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Women's Empowerment, Sibling Rivalry, and Competitiveness

Evidence from a Lab Experiment and a Randomized Control Trial in Uganda

Niklas Buehren
Markus Goldstein
Kenneth Leonard
Joao Montalvao
Kathryn Vasilaky

WORLD BANK GROUP
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Abstract

This study looks at how a community event—adolescent women's economic and social empowerment—and a family factor—sibling sex composition—interact in shaping gender differences in preferences for competition. To do so, a lab-in-the-field experiment is conducted using competitive games layered over the randomized rollout of a community program that empowered adolescent girls in Uganda. In contrast with the literature, the study finds no gender differences in competitiveness among adolescents, on average. It also finds no evidence of differences in competitiveness between girls in treatment and control communities, on average. However, in line with the literature, in control communities the study finds that boys surrounded by sisters are less competitive. Strikingly, this pattern is reversed in treatment communities, where boys surrounded by (empowered) sisters are more competitive.

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Women's Empowerment, Sibling Rivalry, and Competitiveness: Evidence from a Lab Experiment and a Randomized Control Trial in Uganda*

Niklas Buehren Markus Goldstein Kenneth Leonard

Joao Montalvao Kathryn Vasilaky†

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† Buehren: World Bank [nbuehren@worldbank.org]; Goldstein: World Bank [mgoldstein@worldbank.org]; Leonnard: University of Maryland [kleonard@arec.umd.edu]; Montalvao: World Bank [jmontalvao@worldbank.org]; Vasilaky: Columbia University [katyav@iri.columbia.edu]

1. Introduction

Gender differences in preferences for competition have emerged as a possible explanation for why men and women experience different labor market outcomes [Bertrand 2011]. Contributing to this view, a large experimental literature documents that women are on average less competitive than men [Niederle and Vedsterlund 2007, 2011], and a few recent studies indicate that gender differences in preferences for competition measured in the lab predict gender differences in important education and labor market outcomes outside the lab [Buser *et al.* 2014, Reuben *et al.* 2015a, 2015b].

A growing body of evidence provides a richer picture. These studies highlight the importance of environmental factors such as cultural norms, family experiences, age, and the gender composition of the environment in shaping gender differences for competition [e.g. Gneezy *et al.* 2009, Booth and Nolen 2012, Cardenas *et al.* 2012, Andersen *et al.* 2013, Cameron *et al.* 2013, Zhang 2015, Okudaira *et al.* 2014, Khachatryan *et al.* 2015, Almås *et al.* 2015]. For example, Gneezy *et al.* [2009] document that gender differences in competitiveness depend on cultural and social norms. While the authors find that men are more competitive than women among the patriarchal Masai in Tanzania, they also find that women compete more than men among the matrilineal Khasi in India.

These findings point towards the importance of nurture in shaping gender differences in competitiveness, and thus to the potential role of carefully designed human capital interventions in reducing these differences. Yet rigorous evidence on which specific interventions can achieve this is nonexistent. We examine this issue with a lab-in-the-field experiment layered over a randomized control trial of a community program that empowers adolescent girls in Uganda. The program successfully empowered girls along economic and social dimensions, and shifted deep rooted social and gender norms in communities randomly assigned to the program. In this paper we look at whether the program also made girls more competitive.

We also study how a key family environmental factor – sibling sex composition – interacts with the program in shaping preferences for competition. Gender is about dynamic relations. Thus when girls are empowered we might expect boys who interact with them to respond differently. These interactions take place in different institutional settings, starting in the family. Previous research has documented the importance of sibling composition in shaping preferences for competition [Cameron *et al.* 2013, Okudaira *et al*. 2015]. In particular, Okudaira *et al*. [2015] show that having sisters is associated with reduced competitiveness for men in urban Japan.[1] In this paper we examine how these sibling dynamics vary with a community-level exogenous shift in adolescent girls' empowerment.

[1] The psychology literature has long highlighted the importance of sibship sex composition in personality development. In particular, research starting with Kock [1955] and Brim [1958] has documented that boys surrounded by sisters tend to substitute 'masculine' with 'feminine' traits.

We present four main findings. First, in contrast with the literature, we find that adolescent girls and boys in Uganda compete at similar levels. Second, we also do not find evidence that the empowerment effects of the program on girls were accompanied by increased competitiveness. Third, in line with previous evidence we document that having sisters, relative to brothers, is associated with a lower willingness to compete for boys in control communities. Fourth, strikingly, this pattern is reversed in treatment communities. There, we find that boys surrounded by (empowered) sisters are more willing to engage in competitive behavior.

The paper is organized as follows. Section 2 outlines the program and its impacts in order to sketch some of the theoretical background motivating the analysis. Section 3 describes the data and the lab-in-the field experimental design. Section 4 presents the results. Section 5 concludes.

2. Background and Theoretical Context

The Empowerment and Livelihood for Adolescents (ELA) program in Uganda, implemented by the NGO BRAC, provides adolescent girls with training on 'hard' vocational skills to help them successfully transition into the labor market, and on 'soft' life skills to enable girls to make informed choices about sex, reproduction and marriage. The program is delivered from development adolescent clubs, which are open five afternoons per week after school, and are led by a local female mentor. Participation is voluntary for girls aged between 14 and 20. To date BRAC has started 1,505 clubs in Uganda which have reached 70,000 girls.

Bandiera *et al.* [2015] evaluate the ELA program in Uganda using a randomized control trial methodology. The study took place in the urban or semi-urban regions of Kampala and Mukono, and the mostly rural region around Iganga and Jinja. The research design delivered 100 treatment and 50 control communities. Each treatment community hosted an ELA club. A baseline survey was administered just before the establishment of the clubs to about 6,000 adolescent girls, 4,000 (2,000) of whom resided in treatment (control) communities. A first follow-up survey took place in 2010. Bandiera *et al.* [2015] show that within two years the ELA program successfully empowered girls along several economic and social dimensions.[2] We list these impacts below in more detail in order to understand how they could translate into increased competitiveness for girls. We then discuss how these impacts could interact with sibling sex composition in shaping boys' competitiveness.

2.1. Women's Empowerment and Competitiveness

There are at least two possible channels through which the program could foster competitiveness for girls. The first channel operates through the program's impact on economic empowerment. Bandiera *et*

[2] As club participation is voluntary, both Bandiera *et al.* [2015] and our analysis focus on intent-to-treat impacts.

al. [2015] show that the program accelerated girls' transition into the labor market. Specifically adolescent girls in treatment communities were significantly more likely to be self-employed relative to girls in control communities. This effect was accompanied by significant increases in girls' entrepreneurial ability as well as reductions in self-reported anxieties related to transition into the labor market. In light of the evidence that preferences for competition are an important determinant of success in the labor market [Buser *et al.* 2014, Zhang 2014, Flory *et al.* 2015, Berge *et al.* 2015, Buser *et al.* 2015, Reuben *et al.* 2015a, 2015b], it is thus plausible that increased competitiveness could have acted as an additional mechanism through which the program improved girls' economic empowerment.

The second channel operates through the program's impact on social empowerment. Bandiera *et al.* [2015] show that the program significantly improved the quality of girls' control over their bodies and views on gender norms. Specifically the program reduced early childbearing, early marriage and having had sex unwillingly for adolescent girls in treatment communities relative to girls in control communities. These results were accompanied by a significant shift in girls' adherence to prevailing gender norms as measured by their views on gender roles, early childbearing, early marriage and desired fertility. To the extent that girls in control communities might shy away from competitive situations because this is what is expected from them under traditional gender norms [Akerlof and Kranton 2000, Bertrand 2011], it is thus possible that by relaxing the psychological pressure of these norms the program increases competitiveness for girls in treatment communities.

2.2. Sibling Sex Composition and Competitiveness

Why could sisters affect their brothers' preferences for competition, and why could the program affect that relationship? We provide possible theoretical underpinnings drawing on literatures from both economics and psychology, and again organize the discussion along the economic and social empowerment impacts of the program.

First, the program could affect the influence of sisters on their brothers' competitiveness through its economic empowerment impacts. To see why it is useful to extend the standard intra-household framework of sibling competition over limited parental resources [Becker and Lewis 1973]. Parents allocate resources across children based on returns to investment and these returns are affected by economic opportunities outside the household. In Uganda, sons are strongly valued, as families traditionally adhere to patrilineal inheritance and patrilocal residence customs. Boys surrounded by (non-empowered) sisters in control communities might thus be less used to competition over scarce resources [Garg and Morduch 1998, Morduch 2000], and choose to compete less.[3] But the program raises the marginal return from investing in daughters in treatment communities. As a result, boys

[3] In Uganda, a girl cannot succeed her father, and when she marries she leaves her village and produces children for another clan. In more traditional communities, girls thus are thought to have little value as children [Beyeza-Kashesya *et. al* 2010].

surrounded by (empowered) sisters in treatment communities might raise their competitiveness in response to increased sibling rivalry over parental resources.[4]

Second, the program might also affect the influence that sisters have on their brothers' competitiveness through its social empowerment impacts. By challenging prevailing gender norms, the program might have threatened boys' sense of traditional male identity [Akerlof and Kranton 2000]. This is particularly true for boys with relatively more sisters, as they are more likely to be indirectly exposed to the program. This gender identity threat can trigger an opposing response aimed at restoring the damaged self-image [Bénabou and Tirole 2011]. If being competitive is part of the male identity under traditional gender norms, boys surrounded by sisters in treatment communities can subsequently become more competitive as a form of cognitive dissonance reduction.

3. Sampling and Lab Experimental Design

3.1. Sampling

The participants in our experiment were randomly drawn from the sampling frame of households surveyed by Bandiera *et al.* [2015], stratified to include both control and treatment communities for the randomized control trial impact evaluation of the ELA program. A total of 700 adolescents participated in the experiment, 40 percent of whom came from control communities and 60 percent from treatment communities. About 55 percent of the participants were girls, both in treatment and control groups.

At the end of each experimental session, participants completed a short exit survey asking basic background socio-demographic related questions such as their age, education, marital status, and whether they have any children. The survey also contains sibling sex composition information on participants, namely the number of brothers and sisters they have. Table 1 presents summary statistics on these characteristics for the full sample of participants and separately for girls and boys in control and treatment communities.

Four points are of note. First, participants in our experiment are in their late adolescence and early adulthood: the average participant is 17 years old, and just under 80 percent are aged 14-21 years (not shown). The bulk of the participants are thus past the critical puberty age around which gender differences in competitiveness have been documented to arise elsewhere [Andersen *et al.* 2014]. Second, the average participant has 2.6 sisters and 2.7 brothers. This large family size is in line with the fact that Uganda has one of the highest fertility rates in the world, and it provides us with enough

[4] The notion that sibling rivalry can help shape personality traits has been extensively hypothesized in the psychology literature [Sulloway 1966]. While our lab experiment takes place only two-years post-intervention, the psychology literature also documents that new behaviors in one setting quickly shape preferences over behaviors in other settings [Breer and Locke 1965].

variation in the data to estimate the effect of sibling sex composition on participants' competitiveness.[5] Third, there are no systematic treatment-control differences along observable dimensions, both among girls and boys. This is consistent with the evidence in Bandiera *et al.* [2015] documenting that the random assignment of the program successfully balanced treatment and control groups. Fourth, girls differ from boys along some observable background characteristics. Namely, girls are more likely than boys to be out of school, to be married, and to have children. Girls also have on average more siblings than boys. In the main empirical analysis it will thus be important to account for these observable differences between girls and boys when measuring gender differences in competitiveness.

3.2. Design

We implemented the experimental protocol of Niederle and Vesterlund [2007]. The experimental task consists of successfully ordering six eight-sided building blocks with various shapes (square, circle, star, etc.) on each side from smallest to largest in 3 minute rounds. The relative location of the shapes on each of the six blocks is different, and the order of the blocks for one shape (e.g. star) differs for the order of the blocks for all other shapes (e.g. circle, square, triangle). Participants were then paid based on the number of shapes they ordered in the 3 minutes.

There were four different experimental rounds, and participants were paid for one of the four selected at random. Participants were first anonymously matched in groups of four (they do not know who else was in their group, nor were group members present in the room). In round 1, participants were paid 400 Ugandan Shillings (UGX) for each correctly completed set of shapes (uncompetitive piece-rate). In round 2, the participant in the group who ordered the greatest number of shapes in the group received four times the piece-rate payment, or 1,600 UGX per set, while the other participants received no payment (competitive tournament).[6] In round 3, participants first chose the compensation scheme (either piece-rate or tournament), and then performed the task. They were told that if they chose to compete then their performance would be compared against their group's round 2 performances. In round 4, there was no task, and participants simply had to choose whether they prefer their past round 1 performance to be paid under the piece-rate or the tournament compensation scheme. If they chose the latter, their performance was compared against the round 1 performances of the other participants in the group. At the end, all participants were asked their beliefs about their relative performance in rounds 1 and 2, and were paid 100 UGX for each correct guess.

The outcome of interest in this experiment is the choice of compensation scheme in round 3 (uncompetitive piece-rate versus competitive tournament), from which we identify participants' preferences for competition. The first two rounds serve to familiarize participants with the task under

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[5] Uganda has the fifth highest fertility rate in the world [https://www.cia.gov/library/publications/the-world-factbook/rankorder/2127rank.html].

[6] At the time our experiment took place (November, 2011) a 1 USD was worth roughly 2500 UGX.

each payment scheme, but most importantly to control for any possible differences in ability. The choice in round 4 serves to control for the influence of factors that may affect willingness to compete other than a pure preference to perform under a competitive environment, such as risk-aversion, feedback-aversion, and self-confidence [for a detailed discussion see Niederle and Vesterlund 2007].

4. Results

4.1. Descriptive Evidence

Table 2 presents descriptive evidence on the experimental results to preview our main findings on the impact of the program on gender differences in competitiveness. The first row focus on the choice of compensation scheme in round 3, the key outcome of interest. We see that tournament entry does not vary significantly by gender and treatment status. In control communities, 36 percent of both girls and boys choose to compete (Columns 2 and 3). In treatment communities, 33 percent of girls and 37 percent of boys make this choice (Columns 4 and 5). These small differences are not statistically significant (Columns 6-9). The lack of gender differences in tournament entry in our setting is in sharp contrast with Niederle and Versterlund [2007]. In their setting, conducted using university students in the United States, they found that 35 percent of women and 73 percent of men choose to experience competition (a statistically significant difference).

The remainder rows of Panel B of Table 1 focus on performance in rounds 1 and 2, the decision to submit past performance in round 1 to a tournament, and whether the participant is confident about having ranked first in round 1 (relative to the other participants in the same session). These variables capture factors that could drive a gender gap in tournament entry other than a gender difference in competitiveness, such as ability, risk and feedback aversion, and overconfidence [see Niederle and Versterlund 2007]. Two points are of note. First, overall these experimental controls are balanced between treatment and control communities, for both boys and girls. The exception is confidence, where we see that both girls and boys in treatment communities are more likely to believe to have ranked first than in control communities. Second, these experimental controls are also balanced by gender, in both control and treatment communities. Taken together with the notion that these different controls could also influence the decision to compete, this is consistent with the evidence that girls and boys are equally likely to compete in both control and treatment communities.

4.2. Women's Empowerment and Competitiveness

We now present regression evidence on the impact of the program on gender differences in competitiveness. This allows us to check whether the above descriptive evidence is robust to the inclusion of experimental controls and observable socio-demographic characteristics. To do so we estimate the following specification using a linear probability model (LPM):

$$y_{ic} = \alpha + \beta_1 girl_{ic} + \beta_2 treat_c + \beta_3[girl_{ic} \times treat_c] + \boldsymbol{\beta}'_{\boldsymbol{X}}\boldsymbol{X}_{ic} + \boldsymbol{\beta}'_{\boldsymbol{W}}\boldsymbol{W}_{ic} + \epsilon_{ic}, \quad (1)$$

where y_{ic} is a dummy variable equal to 1 if participant i in community c selects the competitive tournament in round 3, and 0 if instead chooses the uncompetitive piece rate. $girl_{ic}$ is a dummy variable equal to 1 for girls and 0 for boys. $treat_c$ is a dummy variable equal to 1 for communities randomly assigned to the ELA program and 0 for control communities. $\boldsymbol{X}_{ic}$ is a vector of experimental controls including performance in round 1; difference in performance between rounds 1 and 2; a dummy variable equal to 1 if the participant submits past piece-rate performance in round 1 to a tournament, and 0 otherwise; and a dummy variable equal to 1 if the participant believes to have ranked first during round 1's performance, and 0 otherwise. $\boldsymbol{W}_{ic}$ is a vector of socio-demographic characteristics, including total number of siblings and number of sisters, age, years of schooling, and indicators for whether the participant is out of school, is married and has children.

The parameters β_1 and $\beta_1 + \beta_3$ in equation (1) indicate the gender gap in competitiveness in control and treatment communities, respectively. Given the random assignment of the ELA program across communities, the parameters β_2 and $\beta_2 + \beta_3$ indicate the causal impact of the program on boys' and girls' competitiveness, respectively.[7] Additionally, β_3 indicates the program's impact on the gender gap in competitiveness. Throughout, we cluster the standard errors at the experimental session level.[8] We also report estimates based on a non-linear probit specification analogous to equation (1) to account for the binary nature of the competitiveness outcome.

Table 3 presents the results. We report estimates for the coefficients of interest. Column 1 only controls for the girl and treatment dummy variables, and their interaction. Consistent with the above descriptive evidence, we see that: (i) there are no significant gender differences in tournament entry in control communities, (ii) the program had no impact on tournament entry for girls or boys, and (iii) as a result there are also no gender differences in tournament entry in treatment communities. Column 2 and 3 sequentially condition on experimental controls and socio-demographic characteristics. Throughout we see that the results on gender and treatment-control differences in competitiveness are robust to the inclusion of these controls. Column 4 estimates equation (1) using a probit model. We also see that the results remain unchanged when using this alternative model.

[7] Since the sampling of girls from treatment communities was independent of their actual participation status in the ELA program and boys were denied participation in the ELA clubs, ours is an intent-to-treat (ITT) analysis for girls and a pure spillover effect analysis for boys.

[8] There were 50 experimental sessions. Each session was run in a lab setting with dividers, and facilitators using stopwatches to queue participants on when to start and stop.

4.3. Sibling Sex Composition and Competitiveness

We now examine the effect of sibling sex composition of a girl or boy's siblings on that adolescent's competitiveness in both control and treatment communities. To do so we estimate the following LPM specification for participant i, sibship size j, and community c, separately for boys and girls:

$$y_{ijc} = \gamma_1 sisters_{ijc} + \gamma_2 treat_c + \gamma_3 [sisters_{ijc} \times treat_c] + \boldsymbol{\gamma}'_{\boldsymbol{X}} \boldsymbol{X}_{ijc} + \boldsymbol{\gamma}'_{\boldsymbol{Z}} \boldsymbol{Z}_{ic} + \mu_{jc} + \varepsilon_{ijc}, \qquad (2)$$

where y_{ijc}, $treat_c$, and $\boldsymbol{X}_{ijc}$ are defined as before. $sisters_{ijc}$ denotes participant i's total number of sisters j. μ_{jc} is a set of fixed effects for the total number of siblings, which we allow to vary by treatment status.[9] $\boldsymbol{Z}_{ic}$ includes other socio-demographic characteristics: age, years of schooling, and indicators for whether the participant is out of school, is married, and has children.

The parameters of interest in equation (2) are γ_1 and $\gamma_1 + \gamma_3$, which indicate the impact on competitiveness of having an additional sister (as compared to an additional brother) in control and treatment communities, respectively. The identification of γ_1 exploits the notion that conditional on the total number of siblings a participant has, the gender composition of the siblings is close to being exogenous.[10] Furthermore, since the ELA program was randomly assigned across communities, γ_3 identifies the causal impact of the program on the impact that sisters have on their siblings' competitiveness.

Table 4 presents the results separately for girls (Panel A) and boys (Panel B), reporting only the coefficients of interest ($\hat{\gamma}_1$ and $\widehat{\gamma_1 + \gamma_3}$). Column 1 only controls for the number of sisters, the treatment dummy, their interaction, and sibship size fixed effects (in isolation and interaction with the treatment dummy). Columns 2 and 3 sequentially introduce experimental and socio-demographic controls. Column 4 estimates equation (2) using a probit model. At the foot of the table we report the p-value on the test of hypothesis $\gamma_3 = 0$, i.e. that the program had no impact on the effect of sisters on their siblings' competitiveness.

In all specifications, boys' competitiveness is systematically affected by the sex composition of his siblings, and girls' competitiveness is not. While in control communities boys surrounded by sisters are less competitive, in treatment communities boys surrounded by sisters are more competitive. Our preferred specification is in Column 3 with experimental and socio-demographic controls. In Panel B this

[9] In practice, μ_{jc} is a vector of dummy variables for each sibship size, in isolation and in interaction with $treat_c$.

[10] Strictly speaking this assumption is violated in the presence of son-preferring differential fertility stopping behavior, whereby parents continue having children until a certain number of boys are born. In such case, a key theoretical prediction is that girls will have more siblings than boys, on average [Yamaguchi 1989, Jensen 2005]. As a result, conditional on family size, families with a higher share of daughters must desire fewer sons [see Barcellos *et al.* 2014]. If parents who want more daughters (plausibly) invest more in daughters, than sisters might actually offer more competition to their siblings. Although we cannot reject the hypothesis that families in our sample engage in son-preferring fertility stopping rules (Table 1 shows that girls have on average 0.85 more siblings than boys, p-value<.05), our results indicate that in control communities sisters are associated with reduced (not increased) competitiveness among boys ($\hat{\gamma}_1 > 0$).

shows that in control communities an additional sister (relative to a brother) corresponds to an 8.8 percentage points *decrease* in tournament entry among boys. In contrast, in treatment communities an additional sister corresponds to 9.8 percentage points *increase* in the likelihood that boys enter tournament. To quantify these magnitudes, we note the mean of the dependent variable is 34.9 percent (see Column 1 in Table 1). The hypothesis that the empowerment of girls (through the program) had no impact on their brothers' willingness to compete is rejected at conventional statistical significance levels (p-value<.01).

5. Conclusion

We conduct a lab-in-the-field experiment in Uganda to measure the impact of a randomly placed adolescent girls' empowerment program on gender differences in preferences for competition. We also exploit variation in sibling sex composition in both control and treatment communities to identify the impact of adolescent girls' empowerment on their brothers' competitiveness.

We present four main findings. First, in contrast with the evidence drawn mostly from developed countries, we find that young men and women in Uganda are equally competitive. Second, we also find that despite the program empowering girls along economic and social dimensions, these changes were not accompanied by increased competitiveness for girls. Third, in line with previous research, we document that in control communities boys surrounded by sisters are less competitive. Fourth, the program reverses this pattern: boys surrounded by (empowered) sisters in treatment communities are more competitive.

Our findings push forward an emerging literature highlighting the importance of studying different cultures and family environments in order to understand gender differences in competitiveness. While much more research is needed to identify policy interventions that effectively foster competitiveness, ours is one of the first pieces of evidence suggesting that large scale female empowerment programs and other programs that shift gender dynamics, also have the potential to significantly alter gender differences in competitiveness.

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Table 1. Descriptive Statistics: Sample Characteristics

Means, standard deviations reported in parentheses, p-values reported in brackets.

						Differences [p-values]			
						Girls vs Boys		**Treatment vs Control**	
	(1) Full Sample	**Control**		**Treatment**		**(6) Control**	**(7) Treatment**	**(8) Girls**	**(9) Boys**
		(2) Girls	**(3) Boys**	**(4) Girls**	**(5) Boys**	*(3) vs (2)*	*(5) vs (4)*	*(4) vs (2)*	*(5) vs (3)*
Age	16.9	17.2	16.7	16.9	16.9	[.157]	[.902]	[.535]	[.525]
	(3.15)	(3.05)	(2.80)	(3.38)	(3.25)				
Married [yes =1]	.052	.072	.023	.076	.023	[.128]	[.012]	[.916]	[.975]
	(.222)	(.260)	(.150)	(.265)	(.151)				
Has child(ren) [yes =1]	.095	.171	.008	.135	.041	[.000]	[.001]	[.429]	[.039]
	(.293)	(.378)	(.008)	(.342)	(.198)				
Out of school [yes =1]	.256	.303	.205	.291	.203	[.057]	[.114]	[.846]	[.984]
	(.437)	(.461)	(.405)	(.455)	(.404)				
Years of schooling	9.95	10.3	9.76	9.92	9.86	[.127]	[.822]	[.324]	[.777]
	(3.01)	(2.90)	(3.03)	(2.90)	(3.21)				
Number of siblings	5.34	6.15	5.30	6.16	5.31	[.012]	[.013]	[.990]	[.988]
	(2.54)	(3.49)	(3.01)	(3.31)	(2.99)				
Number of brothers	2.74	3.13	2.95	3.20	2.81	[.446]	[.059]	[.763]	[.601]
	(1.55)	(2.16)	(2.57)	(2.24)	(1.94)				
Number of sisters	2.60	3.14	2.55	3.05	2.51	[.024]	[.013]	[.741]	[.886]
	(1.59)	(2.45)	(2.23)	(2.25)	(1.75)				

Notes: Column 1 refers to all participants (girls and boys) across control and treatment communities. Columns 2 and 3 refers to girls and boys from control communities, respectively. Columns 4 and 5 refers to girls and boys from treatment communities, respectively. Columns 6-9 show p-values on tests of equality obtained from an OLS regressions and allows the error term to be clustered by experimental session.

Table 2. Descriptive Statistics: Experimental Results

Means, standard deviations reported in parentheses, p-values reported in brackets.

						Differences [p-values]			
						Girls vs Boys		Treatment vs Control	
	(1) Full	Control		Treatment		(6) Control	(7) Treatment	(8) Girls	(9) Boys
	Sample	(2) Girls	(3) Boys	(4) Girls	(5) Boys	*(3) vs (2)*	*(5) vs (4)*	*(4) vs (2)*	*(5) vs (3)*
Competitive [yes =1]	.349	.362	.356	.325	.372	[.919]	[.323]	[.460]	[.787]
	(.477)	(.482)	(.481)	(.469)	(.485)				
Round 1 performance	8.69	8.62	8.64	8.82	8.61	[.942]	[.320]	[.442]	[.923]
	(1.88)	(1.90)	(1.97)	(1.81)	(1.90)				
Round 2 performance	10.4	10.3	10.2	10.6	10.3	[.759]	[.259]	[.224]	[.693]
	(1.99)	(1.98)	(2.03)	(1.94)	(2.03)				
Submit round 1 to tournament [yes =1]	.375	.342	.417	.367	.378	[.210]	[.788]	[.606]	[.517]
	(.484)	(.476)	(.495)	(.483)	(.486)				
Confident [yes =1]	.478	.401	.432	.498	.541	[.618]	[.408]	[.059]	[.052]
	(.499)	(.492)	(.497)	(.501)	(.500)				

Notes: Column 1 refers to all participants (girls and boys) across control and treatment communities. Columns 2 and 3 refers to girls and boys from control communities, respectively. Columns 4 and 5 refers to girls and boys from treatment communities, respectively. Columns 6-9 show p-values on tests of equality obtained from an OLS regressions and allows the error term to be clustered by experimental session. Competitive is a dummy variable equal to 1 if the participant chooses the competitive tournament in round 3, and 0 if instead chooses the uncompetitive piece rate. Confident is a dummy variable equal to 1 if the participant believes to have ranked first during round 1 performance (relative to the other participants in the same session), and 0 otherwise.

Table 3. Women's Empowerment and Gender Differences in Competitiveness

Dependent variable =1 if participant chooses tournament in Round 3, =0 if instead chooses piece-rate.
Linear probability model estimates in Columns 1-3, Probit estimates in Column 4, standard errors reported in parentheses.

	LPM Estimates			Probit Estimates
	(1) No controls	**(2) Experimental controls**	**(3) Other controls**	**(4) All controls**
Gender gap in control communities [$\boldsymbol{\beta_1}$]	.006	.037	.042	.045
	(.056)	(.051)	(.051)	(.050)
Program impact on boys [$\boldsymbol{\beta_2}$]	.016	.034	.034	.036
	(.059)	(.050)	(.049)	(.048)
Gender gap in treatment communities [$\boldsymbol{\beta_1 + \beta_3}$]	-.047	-.046	-.047	-.036
	(.047)	(.043)	(.044)	(.048)
Program impact on girls [$\boldsymbol{\beta_2 + \beta_3}$]	-.037	-.050	-.054	-.056
	(.050)	(.044)	(.043)	(.042)
Experimental controls	No	Yes	Yes	Yes
Other controls (socio-demographics)	No	No	Yes	Yes
P-value: $\boldsymbol{\beta_3 = 0}$	[.475]	[.206]	[.169]	[.135]
R-Squared	.002	.178	.183	–
Observations	693	693	693	693

Notes: *** (**) (*) indicates significance at 1% (5%) (10%) level. Each column corresponds to a separate regression. In all columns the dependent variable is a dummy equal to 1 if the participant chooses competitive tournament in round 3, and 0 if instead chooses uncompetitive piece-rate. Linear probability model (OLS) estimates are reported in Columns 1-3. Probit marginal estimates are reported in Column 4. Robust standard errors clustered by experimental session reported in parentheses (50 clusters). Column 1 only controls for a girl dummy, a treatment dummy, and their interaction. Column 2 additionally includes experimental controls: participant's performance in round 1, improvement in performance from round 1 to round 2, a dummy equal to 1 if the participant believes to have ranked first during round 1 performance and 0 otherwise, and a dummy equal to 1 if the participant chooses to submit past performance in round 1 to tournament and 0 to piece-rate. Columns 3 and 4 additionally control for participant-level socio-demographic characteristics: age, years of schooling, indicators for whether the participant is out of school, is married, and has children, total number of siblings, and number of sisters.

Table 4. Sibling Sex Composition and Competitiveness

Dependent variable =1 if participant chooses tournament in Round 3, =0 if instead chooses piece-rate.
Linear probability model estimates in Columns 1-3, Probit estimates in Column 4, standard errors reported in parentheses.

	LPM Estimates			Probit Estimates
	(1) No controls	(2) Experimental controls	(3) Other controls	(4) All controls
Panel A. Girls				
Impact of sisters in control communities [γ_1]	.028	.037	.043	.037
	(.053)	(.045)	(.044)	(.039)
Impact of sisters in treatment communities [$\gamma_1 + \gamma_3$]	-.011	-.020	-.019	-.018
	(.036)	(.034)	(.034)	(.032)
Siblings fixed effects	Yes	Yes	Yes	Yes
Experimental controls	No	Yes	Yes	Yes
Other controls (socio-demographics)	No	No	Yes	Yes
Test (p-value): $\gamma_3 = 0$	[.523]	[.274]	[.584]	[.248]
R-Squared	.043	.221	.227	–
Observations	389	389	389	389
Panel B. Boys				
Impact of sisters in control communities [γ_1]	-.103**	-.089**	-.087**	-.088**
	(.043)	(.043)	(.044)	(.044)
Impact of sisters in treatment communities [$\gamma_1 + \gamma_3$]	.077**	.094***	.098***	.105***
	(.038)	(.033)	(.030)	(.029)
Siblings fixed effects	Yes	Yes	Yes	Yes
Experimental controls	No	Yes	Yes	Yes
Other controls (socio-demographics)	No	No	Yes	Yes
P-value: $\gamma_3 = 0$	[.002]	[.002]	[.002]	[.000]
R-Squared	.090	.259	.268	–
Observations	304	304	304	303

Notes: *** (**) (*) indicates significance at 1% (5%) (10%) level. Each column corresponds to a separate regression. In all columns the dependent variable is a dummy equal to 1 if the participant chooses competitive tournament in round 3, and 0 if instead chooses uncompetitive piece-rate. Linear probability model (OLS) estimates are reported in Columns 1-3. Probit marginal estimates are reported in Column 4. Robust standard errors clustered by experimental session reported in parentheses (50 clusters). Column 1 only controls for the number of sisters, the treatment dummy, their interaction, and sibship size fixed effects (in isolation and interacted with the treatment dummy). Column 2 additionally includes experimental controls: participant's performance in round 1, improvement in performance from round 1 to round 2, a dummy equal to 1 if the participant believes to have ranked first during round 1 performance and 0 otherwise, and a dummy equal to 1 if the participant chooses to submit past performance in round 1 to tournament and 0 to piece-rate. Columns 3 and 4 additionally control for participant-level socio-demographic characteristics: age, years of schooling, indicators for whether the participant is out of school, is married, and has children.