The Family Origins of the Gender Gap in Competitiveness

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The family origins of the gender gap in competitiveness

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The gender gap in competitiveness predicts disparities in life outcomes, yet its origins remain unclear. We investigate whether the gap originates within the family by exploiting quasi-experimental variation in sibling presence and sibling sex composition. We combine this variation with an incentivized measure of competitiveness in two culturally distinct populations to identify their causal effects on the gender gap. In a representative U.S. sample (N = 2,471), first-born women with younger brothers are far less likely to compete than those with younger sisters—who compete as often as men—driving the gender gap. In China (N = 421), the gap appears only among cohorts born before the One-Child Policy, who grew up with siblings. In both samples, the gap is concentrated in households with traditional gender norms. Our findings point to gendered upbringing within the family as one origin of the gender gap in competitiveness.

Men are substantially more willing than women to enter into competitive environments, even when their chances of winning are similar[1–3]. This gender gap in competitiveness explains disparities in key life outcomes between men and women, including academic achievement, occupational choices, career advancement, and earnings[4–9]. Despite this, little is known about its origins. Evidence shows the gap appears early in life[10,11] and varies not only across societies[12–14] but also across families[15]. Though correlational, these patterns suggest that the origins of the gap may lie within the family. Consistent with this possibility, characteristics of the family environment have been linked to many of the same outcomes that competitiveness predicts. Specifically, sibling sex composition, i.e., the sex of one's siblings has been shown to affect earnings[16–18], as well as career and family choices[18,19]. Whether features of the sibling environment, including sibling presence and sibling sex composition, also shape the gender gap in competitiveness, however, remains an open question.

The idea that siblings shape the traits children develop goes back a century. Building on early work by Adler[20], an influential theory holds that siblings develop distinct traits as they compete for limited parental attention and resources[21]. In line with this, empirical evidence shows that growing up without siblings affects traits such as competitiveness and risk attitudes[22]. However, this literature has largely overlooked the possibility that sibling influences are gendered. If families socialize boys and girls differently, sibling presence could shape not just levels of competitiveness and risk tolerance, but also gender differences in these traits. Likewise, if sibling interactions are themselves gendered, sibling sex composition should also shape those gender differences. Research on sibling sex composition, however, has so far examined average effects on traits rather than gender differences in those traits[23,24]. Competitiveness provides a particularly useful setting in which to examine this hypothesis because it is strongly gender-typed[25], and parents appear to transmit competitive preferences differently to sons and daughters[26]. We later contrast our findings on competitiveness with those for risk attitudes, a trait that also exhibits a robust gender gap but which is less strongly associated with masculine gender norms[25,26].

To test whether sibling influences are gendered, we exploit quasi-experimental variation in sibling presence and sibling sex composition in two culturally distinct populations: a representative U.S. sample ($N = 2,471$) and a Chinese sample ($N = 421$). We hypothesize that the gender gap in competitiveness will differ between only children and children with siblings and, among the latter, vary with sibling sex composition. We further expect these differences to be most pronounced in households with traditional gender norms, where gendered socialization is likely to be stronger. These predictions are supported by evidence that parenting is gendered: parents exhibit preferences for sons[27], and raising boys and girls together appears to strengthen gender-differentiated parenting[19].

Identifying causal effects of the family environment is challenging because sibling presence and sibling sex composition may be correlated with parental resources, fertility preferences, and parenting practices. We therefore exploit two complementary sources of quasi-experimental variation. In the U.S. sample, we exploit the effectively random assignment of a younger sibling's sex among first-born individuals to identify the causal effect of having a younger brother rather than a younger sister. Restricting attention to first-borns eliminates bias arising from parental stopping rules[27], while the stable U.S. sex ratio at birth makes systematic sex selection unlikely[28,29]. Consistent with this identification strategy, first-borns with younger brothers and younger sisters are balanced on observable characteristics (Supplementary Information Table A.1).

In the Chinese sample, we exploit variation in sibling presence induced by the One-Child Policy, comparing individuals born shortly before and shortly after its introduction to estimate the causal effect of growing up without siblings on the gender gap in competitiveness. Whereas previous work has examined how the One-Child Policy affected average levels of traits such as competitiveness[22], we ask whether it altered the gender gap in competitiveness. Together, the U.S. and Chinese designs provide complementary tests of the causal effects of sibling sex composition and sibling presence on the gender gap in competitiveness. Although these designs identify whether sibling characteristics shape the gender gap, they do not by themselves reveal the underlying mechanism. To examine whether gendered upbringing explains the observed patterns, we rely on measures related to household gender norms in both studies—maternal labor force attachment in the U.S. sample and the use of childcare in the Chinese sample, each a proxy for household gender norms—and test whether sibling effects are stronger in more traditional households.

In both studies, competitiveness is measured using the standard incentivized tournament-entry paradigm[1], in which participants choose between a piece-rate payment and a tournament that pays more only if they outperform another participant. Choosing the tournament provides our measure of competitiveness. We also measure risk attitudes, a trait that also exhibits a robust gender gap[2,30] but is less strongly associated with masculine gender norms and gender-differentiated socialization[25,26], using established incentivized elicitation tasks. Comparing the effects of sibling presence and sibling sex composition across the two traits allows us to assess whether sibling influences are specific to competitiveness, as predicted by a gendered-upbringing account, or extend more broadly to another psychological trait.

Results

Sibling sex composition

We first examined whether the gender composition of siblings matters for gender differences in competitiveness, using a general-population U.S. sample (see Methods). We focused on first-born individuals—for whom a younger sibling's gender is effectively randomly assigned—and compared four groups: first-born women with a younger brother (denoted Fm), first-born women with a younger sister (Ff), first-born men with a younger brother (Mm), and first-born men with a younger sister (Mf). Our data also allow us to explore the effect of siblings' gender in larger families. In these families, identifying this effect is complicated when a family includes both younger brothers and younger sisters; we therefore consider families with more than two children in which all of the first-born's younger siblings share the same gender—all brothers or all sisters. Fm+ and Ff+ denote female participants who only have younger brothers or only have younger sisters, respectively; Mm+ and Mf+ denote the corresponding male participants. These comparisons isolate the effect of a younger sibling's gender on the first-born's competitiveness while holding birth order constant.

The results support a pronounced sibling-gender effect on women's competitiveness. Our main estimates come from probit regressions of the decision to compete as a function of participant gender and sibling composition, estimated on the first-borns whose younger siblings all share the same gender ($N = 421$), using sampling weights to ensure U.S.-representative estimates (Table 1); Models 4-6 additionally control for risk attitudes, confidence, and task performance, covariates to which we return below. The omitted category is first-born women who only have younger sisters

(Ff+), so the coefficient on Fm+, for example, captures the effect of having younger brothers rather than younger sisters on first-born women's competition entry. First-born women with younger brothers were significantly less likely to compete than the reference group (Fm+ coefficient = -0.192, $p < 0.001$, Model 1). First-born men's willingness to compete, in turn, was unaffected by a sibling's gender: the coefficients on Mm+ and Mf+ are small and not statistically significant (0.006 and -0.003, Model 1), indicating that men competed at similar rates whether their younger siblings were brothers or sisters—and at rates similar to those of women with younger sisters.

The raw data show the same pattern. In two-sibling families (Fig. 1a), first-born women with a younger brother (Fm) were far less likely to enter the competition than first-born women with a younger sister (Ff; difference 18.86 percentage points, test of proportions, $z = 2.249$, $p = 0.025$, N $= 135$), whereas men with a younger sister (Mf) competed just as often as those with a younger brother (Mm; difference: 0.0 percentage points, $z = 0.031$, $p = 0.975$, N $= 156$). Moreover, a first-born woman with a sister (Ff) was about equally likely to compete as a first-born man (differences of only 3.4–3.6 percentage points relative to men with a sister or a brother; $z = 0.405$, $p = 0.685$, N $= 147$ and $z = 0.423$, $p = 0.673$, N $= 137$). By contrast, first-born women with a younger brother (Fm) entered the competition 22.23 percentage points less often than first-born men with a younger sister (Mf; $z = 2.790$, $p = 0.005$, N $= 154$) and 22.48 percentage points less often than first-born men with a younger brother (Mm; $z = 2.742$, $p = 0.006$, N $= 144$).

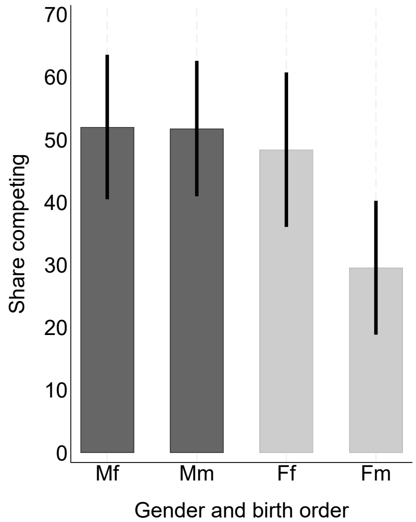
Fig. 1b displays the corresponding comparisons for the broader sample of larger families: the pattern is similar to that in two-sibling families. Women with younger brothers (Fm+) show a substantially reduced willingness to compete compared with women with younger sisters (Ff+) or

Table 1: Birth order, gender, and competitiveness: Probit regressions

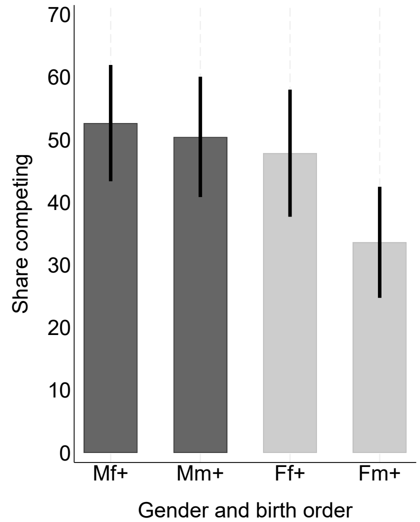
Sample	All participants	Low MLFA	High MLFA	All participants	Low MLFA	High MLFA
Model	(1)	(2)	(3)	(4)	(5)	(6)
Fm+	-0.192***	-0.290***	-0.055	-0.187**	-0.283***	-0.038
	(0.074)	(0.094)	(0.109)	(0.073)	(0.095)	(0.103)
Mm+	0.006	-0.056	0.054	-0.056	-0.104	-0.004
	(0.080)	(0.111)	(0.109)	(0.077)	(0.109)	(0.102)
Mf+	-0.003	-0.122	0.077	-0.062	-0.166	0.007
	(0.084)	(0.121)	(0.107)	(0.083)	(0.115)	(0.105)
Risk taking				0.031***	0.021	0.035***
				(0.010)	(0.015)	(0.013)
Confidence				0.003***	0.003*	0.004***
				(0.001)	(0.002)	(0.001)
Performance				0.001	-0.001	0.005
				(0.005)	(0.007)	(0.007)
Observations	421	190	231	421	190	231

Notes: The table shows marginal effects from a probit regression of competition entry on dummies for first-born female participants who only have younger brothers (Fm+), first-born male participants who only have younger sisters (Mf+), and first-born male participants who only have younger brothers (Mm+). The omitted category is female participants who only have younger sisters. Low and High MLFA split the sample by the mother's labor force attachment (see main text). ***,**,* indicate significance at the 1%, 5%, 10% levels.

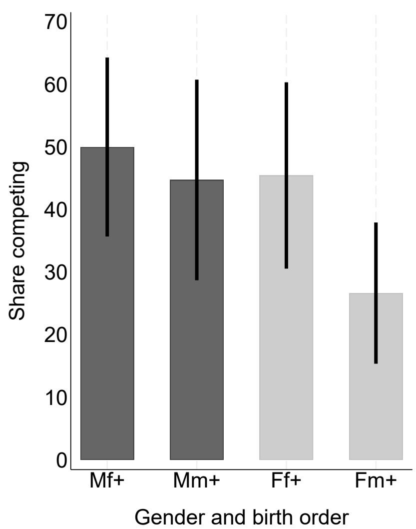
Figure 1: Birth order, gender, and competitiveness



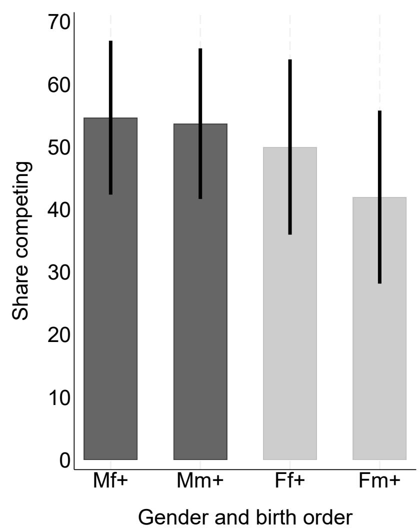
(a) Two-sibling families



(b) All families



(c) Low MLFA



(d) High MLFA

Note: Bars show the share of first-born participants who choose to compete. In the group codes, the first letter denotes the participant's gender (F = female, M = male) and the second the younger sibling's gender (f = sister, m = brother). Panel (a) presents two-sibling families: Mf denotes first-born men with a younger sister, Mm first-born men with a younger brother, Ff first-born women with a younger sister, and Fm first-born women with a younger brother. The share choosing to compete is substantially lower for women with a younger brother, whereas men with a younger sister show competition entry similar to that of women and men with a same-sex younger sibling. Panel (b) extends the sample to all families in which every sibling younger than the first-born is of the same gender: Fm+ and Ff+ denote female participants who only have younger brothers or only have younger sisters, respectively; Mm+ and Mf+ denote the corresponding male participants. The pattern mirrors Panel (a). Panels (c) and (d) show the same groups as Panel (b), restricting the sample by the mother's labor force attachment: Panel (c) presents participants whose mothers had low labor force attachment (Low MLFA) and Panel (d) participants whose mothers had high labor force attachment (High MLFA). The share choosing to compete is substantially lower for women with younger brothers only when mothers had low labor force attachment.

men (Mm+ and Mf+), whereas first-born men with sisters (Mf+) show competition levels similar to those of men with brothers (Mm+). The difference between women with younger brothers and women with younger sisters is 14.24 percentage points ($z = 2.067$, $p = 0.039$, N $= 204$); the difference between men with younger sisters and men with younger brothers is only 2.20 percentage points ($z = 0.324$, $p = 0.746$, N $= 217$).

We then examined whether the sibling-gender effect on competitiveness depends on the gender roles within the family. As a proxy for a household's gender-role attitudes, we categorized households by maternal labor force attachment (MLFA): whether the participant's mother worked outside the home for at least 15 of the first 20 years of the participant's life. The effect of having a brother (rather than a sister) on women's competitiveness was concentrated in traditional households where mothers had low labor force attachment: in regressions estimated separately by MLFA, the negative effect of younger brothers is large and significant for Low-MLFA mothers (Fm+ coefficient = -0.290, $p < 0.001$) but essentially zero for High-MLFA mothers (Fm+ = -0.055, $p = 0.58$; Table 1, Models 2 and 3).

The raw comparisons show the same contrast. Within the Low-MLFA subsample (Fig. 1c), first-born women with a brother competed 18.8 percentage points less often than first-born women with a sister ($z = 2.000$, $p = 0.047$, N $= 104$); relative to first-born men, their entry rate was lower by 18.1 points compared to men with a sister ($z = 1.844$, $p = 0.065$, N $= 98$) and by 23.3 points compared to men with a brother ($z = 2.495$, $p = 0.013$, N $= 108$). By contrast, no such gap emerged in more egalitarian households where the mother had high labor force attachment (Fig. 1d). In these families, first-born women with a younger brother competed at roughly the same rate as all other groups—only 8.0 percentage points less than women with a sister ($z = 0.803$, $p = 0.422$, N $= 100$), with similarly small, non-significant gaps relative to first-born men (differences of 11.7 and 12.7 points; $z = 1.256$, $p = 0.209$, N $= 117$; $z = 1.345$, $p = 0.179$, N $= 114$).

These findings suggest that household gender norms moderate sibling effects: in families where mothers adhered to a traditional role, daughters with younger brothers were less competitive, whereas in more gender-egalitarian families this effect disappeared. Consistent with this interpretation, participants' own gender-role attitudes reflect their upbringing. Supplementary Information Fig. A.2a shows that participants whose mothers had low labor force attachment tend to hold more traditional views on gender roles (for example, agreeing that mothers of young children should not work full-time), whereas those from high-attachment households express more egalitarian views. This intergenerational correlation is particularly strong for first-born women with one sibling (Supplementary Information Fig. A.2b)—the group at the center of our cleanest test of the sibling-gender effect—in line with the idea that the family's gender climate during childhood shapes competitive behavior in adulthood.

The analyses so far show that the gender composition of siblings causally affects women's willingness to compete. Several traits, however, may influence the decision to enter competition. The literature has identified gender differences in risk attitudes, in beliefs about one's own ability (confidence), and in ability itself as potential drivers of gender differences in the willingness to compete. A gender difference in a separate trait—participants' *preference for competition*, or *competitiveness*—has also been argued to matter for explaining gender differences in competition entry[1,31,32]. This preference is traditionally obtained as the residual gender difference in competition entry after regressing the willingness to compete on risk attitudes, performance beliefs, and actual performance. Even after accounting for risk, confidence, and ability, women with younger brothers remained significantly less competitive than the other groups: in Model 4, the indicator for first-born women with brothers (Fm+) is negative and highly significant (-0.187, $p < 0.005$). The sibling-gender effect thus extends to the underlying preference for competition, beyond what risk aversion or a lack of confidence can explain. The moderating influence of maternal labor force attachment persists in the fully controlled models (Table 1, Models 5-6): the sibling effect on competitiveness is pronounced only in traditional households. Analogous OLS regressions yield similar results (Supplementary Information Table A.2).

Finally, we found no corresponding sibling-gender effects among second-born participants (Supplementary Information Fig. A.1). A second-born daughter with an older brother, for instance, was about as likely to compete as a second-born daughter with an older sister (difference about 7 percentage points; $z = 0.808$, $p = 0.419$, N $= 129$), and second-born sons showed virtually no difference based on having an older sister vs. an older brother (difference about 1 percentage point; $z = 0.114$, $p = 0.909$, N $= 115$). These null results suggest that sibling composition alone does not account for the observed differences: the first-born's position in the family appears to matter as well, a point we return to in the Discussion.

Sibling presence

We next examined whether the presence of siblings itself matters for gender differences in competitiveness—for individuals who grow up without siblings, there is no sibling against whom gendered roles and expectations can be defined. Simply comparing only-children with children who have siblings does not answer this question, because the number of children in a family reflects parental choices: families that stop at one child may differ systematically—in resources, preferences, and expectations—from families that go on to have more. We therefore exploited China's One-Child Policy (OCP) as a natural experiment providing variation in sibling presence that does not stem from such choices. Our Chinese general population sample comprises 421 participants born just before the introduction of the OCP, when parents could still influence the number of children, and just after its introduction, when most families were restricted to having at most one child. Comparing randomly sampled participants born just before and just after the introduction of the OCP keeps the two groups close in age and similar in other characteristics relevant for competition entry, while they differ in whether they were affected by the OCP. This design allows us to identify the causal effect of growing up without siblings on the gender gap in competitiveness. Indeed, the introduction of the OCP had strong effects on sibling composition, significantly increasing the share of only-children and decreasing the average number of siblings (Supplementary Information Table A.3). As in the U.S. study, participants performed a math task, and their willingness to compete was measured by their choice between a piece rate and a tournament payment scheme.

Our main result is a sizable gender gap in competitiveness before the OCP and none after. Participants born before the OCP are naturally slightly older than participants born after (see again

Supplementary Information Table A.3), and the two groups differ in some other observable characteristics; in line with previous work[22], we therefore estimated probit models of competition entry controlling for education, parental education, and whether the participant was born in Beijing. We obtained a gender difference in competition entry of 13.5 percentage points before the reform (Table 2, Model 1; marginal effect $= 0.135$, $p = 0.043$) and an estimated difference of only 0.7 percentage points after the reform (Model 4; marginal effect $= -0.007$, $p = 0.922$). Analogous OLS regressions yield similar results (Supplementary Information Table A.4).

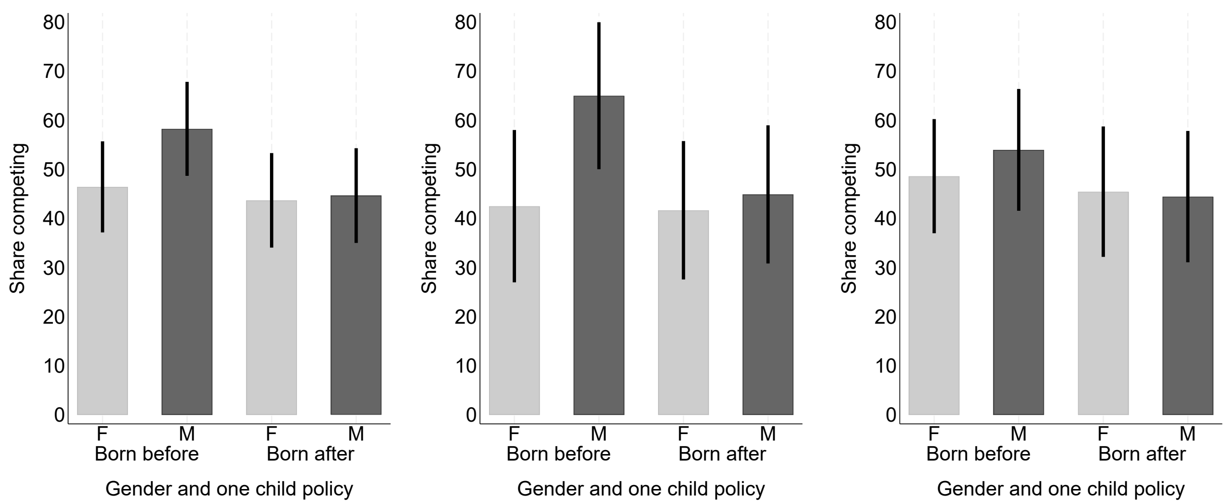
Table 2: Siblings, gender, and competitiveness: Probit regressions

	Before OCP			After OCP
	All participants	No childcare	Childcare	All participants
	(1)	(2)	(3)	(4)
Male	0.135**	0.277***	0.062	-0.007
	(0.067)	(0.105)	(0.087)	(0.069)
Observations	215	79	135	206

Notes: The table shows marginal effects from a probit regression of competition entry on a dummy for the participant being a man before and after the introduction of the OCP. We control for education, parental education, and whether the participant was born in Beijing[22]. Columns (2) and (3) split the pre-OCP sample by whether the participant attended formal childcare (see main text). ***,**,* indicate significance at the 1%, 5%, 10% levels.

The unadjusted comparisons, shown in Fig. 2a, mirror these estimates. Among participants who grew up before the policy (those born in 1975 or 1978), men were 11.82 percentage points more likely to enter the tournament than women ($z = 1.734$, $p = 0.084$, N $= 215$). The gap was larger and statistically significant in the cohort immediately preceding the policy: among participants born in 1978, men competed at a 23.61 percentage point higher rate than women ($z = 2.533$, $p = 0.011$, N $= 113$). By contrast, among participants born under the OCP in 1980, the gender gap in competitiveness was virtually zero (difference of about 0.7 percentage points, $z = 0.697$, $p = 0.486$, N $= 99$). In the combined post-OCP sample (1980 and 1983 births), the gender difference was 1.0 percentage point ($z = 0.140$, $p = 0.889$, N $= 206$). Growing up without siblings thus corresponded to no gender gap in competitiveness, whereas growing up with siblings produced a clear gender gap.

Figure 2: Siblings, gender, and competitiveness: Evidence from China's One-Child Policy



(a) All participants (b) No childcare (c) Childcare

Note: The figure shows the share of participants choosing the tournament among women (F) and men (M), separately for participants born before (Born before) and after (Born after) the introduction of the OCP. Panel (a) shows all participants: there is a clear gender gap in the willingness to compete among participants born before the OCP but none among those born after. Panel (b) shows participants who did not attend formal childcare; in this group the gender gap before the OCP is large. Panel (c) shows participants who attended formal childcare; in this group there is no significant gender gap.

We conducted additional analyses to assess whether the before-after contrast reflects factors other than the OCP. One concern is prenatal sex selection in the post-OCP era: following the policy, son-biased sex selection became more common and the male-to-female birth ratio in China rose[33,34]. This shift emerged mainly in the mid-to-late 1980s, after the cohorts we study, and therefore does not confound our comparison of the 1975/78 and 1980/83 cohorts. A second concern is anticipation of the policy: couples were urged to marry late, space births, and limit family size in the early 1970s, and China's total fertility rate had already decreased substantially before 1978[33,34]. Reassuringly, we continue to find evidence of a gender gap in competitiveness before the policy's introduction when we exclude participants born in 1978 who report being an only child as a result of the introduction of the OCP (test of proportions, $z = 1.790$, $p = 0.074$, $\mathrm{N} = 156$).

As in the U.S. sample, we examined how parental behavior shapes the formation of the gender difference in competitiveness. To do so, we used information on the labor force attachment of mothers, as measured by whether their child attended childcare. We split the pre-OCP participants by whether they spent more than 2.5 years in formal childcare during their first few years; this median split separates families in which the mother likely stayed home longer from families in which she returned to work or used childcare. The gender gap before the OCP was concentrated in families without formal childcare. In regressions estimated separately by childcare attendance, with the same covariates as above, the gender difference in competition entry is large and significant among participants who did not attend childcare but small and not significant among those who did (marginal effects $= 0.277$ and 0.062; Table 2, Models 2 and 3). The raw comparisons show the same pattern (Fig. 2b and Fig. 2c): among participants who did not attend childcare, men were 22 percentage points more likely to compete than women ($z = 2.018$, $p = 0.044$, $\mathrm{N} = 80$), whereas in families where children spent more time in external care, there was no significant gender gap

($z = 0.621$, $p = 0.535$, N $= 135$). After the OCP, when most participants grew up as only-children, it made little difference whether a child had attended childcare: virtually no gender gap emerged in the post-policy cohorts either way. This suggests that selection effects—differences between families that did and did not use childcare—are unlikely to explain the pre-OCP results.

Having established a causal relationship between sibling presence and the gender gap in competitiveness, we can ask whether a similar pattern appears in the U.S. sample, where we lack an analogous natural experiment. A simple, exploratory comparison by family size yields a consistent picture: participants with at least one sibling show a pronounced gender difference in competitiveness, whereas participants with no siblings do not (Supplementary Information Fig. A.3). Men from multi-child families were about 9.47 percentage points more likely to compete than women ($z = 4.495$, $p < 0.001$, N $= 2,245$), but among only-children there was essentially a 0% gender gap (0.92 percentage points, test of proportions, $z = 0.138$, $p = 0.890$, N $= 226$). Because parents have partial influence on the number of children, this comparison does not allow for a causal interpretation. It is notable, however, that the magnitude of the gender gap in multi-sibling families (on the order of 9–10 percentage points) is similar to that observed in the pre-OCP Chinese cohort, despite the very different cultural context. This convergence suggests that gender gaps in competitiveness emerge in the presence of siblings and shrink or vanish when a child grows up without siblings.

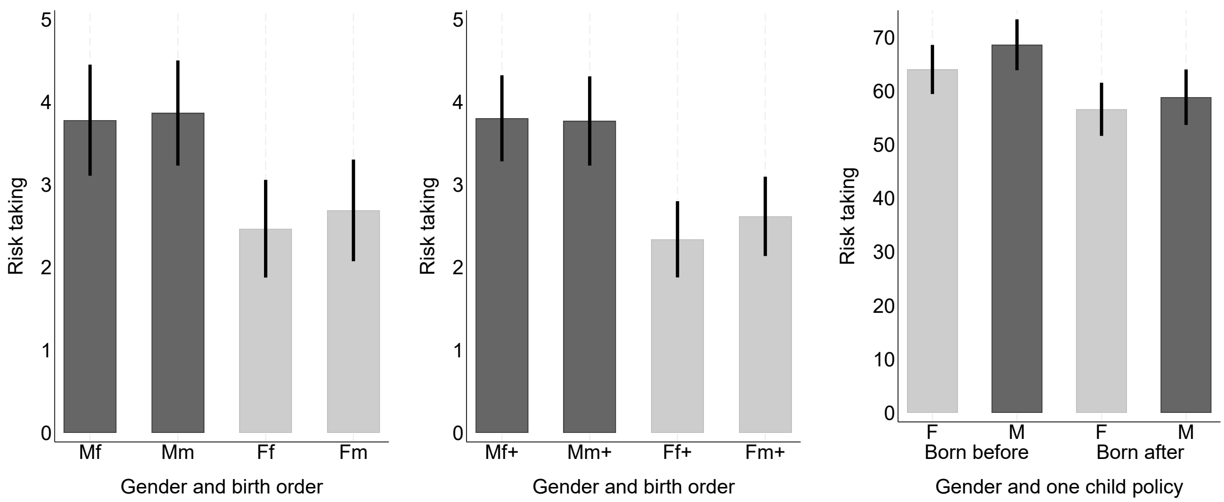
Finally, paralleling the U.S. analysis, we examined whether the preference for competition—net of risk and confidence—was also affected by the OCP. In the Chinese data, the gender gap in competition entry largely vanishes once we control for risk preferences. When we include performance and confidence as controls (but not risk), a sizable gender effect remains; adding risk attitudes as a regressor renders the male-female coefficient non-significant, suggesting that men's greater risk-taking propensities explained their higher tournament entry in the pre-OCP sample. In the U.S. sample, by contrast, the sibling-related gap in competitiveness persists after accounting for risk and confidence: among participants with siblings, a significant gender gap of about 7.9 percentage points remains ($p = 0.002$), whereas among only-children the adjusted gap is only 3.1 points and not significant ($p = 0.696$).

Risk attitudes

Having shown that the presence and gender of siblings shape the gender gap in the willingness to compete, we turned to our benchmark trait: risk attitudes. In both the U.S. and Chinese samples, participants completed incentivized risk-elicitation tasks (see Methods). The question is not whether gender differences in risk taking exist; such differences are well documented[2,30], and indeed Fig. 3a shows a sizable overall gap between men's and women's risk taking in the U.S. sample. The question is whether the same family conditions bear on the gender gap in risk attitudes. We found no evidence that sibling gender composition shaped risk attitudes. The risk attitudes of first-born women with a younger sister did not differ significantly from those of first-born women with a younger brother (difference: 2.2, $t = 0.507$, $p = 0.613$, N $= 135$), nor did first-born men's risk attitudes differ by the gender of their younger sibling (difference: 0.08, $t = 0.184$, $p = 0.855$, N $= 156$). This null finding held for larger families as well (Fig. 3b) and in regressions analogous to those for competitiveness: the coefficient for first-born women with younger brothers (Fm+) is small and not statistically significant (Supplementary Information Tables A.5 and A.6). We likewise found no significant differences among second-born participants (differences of 0.13 for women and 0.78 for men, $p = 0.734$ and $p = 0.142$; Supplementary Information Fig. A.4). In short, unlike competitiveness, sibling gender composition had no observable influence on risk preference formation.

China's One-Child Policy provides a second test, comparing individuals who grew up as only-children with those who grew up with siblings. Fig. 3c shows the gender difference in risk taking for the cohorts born before and after the introduction of the OCP. Men invested slightly

Figure 3: Siblings, gender, and risk taking



(a) U.S.: two-sibling families (b) U.S.: all families (c) China: before and after the OCP

Note: The figure shows participants' risk taking in both samples. Panels (a) and (b) display the U.S. sample, where risk taking is measured by the lottery choice (see Methods). Panel (a) presents two-sibling families: Fm refers to female participants who have a younger brother; Ff refers to female participants who have a younger sister; Mf refers to male participants who have a younger sister; Mm refers to male participants who have a younger brother. The willingness to take risks varies by gender but not with the gender of the second-born sibling. Panel (b) shows families with more than two siblings: Fm+ and Ff+ refer to female participants who only have younger brothers or sisters, respectively; Mf+ and Mm+ refer to male participants who only have younger sisters or brothers, respectively. The results are similar to our findings for participants with one sibling. Panel (c) displays the Chinese sample: the amount invested out of 100 yuan, for women (F) and men (M), separately for participants born just before (Born before) and after (Born after) the introduction of the OCP. The gender gap in risk taking appears similar in both cohorts.

more than women both before (difference: 4.61, $t = 1.369$, $p = 0.172$, N $= 215$) and after the policy (difference: 2.26, $t = 0.619$, $p = 0.537$, N $= 206$), but neither gap was statistically significant; regressions with the same covariates as before yield the same conclusion (Supplementary Information Table A.7). Similarly, in the U.S. sample we found no evidence that growing up with or without siblings affected the male–female difference in risk preferences (Supplementary Information Fig. A.5).

Taken together, these results indicate that the influence of the family conditions we study is specific to competitiveness. Siblings' presence and gender shaped the gender gap in the willingness to compete, but we found no corresponding shifts in risk attitudes: men's greater risk taking was relatively stable across family environments, with no significant contrast between only-children and participants with siblings or between participants with opposite-sex and same-sex siblings. This asymmetry is what the gendered-upbringing account predicts: a trait typed as masculine and transmitted differently to sons and daughters bears the family's imprint, while one that is neither does not.

Discussion

We hypothesized that competitiveness is subject to gendered upbringing within the family, so that the gender gap in competitiveness should depend on the family environment in which children grow up—on whether they have siblings, on those siblings' gender, on their own position in the birth order, and on the values their parents hold. Each of these features mattered, though not uniformly. In the U.S. sample, first-born women with younger brothers were substantially less likely to enter competition than first-born women with younger sisters, whereas men's competition entry was unaffected by the gender of their younger siblings; the effect was concentrated in households with low maternal labor force attachment and was not observed among second-borns. In China, we documented a pronounced gender gap in competitiveness before the introduction of the OCP and the absence of this gap after its implementation. We found no corresponding effects on risk attitudes in either sample. Our causal claims rest on the effectively random assignment of a younger sibling's gender and on the variation in sibling presence induced by the OCP.

What can explain this pattern of results, and in particular why the arrival of a younger brother matters for first-born women while a younger sibling's gender leaves men unaffected? We propose that the driving force is a change in the first-born's status within the family[20,21], and specifically how that change depends on gender. In households with traditional gender roles, parents may treat one child as the family's achiever, the one expected to compete and to carry the family's ambitions, and reserve that role for a son even when he is not the first-born. A first-born daughter may initially hold this role, but when a brother arrives she moves, in effect, from heir to spare: parental expectations shift to her brother, and the family environment may begin to discourage rather than encourage her competitiveness[25]. What matters, on this account, is the change in status, and the asymmetries in our results follow from who can lose it. First-born women can: a brother's arrival displaces them. First-born men cannot: a younger sister would not be assigned the role, and a younger brother arrives to find it already filled. Second-borns never held it to begin with. And first-born women with younger sisters, who keep the role, indeed competed at rates similar to men's. The account also explains why the effect is concentrated in traditional households, where the achiever role is most likely to be assigned by gender, and why it is specific to competitiveness:

the role at stake carries the mandate to compete, and competitive behavior is practiced, rewarded, or discouraged within the sibling pair, whereas taking risks involves neither the role nor a rival. Consistent with this, the effect of a younger brother persisted after accounting for risk attitudes, confidence, and performance: what is discouraged appears to be the preference for competition itself.

The same logic extends to only children: with no sibling to whom parental expectations could shift, the family's ambitions rest on the only child regardless of gender, and no gender gap should emerge. That is what we observe in the post-OCP cohorts in China and among only-children in the U.S. sample. Independent evidence points the same way: parents in the United States have been found to favor sons[27]; parents' choices on their children's behalf generate a gender gap in competition entry[26]; and women who grew up with brothers make more gender-conforming choices and earn less, in part because parents lower their educational expectations of daughters once a son arrives[17,19].

Our account assigns the leading role to parents. Classic theories of sibling influence, in which children shape one another directly, fit our results less well[?]: if children took on the traits of an opposite-sex sibling[?], a younger brother should, if anything, raise his sister's competitiveness, the opposite of what we find; and if siblings differentiated themselves from one another to reduce rivalry[?], the divergence should be strongest between same-sex siblings, whereas the effect we document arises in opposite-sex pairs.

Household values are central to this account, and the moderation patterns bear this out: in both samples, the gender gap in competitiveness is more pronounced in households with low maternal labor force attachment, our proxy for traditional gender norms, consistent with gendered upbringing operating most strongly where traditional norms prevail. The absence of corresponding effects on risk attitudes likewise aligns with past studies that find no evidence that the gender gap in risk attitudes is shaped by the social environment[24,35].

Our results also offer a cautionary tale: the same observed outcome—a gender difference in a trait—may emerge through different mechanisms. Men are generally found to be both more risk-seeking and more competitive than women, yet these gaps need not share an origin. The contrast we document is less about nature versus nurture than about the role of the family: the gender gap in competitiveness widened and narrowed with sibling composition and household gender norms, whereas the gap in risk attitudes was insensitive to the same family conditions. In the terms of our framework, the competitiveness gap aligns with an environmental account centered on gendered upbringing within the family, while the sources of the risk gap—whether dispositional or environmental—appear to lie largely outside the family.

We conclude that gendered upbringing within the family contributes to the gender gap in competitiveness. Given the pervasiveness of gender differences in many life outcomes, their potentially high costs, and the documented role of competitiveness in shaping these outcomes, policies targeting gender norms appear promising. Future research should extend our design to traits that vary in how strongly they are gender-typed, and pair it with direct measures of parental expectations, parental investment, and sibling interaction in childhood. Such evidence would map the family conditions under which gender gaps emerge across traits and clarify how far environmental accounts of these differences reach.

Methods

Study 1

Procedures. We conducted an incentivized online experiment in the United States in collaboration with YouGov. The sample was drawn using stratified quotas to ensure representativeness along race/ethnicity (four categories), gender, age (four categories), education (four categories), political views (2016 Presidential vote choice), and region. Quotas for gender, age, race, and education were interlocked, and YouGov provided post-stratification weights. Eligible participants were between 25 and 55 years of age.

A total of 2,471 individuals completed the study in January to February 2021. On average, participation lasted 20 minutes. Participants received a completion fee of $1.50 and, in addition, earned an average of $7.30 from the incentivized tasks.

The study complied with all relevant ethical regulations and was approved by the Institutional Review Board at NYU Abu Dhabi. Informed consent was obtained from all participants.

Competitiveness. Competitiveness was measured using a variant of an established paradigm[1]. Each participant completed three tasks, one of which was randomly selected for payment to prevent hedging across tasks. In each task, participants counted the number of “1”s in matrices filled with 0s and 1s. Each task lasted 75 seconds. Participants viewed one matrix at a time, received no accuracy feedback during the task, and learned the rules of each task only immediately beforehand. Table 3 summarizes the three tasks. In Task 1 (Piece Rate), participants received 1 point per correct answer. In Task 2 (Tournament), participants’ earnings depended on their performance relative to another participant with whom they were randomly matched: they received 2 points per solved table if they solved more tables than the other participant, and 0 points if the other participant solved more tables than them. In case of a tie, the computer randomly selected who received 2 points per solved table and who received 0 points. In Task 3 (Choice), before performing the task, participants selected whether to be paid according to a piece rate, receiving 1 point for each table solved irrespective of the performance of others, or a tournament, receiving 2 points per table solved if they solved more tables than a randomly chosen other participant, and no points otherwise. Points were converted into monetary amounts paid after completion of the experiment. The choice participants made in Task 3 is our measure of competitiveness. This measure is predictive of behavior outside experimental settings and can help account for gender differences in educational choices and earnings[3,4,7,8,36].

Table 3: Elicitation of competition preferences

Task 1	Piece Rate	1 point per table independent of performance of others
Task 2	Tournament	2 points per table if more than random other participant, 0 otherwise
Task 3	Choice	Choice between Piece Rate and Tournament

Note: The table shows the experimental design used to measure participants' competitiveness.

Beliefs about relative performance were elicited after Task 2 (the tournament condition): participants estimated how many out of 100 other participants outperformed them. Participants' guesses were incentivized based on a linear payment scheme: they received \$8 if their guess differed by 1 or 2 from the actual number, \$7 if their guess differed by 3 or 4 from the actual number, and so on.

Risk taking. Risk preferences were measured using a standard lottery-choice task. Participants were presented with nine lotteries, each offering two equally likely outcomes that differed in expected value and variance. Participants had to choose one of them. If this task was selected for payment, the outcome of the two payments associated with the chosen lottery was determined randomly by the computer.

As shown in Table 4, expected values increased by 1.5 across lotteries (except Lottery I, where the increase was 0.5), while the standard deviation also increased. Thus, the selected lottery provides a measure of risk preference: very risk-averse participants sacrifice expected value to minimize variance (choosing earlier lotteries), whereas risk-neutral individuals maximize expected value (choosing Lottery I). This measure is well established, has been cited extensively[37], and correlates with risk-taking behavior outside the lab[38].

Table 4: Elicitation of risk preferences

	Probability		EV	Risk
	1/2	1/2		(SD)
Lottery A	8	8	8	0
Lottery B	12	7	9.5	2.5
Lottery C	16	6	11	5
Lottery D	20	5	12.5	7.5
Lottery E	24	4	14	10
Lottery F	28	3	15.5	12.5
Lottery G	32	2	17	15
Lottery H	36	1	18	17.5
Lottery I	37	0	18.5	18.5

Note: The table shows the experimental design used to measure participants' risk preference.

Other measures. We also collected detailed participant information. First, we obtained variables about the participant's family background: parental educational attainment, sector of work, and the parents' ages at the participant's birth. We also elicited whether the participant's mother stopped working when they were born, whether their parents divorced, the employment status of their mother during their childhood, and, as described in the main text, the number of years their mother worked during the first 20 years of their life.

Second, we elicited a measure of (injunctive) gender norms: participants' responses to the question "Do you think that women with children under school age should work outside the home?”

Third, we collected a large set of individual characteristics. These included information on the participant’s personal background, such as age, education, income, migration status, political orientation, importance of religion, marital status, sexual orientation, and number of children. They also covered labor market status, including working experience, employment status, and industry and occupation of work.

Study 2

Procedures. The data for Study 2 were collected by Cameron et al.[22] using a pen-and-paper experimental design. Participants were born in 1975, 1978, 1980, or 1983, that is, shortly before or shortly after the introduction of the OCP. Gender balance was maintained within each cohort. While the sample was somewhat more educated than the general population, other demographic characteristics were broadly representative.

Competitiveness. Competitiveness was measured by asking participants to add up as many sets of five two-digit numbers as possible within 5 minutes. Calculators were prohibited, but participants were allowed to use scrap paper.

Participants chose between two payment schemes. Under the piece rate payment scheme, they received 5 yuan for every correct solution. Under the competitive compensation scheme, they were randomly paired with another participant and were paid 10 yuan for every correct solution if they completed more sums correctly than their partner, and 0 yuan otherwise.

Risk taking. Risk taking was measured with an investment task. Participants received 100 yuan (approximately U.S. $15) and could invest any amount. The investment had a 50% chance of tripling the invested amount and a 50% chance of yielding nothing. The choice was incentivized and outcomes were determined by a coin flip.

Other measures. A large set of other variables was collected. For details, see the manuscript and supplementary material of the original study[22].

Reporting. We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the studies. Neither study was preregistered.

1. Niederle, M. & Vesterlund, L. Do women shy away from competition? do men compete too much? *The Quarterly Journal of Economics* **122**, 1067–1101 (2007).

2. Croson, R. & Gneezy, U. Gender differences in preferences. *Journal of Economic Literature* **47**, 448–74 (2009). URL https://www.aeaweb.org/articles?id=10.1257/jel.47.2.448.

3. Niederle, M. A gender agenda: a progress report on competitiveness. *American Economic Review* **107**, 115–119 (2017).

4. Buser, T., Niederle, M. & Oosterbeek, H. Gender, competitiveness, and career choices. *The Quarterly Journal of Economics* **129**, 1409–1447 (2014).

5. Buser, T., Peter, N. & Wolter, S. C. Gender, competitiveness, and study choices in high school: Evidence from switzerland. *American Economic Review: Papers & Proceedings* **107**, 125–30 (2017).

6. Buser, T., Niederle, M. & Oosterbeek, H. Can competitiveness predict education and labor market outcomes? evidence from incentivized choice and survey measures (2021). NBER Working Paper No. 28916, National Bureau of Economic Research.

7. Dariel, A., Ham, J. C., Nikiforakis, N. & Stoop, J. Disparities in psychological traits and income: Race, ethnicity, and gender in the us. Tech. Rep., IZA Discussion Papers (2024).

8. Reuben, E., Wiswall, M. & Zafar, B. Preferences and biases in educational choices and labour market expectations: Shrinking the black box of gender. *The Economic Journal* **127**, 2153–2186 (2017).

9. Reuben, E., Sapienza, P. & Zingales, L. Overconfidence and preferences for competition. *The Journal of Finance* **79**, 1087–1121 (2024).

10. Sutter, M. & Glätzle-Rützler, D. Gender differences in the willingness to compete emerge early in life and persist. *Management Science* **61**, 2339–2354 (2015).

11. Andersen, S., Ertac, S., Gneezy, U., List, J. A. & Maximiano, S. Gender, competitiveness, and socialization at a young age: Evidence from a matrilineal and a patriarchal society. *Review of Economics and Statistics* **95**, 1438–1443 (2013).

12. Gneezy, U., Leonard, K. L. & List, J. A. Gender differences in competition: Evidence from a matrilineal and a patriarchal society. *Econometrica* **77**, 1637–1664 (2009).

13. Palacios-Huerta, I. Competitiveness among nandi female husbands. *Proceedings of the National Academy of Sciences* **119**, e2117454119 (2022). URL https://www.pnas.org/doi/abs/10.1073/pnas.2117454119. https://www.pnas.org/doi/pdf/10.1073/pnas.2117454119.

14. Hauge, K. E., Kotsadam, A. & Riege, A. Culture and Gender Differences in Willingness to Compete. *The Economic Journal* **133**, 2403–2426 (2023). URL https://doi.org/10.1093/ej/uead033. https://academic.oup.com/ej/article-pdf/133/654/2403/50955145/uead033.pdf.

15. Almås, I., Cappelen, A. W., Salvanes, K. G., Sørensen, E. Ø. & Tungodden, B. Willingness to compete: Family matters. *Management Science* **62**, 2149–2162 (2016).

16. Butcher, K. F. & Case, A. The Effect of Sibling Sex Composition on Women's Education and Earnings*. *The Quarterly Journal of Economics* **109**, 531–563 (1994). URL https://doi.org/10.2307/2118413. https://academic.oup.com/qje/article-pdf/109/3/531/5202913/109-3-531.pdf.

17. Cools, A. & Patacchini, E. The brother earnings penalty. *Labour Economics* **58**, 37–51 (2019). URL https://www.sciencedirect.com/science/article/pii/S0927537119300156.

18. Peter, N., Lundborg, P., Mikkelsen, S. & Webbink, D. The effect of a sibling's gender on earnings and family formation. *Labour Economics* **54**, 61–78 (2018).

19. Brenøe, A. A. Brothers increase women's gender conformity. *Journal of Population Economics* **35**, 1859–1896 (2022).

20. Adler, A. Characteristics of the first, second, and third child. *Children* **3**, 14–52 (1928).

21. Sulloway, F. J. *Born to rebel: Birth order, family dynamics, and creative lives.* (Pantheon Books, 1996).

22. Cameron, L., Erkal, N., Gangadharan, L. & Meng, X. Little emperors: behavioral impacts of china's one-child policy. *Science* **339**, 953–957 (2013).

23. Detlefsen, L., Friedl, A., Lima de Miranda, K., Schmidt, U. & Sutter, M. Are economic preferences shaped by the family context? the relation of birth order and siblings' gender composition to economic preferences. *Journal of Risk and Uncertainty* **69**, 1–31 (2024).

24. Dudek, T., Brenøe, A. A., Feld, J. & Rohrer, J. M. No evidence that siblings' gender affects personality across nine countries. *Psychological Science* **33**, 1574–1587 (2022).

25. Prentice, D. A. & Carranza, E. What women and men should be, shouldn't be, are allowed to be, and don't have to be: The contents of prescriptive gender stereotypes. *Psychology of Women Quarterly* **26**, 269–281 (2002).

26. Tungodden, J. & Willén, A. When parents decide: Gender differences in competitiveness. *Journal of Political Economy* **131**, 751–801 (2023).

27. Dahl, G. B. & Moretti, E. The demand for sons. *The review of economic studies* **75**, 1085–1120 (2008).

28. Mathews, T., Hamilton, B. E. *et al.* Trend analysis of the sex ratio at birth in the united states. *National vital statistics reports* **53**, 1–17 (2005).

29. Almond, D. & Edlund, L. Son-biased sex ratios in the 2000 united states census. *Proceedings of the National Academy of Sciences* **105**, 5681–5682 (2008).

30. Eckel, C. C. & Grossman, P. J. Men, women and risk aversion: Experimental evidence. *Handbook of Experimental Economics Results* **1**, 1061–1073 (2008).

31. van Veldhuizen, R. Gender Differences in Tournament Choices: Risk Preferences, Overconfidence, or Competitiveness? *Journal of the European Economic Association* **20**, 1595–1618 (2022). URL https://doi.org/10.1093/jeea/jvac031. https://academic.oup.com/jeea/article-pdf/20/4/1595/45349289/jvac031.pdf.

32. Lozano, L. & Reuben, E. Measuring preferences for competition (2023). NYUAD Working Paper, NYU Abu Dhabi.

33. Kane, P. & Choi, C. Y. China's one child family policy. *Bmj* **319**, 992–994 (1999).

34. Whyte, M. K., Feng, W. & Cai, Y. Challenging myths about china's one-child policy. *The China Journal* 144–159 (2015).

35. Sutter, M., Kocher, M. G., Glätzle-Rützler, D. & Trautmann, S. T. Impatience and uncertainty: Experimental decisions predict adolescents' field behavior. *American Economic Review* **103**, 510–531 (2013).

36. Dariel, A. & Nikiforakis, N. *Is There a Motherhood Gap in the Willingness to Compete for Pay?: Evidence from the Netherlands, the UAE and the USA* (New York University Abu Dhabi, 2022).

37. Friedman, D., Habib, S., James, D. & Williams, B. Varieties of risk preference elicitation. *Games and Economic Behavior* **133**, 58–76 (2022).

38. Dohmen, T. *et al.* Individual risk attitudes: Measurement, determinants, and behavioral consequences. *Journal of the European Economic Association* **9**, 522–550 (2011).

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Data availability The data supporting the findings of this study will be made available from the corresponding author upon reasonable request.

Code availability Analysis code is available from the corresponding author upon reasonable request.

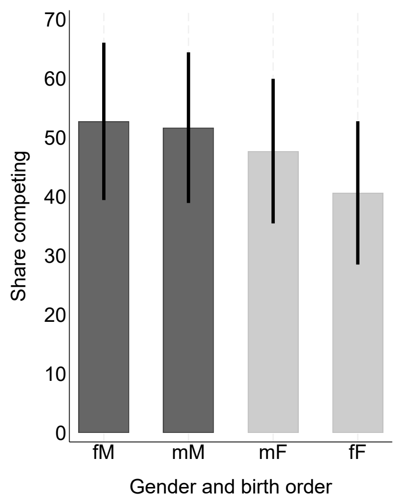
Author contributions [To be completed by the authors — CRediT format: conceptualization, methodology, formal analysis, writing.]

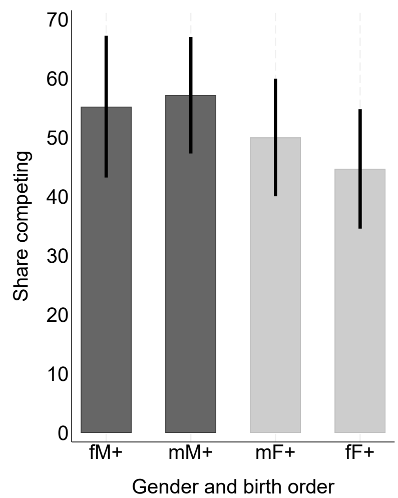
Competing interests [To be completed by the authors — e.g., "The authors declare no competing interests."]

Supplementary Information

A Additional figures and tables

Figure A.1: Birth order, gender, and competitiveness: Second-born participants

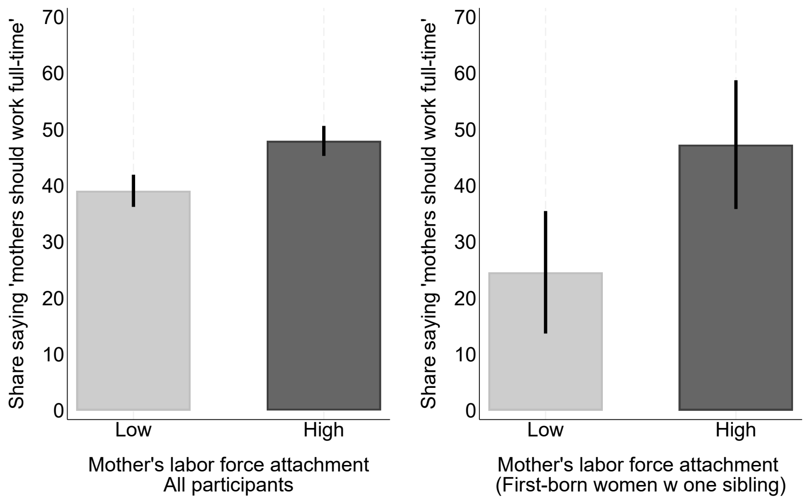




(a) Two-sibling families (b) All families

Note: The figure shows the share of second-born participants who choose to compete. Panel (a) presents the results for two-sibling families. mF refers to female participants who have an older brother; fF refers to female participants who have an older sister; fM refers to male participants who have an older sister; mM refers to male participants who have an older brother. We observe no significant differences among second-born participants. Panel (b) shows the results for families with more than two siblings. mF+ refers to female participants who only have brothers; fF+ refers to female participants who only have sisters; fM+ refers to male participants who only have sisters; mM+ refers to male participants who only have brothers. The results mirror the two-sibling case.

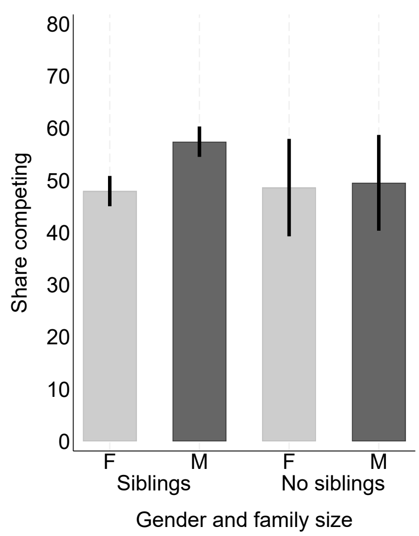
Figure A.2: Labor force attachment and gender norms



(a) All participants (b) First-born women, one sibling

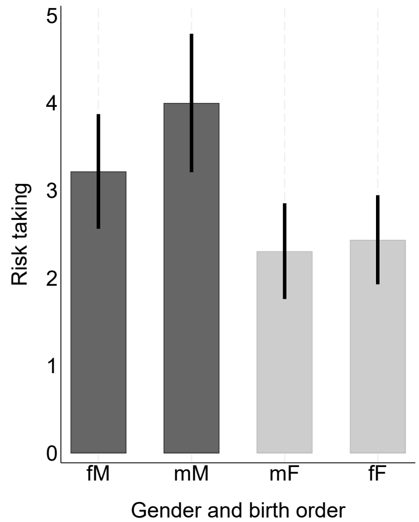
Note: The figure shows the share of participants who agree that women with children under school age should work full-time (the survey question is quoted in Methods), split by the mother's labor force attachment: Low, our proxy for more traditional household gender norms, and High, our proxy for more liberal gender norms. Panel (a) shows all participants; Panel (b) shows first-born women with one sibling.

Figure A.3: Siblings, gender, and competitiveness: Evidence from the U.S.



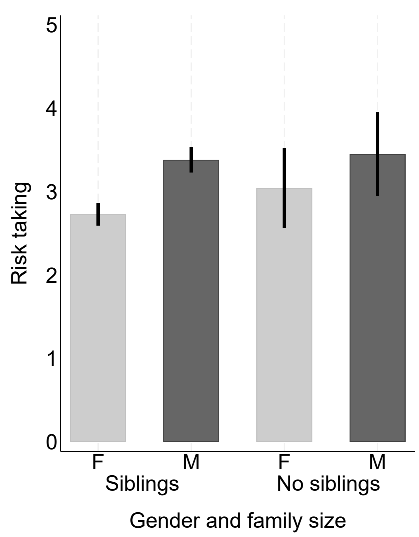
Note: The figure shows the share of U.S. participants who choose to compete, for women (F) and men (M), separately for participants who grew up with siblings (Siblings) and for only-children (No siblings). We observe a clear gender gap among participants with siblings and no gender gap among only-children.

Figure A.4: Birth order, gender, and risk taking: Second-born participants



Note: The figure shows the risk taking of second-born participants. mF refers to female participants who have an older brother; fF refers to female participants who have an older sister; fM refers to male participants who have an older sister; mM refers to male participants who have an older brother. We observe no significant differences among second-born participants (difference for women: 0.13, $p = 0.734$; difference for men: 0.78, $p = 0.142$).

Figure A.5: Siblings, gender, and risk taking: Evidence from the U.S.



Note: The figure shows the average risk taking of U.S. participants, as measured by their lottery choice (see Methods), for women (F) and men (M), separately for participants who grew up with siblings (Siblings) and for only-children (No siblings). Men take somewhat more risk in both groups; the gender gap is similar for participants with and without siblings.

Table A.1: Balancedness of covariates: Study 1

	Fm+	Ff+	Mm+	Mf+	Δ
Age	41.11	39.63	41.21	40.34	0.524
Education	0.68	0.65	0.66	0.65	0.949
Father education	0.69	0.61	0.71	0.63	0.307
Mother education	0.64	0.51	0.69	0.70	0.020
MLFA	0.45	0.53	0.57	0.64	0.491
Siblings	1.51	1.43	1.44	1.25	0.041
Task Performance	8.10	8.12	8.55	7.83	0.232
N	110	94	112	105	421

Notes: Columns (1) to (4) show averages and shares for our main variables for first-born participants, by gender and sibling composition. Column (5) displays the p-values from χ^2 tests for the categorical variables and from F-tests for the continuous variables. Participants are similar with respect to most individual characteristics. Notably, first-born women with brothers tend to have more siblings than first-born men with sisters.

Table A.2: Birth order, gender, and competitiveness: OLS regressions

Sample	All participants	Low MLFA	High MLFA	All participants	Low MLFA	High MLFA
Model	(1)	(2)	(3)	(4)	(5)	(6)
Fm+	-0.192**	-0.295***	-0.056	-0.188**	-0.293***	-0.037
	(0.076)	(0.102)	(0.112)	(0.075)	(0.105)	(0.106)
Mm+	0.006	-0.062	0.054	-0.055	-0.113	-0.003
	(0.082)	(0.123)	(0.111)	(0.079)	(0.121)	(0.104)
Mf+	-0.003	-0.133	0.077	-0.061	-0.178	0.014
	(0.087)	(0.133)	(0.108)	(0.086)	(0.128)	(0.107)
Risk taking				0.032***	0.022	0.035***
				(0.010)	(0.015)	(0.012)
Confidence				0.003***	0.003*	0.004***
				(0.001)	(0.002)	(0.001)
Performance				0.001	-0.000	0.005
				(0.005)	(0.007)	(0.007)
Constant	0.527***	0.527***	0.527***	0.551***	0.591***	0.493***
	(0.057)	(0.084)	(0.078)	(0.123)	(0.160)	(0.181)
Observations	421	190	231	421	190	231

Notes: The table shows results from OLS regressions of competition entry on dummies for first-born female participants who only have younger brothers (Fm+), first-born male participants who only have younger sisters (Mf+), and first-born male participants who only have younger brothers (Mm+). The omitted category is female participants who only have younger sisters. Low and High MLFA split the sample by the mother's labor force attachment (see main text). ***,**,* indicate significance at the 1%, 5%, 10% levels.

Table A.3: Balancedness of covariates: Study 2

	Before OCP	After OCP	Δ
Single-child	0.46	0.86	< 0.001
No of siblings	0.71	0.16	< 0.001
Being the first born	0.15	0.03	< 0.001
Age	33.12	28.17	< 0.001
Education	0.41	0.30	0.026
Mother education	0.17	0.17	0.963
Father education	0.23	0.23	0.927
Being from Beijing	0.92	0.84	0.013
N	221	207	430

Notes: Column (1) shows averages and shares for our main variables for participants born before the introduction of the OCP. Column (2) displays these values for participants born after the introduction of the OCP. Column (3) shows the p-values from t-tests and tests of proportions for the continuous and categorical variables, respectively.

Table A.4: Siblings, gender, and competitiveness: OLS regressions

	Before OCP			After OCP
	All participants	No childcare	Childcare	All participants
	(1)	(2)	(3)	(4)
Male	0.134*	0.284**	0.060	-0.010
	(0.070)	(0.122)	(0.090)	(0.070)
Constant	0.255	0.187	0.126	0.344
	(0.186)	(0.300)	(0.256)	(0.224)
Observations	215	80	135	206

Notes: The table shows coefficients from an OLS regression of competition entry on a dummy for the participant being a man, before and after the introduction of the OCP. We control for education, parental education, and whether the participant was born in Beijing (cf.[22]). Columns (2) and (3) split the pre-OCP sample by whether the participant attended formal childcare (see main text). ***,**,* indicate significance at the 1%, 5%, 10% levels.

Table A.5: Birth order, gender, and risk taking: Probit regressions

	All participants	Low MLFA	High MLFA
Model	(1)	(2)	(3)
Fm+	-0.020	0.020	-0.057
	(0.056)	(0.082)	(0.075)
Mm+	0.168***	0.268***	0.104
	(0.060)	(0.100)	(0.074)
Mf+	0.032	-0.025	0.070
	(0.067)	(0.105)	(0.085)
Observations	421	190	231

Notes: The table shows marginal effects from a Probit regression of risk taking on dummies for first-born female participants who only have younger brothers (Fm+), first-born male participants who only have younger sisters (Mf+), and first-born male participants who only have younger brothers (Mm+). The omitted category is female participants who only have younger sisters. Low and High MLFA split the sample by the mother's labor force attachment (see main text). ***,**,* indicate significance at the 1%, 5%, 10% levels.

Table A.6: Birth order, gender, and risk taking: OLS regressions

	All participants	Low MLFA	High MLFA
Model	(1)	(2)	(3)
Fm+	0.343	0.536	0.281
	(0.376)	(0.515)	(0.558)
Mm+	1.400***	1.992***	0.951*
	(0.405)	(0.581)	(0.558)
Mf+	1.230***	0.777	1.449**
	(0.442)	(0.664)	(0.567)
Constant	2.425***	2.068***	2.706***
	(0.267)	(0.390)	(0.364)
Observations	421	190	231

Notes: The table shows results from an OLS regression of risk taking on dummies for first-born female participants who only have younger brothers (Fm+), first-born male participants who only have younger sisters (Mf+), and first-born male participants who only have younger brothers (Mm+). The omitted category is female participants who only have younger sisters. Low and High MLFA split the sample by the mother's labor force attachment (see main text). ***,**,* indicate significance at the 1%, 5%, 10% levels.

Table A.7: Siblings, gender, and risk taking: OLS regressions

	Before OCP	After OCP
	(1)	(2)
Male	4.981	0.506
	(3.358)	(3.684)
Constant	62.034***	70.080***
	(8.971)	(11.720)
Observations	215	206

Notes: The table shows results from an OLS regression of risk taking on a dummy for the participant being a man, before and after the introduction of the OCP. We control for education, parental education, and whether the participant was born in Beijing (cf.[22]). ***,**,* indicate significance at the 1%, 5%, 10% levels.