Gender Differences in Risk Behaviour: Does Nurture Matter?*

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Women and men may differ in their propensity to choose a risky outcome because of innate preferences or because pressure to conform to gender-stereotypes encourages girls and boys to modify their innate preferences. Single-sex environments are likely to modify students' risk-taking preferences in economically important ways. To test this, we designed a controlled experiment in which subjects were given an opportunity to choose a risky outcome - a real-stakes gamble with a higher expected monetary value than the alternative outcome with a certain payoff - and in which the sensitivity of observed risk choices to environmental factors could be explored. The results of our real-stakes gamble show that gender differences in preferences for risk-taking are indeed sensitive to whether the girl attends a single-sex or coed school. Girls from single-sex schools are as likely to choose the real-stakes gamble as boys from either coed or single sex schools, and more likely than coed girls. Moreover, gender differences in preferences for risk-taking are sensitive to the gender mix of the experimental group, with girls being more likely to choose risky outcomes when assigned to all-girl groups. This suggests that observed gender differences in behaviour under uncertainty found in previous studies might reflect social learning rather than inherent gender traits.

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I. Introduction

It is well-known that women are under-represented in high-paying jobs and in high-level occupations. Recent work in experimental economics has examined to what degree this under-representation may be due to innate differences between men and women. For example, gender differences in risk aversion, feedback preferences or fondness for competition may help explain some of the observed gender disparities. If the majority of remuneration in high-paying jobs is tied to bonuses based on a company's performance, then, if men are less risk averse than women, women may choose not to take high-paying jobs because of the uncertainty. Differences in risk attitudes may even affect individual choices about seeking performance feedback or entering a competitive environment.

Understanding the extent to which risk attitudes are innate or shaped by environment is important for policy. If risk attitudes are innate, under-representation of women in certain areas may be solved only by changing the way in which remuneration is rewarded. However if risk attitudes are primarily shaped by the environment, changing the educational or training context could help address under-representation. Thus the policy prescription for dealing with under-representation of women in high-paying jobs will depend upon whether the reason for the absence is innate to one's gender.

Why women and men might have different preferences or risk attitudes has been discussed but not tested by economists. Broadly speaking, those differences may be due to either nurture, nature or some combination of the two. For example, boys are pushed to take risks when participating in competitive sports and girls are often encouraged to remain cautious. Thus, the riskier choices made by males could be due to the nurturing received from parents or peers. Likewise the disinclination of women to take risks could be the result of parental or peer pressure not to do so.

With the exception of Gneezy, Leonard and List (2008) and Gneezy and Rustichini (2004), the experimental literature on competitive behaviour has been conducted with college-age men and women attending coeducational universities. And yet the education literature shows that the academic achievement of girls and boys responds differentially to coeducation, with boys typically performing better and girls worse than in single-sex environments (Kessler et al., 1985; Brutsaert, 1999). Moreover, psychologists argue that the gendered aspect of individuals' behaviour is brought into play by the gender of others with whom they interact (Maccoby, 1998, and references therein.) In this paper we sample a different subject pool to that normally used in the literature to investigate the role that nurturing might play in shaping risk preferences.[1] We use students in the UK from years 10 and 11 who are attending either single-sex or coeducational

1. In a companion paper, Booth and Nolen (2009), we investigate how competitive behaviour (including the choice between piece-rates and tournaments), is affected by single-sex schooling.

schools. We will examine the effect on risk attitudes of two types of environmental influences – educational environment and randomly assigned experimental peer-groups. The first represents longer-run nurturing experiences, while the last – the experimental group – captures short-run environmental effects. Finally, we will compare the results of our experiment with survey information – stated attitudes to risk obtained from a post-experiment questionnaire – to examine if reported and observed levels of risk aversion differ.

An important paper by Gneezy, Leonard and List (2008) explores the role that culture plays in determining gender differences in competitive behaviour. Gneezy et al. (2008) investigate two distinct societies – the Maasai tribe of Tanzania and the Khasi tribe in India. The former are patriarchal while the latter are matrilineal. They find that, in the patriarchal society, women are less competitive than men, which is consistent with experimental data from Western cultures. But in the matrilineal society, women are more competitive than men. Indeed, the Khasi women were found to be as competitive as Maasai men.[2] The authors interpret this as evidence that culture has an influence.[3] We too use a controlled experiment to see if there are gender differences in the behaviour of subjects from two distinct environments or "cultures." But our environments – publicly-funded single-sex and coeducational schools – are closer to one another than those in Gneezy et al (2008) and it seems unlikely that there is much evolutionary distance between subjects from our two separate environments.[4] Any observed gender differences in behaviour across these two distinct environments is unlikely to be due to nature but more likely to be due to the nurturing received from parents, teachers, peers, or to some combination of these three.

Women are observed to be on average more risk averse than men, according to the studies summarized in Eckel and Grossman (2002).[5] This could be through inherited attributes or nurture. The available empirical evidence suggests that parental attributes shape these risk attitudes. For instance Dohmen et al. (2006) find, using the German Socioeconomic Panel, that individuals with highly educated parents are significantly more likely to choose risky outcomes.

When looking at the role of peer groups on individuals, we potentially face an endogeneity issue. If individuals choose the peer groups with whom they associate, they might sort themselves into groups with similar or opposite characteristics. That is, individuals might

2. The experimental task was to toss a tennis ball into a bucket that was placed 3 metres away. A successful shot meant that the tennis ball entered the bucket and stayed there.

3. Interestingly the authors find no evidence that, on average, there are gender differences in risk attitudes within either society.

4. We use subjects from two adjacent counties in south-east England, Essex and Suffolk. One would be hard-pressed to argue that Essex girls and boys evolved differently from Suffolk girls and boys, popular jokes about "Essex man" notwithstanding.

5. However some experimental studies find the reverse. For example, Schubert et al. (1999) using as subjects undergraduates from the University of Zurich, show that the context makes a difference. While women do not generally make less risky financial choices than men, they are less likely to engage in an abstract gamble.

positively or negatively assortatively match on risk attitudes. Peer-group endogeneity would seem particularly likely if the group under consideration comprised friends. But fortunately, we have available information on peer groups that is exogenous to the individual: attendance at publicly-funded single-sex or coeducational schools. If girls are on average more risk averse than boys, as empirical evidence suggests, will girls who are surrounded by risk-averse individuals (girls) at school behave in a more risk averse way than girls who are surrounded by less risk averse individuals (boys)? That is, will girls from single-sex schools exhibit more or less risk aversion than girls from coeducational schools?

Our other potential "nurturing" environment is the randomly assigned experimental peer-group. On arriving at the experiment, students were randomly assigned to three different groups: all-girls; all-boys; or mixed gender. Just as educational and household environments may affect individual subjects' choices, so too might the experimental peer-group. Girls in an all-girl group may feel more comfortable taking a risk, for instance. Given that the peer-group was randomly assigned, there are no issues of endogeneity. We will test if the experimental environment has a separate influence on girls' and boys' behaviour under uncertainty. We are particularly interested in seeing if girls and boys who are placed in a same-sex group for the experiment behave differently to girls and boys placed in a mixed group. While this group-effect has been explored in previous work by Gneezy et. al. (2003), Niederle and Yestrumskas (2007) and Datta Gupta et. al. (2005), those studies all use students from coeducational environments, focus on competitive tasks and do not investigate risk attitudes.

Our final goal is to use the controlled experiment to see if commonly asked survey questions about risk yield the same conclusions about gender and risk-aversion to those based on an experiment. During the experiment, our subjects can choose to make risky choices with real money at stake. At the end of the experiment, they answer questions about their risk-attitudes as well as respond to a hypothetical lottery question. (They are also asked questions about their family background, to be discussed later.) We are therefore able to compare actual behaviour with stated attitudes. This allows us to investigate (i) if girls and boys *behave* differently when there is actual money at stake; (ii) if girls and boys differ significantly in their *stated* attitudes to risk;[6] (iii) if there are significant gender differences in the distance between actual choices made under uncertainty and stated behaviour under uncertainty; and (iv) if the general risk question is sufficient to describe actual risk-taking behaviour. In so doing, we explore the degree to which observed gender differences in choices under uncertainty and stated risk attitudes vary across subjects who have been exposed to single-sex or coeducational schooling. Furthermore we are able to provide a comparison of results from a controlled experiment to commonly asked survey questions.

6. For instance, boys might state they are more risk-loving as a form of bragging.

II. Hypotheses

Women and men may differ in their propensity to choose a risky outcome because of innate preferences or because the existence of gender-stereotypes - well-documented by Akerlof and Kranton (2000) - encourages girls and boys to modify their innate preferences. Our prior is that single-sex environments are likely to modify students' risk-taking preferences in ways that are economically important.

To test this, we designed a controlled experiment in which subjects were given an opportunity to choose a risky outcome – a real-stakes gamble with a higher expected monetary value than the alternative outcome with a certain payoff – and in which the sensitivity of observed risk choices to environmental factors could be explored. Suppose there are preference differences between men and women. Then, using the data generated by our experiment to estimate the probability of choosing the real-stakes gamble, we should find that the female dummy variable is statistically significant. Furthermore, if any gender difference is due *primarily* to nature, the inclusion of variables that proxy the students' "socialization" should not greatly affect the size or significance of the estimated coefficient to the female dummy variable. However, if proxies for "socialization" are found to be statistically significant, this would provide some evidence that nurturing plays a role.

Our hypotheses can be summarised as follows.

Conjecture 1 *Women are more risk averse than men.*

As summarized in Eckel and Grossman (2002) most experimental studies have found that women are more risk averse than men. A sizable number of the studies used elementary and high school aged children from coed schools (for example Harbaugh, Krause and Vesterlund, 2002). Since our subject pool varies from this standard young adult sample, in that it involves students from both single-sex and coed schools, we will first examine whether or not there are gender differences in risk aversion. We expect to find that women in our sample are on average more risk averse than men.

Conjecture 2 *Girls from single-sex schools are less risk averse than girls from coed schools.*

Studies show that there may be more pressure for girls to maintain their gender identity in schools where boys are present than for boys when girls are present (Maccoby, 1990; Brutsaert, 1999). In a coeducational environment, girls are more explicitly confronted with adolescent subculture (such as personal attractiveness to members of the opposite sex) than they are in a single-sex environment (Coleman, 1961). This may lead them to conform to boys' expectations of how girls should behave to avoid social rejection (American Association of University Women, 1992). If risk avoidance is viewed as being a part of female gender identity while risk-seeking is a part of male gender identity, then being in a coeducational school environment might lead girls to make safer choices than boys.

How might this actually work? It is helpful to extend the identity approach of Akerlof and Kranton (2000) to this context. Adolescent girls in a coed environment could be subject to more conflict in their gender identity, since they have to compete with boys academically while at the same time they may feel pressured to develop their femininity in order to be attractive to boys. Moreover, there may be an externality at work, since girls are competing with other girls to be popular with boys. This externality may reinforce their need to adhere to their female gender identity. Why would boys not feel similarly pressured? First, academic success, assertive behaviour and being attractive to girls are not such contradictory goals, owing to the prevalence of the male bread-winner model in our society. While adolescent boys in a coed environment are likely to be very aware of their gender identity, they may experience different conflicts to those of the girls. To the extent that the presence of girls pressures boys to develop their masculinity to increase their popularity – or to reduce any threat to their male identity – this might make them more assertive and risk-taking. The fact that they are also competing with other boys for popularity might reinforce this tendency.

If this is true, we would expect girls in coed schools to be less likely than girls in single-sex schools to take risks. One might also expect coed schoolboys to be more likely to take risks than single-sex schoolboys, although the education literature suggests that there is greater pressure for girls to maintain their gender identity in schools where boys are present than for boys when girls are present (Maccoby, 1990, 1998).[7]

Conjecture 3 *Girls in same-gender groups are less risk averse than girls in coed groups.*

Psychologists have shown that the framing of tasks and cultural stereotypes does affect the performance of individuals (see inter alia Steele, Spencer, and Aronson, 2002). Being in a single-sex group for the experiment might have the same effect on girls as being in educated in a single-sex school. For example, a girl assigned to mixed-sex groups may feel their gender identity is threatened when they are confronted with boys. This might lead them to affirm their femininity by conforming to perceived male expectations of girls' behaviour, and consequently making less risky choices if they perceive risk-avoidance as a feminine trait. Should the same girl be assigned instead to an all-girl group, such reactions would not be triggered. If girls do feel more pressured to maintain their gender identity when boys are present than boys feel when girls are present, then we should expect to observe a gender gap in risk-taking for girls and boys attending single-sex schools who are assigned to mixed-sex groups.

7. There is also evidence that in coed classrooms boys get more attention and dominate activities (Sadker et al, 1991; Brutsaert, 1999)

Conjecture 4 *Girls in same-gender environments (single-sex schooling or same-gender experimental groups) are no less risk averse than boys.*

The psychological and education literature cited above suggests that girls, rather than boys, are likely to respond to the same-gender environments. The question is: how much will girls change? Given that we hypothesize that girls will be less risk averse because of same-gender environments, we conjecture that girls' risk attitudes in single-sex environments will be the same as their male counterparts. If this is the case it would suggest that the gender differences in observed risk attitudes is due to one's environment and not innate differences.

Conjecture 5 *Gender differences in risk aversion are sensitive to the way the preferences are elicited.*

To test this, we will compare the results from the choice of whether or not to engage in a real-stakes gamble with responses obtained from two post-experiment survey questions. The first survey question is on general risk attitudes while the second asks how much the respondent would invest in a risky asset using hypothetical lottery-winnings. (Both questions will be given in full in the next section.) Moreover, abstract real-stakes gambles might generate different gender gaps in risky choices than context-specific hypothetical gambles (Schubert et al, 1999).

In particular, we will examine how much, if at all, the answers about general risk attitudes or the hypothetical lottery explain observed choices made in the real-stakes experimental gamble. This will allow us to examine how close stated risk attitudes are to observed behaviour and to see if girls and boys differ on any "gap" that may exist. For example, suppose that boys state that they are more risk-seeking than they are in actuality, perhaps because being risk-loving is associated with a notion of "hegemonic masculinity" governing male gender identity (Kessler et al, 1985). If so, then boys might overstate their willingness to take risks when responding to a gender-attitudes survey question – after all, no real outcome depends on it – but be more likely to express their true risk aversion when confronted with a real-stakes gamble. In contrast, if being risk-loving is not part of female identity, there should be less distance in outcomes for girls.

III. Experimental Design

Our experiment was designed to test the conjectures listed above. To examine the role of nurturing, we recruited students from coeducational and single-sex schools to be subjects. We also designed an 'exit' survey to elicit information about family background characteristics. At no stage were the schools we selected, or the subjects who volunteered, told why they were chosen. Our subject pool is relatively large for a controlled, laboratory-type experiment. We wished to have a large number of subjects from a variety of educational backgrounds in order to be able to investigate the conjectures outlined above.

Below we first discuss the educational environment from which our subjects were drawn, and then the experiment itself.

III.A. Subjects and Educational Environment

In September 2007, students from eight publicly-funded schools in the counties of Essex and Suffolk in the UK were bused to the Colchester campus of the University of Essex to participate in the experiment. Four of the schools were single-sex.[8] The students were from years 10 or 11, and their average age was just under 15 years. On arrival, students from each school were randomly assigned into 65 groups of four. Groups were of three types: all-girls; all-boys; or mixed. Mixed groups had at least one student of each gender and the modal group comprised two boys and two girls. The composition of each group - the appropriate mix of single-sex schools, coeducational schools and gender - was determined beforehand. Thus only the assignment of the 260 girls and boys from a particular school to a group was random. The school mix was two coeducational schools from Suffolk (103 students), two coeducational schools from Essex (45 students), two all-girl schools from Essex (66 students), and two all-boy schools from Essex (46 students).

In Suffolk county there are no single-sex publicly-funded schools. In Essex county the old "grammar" schools remain, owing to a quirk of political history.[9] These grammar schools are single-sex and, like the coeducational schools, are publicly funded. It is highly unlikely that students themselves actively choose to go to the single-sex schools. Instead Essex primary-school teachers, with parental consent, choose the more able Essex children to sit for the Essex-wide exam for entry into grammar schools.[10] Parents must be resident in Essex for their children to

8. A pilot was conducted several months earlier, in June at the end of the previous school year. The point of the pilot was to determine the appropriate level of difficulty and duration of the actual experiment. The pilot used a different subject pool to that used in the real experiment. It comprised students from two schools (one single-sex in Essex and one coeducational in Suffolk) who had recently completed year 11. The actual experiment conducted some months later, at the start of the new school year, used, as subjects, students who had just started years 10 or 11.

9. In the UK, schools are controlled by local area authorities but frequently "directed" by central government. Following the 1944 Education Act, grammar schools became part of the central government's tripatrtite system of grammar, secondary modern and technical schools (the latter never got off the ground). By the mid-1960s, the central Labour government put pressure on local authorities to establish "comprehensive" schools in their place. Across England and Wales, grammar schools survived in some areas (typically those with long-standing Conservative boroughs) but were abolished in most others. In some counties the grammar schools left the state system altogether and became independent schools; these are not part of our study. However, in parts of Essex, single-sex grammar schools survive as publicly-funded entities, while in Suffolk they no longer exist.

10. If a student achieves a high enough score on the exam, s/he can attend one of the 12 schools in the Consortium of Selective Schools in Essex (CSSE). The vast majority of these are single-sex. The four single-sex schools in our experiment are part of the CSSE.

be eligible to sit the entrance exam (the 11+ exam). A student must attain above a certain score (the score will vary from year to year) to attend one of the schools. Therefore students at the single-sex schools are not a random subset of the students in Essex, since they are selected based on measurable ability at age 11.

One of the strengths of our experiment is that, while it does not explicitly solve the selection problem into single-sex and coeducational schools, it was carefully constructed to mitigate selection issues. First, we designed the experiment so we could obtain good measures of cognitive ability in the early stages of the experiment. These we then use as controls in the main part of the experiment. Second, we developed a post-experiment questionnaire, in order to gather information on where students lived and their family background. This facilitates construction of plausible instruments for school choice. As will be seen in Section IV.C, we will compare the sample of single-sex students to different subgroups of our sample and use two econometric techniques – instrumental variables and propesity score matching – to examine any possible selection bias that may exist. Third, we asked our participating coeducational schools, from both Essex and Suffolk, to provide students only from the higher-ability academic stream so that they would be more comparable to the grammar school students.[11]

Potential selectivity does not apply to our second environmental treatment, the gender composition of the experimental peer-group. Students were randomly assigned to these groups, and therefore the identification is not in doubt. At the time of the "fiver" lottery, described below, the student will have been in her group for only 30 minutes, much less than the average four-years of attendance at a single-sex or coed school, so any effect of from the peer-group may also allow us examine the reliability of the estimated schooling effect.

The experiment took place in a very large auditorium with 1,000 seats arranged in tiers. Students in the same group were seated in the same row with an empty seat between each person. There was also an empty row in front of and behind each group. While subjects were told which other students were in the same group, they were sitting far enough apart for their work to be private information. If two students from the same school were assigned to a group, they were forced to sit as far apart as possible; for example, in a group of four, two other students would sit between the students from the same school. There was one supervisor, a graduate student, assigned to supervise every five groups. Once the experiment began, students were told not to talk. Each supervisor enforced this rule and also answered individual questions.

11. To compare students of roughly the same ability we recruited students from the top part of the distribution in the two coeducational schools in Essex: only students in the academic streams were asked to participate. Students from Suffolk do not have the option to take the 11+ exam and therefore higher ability students are unlikely to be selected out of Suffolk schools in the same way as in Essex. Nonetheless we only recruited students from the academic streams in the Suffolk as well.

III.B. Experiment

Five rounds were conducted during the experiment. In Appendix A we give full details of all rounds, and there we also describe payments and incentives, which varied from round to round.[12] In the present paper we focus on the results from the round involving the real-stakes gamble or "fiver" lottery. After the experiment ended, students filled out a post-experimental questionaire that had questions on risk attitudes, family background, and that also included a hypothetical investment decision using the proceeds from winning a lottery. (Results from the first few rounds, designed to elicit differences in competitive behaviour under piece rates and tournaments, are reported in Booth and Nolen (2009).)

A description of the real stakes gamble (called the "Fiver" Lottery) and the two main survey questions are discussed below.

"Fiver" Lottery. Each student chooses Option One or Option Two. Option One is to get £5 for sure. Option Two is to flip a coin and get £11 if the coin comes up heads or get £2 if the coin comes up tails.

Survey Question: General Risk. Each student was asked: "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?" The students then ranked themselves on an 11-point scale from 0 to 10 with 0 being labelled "risk averse" and 10 as "fully prepared to take risks."

Survey Question: Hypothetical Lottery. Each student was asked to consider what they would do in the following situation: "Imagine that you have won £100,000 in the lottery. Almost immediately after you collect the winnings, you recieve the following financial offer from a reputable bank, the conditions of which are as follows: (i) there is a the chance to double your the money within two years; (ii) it is equally possible that you could lose half the amount invested; (iii) you have the opportunity to invest the full amount, part of the amount or reject the offer. What share of your lottery winnings would you be prepared to invest in this financially risky yet lucrative investment?" The subject then ticked a box indicating if she would invest £100,000, £80,000, £60,000, £40,000, £20,000, or Nothing (reject the offer).

12. Payment structures varied in the previous rounds. To examine how the payment structure affected performance and choices, subjects were only paid for one randomly chosen round. Randomly paying for one round is common in experimental economics because it allows the results from each round to be analyzed separately: in order to maximize payment the subject should choose the level of performance that maximizes that round's payment independently of what happened in any other round. This might leave room for fatigue if repeating a task is required. Indeed, the experiment was designed to be short for this reason. Moreover, fatigue should not be an issue for the risk round discussed here, as this was the only one of its kind in the experiment.

The payments (both the show-up fee of £5 plus any payment from performance in the randomly selected round) were in cash and were hand-delivered in sealed envelopes (clearly labelled with each student's name) to the schools a few days after the experiment. The average payment was £7. In addition, immediately after completing the Exit Questionnaire, each student was given a bag containing a soft drink, packet of crisps and bar of chocolate.

IV. Experimental Results

In this section we discuss whether the results from the fiver lottery support the first four conjectures. We then use a series of robustness checks to see, first, if the evidence stands up to using different control groups and, second, if the results alter when we instrument for single-sex schooling or use propensity score matching.

IV.A. The Sample

Table 1 shows means for each of our four subsamples – school differences for girls and boys and gender differences by school type. Risk attitudes and the demographic variables were obtained from the post-experiment survey questionnaire.

The goal is to have the treatment and control groups roughly equivalent and to control for any differences that may exist. Table 1 shows that there are some statistically significant differences between students from coeducational and single-sex schools. For example, girls and boys at single-sex schools were more likely to have both parents with a university (college) degree than their coeducational counterparts. As discussed before, an educated parent could have an effect on their child's level of risk-aversion. Furthermore, boys at single-sex schools tend to be younger than girls at single-sex schools. For our variable of interest, whether a student choose option two in the "Fiver" lottery, there is a gender difference among coed students but not among single-sex students, and girls from single-sex schools enter the lottery more than girls from coed schools. There is also a statistically significant difference in reported levels of risk between single-sex schoolgirls and their coed counterparts.[13]

[Insert Table 1 here]

A measure of cognitive ability is provided by student performance in the first two rounds of the experiment, when students were required to solve paper mazes under a piece rate (round

13. In the post-experiment survey questionnaire, individuals were asked to report their risk attitudes on a scale running from 0 to 10, with 0 labelled as "risk averse" and 10 as "fully prepared to take risks", as we described in the previous section. The format of this is identical to that in the 2006 GSOEP.

1) and a mandatory tournament (round 2).[14] Table 1 gives the mean number of mazes solved in round 1 and round 2, denoted by R1 and R2 respectively. The difference between these two measures is represented by R2-R1.

IV.B. Gender Differences and Nurture

The expected monetary value of the fiver lottery discussed above is £6.50 which is greater than the alternative choice – a certain outcome of £5. Assuming a constant relative risk aversion utility function of the type $u(x) = x^{1-\sigma}/(1-\sigma)$, where σ is the degree of relative risk aversion, we calculate that the value of σ making an individual just indifferent between choosing the lottery and the certain outcome is approximately 0.8. Individuals with $\sigma \geq 0.8$ will choose the certain outcome, while those with $\sigma < 0.8$ will choose the lottery.[15]

To examine if there are any gender differences in the choice of whether or not to enter the fiver lottery we construct an indicator variable taking the value one if the individual choses to enter the fiver lottery and zero otherwise. This becomes our dependent variable in a probit model of the probability of choosing the lottery. Table 2 shows the marginal effects of those probit regressions.

[Insert Table 2 here]

Column [1] of Table 2 shows that, on average, girls choose to enter the lottery 16 percentage points less than boys. The sign and significance of this coefficient is consistent with other work looking at gender and risk aversion and suggests that in our sample female students are also more risk averse than male students. This provides evidence for conjecture one. Next we want to investigate if the gender differences alter when environmental factors reflecting nurture are incorporated into the estimation.

The specification in Column [2] adds controls for school-type and experimental group composition. In this specification the gender gap for girls in single-sex schooling becomes even more pronounced; girls now choose to enter the lottery 36 percentage points less than boys. However, girls in single-sex schools are now just as likely to enter the tournament as boys from coed and single-sex schools. This evidence allows us to discuss conjectures two and four. Given that the coefficient on female interacted with single-sex is positive, it appears that females' risk-aversion is being affected by single-sex education, supporting conjecture two. Furthermore, since the

14. Both rounds involved students trying to solve as many mazes as possible. The rounds differed only in their payment mechanism, with round 1 being rewarded individually on the basis of the number of mazes solved and round 2 being a tournament, where the person in the group solving the most mazes would be the only one to be paid. For further details, see Booth and Nolen (2009)

15. This was calculated from $pu(x) + (1-p)u(y) = u(z)$, where p =0.5, x =11, y = 2 and z =5. We use the specific CRRA functional form for $u(.)$ given in the text.

marginal effect for comparing a single-sex girl to a coed boy, -0.07, is statistically insignificant, then there is no evidence that single-sex girls are any different to coed boys.

We can now examine conjectures three and more of conjecture four. Girls in all-girls groups are 12 percentage points more likely to enter the lottery than girls in mixed groups. This means that being in an all-girls group is causing women to be less risk averse since girls were randomly assigned to their groups. Thus there is strong evidence for conjecture three, that girls in same-gender experimental groups are less risk averse than girls in mixed gender experimental groups. This result is after 30 minutes of being in an all-girls group and, in comparison to the female single-sex schooling interaction, suggests that women are not more risk averse than men by nature. However the effect from being in an all-girls group does not cancel out the effect of being female and thus it seems that girls in same gender experimental groups do not choose to enter the tournament as much as coed boys.

One of the strengths of our experiment is that, while it does not explicitly solve the selection problem into single-sex and coeducational schools, it was designed to obtain good measures of cognitive ability in the early stages of the experiment. In addition, because we gathered information in the post-experiment questionnaire on where students lived, we were able to construct plausible instruments for school choice. How do our estimates alter when we add in these measures of cognitive ability? Column [3] of Table 2 reports estimates from a specification in which we also included students' scores obtained from earlier rounds of the experiment, as described at the end of Section IV.A. These controls proxy cognitive ability, which recent work suggests might affect willingness to take risks.[16] However, in our sample of British secondary school girls and boys, cognitive ability has a statistically insignificant effect on the probability of entering the lottery, and the coefficients of interest remain unaltered. This may be because our sample of children, all from academic streams in English schools, has less variance in cognitive ability.[17]

In summary, columns [1]-[3] of Table 2 provide strong evidence for conjectures one, two, and three and evidence for part of conjecture four. In the next section we will use the information

16. For example Benjamin, Brown, and Shapiro (2006), in an experiment involving 92 Chilean high school students, found that higher cognitive ability–especially mathematical ability measured in elementary school –is associated with lower levels of small-stakes risk aversion and short-run impatience. Dohmen et al. (2007), using a random sample of around 1,000 German adults, found that lower cognitive ability is associated with greater risk aversion and more pronounced impatience. A similar result was found by Burks et al. (2009), using a sample of 1,000 trainee truckers in the US. None of the studies looked specifically at gender, although a dummy variable for gender was included. Benjamin et al (2006) found that boys were about 8 percentage points more likely to be perfectly risk neutral than girls..

17. For most students who took the 11+ exam we also have the score they recieved on the test. When controlling for the score there is no significant change in our estimates. Furthermore, given the way students are allocated to different single-sex schools, the cut-off for admission will vary by school and year. The school fixed effect interacted with year effects would then capture, on average, if that change in average ability effected risk choices. Those controls also do not change the results.

gathered in the post-experiment questionnaire to construct plausible instruments for school choice, and to discuss some other robustness checks. Columns [4]-[7] of Table 2 report the additional estimates, and to these we now turn.

IV.C. Robustness Checks

We have already noted that a student's attendance at a single-sex school is likely to be influenced by her ability as well as by the choices of her parents or teachers.[18] Therefore students from single-sex schools may not be a random subset of the students from Essex. However it should be remembered that we asked only top students from coeducational schools to participate in the experiment. As a sensitivity analysis we performed three checks of the single-sex schooling and female interaction results. First, we compared single-sex students to a different comparison group: students from Suffolk *plus* students in Essex who took the 11+ exam. Second, we instrumented for single-sex school attendance. Finally we used propensity score matching to examine the female, single-sex schooling interaction.[19]

Column [4] of Table 2 is estimated on a subsample comprising students from Suffolk, students who took the 11+ exam, and students from single-sex schools. Students in Suffolk have to attend their closest school so they are likely to be a more representative sample. Furthermore, if "parental pushiness" is an issue, then those students who took the 11+ exam should look more like the single-sex students. Using this sample, we see that the gender gap actually becomes slightly larger: girls are 48 percentage points less likely to enter the lottery. However, the single-sex coefficient is also negative and significant. This suggests that boys in coed schools are more likely to take risks and perhaps "show off" for the girls, i.e. that stereotype threat could be causing the gender gap in risk aversion to be larger. This evidence would fit with the discussion of conjecture two. Girls in same-gender groups, are again 12 percentage points more likely to enter the lottery than girls in coed groups, still providing evidence for conjecture three. Finally with regards to conjecture four, the marginal effect for the difference between a single-sex girl and a coed boy is still insignificant; a single-sex schoolgirl is 13 percentage points less likely to choose the lottery than a coed boy but, given the standard error, the point estimate is not statistically differen than zero. By comparing single-sex students to a different control group we find that there is still evidence for conjectures one, two, three, and four.

In column [5] of Table 2 we present the regression results of the linear probability model (LPM). We do this so that we can address the potential endogeneity of the single-sex schooling

18. As noted earlier, Essex primary-school teachers and parents choose which children sit for the Essex-wide exam for entry into grammar schools. Parents must be resident in Essex for their children to be eligible to sit the entrance exam (the 11+ exam).

19. The degree of selection on the unobservables would have to be far stronger than the degree of selection on the observables to be able to explain away the single-sex girls' schooling effect (see Altonji et al, 2005).

variable in another way: by instrumenting for single-sex schooling. We used the six-digit residential postcode for each student to calculate the distances to the nearest single-sex school and to the nearest coed school. (Our sample size shrinks slightly, as some postcode responses were unreadable.) From this, we imputed the minimum traveling time to the closest coeducational school and to the closest single-sex school.[20] We next calculated a variable equal to the minimum time needed to travel to the closest single-sex school minus the minimum time to travel to the closest coeducational school. We break this variable into deciles creating 10 dummy variables. For example, if the difference in travelling time for a student fell in the first decile, that student would be assigned a one for the first dummy variable and a zero for all others. Using these 10 variables, we instrumented for attendance at a single-sex school using a two-step process. First, we estimated the probability of a student attending a single-sex school, where the explanatory variables were an Essex dummy (taking the value one if the student resides in Essex and zero otherwise) and an interaction of Essex-resident with the 10 travelling-time variables. We then estimated the regression reported in column [6], which is a LPM, where we use predicted single-sex school attendance in place of the original single-sex school dummy.[21] Since the equation uses predicted values, we bootstrapped the standard errors for attending a single-sex school.[22] Even here we find that the female, single-sex schooling interaction and all-girls group variable are statistically significant.

Given that there were some differences between our samples in Table 1, we used all controls that were different at the 5% level in our summary statistics and added them as controls in column [7] of Table 2. The controls used were whether a student's mother had a university degree, whether a student's father had a university degree, whether a student was the eldest child, and whether the student was aged 14 years. Furthermore we wished to allow these factors to affect a student's risk aversion differently by gender and schooling type, so we interacted the controls by female, single-sex schooling, and their interaction. The regression results in column [7] again provide strong evidence for conjectures one, two, three and some evidence for conjecture four.

Finally, since some may argue that the distance to one's school is not exogeneous to the choice of where to go to school and perhaps one's risk attitudes, we also use propensity score matching to examine the effect of the female, single-sex schooling interaction. Using propensity score matching allows us to control on observables and, rather than getting an average effect by

20. To calculate this, we used the postcode of each school and the postcode in which a student resides. We then entered the student's postcode in the "start" category in MapQuest.co.uk (http://www.mapquest.co.uk/mq/directions/mapbydirection.do) and the school's postcode in the "ending address." Mapquest then gave us a "total estimated. time" for driving from one location to the other. It is this value that we used. Thus the "average time" is based on the speed limit of roads and the road's classification (i.e. as a motorway or route).

21. The first-stage results for the IV regression are included as Table A.1. in the Appendix.

22. We randomly drew 1,000 different samples from our experimental data to calculate the bootstrap results.

looking at the linear trend over the entire distribution, we compare observations to only to the people that look the most like them on observables. Therefore, a student from a coed school is more likely to be compared to a student from a single-sex school whose parents are employed in the same sector and have the same level of education than a single-sex student whoses parents on not as similar on observables. To infer that the effect captured by propensity score matching is causal, though, we must assume that, conditional on the pretreatment characteristics below, single-sex school is randomly assigned. The results of the matching are presented in Table 3.[23]

[Insert Table 3]

The estimations in Table 3 are calculated using all pretreatment characteristics. We use the number of siblings a student has, the number of female siblings, the education level of the mother and father, the mother and father's employment status when the student was aged 14, and finaly the industry in which the student's mother or father was employed when the student was 14 years old. Based on those charateristics we estimate the propensity score presented in Table 3. The point estimates are all significant at the 1% level and are roughly the same as the female, single-sex interaction point estimate in column [6] of Table 2.

Given these there robustness checks and the continued significance of the single-sex, female interaction and the all-girls group variable, there seems to be strong evidence for conjectures two and three, that single-sex girls enter the lottery more than coed girls and that girls in same-gender groups enter the lottery more than girls in mixed gender groups. There is also evidence for part of conjecture four, that girls in single-sex environments take the risky option as much as boys. The marginal effects for single-sex girls compared to coed boys is negative in all columns of Table 2 but they are insignificant, suggesting that single-sex girls choose the risky option as much as boys. However the size of the coefficient on the all-girls group dummy variable is not large enough to cancel out the negative coefficient on the female dummy variable. Therefore girls in same-gender groups are not entering the lottery as much as coed boys. Since girls in some same-gender environments are not choosing the risky option as much as boys, then cannot find fully support for this hypothesis. The length of time a girl has been exposed to the same-gender environment - three years on average for girls at single-sex schools and only 30 minutes for girls in single-sex groups - may explain the difference in the size of the effect. However, the support for conjectures two, three, and part of four provides strong evidence not only that nurture is affecting the risk attitudes of girls but also that the magnitude of this effect is large; completely canceling out the gender gap in some cases. We now want to examine if this finding can also be revealed using commonly asked survey questions about risk.

23. Given that the the point estimate from the matching is constant and significant over such a large set of neighbours shows that the effect is constant over a large area.

V. Survey Versus Experimental Results

The experimental setting provided evidence that nurturing affects a girl's behaviour under uncertainty. We now examine whether survey questions could have been used to obtain those results and if the answers to commonly used survey questions provide any predictive power in explaining how a subject behaves in an experimental setting. To see if a student's answer to the general risk question, outlined in detail in Section III.B, provided any insight into whether the student would enter the "fiver" lottery, we reran that probit regression with an additional control for general risk attitude. The marginal effects are reported in column [2] of Table 4. The results show that choosing the "fiver" lottery is positively correlated with how prepared a student is to take risks. But inclusion of risk attitudes does not take away the explanatory power of the single-sex, female interaction or of the all-girls group coefficient.[24] Furthermore, the interaction of responses to the general risk question with being female is statistically insignificant. If student responses to the general risk attitudes question pick up their unobserved propensity to overstate their risk-loving, then the insignificance of this interaction implies that neither sex overstates more than the other. Likewise, when we use the student's answer to the hypothetical lottery – see column [3] of Table 4 – the explanatory power of the single-sex female interaction and being in all-girls group coefficient remain statistically significant even though some of the coefficienta to the survey response are also statistically significant. However there is little difference in how boys and girls responded the survey question, as the hypothetical amount interacted with being female has little explanatory value. This again suggests that the survey questions are being answered in a similar way by both boys and girls.

[Insert Table 4 here]

Since the general risk question and the answer to the hypothetical lottery are positively correlated with choosing to enter the fiver lottery, we will now examine if the answers to the two survey questions could have been used as dependent variables instead of the real stakes experimental outcome. Columm [4] of Table 4 uses the responses to the general risk question as the dependent variable. In this case the regression model used is Ordered Probit. Notice that all of the variables of interest are now statistically insignificant. There is no gender effect (the female dummy is not significant); there is no school-level nurturing (the single-sex and female interaction is insignificant); and there is no effect of the experimental peer-group. Even if OLS is used or a binary variable is created from the general risk attitudes question – using any cut point ranging from 3 to 8 – the survey question does not yield the same results as the real stakes experimental lottery.

24. This result is robust to entering a dummy variable for each option in the general risk scale, or for entering a squared term for the general risk question.

Columns [5]-[7] of Table 4 use the responses to the hypothetical risky financial investment as the dependent variable. As noted earlier, this not only represents a risky investment decision, as distinct from the abstract gamble for real stakes represented by the fiver lottery, but it also involves hypothetical amounts. Column [5] reports the results from OLS estimation. Notice that the female dummy has a statistically insignificant effect but that the interaction of female with single-sex schooling is statistically significant at the 5% level. In column [6] a tobit model is used (because a student can choose to put none of her hypothetical lottery winnings in the risky investment). Again, only the single-sex school and female interaction is significant at the 5% level. Finally, in column [7] an ordered probit model is used and again only the single-sex and female result is significant (5% level). This suggests that, while the hypothetical lottery investment does not provide the same evidence about relative risk-aversion as the real stakes experimental lottery, nonetheless the interaction of female with single-sex schooling remains statistically significant across the three estimation methods. Using the survey question as the dependent variable would suggest that, while there is no gender difference in risk aversion, women attending single-sex schools are not only as likely as men to enter the real-stakes gamble, but they also invest more in the hypothetical risky investment than do coed women and all men.

Given the results in Table 4, it seems that there is mixed evidence for the fifth conjecture. While the commonly used general risk attitude question is positively correlated with actual risky choices made under uncertainty, the determinants of these general risk attitudes differ quite markedly from the determinants of actual risky choices under uncertainty. This suggests that relying only on general risk attitudes might lead researchers to make misleading inferences about gender differences in choice under uncertainty. In contrast, the determinants of the amounts invested from the hypothetical lottery had some similarities to the determinants of actual risky choices under uncertainty. Estimating the determinants of amounts invested from the hypothetical lottery yielded the insight that girls attending single sex schools invest more in the risky outcome than boys. The real-stakes experimental lottery showed that girls from single-sex school were as likely as boys to enter the lottery, which is not inconsistent with the hypothetical lottery results. This example illustrates the complementary roles of experimental and survey data.

An alternative interpretation of these findings is that, while the domain of the fiver lottery and the hypothetical lottery is broadly similar, measuring risk aversion in financial matters, the context is different in the general risk question. Indeed, our results suggest that gender differences in risk aversion differ across contexts.

VI. Conclusion

Women and men may differ in their propensity to choose a risky outcome because of innate preferences or because pressure to conform to gender-stereotypes encourages girls and boys to modify their innate preferences. Single-sex environments are likely to modify students' risk-taking preferences in economically important ways. To test this, we designed a controlled experiment in which subjects were given an opportunity to choose a risky outcome – a real-stakes gamble with a higher expected monetary value than the alternative outcome with a certain payoff – and in which the sensitivity of observed risk choices to environmental factors could be explored. The results of our real-stakes gamble show that gender differences in preferences for risk-taking are indeed sensitive to whether the girl attends a single-sex or coed school. Girls from single-sex schools are as likely to choose the real-stakes gamble as boys from either coed or single sex schools, and more likely than coed girls. Moreover, we found that gender differences in preferences for risk-taking are sensitive to the gender mix of the experimental group, with girls being more likely to choose risky outcomes when assigned to all-girl groups.

We also found that gender differences in risk aversion are sensitive to the method of eliciting preferences. While the commonly used general risk attitude question is positively correlated with actual risky choices made under uncertainty, the determinants of these general risk attitudes differ quite markedly from the determinants of actual risky choices under uncertainty. This suggests that relying only on survey-based general risk attitudes might lead researchers to make misleading inferences about gender differences in choice under uncertainty. In contrast, the determinants of the amounts invested from the hypothetical lottery had some similarities to the determinants of actual real-stakes gambles under uncertainty.

To summarize our main results, we have discovered at least one setting – in addition to the Kasai tribe of India studied by Gneezy, Leonard and List (2008) – in which it is untrue that the average female avoids risky behaviour more than the average male. On average girls from single-sex schools are found in our experiment to be as likely as boys to choose the risky behaviour. This suggests that observed gender differences in behaviour under uncertainty found in previous studies might reflect social learning rather than inherent gender traits, a finding that would be hard, if not impossible, to show using survey-based evidence alone.

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VII. Appendix A: The Experiment

In the experiment, students were escorted into a large auditorium. One individual read off the instructions at the same time to everyone who was participating. All the graduate supervisors hired to supervise groups were given a copy of the instructions, were involved in the pilot that had taken place, and had gone through comprehensive training. These supervisors answered questions if they were raised.

Below are the text of the slides that were shown to the students when they arrived at the auditorium:

Slide 1:

Welcome to the University of Essex!

Today you are going to be taking part in an economics experiment.

Treat this as if it were an exam situation:

No talking to your neighbours.

Raise your hand if you have any questions.

There will be no deception in this experiment.

Slide 2:

The experiment today will involve completing 3 rounds of mazes.

Rules for completing a maze:

Get from the flag on the left hand side to the flag on the right hand side.

Do not cross any lines!

Do not go outside of the box.

We will now go through an example!!

Comment:

At this point students were shown one practice maze and were walked through how to solve it, illustrating the three points raised above.

Slide 3:

The supervisors in your row will be handing you maze packets throughout the session. At all times you need to put your seat letter and number on the packet and your name.

Please make sure you know your row letter and seat number.

Your seat is also on your badge. It is the middle grouping. For example, if you badge was 1-A3-F your seat number should be A3. Make sure this is correct now.

Mazes: You should do the mazes in order.

If you cannot solve a maze put an X through it and go onto the next maze.

If you do not put an X through it none of the following mazes will be marked.

Note: If you do not have the correct seat number on your maze packets you may be paid incorrectly.

Slide 4:

We are going to be doing six rounds of mazes.

Before each round of mazes we will explain how you will be paid for that round.

After all six rounds of mazes are finished we will choose one round to "implement".

That means you will get paid for your performance in that round.

The round for which you will be paid will be chosen randomly from this cup.

You will also receive GBP 5 for showing up today.

Since you do not know for which round you will be getting paid, you should do your best in each round and treat each round separately.

Slide 5:

You will get 5 minutes to solve up to 15 mazes.

Please solve as many mazes as you can.

Do not begin until I say go!

For this round you will get \pounds 0.50 for each maze you solve correctly:

Example: If you solve 8 mazes correctly you will earn GBP 4.

Please make sure you have put your name and seat on the maze packet now.

Are there any questions?

OK –> GO!

OK –> STOP

No Talking!

Slide 6:

Now you will get \pounds 2 for each maze you solve correctly IF you solve the most mazes correctly in your group.

Your group consists of you and the 3 other people sitting in your \textquotedblleft row\textquotedblright who have the same first number on their badge.

Example: If your badge number is 1-B2-M then your group consists of you and the three other students with the badges 1-**-* in your row.

If you are in group 1 and you solve 8 mazes correctly then:

IF everyone else in your group solved fewer than 8 mazes correctly you will get GBP 16.

IF someone in your group solved 9 mazes correctly, you would get GBP 0.

Note: Ties will be broken randomly. Thus IF two people in your group solve 8 mazes correctly we flip a coin to see who gets the GBP 16.

Are there any questions?

Slide 7:

You will get 5 minutes to solve up to 15 mazes.

Please solve as many mazes as you can

Please make sure you have put your name and seat on the maze packet now.

Do not begin until I say go!

OK –> GO!

OK –> STOP

No Talking!

Slide 8:

In this round you choose between two options.

Option 1: Get GBP 0.50 per maze you solve correctly.

Option 2: Get GBP 2 per maze you solve correctly IF you solve more mazes correctly than the other three people in your group did LAST round.

Example: Say you solve 8 mazes correctly this round.

If you chose option 1 you get GBP 4.

If you chose option 2:

You get GBP 16 IF the other three people in your group solved fewer than 8 mazes correctly in Round 2.

You get GBP 0 IF one other person solved 9 mazes correctly in Round 2.

Note: Ties will be broken randomly. Thus IF one person in your group solved 8 mazes correctly in round 2 we flip a coin to see if you get the GBP 16.

Are there any questions?

Slide 9:[25]

A supervisor will now come by and give you a card for you to circle option 1 or option 2.

Option 1: Get GBP 0.50 per maze you solve correctly.

Option 2: Get GBP 2 per maze you solve correctly IF you solve more mazes correctly than the other three people in your group did LAST round.

Circle your choice, fold the paper and give it back to the supervisor.

You need to write your seat number on the piece of paper

Do not tell anyone your choice!

You will get 5 minutes to solve up to 15 mazes.

Please solve as many mazes as you can

Do not begin until I say go!

25. We have not yet analysed the results of this fourth round.

Please make sure you have put your name and seat on the maze packet now.

Do not begin until I say go!

OK –> GO!

OK –> STOP

No Talking!

Slide 10:

In this round you will not have to do any mazes.

Everyone will be given £5 to play with. Think of the £5 as already being your own money.

You now face a choice:

Option One: Keep your £5.

Option Two: Gamble with your £5.

IF you choose option two you will flip a coin at the end of this round.

IF the coin comes up heads you will get £11.

IF the coin comes up tails you will get £2.

A supervisor will now hand you a piece of paper. Choose Option One or Option Two and then fold the paper.

Please put your seat number on the option card

Do not tell anyone your choice!

Everyone will now stand up when the supervisor comes to you and Flip a coin. Your supervisor will record the flip.

Slide 11:

Thank you for completing the mazes!

Your last set of mazes will now be collected – please stay seated.

I will now pull the number from the hat..... AND!?

You will be handed a survey – Read the questions very carefully and make sure you respond to ALL the questions including the ones at the very end.

After everyone is done completing the survey a supervisor will hand you some refreshments.

Make sure you put your seat on the survey!

Then after 10-15 minutes, your supervisor will give you an envelope with your money and ask you to sign a piece of paper. Then you will go to your bus.

Please keep your winnings confidential.

THANKS!

Comment:

Due to the time it took to fill all the envelopes with money, subjects ended up recieving the money two days later as the students needed to get back to their schools to be picked up by their parents.

Table 1: Sample proportions and averages by gender and school-background

	GIRLS				BOYS			
VARIABLES	Coed	SS	Dif	S.E. Dif	Coed	SS	Dif	S.E. Dif
Choose Option 2	0.54	0.86	0.32***	[0.07]	0.88	0.78	-0.10	[0.07]
Piece-Rate Score	2.16	2.62	0.46***	[0.17]	2.88	3.13	0.25	[0.24]
Tournamen Score	3.78	4.14	0.36	[0.24]	4.71	5.17	0.46	[0.29]
Tournament - Piece Rate Score	1.63	1.52	-0.11	[0.24]	1.83	2.05	0.22	[0.26]
Number of Siblings	1.67	1.59	-0.08	[0.17]	1.69	1.28	-0.41*	[0.22]
Number of Female Siblings	0.80	0.57	-0.23*	[0.12]	0.87	0.68	-0.19	[0.19]
Birth Order	1.73	1.78	0.05	[0.15]	1.86	1.46	-0.40**	[0.17]
Age	14.80	14.95	0.15	[0.10]	14.81	14.48	-0.33**	[0.13]
Mother went to University (=1)	0.13	0.49	0.36***	[0.07]	0.15	0.43	0.28***	[0.09]
Father went to University (=1)	0.16	0.52	0.36***	[0.07]	0.27	0.54	0.27***	[0.10]
Min travel time to nearest Coed School	13.45	24.23	10.78***	[1.64]	14.59	27.63	13.04***	[1.91]
Min travel time to nearest Single-Sex School	24.18	15.32	-8.86***	[1.24]	24.53	12.95	-11.58***	[1.38]
Prepared to take Risk (0-10)	6.40	6.95	0.55*	[0.29]	6.90	6.69	-0.21	[0.40]
Amount invested in Financial Offer	£27,579	£42,424	£14,845***	[4,293.67]	£37,308	£34,783	-£2,525	[5,709.01]

	SINGLE-SEX				COED			
VARIABLES	Girls	Boys	Dif	S.E. Dif	Girls	Boys	Dif	S.E. Dif
Choose Option 2	0.86	0.78	0.08	[0.07]	0.54	0.88	-0.34***	[0.08]
Piece-Rate Score	2.62	3.13	-0.51**	[0.22]	2.15	2.88	-0.73***	[0.19]
Tournamen Score	4.13	5.17	-1.04***	[0.28]	3.78	4.71	-0.93***	[0.26]
Tournament - Piece Rate Score	1.51	2.04	-0.53*	[0.27]	1.63	1.83	-0.20	[0.24]
Number of Siblings	1.59	1.28	0.31	[0.19]	1.66	1.69	-0.03	[0.19]
Number of Female Siblings	0.57	0.67	-0.10	[0.15]	0.81	0.87	-0.06	[0.15]
Birth Order	1.78	1.47	0.31*	[0.16]	1.72	1.86	-0.14	[0.17]
Age	14.95	14.48	0.47***	[0.12]	14.8	14.81	-0.01	[0.11]
Mother went to University (=1)	0.48	0.43	0.05	[0.10]	0.12	0.15	-0.03	[0.06]
Father went to University (=1)	0.51	0.54	-0.03	[0.10]	0.16	0.27	-0.11*	[0.07]
Min travel time to nearest Coed School	24.23	27.63	-3.40*	[2.02]	13.45	14.59	-1.14	[1.64]
Min travel time to nearest Single-Sex School	15.32	12.95	2.37	[1.69]	24.18	24.53	-0.35	[1.06]
Prepared to take Risk (0-10)	6.95	6.69	0.26	[0.38]	6.4	6.90	-0.50	[0.30]
Amount invested in Financial Offer	£42,424	£34,783	£7,642	[4,829.94]	£27,579	£37,308	-£9,729*	[4,982.45]

Table 2: Dependant variable (=1) if student choose option two in "Fiver Round"

COEFFICIENT	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Female (=1)	-0.16***	-0.36***	-0.37***	-0.48***	-0.43***	-0.46***	-0.34***
	[0.05]	[0.07]	[0.07]	[0.09]	[0.08]	[0.09]	[0.11]
Single-Sex (=1)		-0.13	-0.13	-0.28**	-0.10	*-0.11*	-0.06
		[0.10]	[0.10]	[0.11]	[0.08]	*[0.10]*	[0.18]
Female * Single-Sex		0.33***	0.33***	0.44***	0.42***	*0.47****	0.30**
		[0.06]	[0.06]	[0.07]	[0.10]	*[0.14]*	[0.12]
All-Girls (=1)		0.12*	0.12*	0.12*	0.13*	0.14*	0.14**
		[0.06]	[0.06]	[0.07]	[0.07]	[0.08]	[0.06]
All-Boys (=1)		-0.05	-0.04	-0.03	-0.04	-0.00	-0.05
		[0.10]	[0.10]	[0.11]	[0.08]	[0.08]	[0.11]
Maze Score R1			-0.01				
			[0.03]				
Maze Score R2 - R1			0.02				
			[0.02]				
Marginal Effect for Female + Single-Sex		-0.07	-0.06	-0.13			-0.03
+ Female * Single-Sex		[0.05]	[0.05]	[0.09]			[0.06]
Controls	No	No	No	No	No	No	Yes
Controls * Female	No	No	No	No	No	No	Yes
Controls * Single-Sex	No	No	No	No	No	No	Yes
Controls * Female * Single-Sex	No	No	No	No	No	No	Yes
Model Type	Probit	Probit	Probit	Probit	LPM	IV LPM	Probit
Constant					0.90***	0.90***	
					[0.05]	[0.06]	
Observations	260	260	260	201	260	243	260
R-squared					0.131	0.115	
F-Stat for IV Variables						155.6	

*Columns [1]-[3], and [5]-[7] use the entire sample of subjects. Column [4] only uses students from Single-Sex schools, students who took the 11+ exam, and students from Suffolk. The reason for the decreased sample in column [6] is due to the fact that some of the post codes used to create the instruments were illegible. Robust Standard Errors are in brackets and *** p<0.01, ** p<0.05, *p<0.1.*

Table 3: Propensity Score Estimate for the female, single-sex education interaction.

Female * Single-Sex (=1)	0.28**	0.29***	0.26***	0.28***	0.27***	0.26***	0.23***	0.25***	0.25***	0.24***
	[0.12]	[0.10]	[0.09]	[0.09]	[0.09]	[0.08]	[0.08]	[0.08]	[0.08]	[0.08]
Observations	242	242	242	242	242	242	242	242	242	242
Using nearest (#) of neighbors	1	2	3	4	5	6	7	8	9	10

Standard errors are calculated by b

**** p<0.01, ** p<0.05, * p<0.1*

Table 4: Examining the Experimental and Survey Results.

	DEPENDENT VARIABLE						
	(=1) If Student Choose Option Two in "Fiver" Round			Readiness to take Risk (0-10)	Hypothetical Lottery Investment		
VARIABLES	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Female (=1)	-0.36***	-0.51***	-0.33***	-0.23	-0.79	-0.92	-0.29
	[0.07]	[0.13]	[0.08]	[0.21]	[0.58]	[0.75]	[0.23]
Single-Sex (=1)	-0.13	-0.12	-0.13	-0.09	-0.34	-0.31	-0.11
	[0.10]	[0.10]	[0.10]	[0.22]	[0.56]	[0.71]	[0.22]
Female * Single-Sex	0.33***	0.32***	0.28***	0.37	1.83**	2.25**	0.70***
	[0.06]	[0.06]	[0.06]	[0.27]	[0.71]	[0.89]	[0.27]
All-Girls (=1)	0.12*	0.13**	0.12**	-0.09	0.25	0.29	0.09
	[0.06]	[0.06]	[0.05]	[0.16]	[0.43]	[0.55]	[0.16]
All-Boys (=1)	-0.05	-0.06	-0.04	-0.07	1.00	1.24*	0.38*
	[0.10]	[0.11]	[0.10]	[0.23]	[0.61]	[0.75]	[0.23]
Readiness to take Risk (0-10)		0.04*					
		[0.02]					
Female * Readiness to Take Risk		0.04					
		[0.03]					
Invest £20,000 (=1)			-0.07				
			[0.14]				
Invest £40,000 (=1)			0.06				
			[0.11]				
Invest £60,000 (=1)			0.04				
			[0.12]				
Invest £80,000 (=1)			0.34***				
			[0.04]				
Invest £100,000 (=1)			-0.14				
			[0.28]				
Female * Invest £20,000			0.05				
			[0.13]				
Female * Invest £40,000			-0.13				
			[0.18]				
Female * Invest £60,000			0.16**				
			[0.08]				
Female * Invest £80,000			-0.88***				
			[0.02]				
Female * Invest £1000,000			0.13				
			[0.12]				
Model Type	Probit	Probit	Probit	Ordered Probit	OLS	Tobit	Ordered Probit
Constant					3.41***	2.87***	
					[0.45]	[0.59]	
Observations	260	255	259	255	259	259	259
R-squared					0.058		
Cut 1				-2.79***			-0.72***
				[0.37]			[0.18]
Cut 2				-2.55***			-0.05
				[0.30]			[0.18]
Cut 3				-1.65***			0.64***
				[0.18]			[0.18]
Cut 4				-1.27***			1.22***
				[0.17]			[0.20]
Cut 5				-0.75***			1.90***
				[0.17]			[0.22]
Cut 6				-0.46***			
				[0.16]			
Cut 7				0.32**			
				[0.16]			
Cut 8				0.86***			
				[0.17]			
Cut 9				1.52***			
				[0.19]			

*Robust standard errors in brackets and *** p<0.01, **p<0.05, * p<0.1*

Table A.1: First Stage Regression for whether a student attended a single-sex school

COEFFICIENT	[1]
Essex (=1)	0.96***
	[0.03]
Essex * Second Decile of Distance to a Single-Sex School - Distance to a Coed School	0.00
	[0.01]
Essex * Third Decile of Distance to a Single-Sex School - Distance to a Coed School	-0.10*
	[0.05]
Essex * Fourth Decile of Distance to a Single-Sex School - Distance to a Coed School	-0.51***
	[0.13]
Essex * Fifth Decile of Distance to a Single-Sex School - Distance to a Coed School	-0.83***
	[0.08]
Essex * Sixth Decile of Distance to a Single-Sex School - Distance to a Coed School	-0.80***
	[0.10]
Essex * Seventh Decile of Distance to a Single-Sex School - Distance to a Coed School	-0.72***
	[0.14]
Essex * Eigth Decile of Distance to a Single-Sex School - Distance to a Coed School	-0.69***
	[0.20]
Essex * Ninth Decile of Distance to a Single-Sex School - Distance to a Coed School	-0.81***
	[0.10]
Essex * Tenth Decile of Distance to a Single-Sex School - Distance to a Coed School	-0.93***
	[0.09]
Female (=1)	0.11**
	[0.05]
All-Girls (=1)	-0.06
	[0.06]
All-Boys (=1)	0.08
	[0.05]
Constant	-0.02
	[0.04]
Observations	243
R-squared	0.622

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1