
# The Origins of Gender Differences in Competitiveness and Earnings Expectations: Causal Evidence from a Mentoring Intervention

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# The origins of gender differences in competitiveness and earnings expectations: Causal evidence from a mentoring intervention

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**Abstract**

We present evidence on the role of the social environment for the development of gender differences in competitiveness and earnings expectations. First, we document that the gender gap in competitiveness and earnings expectations is more pronounced among adolescents with low socioeconomic status (SES). We further document that there is a positive association between the competitiveness of mothers and their daughters, but not between the competitiveness of mothers and their sons. Second, we show that a randomized mentoring intervention that exposes low-SES children to predominantly female role models causally affects girls' willingness to compete and narrows both the gender gap in competitiveness as well as the gender gap in earnings expectations. Together, the results highlight the importance of the social environment in shaping willingness to compete and earnings expectations at a young age.

Keywords: competitiveness, gender, socioeconomic status, inequality, earnings expectations

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# 1 Introduction

There are persistent differences in earnings between men and women. While there are many reasons for gender differences in earnings, one plausible partial explanation are gender differences in competitiveness. Competitiveness is a trait that systematically varies across individuals and is predictive of career choices and labor market outcomes. A large body of literature documents that men are more willing to compete than women, and that this gender difference can partially explain gender differences in career decisions such as the choice of university major and professional career (Croson and Gneezy, 2009; Niederle, 2016). Despite significant advances in understanding the consequences of gender differences in competitiveness, little is known about how these differences develop in childhood and the role that the social environment plays in this process.

We make a first step towards understanding whether and how the social environment at a young age differentially influences the willingness to compete of girls and boys as well as their earnings expectations. In a sample of German adolescents, we first investigate how the competitive preferences of girls and boys vary with socioeconomic status (SES) and the preferences of their mothers. To elicit the competitiveness of the children and their mothers, we use a novel easy-to-use and validated measure developed by Buser, Niederle, and Oosterbeek (2021). We document large gender differences in competitiveness in our sample of adolescents and show that the gender gap in competitiveness is particularly pronounced among low-SES children. We further document that girls with more competitive mothers are more competitive themselves. We do not find a similar intergenerational correlation between the competitiveness of mothers and their sons. This suggests that female role models may be particularly important for shaping the competitive preferences of girls.

We then analyze the causal impact of a change to the social environment. More specifically, we examine whether giving low-SES children randomized access to a well-established and intensive mentoring program has an impact on individual willingness to compete as well as earnings expectations. For a period of about one year, treated children are provided with a mentor whose brief is to act as a role model and to enrich the social environment of the child. Volunteer mentors are predominantly university students and all girls receive a female mentor, thereby exposing low-

SES girls to a successful female role model. Role models have been shown to be influential for the choices of young women, for example, in the context of education (Carlana, 2019; Porter and Serra, 2020; Breda et al., 2020). We therefore expect a positive impact of the mentoring intervention on the willingness to compete of low-SES girls, potentially resulting in a reduction in the gender gap. Our results are consistent with this hypothesis. The intervention significantly narrows the gender difference in competitiveness, mainly by increasing the competitiveness of girls, with the strongest effect for those girls who are most averse to competition.

There is mounting evidence that individual preferences for competition predict labor market outcomes (Reuben, Sapienza, and Zingales, 2015; Buser, Niederle, and Oosterbeek, 2021). About six years after the end of the intervention, we administered a questionnaire in which we elicit adolescents' beliefs about their likely earnings at age 30. While the teenagers in our sample have not entered the labor market yet, we show that large gender gaps in earnings expectations already exist at this age, especially among the group of low-SES adolescents. We further use these data to get a first indication of whether the impact of the intervention on the gender difference in competitiveness translates into a corresponding narrowing in labor market expectations. Consistent with the impact on competitiveness, we find that the intervention significantly narrows the gender gap in earnings expectations. Taken together, our results suggest that low-SES girls are doubly disadvantaged, by both their socioeconomic background and their gender, but that interventions can partially mitigate this disadvantage. The results of our paper have important policy implications. Providing adolescents with an enriched social environment may not only result in better outcomes for disadvantaged children but may also lead to a significant reduction in gender inequality.

We contribute to several strands of the literature. The literature on willingness to compete fits within a larger body of economic literature linking personality traits, non-cognitive skills and economic preferences to educational achievement and career outcomes (Borghans et al., 2008; Heckman, Stixrud, and Urzua, 2006; Dohmen and Falk, 2011; Becker et al., 2012). Interest in competitiveness stems from an experimental economics literature that documents a large and robust gender gap in willingness to compete (see Gneezy, Niederle, and Rustichini (2003) and Niederle and Vesterlund (2007)[1] for pioneering studies and Croson and Gneezy (2009), Niederle

[1]Niederle and Vesterlund (2007) find that when given the choice between a piece-rate payment and a four-

and Vesterlund (2011) and Niederle (2016) for surveys of the literature). Several recent studies indicate that individual preferences for competition are associated with educational choices and early labor market outcomes (e.g. Buser, Niederle, and Oosterbeek, 2014; Reuben, Sapienza, and Zingales, 2015).[2] Some studies find a gender difference in competitiveness already in young children (Gneezy and Rustichini, 2004; Sutter and Glätzle-Rützler, 2014) and teenagers (Almås et al., 2015; Buser, Niederle, and Oosterbeek, 2014; Buser, Peter, and Wolter, 2018) but not always in pre-schoolers (Samek, 2013; Khadjavi and Nicklisch, 2018), making it likely that the gap is affected by unknown aspects of the childhood environment.

A number of studies have explored the determinants of individual preferences for competition and the gender gap therein. This includes studies showing that the gender gap varies across cultural settings (Gneezy, Leonard, and List, 2009; Andersen et al., 2013; Apicella and Dreber, 2015; Booth et al., 2019), as well as studies exploring biological and neural correlates (Buser, 2012; Wozniak, Harbaugh, and Mayr, 2014; Ranehill et al., 2018; Buser et al., 2021), generally finding no or contradictory effects. Few studies have explored the correlation between the home and social environment of children and gender differences in competitiveness. Almås et al. (2015) find that the gender gap in willingness to compete is zero for Norwegian secondary-school students with the lowest socioeconomic background (bottom 8 percent of families), whereas it is large and significant for the rest of students. Tungodden (2018) finds that more competitive parents have more competitive girls.[3] These studies do not attempt to isolate the causal effects of the social environment on the competitiveness of boys and girls. A couple of studies estimate the causal

person winner-takes-all tournament for solving simple addition problems, 73% of men and 35% of women choose the tournament despite the lack of any significant difference in performance on the task. This result has proven robust in many follow-up experiments, in particular when stereotypically male tasks are used.

[2]Buser, Niederle, and Oosterbeek (2014) and Buser, Peter, and Wolter (2017) show that an incentivized measure of competitiveness predicts specializing in more prestigious and math-heavy subjects for Dutch and Swiss secondary-school students from the top of the ability distribution (pre-university track). Reuben, Sapienza, and Zingales (2015) show the same for the starting salaries and occupation choices of MBA graduates. Other studies find that competitiveness predicts participating in a competitive high school entrance exam (Zhang, 2012), investment choices of entrepreneurs (Berge et al., 2015), choosing an ambitious college track in high school (Almås et al., 2016), future salary expectations of undergraduate students (Reuben, Wiswall, and Zafar, 2017), career choices at the vocational education level (Buser, Peter, and Wolter, 2018), and labor market outcomes (Buser, Niederle, and Oosterbeek, 2021). Flory, Leibbrandt, and List (2015) and Samek (2019) run field experiments recruiting people for real jobs and show that compensation schemes that depend on relative performance deter women from applying relative to men.

[3]Khadjavi and Nicklisch (2018) do not find a gender difference in willingness to compete in pre-schoolers, but they find that the decisions of children are correlated with their parents' ambitions.

effects of aspects of the school environment. Lee, Niederle, and Kang (2014) explore the effect of randomized assignment to single-sex schooling in South Korea, finding no effect.[4] Alan and Ertac (2019) estimate the causal effect of a classroom intervention aimed at fostering grit on competitiveness, finding that the gender gap is reduced in the treatment group.

We further contribute to the literature that explores beliefs about educational choices and future labor market outcomes. A growing number of studies examine the relationship between perceived returns to educational choices and individual schooling decisions (see, e.g., Dominitz and Manski, 1996; Jensen, 2010; Attanasio and Kaufmann, 2014; Boneva and Rauh, 2019; Belfield et al., 2019; Boneva, Golin, and Rauh, 2021) or choice of major (see, e.g., Zafar, 2013; Wiswall and Zafar, 2015, 2018). We show that there is a sizable gap in earnings expectations between boys and girls already at a young age. This gender gap is larger among children in low-SES households. We further provide evidence that a mentoring intervention that exposes low-SES adolescents to predominantly female role models can causally affect the earnings expectations of young adolescents, and can narrow the gender gap in beliefs about future earnings, possibly by increasing girls' willingness to compete. Previous studies have documented that individual experiences can play a role in belief formation in other contexts (see, e.g., Malmendier and Nagel, 2011; Hyll and Schneider, 2013; Giuliano and Spilimbergo, 2013; Malmendier and Nagel, 2016; Laudenbach, Malmendier, and Niessen-Ruenzi, 2019, 2020) but little is known about the formation of individual earnings expectations in the teenage years. We contribute to this literature by showing that adolescents' beliefs about earnings are malleable and that positive changes to the social environment at this age causally affect future earnings expectations. The remainder of the paper is organized as follows. Section 2 describes the sample, measures and intervention. Section 3 presents the results from the descriptive analysis and the randomized intervention. Section 4 concludes.

[4]Booth and Nolen (2012) instrument single-sex schooling for English girls with travel-to-school time based on their residential post code, finding that girls from single-sex schools are more competitive.

# 2 Data and intervention

## 2.1 Sampling and data collection

To examine competitiveness and earnings expectations, we use data from the briq family panel (bfp). This panel provides us with an ideal resource to examine the questions of interest as it contains detailed information on both competitiveness and earnings expectations, as well as a large set of background characteristics. The sampling design and data collection procedures as well as details on the mentoring intervention are described in Falk and Kosse (2021).[5] Here, we provide a brief summary of the most important aspects relevant to this paper. At the baseline data collection in fall 2011, the bfp sample consisted of families living in the German cities of Bonn and Cologne with children born between September 2002 and August 2004 who had previously expressed their interest in participating in the mentoring program.

Based on information provided in the baseline survey, households were classified as low SES if at least one of the three following criteria was met: (1) low income (equivalence income of the household is lower than €1,065; this corresponds to the 30% quantile of the German income distribution); (2) low education (neither the mother nor father of the child has a school-leaving degree qualifying for university studies); or (3) single-parent status (a parent is classified as a single parent if he/she is not living together with a partner). Households for which none of these three criteria applied were classified as high SES.

Low-SES households form the target group for the randomized intervention. Out of 590 interested and eligible low-SES families, 212 were randomly selected and constitute our intention-to-treat (ITT) group (low SES treatment).[6] The remaining 378 families form the control group (low SES control). As a second control group, 150 randomly-chosen[7] high-SES families were invited, 122 of whom took part in the baseline interviews (high SES comparison). Shortly after the end of the 1-year intervention (see section 2.3 for details), in early 2013, the second wave of interviews

[5] Using the bfp, Falk et al. (2021) demonstrate that high-SES children in the sample are more patient and altruistic, have a higher IQ, and are less risk-seeking. Kosse et al. (2020) show that the mentoring intervention led to a persistent increase in prosociality in the treatment group.

[6] Randomization was stratified at the city level. We therefore present regression specifications that control for a location dummy.

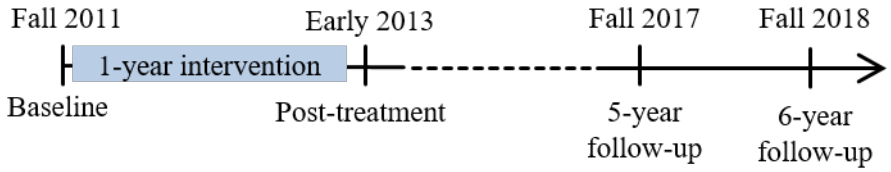
[7] Among those who had answered the information letter and given their written consent.

was conducted and, since fall 2014, yearly follow-up data has been collected.

## 2.2 Measures and sample description

The analyses presented in this paper mainly rely on the data collected as part of the five-year follow-up survey. This wave contains information on the competitiveness of children and their parents (see Figure 1). The mean age of the children at the time of the data collection was 13.8 years. Our main sample comprises 478 children who answered the competitiveness questions, 242 in the low-SES control group, 140 in the treatment group, and 96 in the high-SES comparison group. Attrition relative to wave 1 is independent of treatment status (p = 0.72, Fisher's exact test) and the sample is balanced across baseline characteristics (see Table A1). In addition, we also elicited the competitiveness of 452 mothers.

Figure 1: Timing of the data collections in the bfp




We elicit *competitiveness* using two survey items that were developed and validated by Buser, Niederle, and Oosterbeek (2021).[8] The first question asks respondents about their general competitiveness through the question "How competitive do you consider yourself to be? Please choose a value on the scale below, where the value 0 means 'not competitive at all' and the value 10 means 'very competitive'." The second question describes the experimental design of Niederle and Vesterlund (2007) and asks respondents whether they would choose piece-rate or tournament compensation in the hypothetical case that they participated in this choice experiment.[9] Buser,

[8]Studies linking competitiveness to outcomes outside of the lab have typically measured competitiveness in an incentivized way using the paradigm of Niederle and Vesterlund (2007), whereby participants choose between competitive and non-competitive incentives for their performance in a real-effort task. This has limited the scope of this literature because running incentivized experiments with large non-student samples is both expensive and logistically cumbersome. The measures of Buser, Niederle, and Oosterbeek (2021) address this issue and aim to facilitate eliciting competitiveness in questionnaires. This approach is based on the work of Dohmen et al. (2011) and Falk et al. (2016) for other economic preferences.

[9]The exact phrasing reads as follows: "Imagine the following hypothetical scenario. You participate in an

Niederle, and Oosterbeek (2021) find that both competitiveness measures are strongly correlated with the choices that participants make in an incentivized competitiveness experiment one year later. Moreover, each measure predicts a number of career outcomes that are also predicted by the incentivized-choice measure, including income, occupation, educational attainment, and choice of college major. The predictive power of the competitiveness measures for career outcomes compares well to other traits including the Big 5 personality traits and risk tolerance. While each survey measure independently predicts both the incentivized competitiveness choice and labor market outcomes, a combination of the two measures has higher predictive power. In the analyses in which we use competitiveness as an outcome, we combine the two measures into a single measure of competitiveness by standardizing each measure and then adding them up. We then standardize this composite measure so that differences and coefficients can be interpreted in terms of standard deviations. We use the same method to construct the competitiveness of the mothers.

One year after the five-year follow-up, we conducted a complementary data collection on the same sample focusing on *labor market expectations*. The mean age of children during that time was 14.8 years. The sample for which we have the measure on willingness to compete as well as labor market expectations comprises 426 children. To obtain a measure of individual labor market expectations, we follow the approach frequently used in the literature and proceed in several steps (see, e.g., Boneva, Golin, and Rauh 2021). First, we elicit students' beliefs about their likely net earnings at age 30 in three distinct scenarios. More specifically, we ask students to imagine that the highest level of education they have obtained is (i) 10th grade, (ii) the Abitur, or (iii) a university degree, and ask them to state what they believe their net monthly earnings to be at age 30 if they would be working full-time. We denote expected earnings in these three terminal nodes as $Y_{1i}$, $Y_{2i}$, and $Y_{3i}$, respectively. Second, we elicit individual expectations about the likelihood of the different scenarios occurring. In particular, we ask students how likely they think it is they will (i) continue with formal schooling after 10th grade ($a_{1i}$), (ii) succeed in obtaining

experiment where you are paid for your performance in a simple task. This task consists in adding up sets of five two-digit numbers without the help of a calculator (so, for example, 43+82+11+94+68=?). You have five minutes to solve as many problems of this type as you can. You have to choose how you want to be paid for your performance in this task: Option 1: Piece rate: you receive 1 Euro for each correctly solved problem Option 2: Competition: you compete against 3 other people. If you perform better than all three, you receive 4 Euros per correctly solved problem, otherwise you receive nothing. Your three opponents are about your age. Which option would you choose?"

the Abitur if they continue with formal schooling ($a_{2i}$), and (iii) obtain a university education if they complete the Abitur ($a_{3i}$). Respondents can indicate their answers on a probabilisitic scale in multiples of 10 (i.e., 0%, 10%,..., 90%, 100%). We use this information to calculate individual perceptions of being in each terminal node. Finally, we obtain a measure of expected earnings at age 30 ($Y_i$) by calculating a weighted average of the three expected earnings questions, where the weights are individual beliefs about the likelihood of being in each terminal node: $Y_i = p_{1i}Y_{1i} + p_{2i}Y_{2i} + p_{3i}Y_{3i}$, where $p_{1i} = (1 - a_{1i}) + a_{1i}(1 - a_{2i})$ is the probability of only having completed 10th grade, $p_{2i} = a_{1i}a_{2i}(1-a_{3i})$ is the probability of having completed the Abitur but no university degree, and $p_{3i} = a_{1i}a_{2i}a_{3i}$ is the probability of having obtained a university education. We use the resulting measure to shed light on socioeconomic and gender differences in labor market expectations in our sample and to study whether the intervention has led to a significant shift in expected earnings.

Our analyses include a range of background characteristics, all measured at baseline before the intervention took place. We use a measure of risk preferences and two measures of confidence as control variables, as those have been shown to predict competitiveness in other settings. *Risk preferences* were elicited by asking children to choose between throwing one of two coins, a safe and a risky one, whereby children earned stars depending on the outcome of the throw.[10] The two *confidence* measures were elicited from the mother of the child and consist of the mother's agreement with the statements "During the last week, my child was proud about themselves" and "During the last week, my child felt scared and insecure".

In additional specifications, we use a number of contemporary controls for traits and preferences that are known to correlate with competitiveness to check whether the effect of the treatment on the willingness to compete might work through one of these other traits. These include measures of risk attitudes, general confidence, math grades, and confidence in and preference for math (see Appendix B for details). We also use a range of baseline characteristics of mothers as controls in regressions where we link the competitiveness of mothers to the competitiveness of their children (see Appendix B for details).

[10] One coin had the same number of stars on each side (three in the first decision, four in the second decision). The second coin had zero stars on one side and seven on the other. We use these two decisions to divide the children into four categories: safe/safe, risky/safe, safe/risky, risky/risky.

## 2.3 The intervention

The intervention is a well-established non-profit mentoring program called "Balu und Du" (Baloo and You). In this program, elementary school children are provided with a mentor for the duration of one year. The mentors, called Baloos, are mostly female university students (aged from 18 to 30) who voluntarily care for their mentees, called Mowglis. All girls in our sample received a female mentor, while a minority of boys had a male mentor. The mentors act as role models and "benevolent friends" who encourage the acquisition of new ideas and skills by enriching the social environment of the children (Müller-Kohlenberg and Drexler, 2013). On a practical level, a mentored child typically spends one afternoon per week in one-to-one interaction with his/her mentor. During this time, the mentor and the mentee engage in joint activities, which are adapted to the individual needs, strengths, and interests of the child (and mentor). To date, the Balu und Du mentoring program has arranged and supervised around 13,000 mentor-child relationships in more than 50 different locations in Germany.

Most mentors are female and all girls in our sample receive a female mentor, thereby providing low-SES girls with a female role model. Role models have been shown influence the choices of young women, for example, in the context of education (Carlana, 2019; Porter and Serra, 2020; Breda et al., 2020). Most mentors are university students and past studies have also shown that both female and male university students and graduates are typically more willing to compete compared to the rest of the population (see, for example, Buser, Niederle, and Oosterbeek, 2021).

The matching process of the mentor and mentee is part of the program and was conducted by the organization. Each child in the ITT group could potentially be matched, but not all selected children were effectively matched with a mentor. A mentor-mentee match was successfully implemented for 74% of the ITT group children. For 26% of the children, matches could not be realized due to a local shortage of mentors, mentor refusals, or coordination problems between mentors and families (e.g. pregnancy of the mentor, the mentor or family moving location, etc.).

# 3 Results

We present our results in three steps. Section 3.1 presents the descriptive results on the gender gap in competitiveness by SES and the correlation between the competitiveness of the children and their mothers. Section 3.2 documents the causal effect of the mentoring intervention on the gender gap in willingness to compete. Section 3.3 investigates whether the impact of the intervention on the gender gap in willingness to compete is accompanied by a corresponding impact on the gender gap in earnings expectations.

## 3.1 Descriptive results

### The gender gap in competitiveness by SES

The existence of a gender gap in competitiveness has been well established in previous studies. In this section, we shed light on whether the gender difference in competitiveness varies with socioeconomic status (SES) and the competitiveness of the mother. All analyses in this section are based on the low-SES control group and the high-SES comparison group. We will explore the effect of the randomized treatment on the gender difference in competitiveness in Section 3.2.

Replicating previous findings in the literature, we find a large gender difference for the non-treated low-SES and high-SES individuals in our teenage sample. The mean of the standardized competitiveness measure is 0.34 for boys and -0.28 for girls ($p < 0.01$; rank-sum test), indicating that the average boy is more than half a standard deviation more competitive than the average girl. Figure A1 in the appendix shows the distribution of the standardized measure by the gender of the child. The distribution of competitiveness of the girls is strongly shifted to the left relative to the boys' distribution, and girls are much more likely than boys to be at the extreme low end of the distribution.

Looking at differences by SES, we find that low-SES girls are 32 percent of a standard deviation less competitive compared to high-SES girls ($p = 0.05$; ranksum test). In Table 1, we show results from OLS regressions of competitiveness on gender, SES and the interaction of the two. Since the SES difference for boys is virtually zero, the gender difference in willingness to compete is roughly

twice as large for low-SES children compared to high-SES children, at 0.71 standard deviations versus 0.38 standard deviations (p = 0.16; OLS).[11]

Table 1: Differences in competitiveness by gender and SES

| | Children's willingness to compete (standardized) | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Girl (dummy) | -0.617*** | -0.619*** | -0.714*** |
| | (0.105) | (0.104) | (0.122) |
| High SES (dummy) | | 0.156 | -0.012 |
| | | (0.117) | (0.168) |
| High SES x Girl | | | 0.332 |
| | | | (0.234) |
| High SES (girls) | | | 0.320* |
| | | | (0.163) |
| Observations | 338 | 338 | 338 |

Note: The table shows coefficients from OLS regressions with our competitiveness measure as the outcome variable. Robust standard errors in parentheses. "High SES (girls)" mean the SES difference for girls (which is equal to the sum of the "High SES" and "High SES x Girl" coefficients.

The definition of socioeconomic status in the bfp is multidimensional. We can therefore explore whether the competitiveness of girls varies across the subsamples defined by the three SES criteria: girls growing up with a single parent (which in almost all cases means a single mother), girls from low-income families, and girls with parents with a low level of education, as well as girls who are low SES according to more than one criterion. Girls growing up with a single parent and girls belonging to several low-SES categories are the least competitive, followed by girls from low-income families, and girls with low-educated parents.[12]

In Figure A2 in the appendix, we show histograms of competitiveness by gender and SES. This tells us where in the distribution of our competitiveness variable the difference between low-SES

[11] At first glance, our results contradict the findings of Almås et al. (2015) who show that the gender gap in Norway is smaller for low-SES children due to low-SES boys being less willing to compete. However, their definition of low SES is very different from ours. It includes only the bottom 8 percent of families based on income and parents' education and does not take into account single parenthood. Our results therefore document differences at very different margins of SES.

[12] Relative to high-SES girls, girls with a single parent are 0.43 standard deviations less competitive (p = 0.10; ranksum test), girls belonging to several low-SES categories are 0.39 standard deviations less competitive (p = 0.04), girls from low-income families are 0.29 standard deviations less competitive (p = 0.33), and girls with low-educated parents are 0.09 standard deviations less competitive (p = 0.51).

and high-SES girls (and between girls and boys within SES) comes from. That is, whether the SES and gender differences occur mainly at the lower end of the distribution (fewer very competition-averse girls in the high-SES group) or at the top of the distribution (more very competitive girls). We find that the strongest differences occur at the lower end: low-SES girls are around 2.5 times more likely to be at the low end of the distribution compared to high-SES girls ($p = 0.03$; Fisher's exact test).[13] Low-SES and high-SES boys hardly differ. Comparing girls and boys, it is striking how much less likely it is for boys to be very competition-averse: low-SES girls are around 4.5 times more likely than low-SES boys to be at the low end of the distribution ($p < 0.01$). This difference is smaller for high-SES girls who are around two times as likely as high-SES boys to be at the low end of the distribution ($p = 0.49$).

**Inter-generational correlation of competitiveness**

We elicited competitiveness not only for the children in our sample but also for their mothers. If mothers serve as role models to their daughters in particular, we would expect more competitive mothers to have more competitive daughters and we would therefore expect to find a larger gender difference in willingness to compete for children whose mothers are averse to competition. In column 1 of Table 2, we regress the competitiveness of children on the competitiveness of their mothers, controlling for the child's gender. The sample again consists of the low-SES control group and the high-SES comparison group. The coefficient on mothers' competitiveness equals 0.11, meaning that a one-standard deviation difference in the mother's competitiveness is associated with a 0.11 standard deviation difference in the competitiveness of the child. In column 2, we interact mothers' competitiveness with the gender of the child. The competitiveness of daughters is strongly and statistically significantly related to the competitiveness of the mother, while the relationship is close to zero for boys.[14] The gender difference in competitiveness is consequently significantly smaller for children with mothers who are more competitive. These results support our conjecture that having access to a competitive role model might increase girls' willingness to

[13]The histograms divide the competitiveness variable into bins of width 1 (-2 to -1, -1 to 0 etc). The p-value is from a Fisher's exact test of the proportion of boys and girls who are in the lowest bin.

[14]Interestingly, a similar pattern has been shown by Alan et al. 2017, who show that mothers' risk preferences are correlated with the risk preferences of their daughters but not of their sons.

compete.

Table 2: Mothers' competitive preferences and the gender difference in willingness to compete

| | Children's willingness to compete (standardized) | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Girl (dummy) | -0.682*** | -0.661*** | -0.661*** | -0.624*** |
| | (0.106) | (0.106) | (0.115) | (0.114) |
| Mother's competitiveness (std.) | 0.108* | -0.022 | 0.119* | -0.073 |
| | (0.056) | (0.075) | (0.067) | (0.086) |
| Mother's competitiveness x Girl | | 0.244** | | 0.371*** |
| | | (0.109) | | (0.123) |
| Mother's competitiveness (girls) | | 0.222*** | | 0.298*** |
| | | (0.079) | | (0.090) |
| Mother controls | No | No | Yes | Yes |
| Observations | 315 | 315 | 286 | 286 |

Note: The table shows coefficients from OLS regressions of our standardized composite measure of competitiveness on the competitiveness of the mother. Robust standard errors in parentheses. The sample comprises children in the low-SES control group and the high-SES comparison group whose mother answered the questionnaire. All regressions control for a SES dummy. The regressions in columns 3 and 4 control for mother's baseline characteristics including age, economic preferences, the Big 5 personality traits, self-confidence and IQ. The lower number of observations in columns 3 and 4 is due to missing values in the control variables. "Mother's competitiveness (girls)" mean the effect of mother's competitiveness for girls (which is equal to the sum of the "Mother's competitiveness" and "Mother's competitiveness x Girl" coefficients.

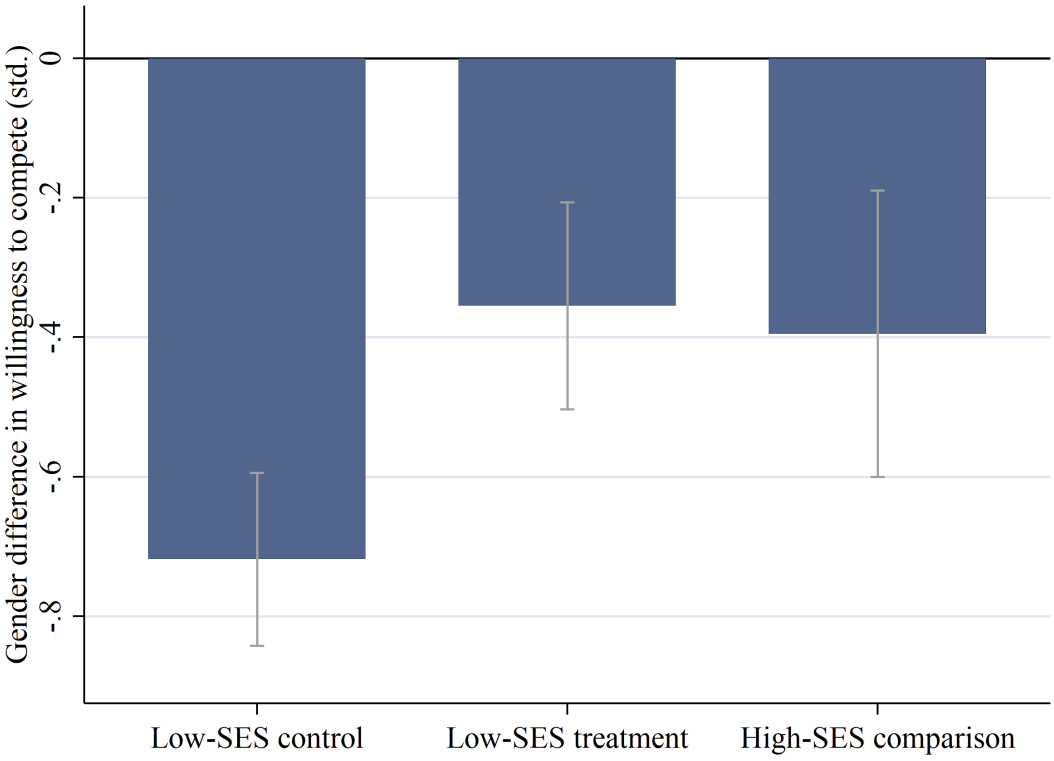
In columns 3 and 4, we repeat this analysis controlling for a list of characteristics of the mother, including age, economic preferences, the Big 5 personality traits, self-confidence and IQ (see Appendix B for details). The correlation between daughters' and mothers' competitiveness is even stronger conditional on these other traits. A mother who is one standard deviation more competitive on average has a daughter who is 30 percent of a standard deviation more competitive. The correlation for boys is again close to zero. While the results are correlational, the fact that the inter-generational correlation of mothers' and daughters' preferences survives controlling for an extensive list of characteristics of the mother makes it more plausible that the correlation is truly between the competitiveness of daughters and the competitiveness of their mothers rather than some other trait of the mother.

## 3.2 Causal evidence from the randomized mentoring intervention

In the previous section, we have shown that there is a significant difference in competitiveness between girls from a high and girls from a low socioeconomic background, and therefore a larger gender gap among low-SES children. Furthermore, the competitiveness of girls, but not boys, is strongly correlated with the competitiveness of their mother, leading to a larger gender difference among children with a competition-averse mother. These results are correlational but, taken together, suggest that the social environment of children plays a role in shaping the gender difference in competitiveness. In this section, we estimate the causal effect of the randomized mentoring intervention for low-SES children that provided children with a role model.

Figure 2 summarizes our main result: the treatment cuts the gender difference in competitiveness in half and closes the gap to the high SES group.

Figure 2: Effect of the mentoring intervention on the gender difference in competitiveness




Note: Gender differences in willingness to compete are given as shares of a standard deviation. Error bars represent standard errors. Gaps reflect OLS estimates using baseline controls (as in Table 3, column 2). N(low-SES control) = 242, N(low-SES treatment) = 140, N(high-SES comparison) = 96.

In Table 3, we use OLS regressions to explore the significance and robustness of the effect of the treatment on the gender gap in competitiveness. We regress our standardized competitiveness measure on a gender dummy, a treatment dummy, and the interaction of the two. In column 1, we show the raw effects with no controls. In column 2, we add baseline controls, as well as location and interviewer fixed effects to increase the precision of the estimates. While we do not have a baseline measure of competitiveness, we have baseline measures of risk tolerance and confidence, two traits that are positively associated with competitiveness (Niederle, 2016). The treatment reduces the gender differences in competitiveness by 0.38 standard deviations ($p < 0.05$; see gender-treatment interaction coefficient in column 2).

Table 3: Effect of randomized mentoring intervention on the gender difference in competitiveness

| | Children's willingness to compete (standardized) | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Girl (dummy) | -0.714*** | -0.697*** | -0.573*** |
| | (0.122) | (0.125) | (0.121) |
| Treatment (dummy) | -0.149 | -0.157 | -0.096 |
| | (0.140) | (0.142) | (0.136) |
| Treatment x Girl | 0.327* | 0.376** | 0.383** |
| | (0.193) | (0.187) | (0.180) |
| Treatment effect (girls) | 0.178 | 0.218* | 0.287** |
| | (0.134) | (0.131) | (0.126) |
| Baseline controls | No | Yes | Yes |
| Contemporary controls | No | No | Yes |
| Observations | 382 | 371 | 361 |

Note: Results are from OLS regressions with our competitiveness measure as the outcome variable. Robust standard errors in parentheses. Baseline controls comprise baseline risk preferences, baseline confidence, age, location and interviewer fixed effects. Contemporary controls are contemporary measures of risk attitudes, general confidence, math grades, and confidence in and preference for math. The lower number of observations in columns 3 and 4 is due to missing values in the control variables. "Treatment effect (girls)" mean the treatment effect for girls (which is equal to the sum of the "Treatment" and "Treatment x Girl" coefficients.

The literature on gender and competitiveness finds that at least part of the gender difference in competitiveness can be explained by gender differences in confidence and risk attitudes (Gillen, Snowberg, and Yariv, 2019; van Veldhuizen, 2017). It is possible that the mentoring treatment

increases the competitiveness of girls by making them more confident or risk-seeking. Moreover, our competitiveness measure is partially based on the stated willingness to compete in a numerical task. If the treatment improves motivation or performance in school, particularly in math, this could also explain part of the treatment effect. In column 3 of Table 3, we present a rough test of whether the treatment affects willingness to compete via an impact on these other traits. There, we additionally control for contemporary measures of risk preferences, confidence, math ability, and preferences for math (see Appendix B for details). The estimates show that the inclusion of contemporary controls hardly changes the size and significance of the interaction effect ($p = 0.03$), indicating that the effect of the mentoring treatment on competitiveness does not mainly operate through an effect on risk preferences, math performance, or confidence.

The treatment mainly works by increasing girls' willingness to compete. Girls in the treatment group are 0.18 standard deviations more competitive compared to girls in the control group ($p = 0.07$; rank-sum test).[15] In the previous section, we showed that girls growing up with a single parent and girls with competition-averse mothers are the least competitive, which also means that the potential scope of the treatment effect is largest for these groups. If we limit the sample to girls from single-parent families, we indeed find a more pronounced treatment effect: treated girls are 0.37 standard deviations more competitive relative to untreated girls in this group ($p = 0.01$; rank-sum test). The same is true if we limit the sample to girls whose mothers are below-median competitive: treated girls in this group are 0.41 standard deviations more competitive relative to untreated girls in this group ($p = 0.03$; rank-sum test).

In Figure A3 in the appendix, we ask where in the distribution of our competitiveness variable the observed differences between treatment and control come from. The left panel shows the distribution of competitiveness for girls by treatment group. Analogous to the SES differences that we documented in the previous section, the strongest differences occur at the lower end: treated low-SES girls are less than half as likely to be at the low end of the distribution compared to low-SES girls in the control group ($p = 0.02$; Fisher's exact test). The differences between treatment and control are much smaller for boys. Comparing girls and boys, we see that the

[15] The treatment reduces the willingness to compete of boys, but not statistically significantly so ($p = 0.32$; rank-sum test), leading to a small overall increase in competitiveness of 0.03 standard deviations for the combined sample of boys and girls ($p = 0.57$).

treatment has a strong impact on the gender difference in the likelihood of being very competition averse: in the control group, girls are around 4.5 times as likely as boys to be at the low end of the distribution ($p < 0.01$; Fisher's exact test), whereas the proportions are nearly identical in the treatment group ($p = 0.80$; Fisher's exact test).

### 3.3 Effects on gender gaps in expected earnings

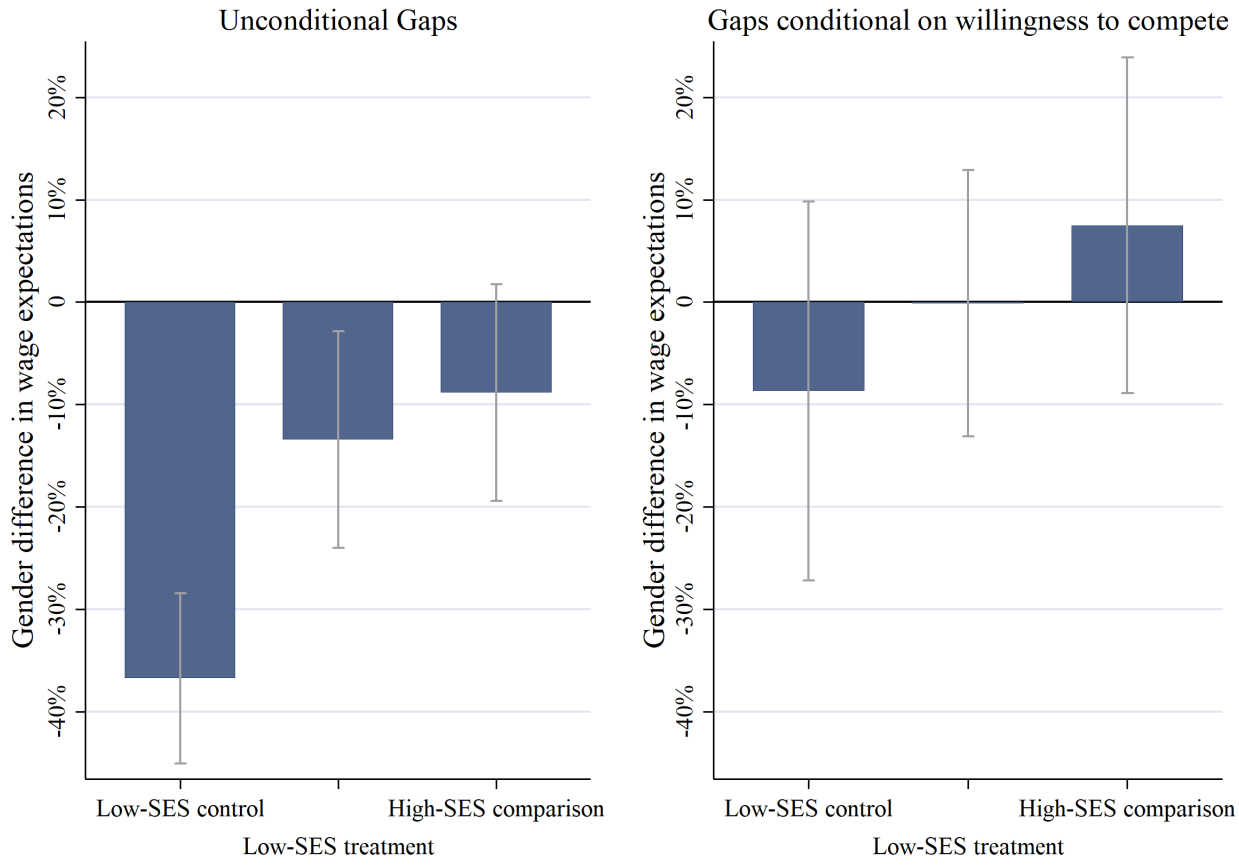
Having established that the intervention has significantly narrowed the gender gap in competitiveness, a natural question which arises is whether the intervention has also led to a corresponding decrease in the gender gap in labor market expectations. As described in Section 2.2, we elicited beliefs about net monthly earnings at age 30 one year after measuring individual willingness to compete. By that time, the children in the sample were about 15 years old. We start by documenting differences in earnings expectations between girls and boys across SES and treatment groups. The raw patterns are displayed in the left panel of Figure 3. Column 1 of Table A2 shows the results of the corresponding regression analysis in which log expected earnings are regressed on dummies for gender, SES, and treatment status, as well as interaction terms.

Several striking patterns emerge. First, there is a sizable gender gap in expected earnings among low SES adolescents in the control group. Low SES girls on average expect 36.7% lower earnings than low SES boys. Second, the gender gap in expected earnings is significantly smaller among the group of high SES adolescents. The gender gap in the high SES group is only 8.8%, and the 27.9 percentage point difference in the gender gap between the low and high SES group is statistically significant ($p=0.039$). Turning to the causal impact of the mentoring program, we document that the intervention led to a significant reduction in the gender gap in expected earnings. As a result of the intervention, the gender gap decreased by 23.3 percentage points ($p=0.083$) to 13.4%, which is statistically indistinguishable from the gender gap in the high SES group. Overall, the patterns we document for earnings expectations closely mirror those for willingness to compete: The gender gap for high SES adolescents is significantly smaller than that for low SES adolescents, and the intervention significantly narrows the gender gap in the low SES group.

While the study design does not allow us to pin down the exact causal mechanism through

which the effect of the treatment on earnings expectations operates, it is plausible that the reduction in the gender gap in competitiveness is linked to the reduction in the gender gap in earnings expectations (see, for example, Reuben, Wiswall, and Zafar, 2017, on the relationship between competitiveness and the earnings expectations of undergraduate students or Buser, Niederle, and Oosterbeek, 2021, on the relationship between competitiveness and actual earnings). Treated girls who become more competitive might be more likely to consider careers with more competitive working environments and higher earnings. In the following, we provide suggestive evidence consistent with this interpretation. First, we note that the correlation between individual willingness to compete and expected earnings at age 30 is positive. The Pearson correlation between the two measures is 0.203 ($N = 427$, $p < 0.01$), while the measurement error corrected correlation, as calculated through the obviously related instrumental variables (ORIV) method (Gillen, Snowberg, and Yariv, 2019), is 0.373 ($N = 427$, $p < 0.01$). Second, we examine the extent to which differences across groups in earnings expectations can be accounted for by differences in willingness to compete. The results are presented in the right panel of Figure 3 as well as in column 2 of Table A2, which presents the results from a regression in which log earnings are regressed on the same set of dummies as in column 1, and differences in willingness to compete are additionally controlled for using the ORIV method (Gillen, Snowberg, and Yariv, 2019). For all three groups, we find that differences in willingness to compete can account for a large proportion of the gender gap in earnings expectations. While merely suggestive, these results are consistent with the reduction in the gender gap in willingness to compete leading to a narrowing in the gender gap in earnings expectations.

Figure 3: Gender differences in expected wages across SES and treatment groups




Note: Gender differences in in expected wages in percent. Error bars represent standard errors. For details on the estimation see Table A2. N(low-SES control) = 216, N(low-SES treatment) = 123, N(high-SES comparison) = 88.

# 4 Conclusions

Competitiveness is an individual trait that has been shown to predict career choices and labor market outcomes, and for which a strong gender difference is often found. Gender differences in preferences for competition might therefore provide a partial explanation for gender differences in career choices, such as differential selection into STEM fields (Buser, Niederle, and Oosterbeek, 2014; Buser, Peter, and Wolter, 2017) or finance (Reuben, Sapienza, and Zingales, 2015). In this paper, we provide causal evidence on the impact of the social environment at a young age on preferences for competition and the gender difference in these preferences.

We first document how the gender difference in competitiveness in teenagers varies with socioeconomic status (SES) and the competitiveness of the mother. Girls from low-SES households and girls with competition-averse mothers are significantly less competitive. These variables matter much less for boys. Combining SES and mothers' characteristics illustrates the potential importance of the home environment for shaping preferences for competition, suggesting that the presence of a role model in the home environment who is willing to compete might increase girls' willingness to compete. We then provide evidence for a causal effect of the social environment on the gender difference in competitiveness through a randomized mentoring intervention that provides low-SES girls with a role model for the course of a year. This intervention increases the competitiveness of girls, leading to a significantly smaller gender difference years later.

Using a non-binary measure of competitiveness allows us to determine in which part of the competitiveness distribution the SES differences and the treatment effect occur. We find that the differences are strongest at the lowest end of the distribution. Low-SES girls are much more likely to be extremely averse to competition compared to low-SES boys and high-SES girls. The treatment works by decreasing the proportion of girls who are extremely competition-averse, rather than by increasing the competitiveness of girls who are already reasonably willing to compete.

A growing body of literature shows that willingness to compete is positively associated with better labor market outcomes. For example, Buser, Niederle, and Oosterbeek (2021) find that the same competitiveness measures used in this paper are positively associated with earnings, the likelihood of holding a prestigious occupation, the likelihood of having completed college, and the career prospects of the chosen college major. While the children in our sample have not yet entered the labor market, we elicit their expectations about their future earnings and show that the treatment does not only narrow the gender gap in willingness to compete but also the gender gap in earnings expectations. Our results contribute to the on-going debate about how earnings expectations are shaped and what drives gender gaps in earnings expectations. We show that beliefs about earnings are malleable at a young age and that the presence of female role models can narrow the gender gaps in earnings expectations of low-SES children, which already exist early in life. We posit that the narrowing in the gender gap in earnings expectations may be driven

by girls in the treatment group being more likely to consider higher-paying careers with more competitive work environments. Whether or not the mentoring intervention will lead to a lasting decrease in the gender gap in earnings is an open question that we will be able to answer by following the adolescents over their life cycle.

Our descriptive results show gender differences in willingness to compete and earnings expectations both for high-SES and low-SES children, but the gaps are much larger for low-SES children. Low-SES girls are therefore doubly disadvantaged, potentially leading to both higher gender inequality and a larger SES difference in labor market outcomes. Our descriptive results also show that the gender gap is larger for children whose mother is averse to competition, suggesting that the absence of a competitive role model in the home environment is associated with lower willingness to compete in girls. However, our results also show that interventions into the social environment at a young age can mitigate these gender gaps. This is in line with other studies showing that interventions at a young age aimed at shaping non-cognitive traits can create large dividends (Kautz et al., 2014). In particular, we show that an existing mentoring intervention has the potential to reduce inequality of opportunity and improve the labor market prospects of low-SES girls in the long run. Our evidence from an out-of-school intervention complements evidence on the effects of a classroom intervention by Alan and Ertac (2019). Combined, these studies equip policy-makers with context-specific tools for policy interventions to fight gender inequality.

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# Appendix A: Additional Tables and Figures

Table A1: Baseline balance in the main sample

| **Baseline measure** | Mean Control Group | Mean Treatment Group | Difference $p$-value |
|---|---|---|---|
| Family characteristics: | | | |
| Low parental education (binary) | 0.458 | 0.493 | 0.502 |
| | (0.032) | (0.042) | |
| Low parental income (binary) | 0.467 | 0.421 | 0.390 |
| | (0.032) | (0.042) | |
| Single parent (binary) | 0.483 | 0.486 | 0.966 |
| | (0.032) | (0.042) | |
| Child characteristics: | | | |
| Female (binary) | 0.496 | 0.464 | 0.553 |
| | (0.032) | (0.042) | |
| Age (in months, at baseline) | 93.67 | 93.20 | 0.479 |
| | (0.391) | (0.537) | |
| Willingness to take risk (std.) | 0.109 | -0.002 | 0.305 |
| | (0.065) | (0.088) | |
| Confidence (proud, std.) | 0.031 | -0.098 | 0.247 |
| | (0.066) | (0.090) | |
| Confidence (insecure, std.) | -0.044 | 0.069 | 0.313 |
| | (0.066) | (0.093) | |

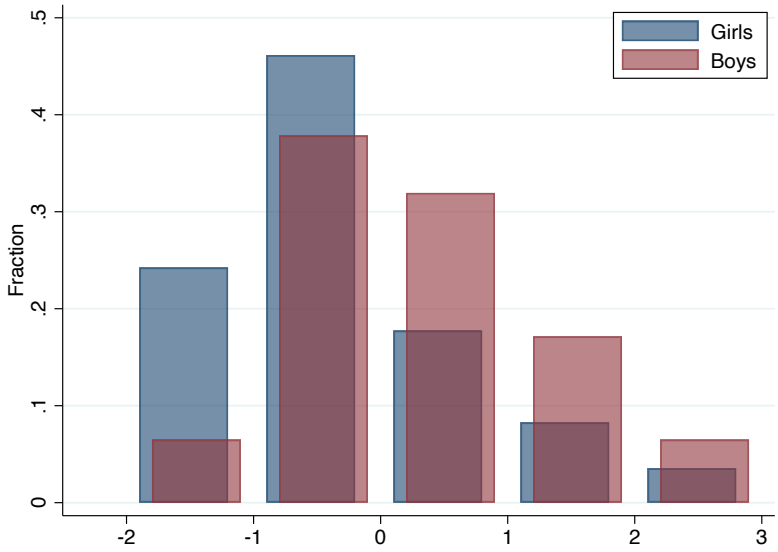
Notes: $N = 478$. The values in columns 1 and 2 are means in control and treatment groups, standard errors are in parentheses. Measures are collected at baseline. Column 3 lists $p$-values of $t$-tests on the null hypotheses that the differences in means between treatment and control group are zero. The full sample (including high SES) is used to standardize variables.

Table A2: Treatment and SES effects on gender gaps in expected earnings.

| | Log Expected Earnings (full time) at Age 30 | |
|---|---|---|
| | (1) | (2) |
| Girl (dummy) | -0.367*** | -0.087 |
| | (0.083) | (0.185) |
| High SES (dummy) | 0.129 | 0.160 |
| | (0.086) | (0.109) |
| High SES x Girl | 0.279** | 0.162 |
| | (0.135) | (0.170) |
| Treatment (dummy) | -0.037 | 0.067 |
| | (0.085) | (0.103) |
| Treatment x Girl | 0.233* | 0.086 |
| | (0.134) | (0.158) |
| Competitiveness | | 0.474* |
| | | (0.257) |
| Observations | 427 | 427 |

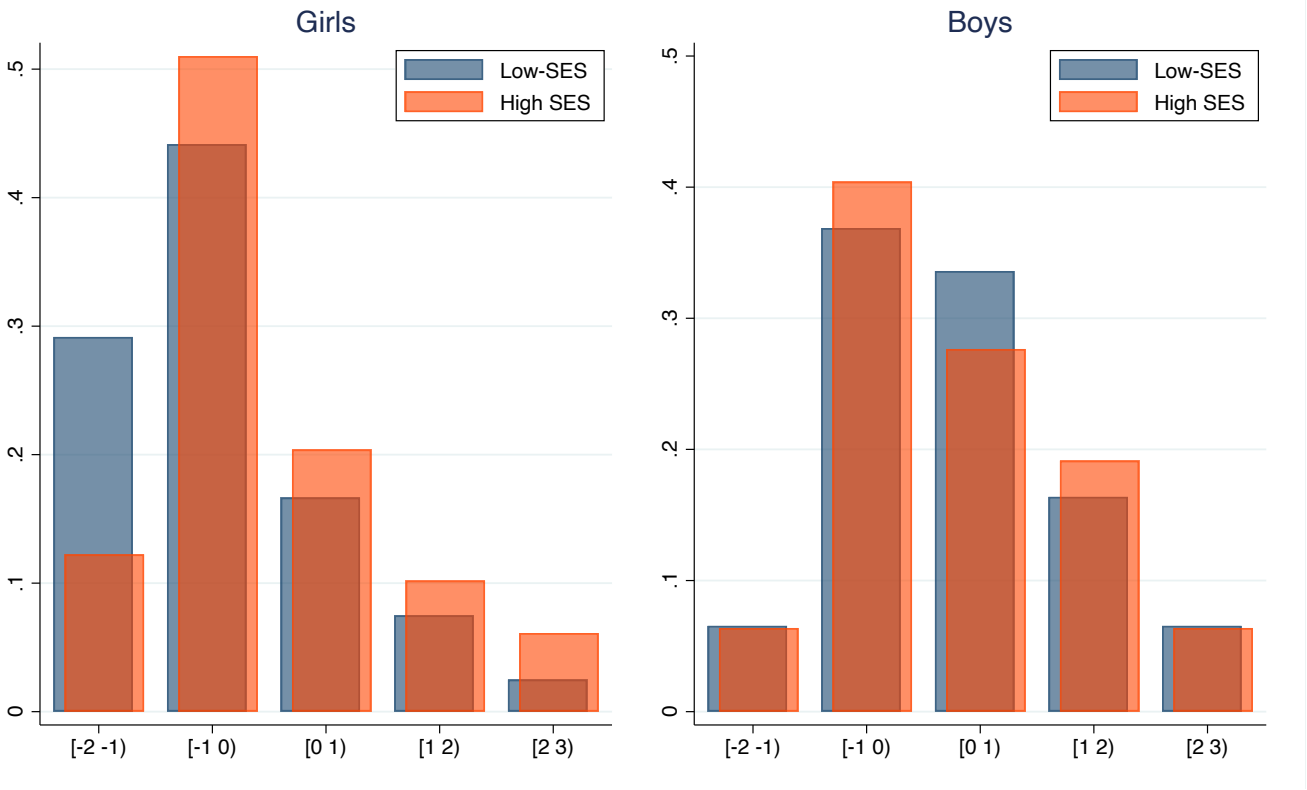
Note: Results are from regressions with log expected earnings as the outcome variable using location fixed effects. Robust standard errors in parentheses. Column 1 is estimated using OLS and column 2 is estimated using ORIV (Gillen, Snowberg, and Yariv, 2019).

Figure A1: Distribution of the competitiveness measure by gender



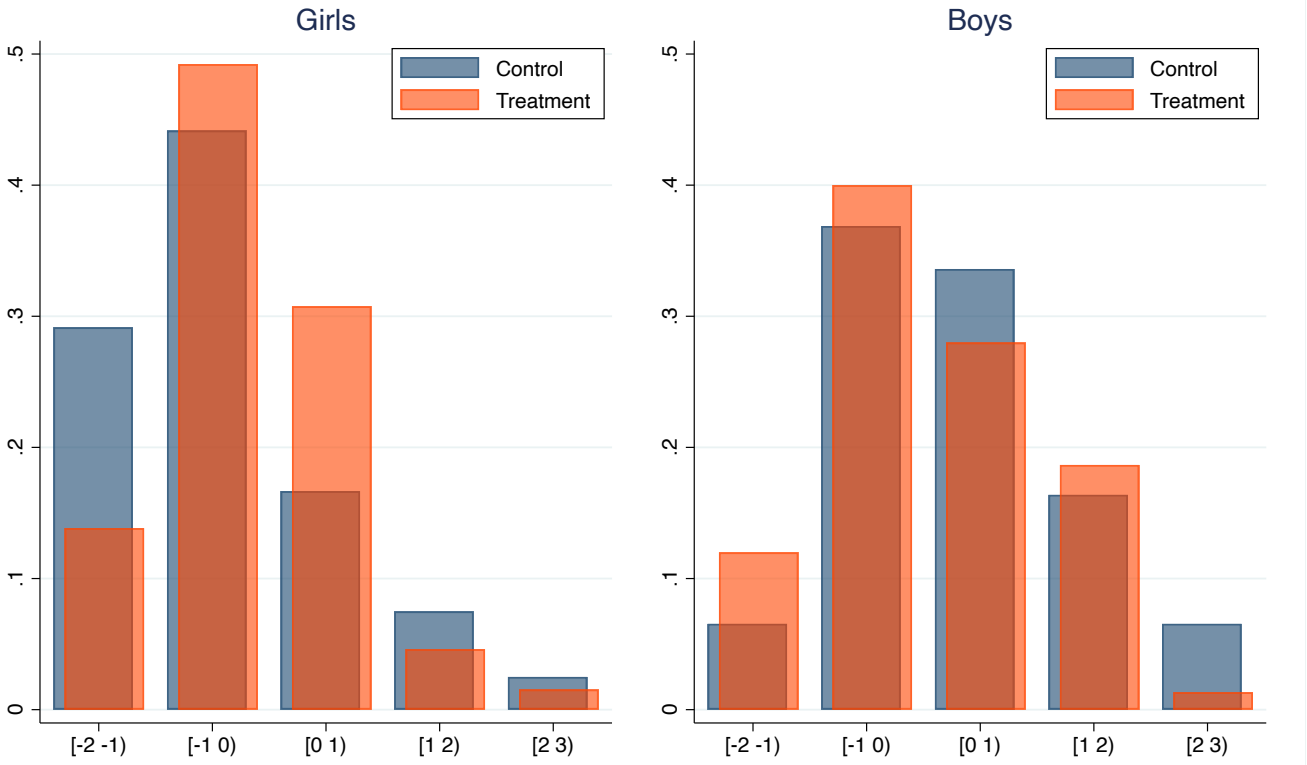

Note: For the histogram, we divide the variable into discrete bins with a width of one.

Figure A2: Distribution of the competitiveness measure by SES and gender




Note: For the histograms, we divide the variable into discrete bins with a width of one.

Figure A3: Distribution of the competitiveness measure by treatment status and gender




Note: For the histograms, we divide the variable into discrete bins with a width of one.

# Appendix B: Additional Data Descriptions

### Contemporary control variables (teenagers)

Contemporary risk preferences of teenagers are mesured using the item: "How do you see yourself: are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?" (Dohmen et al., 2011). General confidence is measured using the items "I have a positive attitude towards myself" and "I tackle difficult tasks". confidence in and preference for math is measured using an 8-item questionnaire that includes e.g. "I am good at math", "I like math" and "Math will be useful in my life". Moreover, the current math grade is used to proxy for math ability .

### Baseline control variables (mothers)

Mothers' economic preferences at baseline are measured using the qualitative items for patience, willingness to take risk, positive and negative reciprocity and trust from the Global Preferences Survey (Falk et al., 2016). The Big 5 personality traits are measured using a validated 15-item short version (Gerlitz and Schupp, 2005). The self-confidence measure is based on the statement "How much do you agree with the following statement: I am someone who is self-confident". Mother is IQ is measured using a 10 item short version of the SPM Plus (collected in 2013).