment. In the Mosuo tradition, property is collectively owned and inherited by all members of the family, whereas in Han Chinese tradition, property is only inherited by the sons, and in the Yi tradition, property is only inherited by the youngest son. These differences in inheritance norms across the cultures, however, are unlikely to produce the patterns in competitive inclination observed for two reasons. First, the collectivization of land under communist rule has decreased the importance of property inheritance in rural China, as compared with, say, India and African countries. Second, if we believe that those who stand to inherit the family wealth are more competitively inclined, perhaps because competitive inclination is related to a sense of entitlement, then we should see that men are more competitively inclined than women in the Han Chinese and Yi cultures, while gender differences in competitive inclination would be smallest among the Mosuo. On the other hand, if we believe that those who stand to inherit are the least competitively inclined because they are already provided for, then we would expect to see women more competitively inclined than men in the Han Chinese and Yi cultures, and gender differences in competitive inclination among the Mosuo would again be the smallest. Neither of these sets of predictions are borne out by the data.

Post-marital residence norms are another cultural factor widely acknowledged to impact parental investment in girls. A common saying in India, where patrilocality is prevalent, is that investing in your daughter is akin to "watering you neighbor's garden." While the Yi and Han women generally leave their natal household to live with her husband's family or clan, the Mosuo woman can expect to remain in her natal household her whole life. If we believe that those who have to break with their kinship network upon marriage are less likely to be competitively inclined,

because competitive inclination is predicated upon a sense of security, then we would expect to see women being less competitively inclined than men in the Han Chinese and Yi cultures and that the smallest gender difference would be found among the Mosuo. On the other hand, if we think that those who are the least secure are those who find it most necessary to be competitive, then we would expect to see the opposite pattern. Again, neither of these sets of predictions are corroborated by the data.

Although one cannot definitively conclude that matriliny plays no role in explaining the larger competitive inclination of the Mosuo women compared with the Yi women, given that Mosuo women enjoy the same autonomy as contemporary Han Chinese women, it stands to reason that if matriliny exerts an additional impact on competitive inclination (for example, through a different mechanism from the way government policies impact competitive inclination), then there would be an appreciable difference in competitive inclination between the Mosuo women and the Han Chinese women. In fact, they have the same competitive inclination.

8.3 Discrimination

Under the main mechanism proposed in this paper, labor market discrimination against minorities and women could lead to differences in competitive inclination across ethnicity-gender groups. If discrimination discourages competitive inclination, we would expect to see Han Chinese males to be the most competitive and Mosuo and Yi females to be the least competitive, being both minority and female. However, these predictions are clearly inconsistent with the data.

agricultural families, and therefore have greater competitive inclination. But Table 7 shows that the Han Chinese women and the Mosuo women have the same competitive inclination, regardless of the sector that their household head works in. There is a large difference for the Yi women, who are much less competitively inclined when they come from agricultural families. However, of the three ethnic groups, the Yi are the least likely to be affected by this mechanism due to their strict rules against marrying outside of their caste, let alone outside their ethnic group.

9 Discussion

In the last 60 years, radical communist reforms and policies have transformed Chinese society from one where women rarely stepped outside of the household to one where both men and women are expected to participate in the paid labor force. The gender differences in competitive inclination for the Yi, who were exempted in important ways from the communist gender egalitarian policies, are significantly larger than that for the Han Chinese, who exhibit no gender differences in competitive inclination, even though these subjects are attending the same high school. To the extent that the gender gaps in competitive inclination for the Yi are similar to that in the traditional Han Chinese society, the difference in gender gaps can be interpreted as the causal impact of cultural change on competitive inclination. As such this paper contributes to the literature on the effect of culture on preferences (see, for example, Guiso et al. 2003; Fernandez et al. 2004; Giuliano 2007; Fernandez and Fogli 2009; Alesina et al. 2011). It is also the first demonstration, to my knowledge, of the impact of a large scale, exogen2(ge(als()-359m0(o7694(cunowlsto)pulthe)-351

entry among male college students in the US and in Europe.

More broadly, in conjunction with related research showing that those less competitively in-

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Figure 1: Empirical CDFs of Compulsory Tournament Score by Ethnicity and Gender

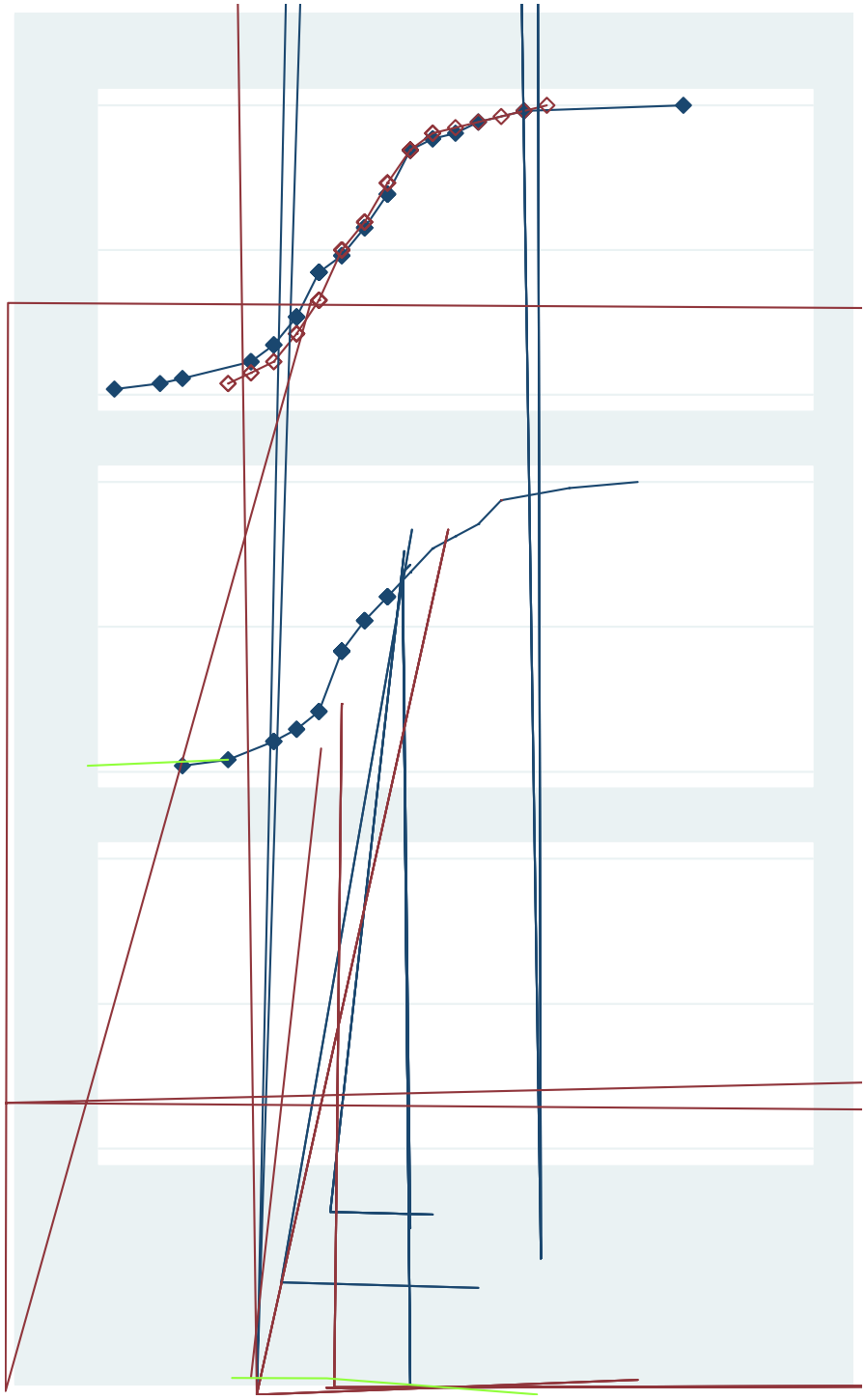


Figure 2: Improvement in Score from Piece-Rate to Tournament Round across Ethnicity, by Gender

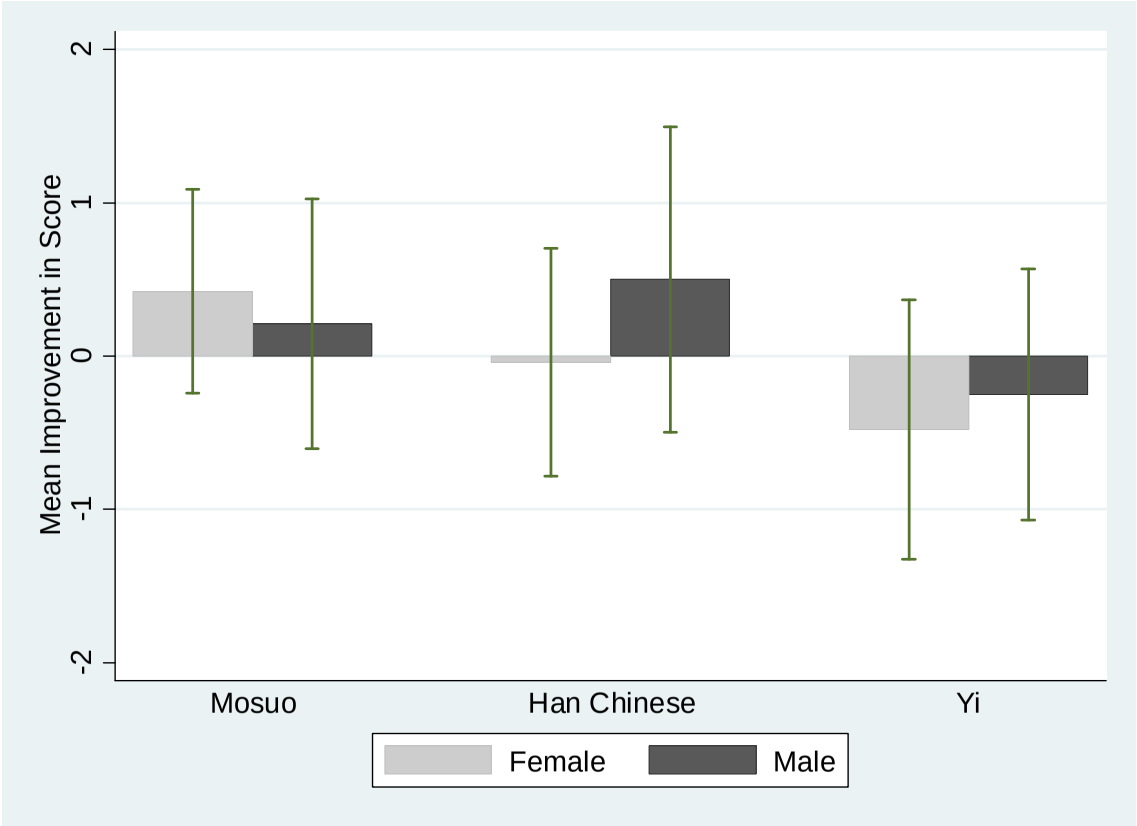


Figure 3: Distribution of the Probability of Winning the Discretionary Tournament across Ethnicity, by Gender

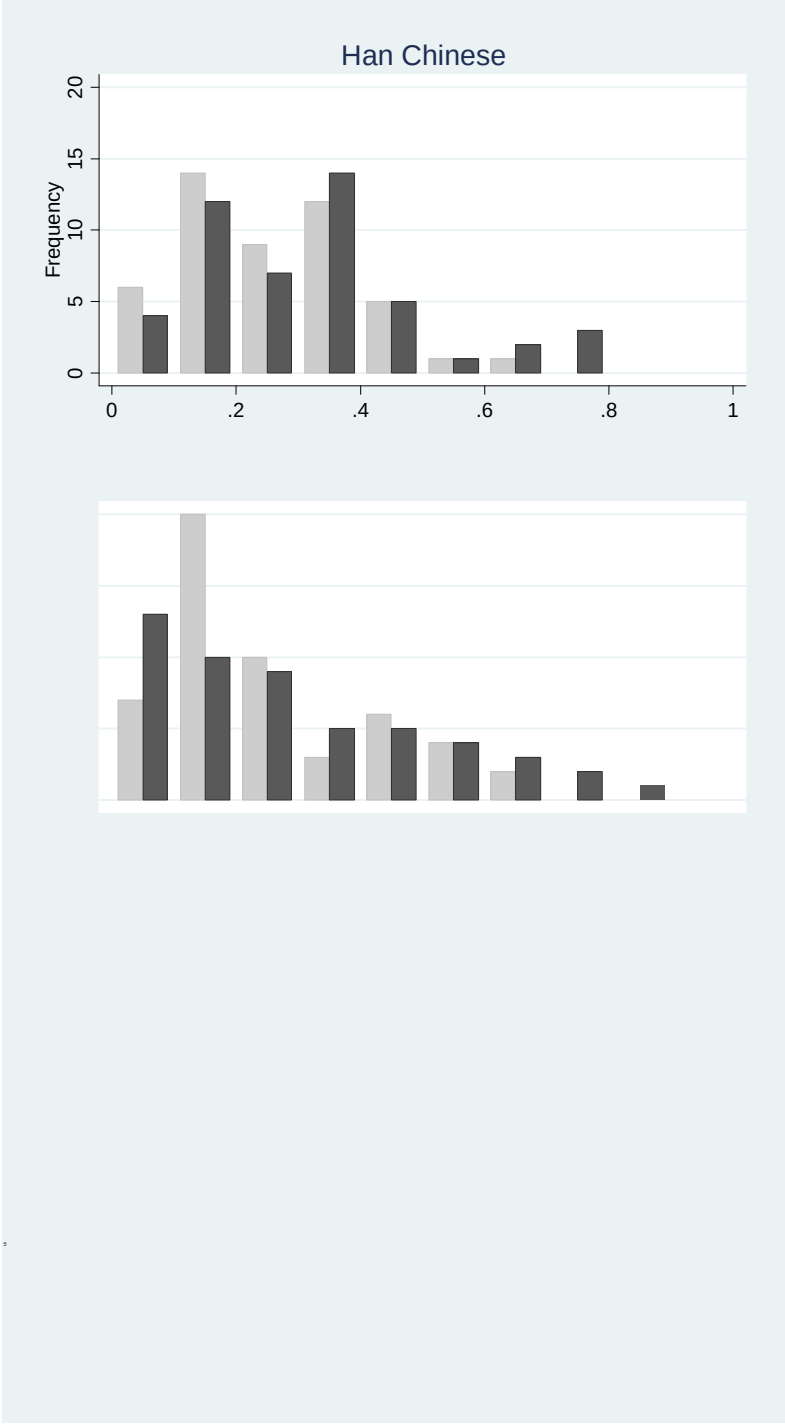


Figure 4: Distribution of the Proxy for Overconfidence

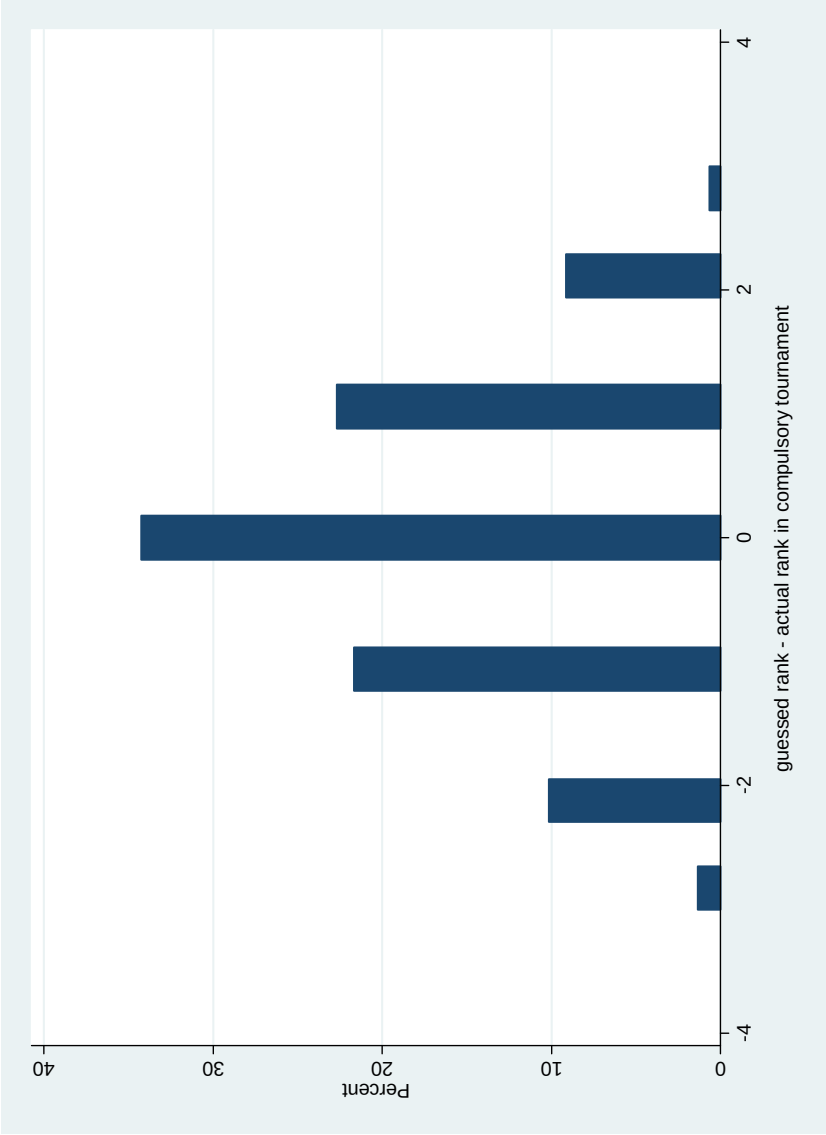


Figure 5: Distribution of the Proxy for Overconfidence across Ethnicity, by Gender

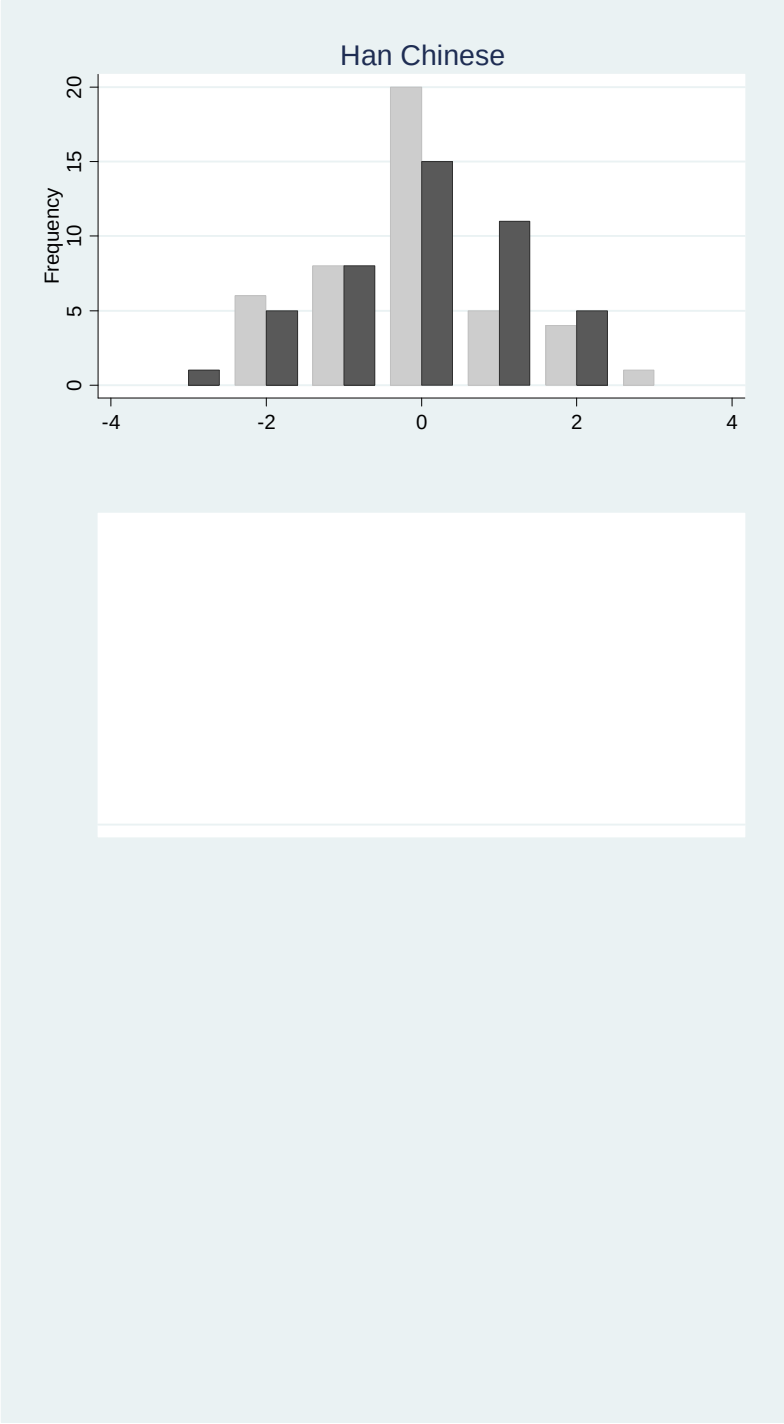
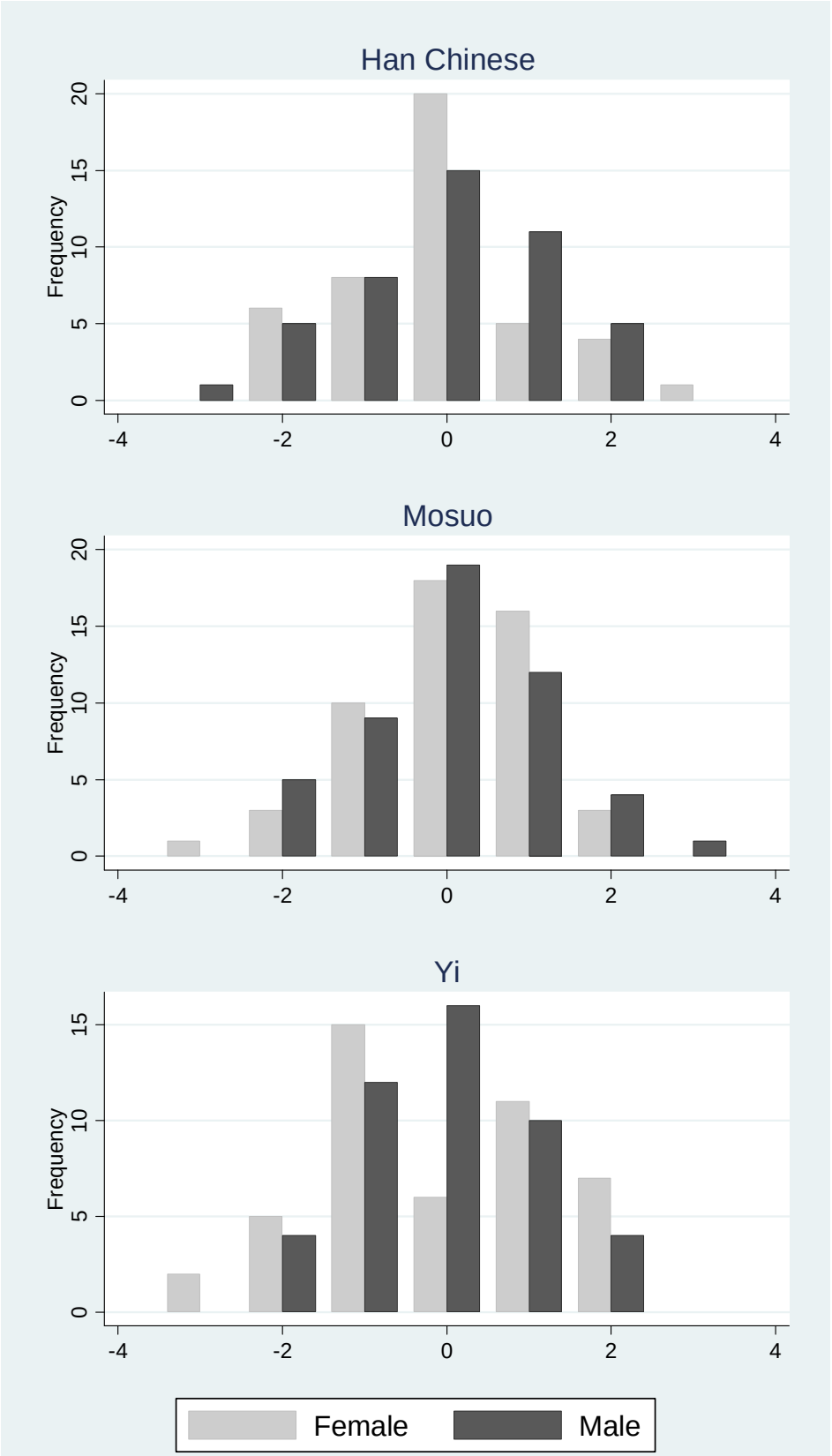


Figure 6: Distribution of Risk Choices with Associated CRRA Coefficients

Figure 7: Distribution of Risk Choices across Ethnicity, by Gender



Coefficient Key 0: -inf to 0; 1: 0 to 0.32; 2: 0.32 to 0.81; 3: 0.81 to 1.72; 4: 1.72 to 9.27; 5: 9.27 to inf

Table 1: Selected Descriptive Statistics (Standard Deviation in Parentheses)

Table 2: Raw Tournament Entry Statistics

	Female	Male	Gender Difference in Tournament Entry	p-value (2-sided t-test)[1]	Obs (Female)	Obs (Male)
[illegible]						
[illegible]						
Han (Chinese)	48%	63%	15%	.154	48	48
Mosuo (Chinese Matrilineal)	59%	73%	23%	.159	52	52
Yi (Chinese Patrilineal)	38%	60%	22%	.025	48	48
Total					148	148
[illegible]						
Niederle & Vesterlund (2007)						
United States	35%	73%	38%	.001	48	48
[illegible]						
Gneezy, Leonard, and List (2009)						
Maasai (Tanzanian Patrilineal)	26%	50%	24%	.004	34	48
Khasi (Indian Matrilineal)	54%	39%	-15%	.221	52	28
Total					86	68

[1] t-tests of reference study data were conducted usin

Table 3: Regressions of Tournament Entry on Gender and Controls, Separated by Ethnicity

[illegible]

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
a ese					
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			[illegible]	[illegible]	[illegible]
			[illegible]	[illegible]	[illegible]
[illegible]					[illegible]
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Y (pa ea)					
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	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
M s (a ea)					
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	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
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			[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Table 4: Risk Instrument

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Table 5: Regressions of Tournament Entry on Gender, Ethnicity and Interactions, Pooled across Ethnicity

Table 6: Regressions of Tournament Entry on Gender, Ethnicity and Interactions, Pooled across Ethnicity

Dependent Variable: Choose Tournament				
	(1)	(2)	(3)	(4)
male	0.047	0.049	0.040	0.035
	(0.060)	(0.053)	(0.052)	(0.056)
male*Yi	0.1 5*	0.211**	0.217**	0.216*
	(0.097)	(0.092)	(0.091)	(0.115)
Yi	0.1 7*	0.179	0.1 1*	0.172
	(0.113)	(0.119)	(0.109)	(0.121)
male* osuo	0.196**	0.211***	0.242***	0.277***
	(0.0 2)	(0.076)	(0.0 3)	(0.071)
osuo	0.025	0.043	0.071	0.112
	(0.109)	(0.105)	(0.096)	(0.0 1)
prob o innin tourn.	0.00 ***	0.007***	0.00 ***	0.007***
	(0.002)	(0.002)	(0.003)	(0.002)
risk aversion	0.024	0.029*	0.023	0.034**
	(0.015)	(0.015)	(0.015)	(0.015)
overcon idence	0.076***	0.076***	0.0 1***	0.0 4***
	(0.024)	(0.025)	(0.026)	(0.021)
rades (percentile)		0.004**	0.004**	0.005**
		(0.002)	(0.002)	(0.002)
School Fixed E ect	Yes	Yes	Yes	Yes
Demo raphic controls	No	No	Yes	Yes
SES controls	No	No	No	Yes
Observations	2 3	2 2	2 2	247
Lo likelihood	1 2.3	177.9	175.2	150.6
ean dep var	0.551	0.550	0.550	0.551

*** p<0.01, ** p<0.05, * p<0.10

ar inal e ects; robust standard errors in parentheses, clustered by session.

Probit re ression: dependent variable = 1 i subject chooses to enter competition, 0 other ise.

an Chinese and emale are omitted.

Demo raphic controls include a e, a e s uared, number o siblin s.

SES controls include education o household head and household income.

Table 7: Regressions of Tournament Entry on Gender, Sector, and Interaction, Separated by Ethnicity

A Appendix

The activities of the Mosuo in the Ninglang region were recorded in the Writings of the Later Han (Hou Han Shu) which covers the history of the Eastern Han dynasty, from 25 to 220 AD (Shih 2010: 36). The earliest Han Chinese in Ninglang were miners and craftsmen recruited to work on a silver mine during the reign of Emperor Qianlong (1736-1796 AD), as tombstone inscriptions indicate (NLYZZZXGKBXZ, 1985: 12). Most of these Han originated from Sichuan province. When the mine ceased operations in the early 1900s, the Han Chinese settled into the basin lands occupied by the Mosuo, and paid the Mosuo chieftains for use of the land (NLYZZZXGKBXZ, 1985: 12). Most of the Yi in Ninglang, according to their genealogies, are descendents of five clans of Yi from the Greater Cool Mountains in Sichuan Province who migrated to Ninglang during the reign of Emperor Daoguang (1820-1850 AD) (NLYZZZXGKBXZ, 1985: 10). The early Yi in Ninglang were probably driven out of Sichuan due to clan warfare but may also have been recruited by the silver mine to provide security (MZWTWZCSYNSBJWYH, 2009: 1-2).