Institutional Sources of Advantage and Selection into Competition

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Abstract

Competitive institutions shape outcomes not only through who wins, but through who chooses to enter. We study whether competition entry depends on the institutional source of competitive advantage. In a real-effort experiment with 654 subjects, we separately vary task difficulty, competitive position, and the source of that position: an easy task is either transparently assigned by chance (legitimate advantage) or obtained through an unverifiable private report (ambiguous advantage). Entry is institutionally contingent. The gender gap in entry is pronounced under competitive advantage but small under competitive disadvantage. Entry is higher under legitimate than under ambiguous advantage, especially among men, and partial-identification bounds indicate that this contrast is not driven by self-selection into reported advantage. Absolute task difficulty alone explains little, and reported easy status strongly predicts entry but is unrelated to baseline ability. Institutional design thus shapes selection into competition by changing not only who is advantaged, but how advantage is created.

Keywords: competition, private reporting, competitive advantage, gender difference.

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1 Introduction

Competition is a central allocation mechanism in many economic settings. Jobs, promotions, grants, bonuses, school placements, procurement contracts, and entrepreneurial opportunities are often allocated through competitive processes. Yet competitors rarely enter these processes on a perfectly level playing field. Some participants may benefit from stronger prior training, better information, referral networks, favorable assignments, or institutional access. Others may gain advantage through less transparent channels, such as inflated credentials, privately reported performance, or behavior that is difficult for outsiders to verify. These examples motivate a common institutional problem: the same observed advantage may have different sources and different meanings. It may reflect legitimate assignment, accumulated opportunity, privileged access, or ambiguous self-reporting. If competition allocates rewards, then institutional features that affect who enters competition may also affect the composition of competitors and the allocation of opportunities.

A large literature in economics documents gender differences in willingness to enter competition. In the canonical tournament-entry paradigm, women are often less likely than men to choose tournament-based compensation, even conditional on performance (Gneezy et al., 2003; Niederle and Vesterlund, 2007). Subsequent work shows that beliefs about relative performance, confidence, risk preferences, feedback concerns, and preferences for competition all help explain gender differences in competitive entry (Croson and Gneezy, 2009; Niederle and Vesterlund, 2011; van Veldhuizen, 2022). This literature has substantially advanced our understanding of individual-level determinants of competition entry. We build on it by shifting attention to the institutional environment in which the competition-entry decision is made. In particular, we study whether competition entry depends on the institutional source of competitive advantage and disadvantage. This shift matters for policy interpretation. If gender differences in competition entry depend on the institutional environment, then the relevant question is not only how to change individual willingness to compete, but also how competitive systems create, reveal, and legitimize advantage.

Our experiment separates three concepts that are often conflated. The first is absolute task difficulty: whether the subject faces an easy or hard task. The second is competitive position: whether that task creates an advantage or disadvantage relative to the matched partner. The third is the institutional source of that position: whether it arises through transparent random assignment or through private reporting. The novelty of the design is that it holds fixed the compensation choice while separately varying whether a subject has an easy or hard task, whether that task creates an advantaged or disadvantaged competitive position, and whether the position is transparently assigned or privately reported. This separation is useful because these concepts have different implications for tournament entry. An easier task raises expected output under both piece-rate and tournament payment, whereas competitive advantage changes expected relative performance. Similarly, a competitive advantage assigned by chance may not be behaviorally equivalent to an advantage that arises through an ambiguous private-reporting channel.

This design also provides a reason to study the question experimentally. In observational data, unequal competitive positions are common, but their sources are often difficult to distinguish. A worker may appear better positioned for promotion because of ability, assignment, access to information, favoritism, or misreporting. A firm may appear advantaged in procurement because of productivity, institutional access, or privately held information. Our experiment holds fixed the payoff rule, matching protocol, and entry decision while varying whether competitive advantage is transparent or privately reported. We therefore study how entry varies not only with being advantaged or disadvantaged, but also with the institutional source of that position.

Subjects complete real-effort tasks and choose whether to be paid by a piece rate or a tournament. In the benchmark conditions, all subjects face either the easy task or the hard task. In the Random condition, the task is assigned by transparent chance. A subject assigned the easy task in this condition has a legitimate competitive advantage, while a subject assigned the hard task has a legitimate competitive disadvantage. In the Die Roll condition, the task is privately reported. A subject reporting the easy task in this condition has an ambiguous competitive advantage, while a subject reporting the hard task has an ambiguous competitive disadvantage. We use the term ambiguous because the private-reporting institution makes the source of the reported task difficult to verify. We do not claim to identify individual cheating. Instead, we compare entry when the same apparent competitive advantage arises through private reporting with entry when it is transparently assigned, accounting explicitly for the fact that a privately reported advantage is self-selected.

We find four main results. First, the gender gap in competition entry is institutionally contingent: it is largest under legitimate advantage, remains statistically significant under ambiguous advantage, and is small or statistically insignificant under competitive disadvantage. Second, the source of competitive advantage matters. Entry is higher under legitimate advantage than under ambiguous advantage, and the difference is concentrated among men. Because the ambiguous-advantage group is defined by the subject's own report, these cell-level contrasts are descriptive; partial-identification bounds developed in Section 6.3 indicate that the contrast is unlikely to be fully explained by the selected composition of the reported-easy group.

Third, absolute task difficulty alone does not explain entry. Entry varies more strongly with whether the environment creates competitive advantage or disadvantage, and it is substantially lower in disadvantage environments, especially among men. Fourth, ambiguous advantage is associated with selection into competition: subjects who report the easy task are substantially more likely to enter, and easy-task reporting is unrelated to baseline ability but associated with risk tolerance and stated competitiveness. Additional analyses show that these patterns are not explained by realized tournament profitability or by the belief measures available in the experiment, and we report randomization-inference and multiple-testing-adjusted p-values for the full family of environment and gender contrasts.

The paper contributes to three literatures. First, it contributes to the literature on gender and competition by showing that gender differences in tournament entry are institutionally contingent. Our results complement explanations based on confidence, risk, and preferences for competition by identifying an institutional margin that shapes entry. In this sense, the paper speaks to policy discussions that look beyond individual traits or encouragement interventions and instead ask how the design of competitive institutions affects selection. Second, the paper contributes to work on fairness, procedural fairness, and uneven playing fields in competition (Trautmann, 2023; Buser et al., 2025). We show that it is not only the presence of an uneven playing field that matters, but also whether the advantage is transparently assigned or privately reported. Third, the paper relates to the literature on dishonesty, private information, and competition (Gneezy, 2005; Fischbacher and Föllmi-Heusi, 2013; Schwieren and Weichselbaumer, 2010; Faravelli et al., 2015; Buser and Sangi, 2025). Unlike studies that seek to measure dishonesty directly or ask whether competition induces misconduct, our focus is on how an ambiguous source of advantage affects the willingness to enter competition.

The remainder of the paper is organized as follows. Section 2 discusses the related literature. Section 3 describes the experimental design. Section 4 presents a simple conceptual framework and the hypotheses. Section 5 reports the main results. Section 6 provides additional evidence on selection into competition, payoff calibration, and beliefs. Section 7 concludes.

2 Related Literature

This paper contributes to the literature on gender differences in willingness to compete. A large experimental literature, beginning with Gneezy et al. (2003) and Niederle and Vesterlund (2007), shows that women are often less likely than men to enter tournament-based compensation schemes, even when performance is held fixed. Reviews by Croson and Gneezy (2009) and Niederle and Vesterlund (2011) summarize evidence that these differences are related to beliefs about relative performance, risk attitudes, feedback concerns, and preferences for competition. More recent work continues to examine how much of the gender gap reflects risk preferences, confidence, or a distinct preference for competition (van Veldhuizen, 2022). A recent meta-analysis further shows that gender differences in tournament entry vary substantially across experimental settings (Markowsky and Beblo, 2022). Consistent with this heterogeneity, several studies show that changing the structure or purpose of competition can reduce gender differences in entry, including competition against one's own past performance, team competition, and prosocial incentives (Apicella et al., 2017; Healy and Pate, 2011; Cassar and Rigdon, 2021). Our paper builds on this literature by shifting attention from individual-level explanations to the institutional environment in which the competition-entry decision is made. We show that the gender gap in competition entry is not a stable feature of the choice problem, but varies substantially with how competitive advantage and disadvantage are created.

A central mechanism in this literature is expected relative performance. In the canonical tournament-entry design, individuals choose between a piece rate and a tournament after observing their own performance but without knowing with certainty whether they will outperform a comparison subject. Differences in confidence, beliefs about the ability distribution, and risk attitudes can therefore affect tournament entry even when objective performance is similar. Our design preserves this basic structure but introduces variation in whether the subject's task creates a competitive advantage or disadvantage relative to the partner. This distinction matters because absolute task difficulty and competitive advantage are conceptually different. An easier task raises expected output under both piece rate and tournament payment, whereas competitive advantage changes expected relative performance. We therefore contribute by separating the role of absolute task difficulty from the role of the competitive environment.

The paper is also related to recent work on fairness, procedural fairness, and uneven playing fields in competition. Trautmann (2023) reviews evidence on procedural fairness and equality of opportunity, highlighting that individuals care not only about outcomes but also about the procedures through which opportunities are allocated. The closest paper to ours is Buser et al. (2025), who study willingness to compete when competition may be unfair because the playing field is uneven or opponents differ in strength. They show that many subjects are willing to compete against opponents who are weaker or exogenously disadvantaged, suggesting that self-interest often outweighs fairness concerns in competition-entry decisions. Our paper asks a different but complementary question. Rather than varying only whether the playing field is uneven, we vary the institutional source of the unevenness. In our experiment, a subject may have a competitive advantage because the task was assigned by transparent chance, or because the task was privately reported in an environment where self-serving reports are possible. This allows us to distinguish legitimate advantage from ambiguous advantage, and legitimate disadvantage from ambiguous disadvantage.

This distinction connects the paper to the experimental literature on dishonesty and private information. A key insight from this literature is that many economically relevant forms of dishonesty are difficult to observe directly at the individual level. Gneezy (2005) studies deception in sender-receiver games and shows that lying behavior depends on the consequences of deception. Fischbacher and Föllmi-Heusi (2013) introduces a private die-roll design in which individual misreporting cannot be detected, but aggregate deviations from the truthful distribution can be used to study dishonesty. Our design draws on this methodological insight, but uses the private-reporting channel for a different purpose. We do not claim to identify individual cheating. Instead, we study whether competition entry changes when competitive advantage arises through a private and ambiguous reporting channel rather than through transparent random assignment.

Finally, the paper relates to work on competition, misconduct, and private information. Laboratory studies show that competitive incentives can affect dishonest behavior and other forms of strategic misconduct (Schwieren and Weichselbaumer, 2010; Faravelli et al., 2015). Very recent work also examines willingness to participate in "dirty" competitive environments. Buser and Sangi (2025) study willingness to engage in dirty competition and willingness to enter competitions in which the opponent may engage in dirty behavior. Our paper differs by focusing on how the source of competitive advantage itself - transparent assignment versus private reporting - shapes entry. The contribution is therefore at the intersection of gender and competition, uneven playing fields, and private-information institutions: we show that the source of competitive advantage and disadvantage is an additional margin shaping competition entry and gendered selection into competition.

3 Experimental Setup

3.1 Design

To examine how unequal competitive environments influence individuals' willingness to compete, we conducted a controlled laboratory experiment designed to mirror the incentives that people face when deciding whether to enter a tournament when competitors may hold different positions. Specifically, we consider a setting in which some individuals may face a competitive advantage or disadvantage, and in which the source of that position is either transparent or privately reported.

The experiment featured four treatments: *Die Roll*, *Random*, *Fixed Easy*, and *Fixed Hard*. The *Die Roll* and *Random* treatments simulated environments with unequal competitive positions. In *Die Roll*, participants privately reported the task assignment implied by their die roll, creating scope for an ambiguous source of competitive advantage. In contrast, *Random* assigned task difficulty by chance, creating unequal conditions through a transparent random mechanism. To control for potential task-specific effects on the decision to compete, we introduced two baseline treatments, *Fixed Easy* and *Fixed Hard*, in which all participants faced identical tasks. These treatments represent level playing fields and serve as benchmarks for comparison. Both were variants of the tournament task used by Niederle and Vesterlund (2007).

Each treatment comprised three parts, followed by a post-experimental questionnaire. The first two parts were identical across all treatments; only Part Three varied by condition.

Part One

In Part One, participants were given 30 seconds to solve as many single-digit addition problems as possible (see Figure 1a). Compensation followed a piece-rate scheme of 20 pence per correct answer.

Part Two

In Part Two, participants completed another 30 - second round, this time solving arithmetic problems involving both addition and subtraction (see Figure 1b). Although the modification from Part One appears modest, the increase in difficulty was substantial. On average, participants solved only about half as many problems correctly compared with Part One. Thus, Part Two provided a markedly more challenging task than Part One.

(a) Part One task example

(b) Part Two task example

Figure 1: Examples of tasks used in Part One and Part Two

We included Parts One and Two in all treatments for two main reasons. First, these tasks allowed us to measure participants' baseline ability, which served as an important control in the subsequent data analysis. Second, by experiencing both tasks, participants developed a clearer understanding of the substantial difference in difficulty between them. This exposure ensured that their choices in Part Three were made with an informed understanding of the relative challenge involved.

Part Three

In Part Three, participants were randomly paired and asked to decide whether they preferred compensation by piece rate or by tournament. Under the piece-rate scheme, participants earned 20 pence per correct answer. Under the tournament scheme, payoffs depended on relative performance: 60 pence per correct answer if the participant outperformed their partner, 30 pence if they tied, and zero if they scored fewer correct answers. Importantly, tournament outcomes depended solely on the total number of correct answers, irrespective of which task each partner completed. As in the previous two parts, participants had 30 seconds to complete the task.

To minimise the influence of pro-social concerns toward their partner, we informed participants that their compensation decisions affected only their own payoffs. For example, a participant could choose to enter the tournament even if their partner selected the piece rate. In this case, their earnings would still depend exclusively on whether they solved more problems than their partner, while the partner would be paid according to the piece-rate scheme.

The type of task assigned to each pair in Part Three varied across treatments:

- **Die Roll**: Each participant received a fair six-sided die and was instructed to roll it twice but report only the outcome of the first roll (Fischbacher and Föllmi-Heusi, 2013). The reported roll determined the task type: outcomes of 1–3 corresponded to the easier Type A task (single-digit addition, as in Part One), while outcomes of 4–6 corresponded to the more difficult Type B task (addition and subtraction, as in Part Two). Reporting was private and unverifiable, thereby creating scope for self-serving reports. On the same page where participants reported their die roll and learned their assigned task, they also chose their preferred compensation scheme (see Figure 2).

- **Random**: Instead of self-reporting, the computer randomly assigned participants to either the Type A or Type B task. The assignment probabilities replicated the distribution observed in a pilot of the *Die Roll* treatment.[1] Participants were informed of their own realized task assignment before choosing between piece-rate and tournament (see Figure 3), but the assignment probabilities themselves were not communicated to participants.

- **Fixed Easy**: All participants were informed that everyone would work on the Type A task (single-digit addition, as in Part One) before choosing their compensation scheme.

- **Fixed Hard**: All participants were informed that everyone would work on the Type B task (addition and subtraction, as in Part Two) before deciding between piece-rate and tournament.

At the end of Part three, the subjects were asked to make some incentivized guesses and answer a post-experimental questionnaire. At the end of the experi-

[1] A pilot was conducted for the Die Roll treatment to estimate the proportion of participants reporting Type A. This estimated reporting frequency was then used to set the task-assignment probability in the Random treatment.

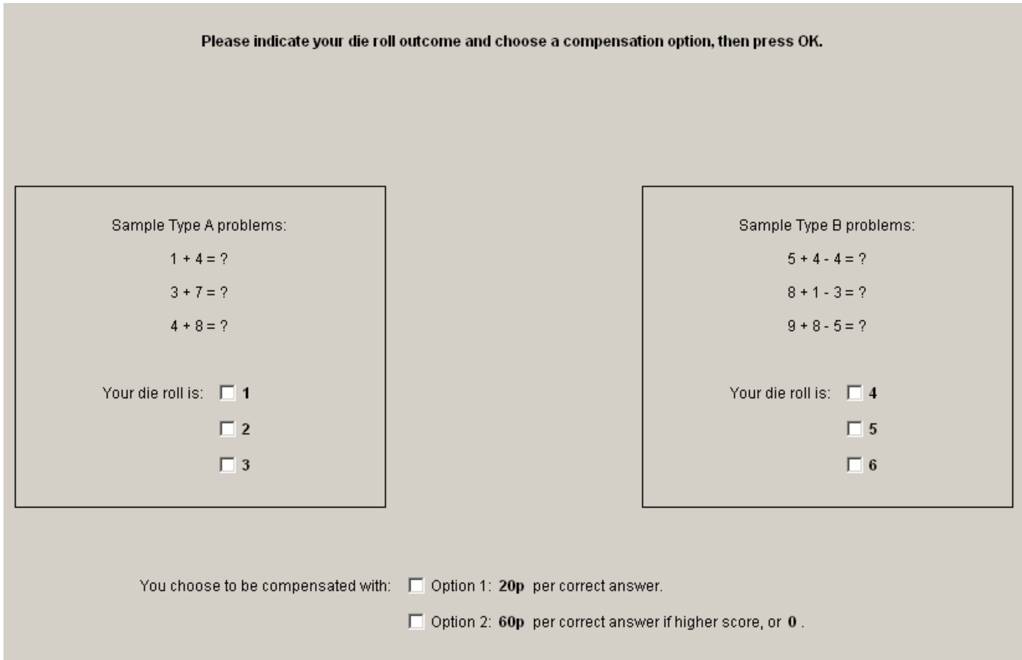

Figure 2: Die Roll Treatment - Decision Page

ment, one of the three incentivized parts was randomly selected for payment. This procedure ensured that each decision could affect earnings while avoiding wealth effects across parts. All subjects reported their beliefs about average performance on the easy task and the hard task. In addition, we elicited beliefs about the matched partner in a way that reflected the information structure of the relevant environment. In the Fixed Easy, Fixed Hard, and Die Roll conditions, subjects guessed whether their matched partner chose the competitive payment scheme. In the Random condition, where the partner's task assignment was uncertain, subjects instead reported conditional beliefs about whether the partner would choose competition if assigned the easy task and if assigned the hard task. In the Die Roll condition, subjects also guessed whether the matched partner reported the easy or hard task; no corresponding partner-task guess was elicited in the Random condition. We emphasize one further design feature that matters for interpretation: in no condition were subjects informed of the distribution of task types among other participants. Neither the

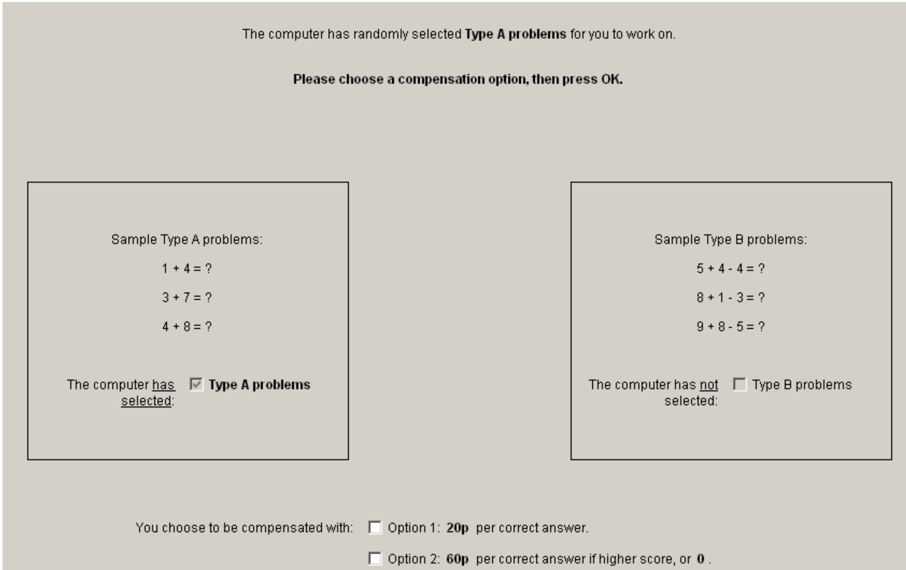

Figure 3: Random Treatment - Decision Page

assignment probabilities in the Random condition nor the distribution of reported tasks in the Die Roll condition was communicated, so beliefs about the matched partner's task were formed endogenously within each institution. The timeline of the experiment is summarized in Figure 4.

The design separates task difficulty from the source of competitive advantage and disadvantage. Subjects may work on either an easy or a hard task. We use the term *competitive advantage* to describe having the easy task in environments where task type may differ across competitors, because the easy task improves expected performance in the competitive payment scheme, especially when the matched partner may face or report the hard task. Conversely, we use the term *competitive disadvantage* to describe having the hard task in those environments, because the hard task worsens expected competitive performance, especially when the matched partner may face or report the easy task. The Fixed Easy condition therefore serves as an easy-task benchmark rather than an advantage condition, since all subjects in that condition face the easy task. Similarly, the Fixed Hard condition serves as a hard-task benchmark. In the Random condition, task type is assigned by chance. We refer to subjects assigned to the easy task as having a legitimate advantage and subjects assigned to the hard task as having a legitimate disadvantage. In the Die Roll condition, task type is determined by the subject's private die-roll report. We refer to subjects reporting the easy task as having an ambiguous advantage and subjects reporting the hard task as having an ambiguous disadvantage, since the report may reflect either the true die-roll outcome or self-serving misreporting. This terminology allows us to compare not only easy and hard tasks, but also whether the source of competitive advantage or disadvantage affects entry into competition.

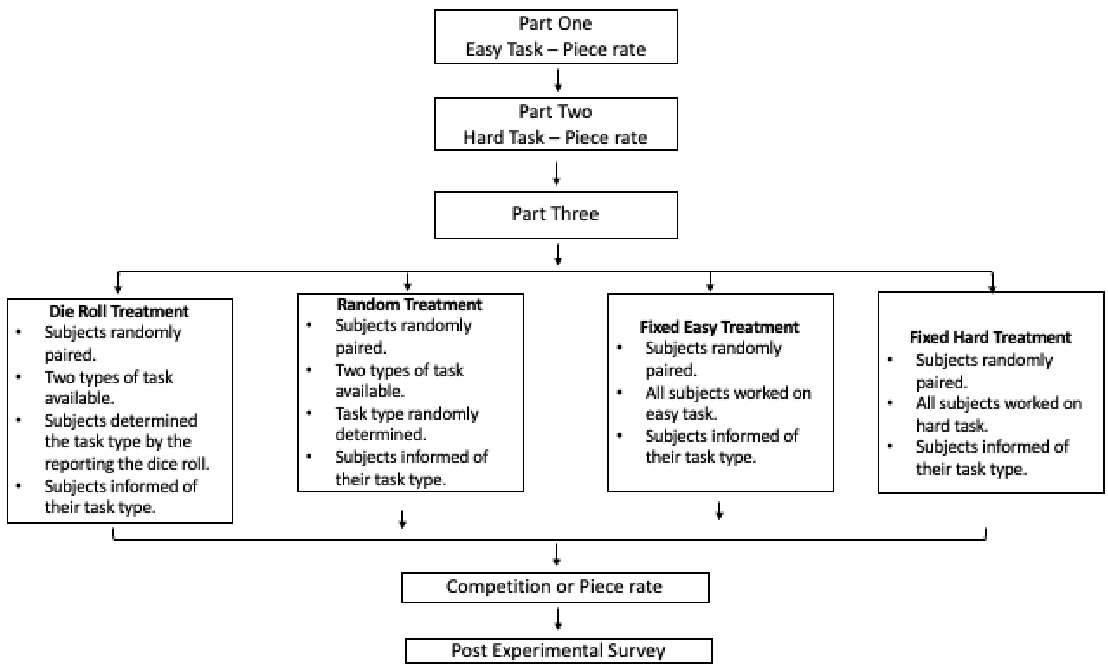

Figure 4: Timeline of the Experimental Treatments

3.2 Procedures

The experiment was conducted in the Finance and Economics Experimental Laboratory at Exeter (FEELE). Participants were recruited from the lab's subject database using Orsee (Greiner, 2004). A total of 654 individuals participated in one of the 26 sessions. The sessions were conducted between December 2017 and March 2018. In any given session, subjects were seated at individual stations with dividers. The instructions were read out loud by the experimenter to ensure common knowledge of the study. The number of participants in a session ranged from 14 to 30. Each session lasted about 45 minutes and the average earnings were around £10 (including £3 for showing up).

The experiment was programmed using Z-Tree software (Fischbacher, 2007) and comprised three incentivised parts and a survey that collected demographic information. All participants received general instructions informing them that one part of the experiment would be randomly selected for payment at the end of the experiment. Participants received no feedback information until the end of the experiment. The hypotheses in Section 4 are motivated by the conceptual framework; given the number of environment and gender contrasts we examine, we report randomization-inference and multiple-testing-adjusted p-values throughout (Appendix Table A.13).

4 Conceptual Framework and Hypotheses

This section presents a simple framework that organizes the empirical tests. The framework is not intended as a structural model of tournament entry. Its purpose is to clarify three distinctions that are central to the design: absolute task difficulty versus competitive advantage or disadvantage, legitimate versus ambiguous sources of advantage, and the possibility that the gender gap in competition entry varies across competitive environments.

Consider a subject i who chooses between a piece-rate payment and a tournament payment. Let $t_i \in \{E, H\}$ denote the subject's task, where E is the easy task and H is the hard task. Let $q_i(t_i)$ denote subject i's expected number of correct answers on task t_i. Let s denote the competitive environment, and let $b_i(t_i, s)$ collect the subject's beliefs about own output, the partner's output, the partner's task or report, and the partner's entry decision. Let $p_i^W(t_i, s)$ and $p_i^T(t_i, s)$ denote the subject's perceived probabilities of winning and tying the tournament in environment s. Under the piece rate, the subject receives 20 pence per correct answer. Under the tournament, the subject receives 60 pence per correct answer if the subject outperforms the matched partner, 30 pence per correct answer in the event of a tie, and zero if the subject performs worse. A reduced-form representation of the expected monetary gain from choosing the tournament rather than the piece rate is

$$M_i(t_i, b_i(t_i, s)) = q_i(t_i) \left[60 p_i^W(t_i, s) + 30 p_i^T(t_i, s) - 20\right]. \tag{1}$$

This expression is intended to summarize the monetary comparison, not to impose a structural model of beliefs, output, or risk preferences.

The expression shows why absolute task difficulty alone has no unambiguous implication for entry. An easier task raises expected output, but it raises output under both payment schemes. Its effect on the return to tournament entry depends on expected relative performance: if the subject expects a sufficiently high probability of beating or tying the partner, the higher-output task can increase the monetary return to entry; if not, it can increase the expected monetary loss from entering. Thus, whether an easy task encourages competition depends on its implications for relative performance, not only on its absolute difficulty.

Competitive advantage and disadvantage enter through expected relative performance. An easy task creates competitive advantage when the matched partner may face, or report, the hard task; a hard task creates competitive disadvantage when the matched partner may face, or report, the easy task. The Fixed Easy and Fixed Hard conditions therefore provide task-difficulty benchmarks. In contrast, the Random and Die Roll conditions create environments in which task assignment can change the subject's expected competitive position relative to the partner.

The source of competitive advantage may also matter. In the Random condition, advantage or disadvantage is generated by a transparent random assignment. Subjects assigned to the easy task have a legitimate advantage, while subjects assigned to the hard task have a legitimate disadvantage. In the Die Roll condition, the subject privately reports the task. Subjects reporting the easy task have an ambiguous advantage, while subjects reporting the hard task have an ambiguous disadvantage. Holding task difficulty fixed, legitimate and ambiguous advantage may generate different entry decisions for two broad reasons. First, the source of advantage may affect beliefs about the matched partner, including beliefs about the partner's task, reporting behavior, or entry decision. Second, the source of advantage may create a non-pecuniary wedge in the tournament-entry decision, for example because subjects respond differently when a favorable competitive position is transparently assigned rather than privately reported.

We represent these channels in reduced form. Using this notation, subject i enters competition when

$$M_i(t_i, b_i(t_i, s)) + \omega_i(t_i, s) \geq 0, \tag{2}$$

where $M_i(t_i, b_i(t_i, s))$ is the expected monetary gain from tournament entry and $\omega_i(t_i, s)$ is a reduced-form non-pecuniary wedge. The wedge may capture preferences for competition, risk attitudes not already reflected in expected-value comparisons, image concerns, moral or self-image costs, or responses to the legitimacy or ambiguity of the competitive environment. We do not attempt to separately identify these primitives. Instead, the empirical analysis asks whether the institutional source of competitive advantage affects entry after accounting for task difficulty, performance, and measured beliefs.

The framework also allows gender differences in entry to vary across environments. Existing explanations for gender differences in competition entry emphasize differences in beliefs, confidence, risk preferences, and preferences for competition. In this setting, these forces may interact with the institutional source of competitive advantage. If men and women differ in how they respond to favorable or unfavorable competitive positions, or in how they respond to the legitimacy and ambiguity of those positions, the gender gap in entry should not be constant across environments. In particular, the gender gap may differ between legitimate and ambiguous advantage because the institutional source of advantage can interact with beliefs, preferences for competition, or responses to legitimacy and ambiguity.

The framework motivates four empirical hypotheses that organize the main tests.

Hypothesis 1. Environment-specific gender gap. *The gender gap in competition entry differs across competitive environments.*

If men and women differ in beliefs, risk preferences, preferences for competition, or responses to the legitimacy or ambiguity of competitive advantage, then the gender gap should not be constant across task-difficulty benchmarks, legitimate advantage or disadvantage, and ambiguous advantage or disadvantage.

Hypothesis 2. Source of competitive advantage. *The institutional source of competitive advantage affects entry.*

Legitimate advantage and ambiguous advantage can produce different entry responses even when the subject faces the same easy task.

Hypothesis 3. Absolute task difficulty. *Absolute task difficulty does not by itself imply higher competition entry.*

Because an easier task changes expected output under both payment schemes, its effect on entry depends on expected relative performance and the perceived return to tournament entry.

Hypothesis 4. Ambiguous advantage and selection. *The private-reporting channel is associated with selection into competition.*

Subjects who report the easy task may differ systematically in entry from subjects who report the hard task if reported easy status changes either the perceived monetary return to entering competition or the non-pecuniary payoff from entering. If the reporting channel primarily selects on baseline ability, reported-easy status should be positively associated with pre-choice performance; if it selects on preferences or responses to ambiguity, reported-easy status may instead be associated with traits such as risk tolerance or competitiveness.

5 Results

We begin by summarizing the sample, baseline performance, and the distribution of subjects across the competitive environments used in the analysis. Section 5.2 then tests the four hypotheses developed in Section 4. We first ask whether the gender gap in competition entry varies across competitive environments. We then test whether entry differs by the institutional source of competitive advantage, whether absolute task difficulty alone explains entry, and whether the private-reporting channel is associated with selection into competition.

5.1 Summary Statistics

The experiment includes 654 participants, of whom 353 are women and 301 are men. The average age is 19.9 years, and 62.2 percent of subjects report having previously completed a math task in the laboratory. Appendix Table A.1 reports balance across the four treatment conditions. Appendix Table A.2 reports the number of observations in each competitive environment by gender.

The performance data confirm that the Type A task is substantially easier than the Type B task. In the pre-choice tasks, subjects solve an average of 17.6 problems in the easy task and 10.0 problems in the hard task. The same difference appears in the tournament entry task: subjects assigned to, or reporting, the easy task solve an average of 21.3 problems in Task 3, compared with 10.8 problems among subjects assigned to, or reporting, the hard task. Men also solve more problems than women on average in the two pre-choice tasks: 18.7 versus 16.7 in the easy task and 10.6 versus 9.4 in the hard task. These baseline differences motivate our use of specifications that control for pre-choice performance, risk preferences, competitiveness, age, and math experience. Appendix Table A.3 reports the corresponding performance and entry summaries by competitive environment and gender.

The main analysis uses six competitive environments. The Fixed Easy and Fixed Hard treatments provide benchmark environments in which all subjects face the same task type. The Random treatment creates legitimate advantage or disadvantage: subjects assigned to the easy task are in the legitimate-advantage environment, while subjects assigned to the hard task are in the legitimate-disadvantage environment. The Die Roll treatment creates ambiguous advantage or disadvantage: subjects reporting the easy task are in the ambiguous-advantage environment, while subjects reporting the hard task are in the ambiguous-disadvantage environment.

Appendix Table A.4 reports task-assignment and reporting shares. In the Fixed

Easy and Fixed Hard conditions, the realized task shares are mechanically 100 percent easy and 0 percent easy, respectively. In the Random condition, 65.0 percent of subjects are assigned to the easy task. In the Die Roll condition, 79.7 percent report the easy task. As described in Section 3, the Random condition was calibrated using pilot evidence from the Die Roll reporting environment. The realized experimental sample nevertheless contains a higher easy-task share in Die Roll than in Random, which is why the main analysis conditions on the realized competitive environment rather than relying only on treatment-level comparisons. Because the realized environment in the Die Roll condition is determined by the subject's own report, contrasts involving the ambiguous environments compare selected groups and are interpreted descriptively throughout; the treatment-level Die Roll–Random comparison (Result 4) and the bounds analysis in Section 6.3 provide the corresponding selection-robust evidence.

5.2 Main results

We start with Hypothesis 1, which states that the gender gap in competition entry differs across competitive environments. Figure 5 reports model-adjusted competition entry rates across the six competitive environments, separately by gender. The upper panel plots predicted entry rates for women and men, while the lower panel reports the corresponding male–female gap in percentage points. Appendix Table A.5 reports the predicted rates and gender-gap tests underlying the figure, and Appendix Figure B.1 reports the corresponding raw entry rates.

The estimates show that the gender gap in competition entry varies substantially with the institutional environment. In the benchmark environments, men are more likely than women to enter competition, but the gap is not statistically significant in the easy benchmark and is only marginally significant in the hard benchmark. The estimated male–female gap is 5.9 percentage points in the easy benchmark ($p = 0.559$) and 16.6 percentage points in the hard benchmark ($p = 0.088$). The gender gap is largest under competitive advantage: 26.0 percentage points under legitimate advantage ($p < 0.001$) and 17.3 percentage points under ambiguous advantage ($p =$

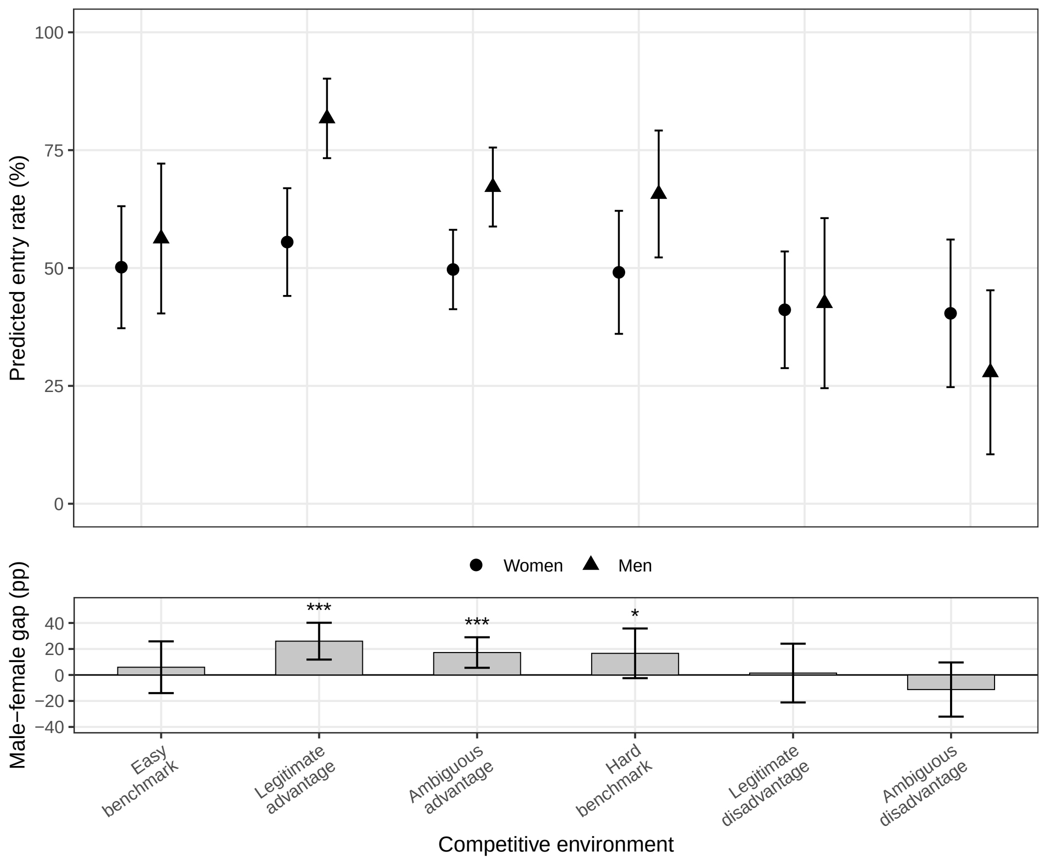

Figure 5: Competition Entry by Competitive Environment and Gender

Notes: The upper panel reports predicted competition entry rates from a probit model, separately by competitive environment and gender. The lower panel reports the corresponding male–female gap in percentage points. Vertical bars denote 95 percent confidence intervals. Stars indicate tests of whether the gender gap differs from zero within each environment. The dependent variable is competition entry. The independent variables are indicators for the six competitive environments, a male indicator, interactions between the environment indicators and the male indicator, baseline task performance, risk preferences, competitiveness, age, and math experience. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

0.004). By contrast, the gap is small and statistically insignificant under legitimate disadvantage, 1.5 percentage points ($p = 0.900$). Under ambiguous disadvantage, the estimated gap reverses sign, -11.2 percentage points, although this reversal is not statistically significant ($p = 0.291$).

These patterns show that the gender gap in competition entry is not a stable difference that appears uniformly across environments. It is large in environments that create competitive advantage and small, or statistically insignificant, in environments that create competitive disadvantage. The advantage-environment gaps are also robust to inference concerns: in randomization-inference tests with Westfall–Young stepdown adjustment for the family of six environment-specific gap tests, the gender gaps under legitimate and ambiguous advantage remain statistically significant (adjusted $p = 0.006$ and $p = 0.033$), while the marginal hard-benchmark gap does not survive adjustment (Appendix Table A.13).

Result 1 *Gender gaps in competition entry are institutionally contingent: they are large under competitive advantage but small or statistically insignificant under competitive disadvantage.*

We next test Hypothesis 2, which concerns whether the institutional source of competitive advantage affects entry. Table 1 compares environments in which subjects face the same task difficulty but differ in whether competitive advantage or disadvantage is generated by transparent random assignment or by private reporting. Panel A focuses on subjects with the easy task, comparing the easy-task benchmark with legitimate advantage and ambiguous advantage. Panel B focuses on subjects with the hard task, comparing the hard-task benchmark with legitimate disadvantage and ambiguous disadvantage.

Panel A shows that the same easy task is associated with different entry decisions depending on how the competitive advantage is generated. In the pooled sample, legitimate advantage increases competition entry by 14.6 percentage points relative to the easy-task benchmark ($p = 0.017$), a comparison identified by random assignment. Entry under ambiguous advantage is only 5.5 percentage points above the easy-task benchmark, and the difference is not statistically significant ($p = 0.326$). The direct

Table 1: The Source of Competitive Advantage and Competition Entry

	Women	Men	Pooled
Panel A. Competitive advantage			
Legitimate advantage - Easy benchmark	5.3	23.9***	14.6**
	(9.0)	(8.6)	(6.1)
Ambiguous advantage - Easy benchmark	0.2	11.3	5.5
	(7.8)	(8.0)	(5.6)
Legitimate advantage - Ambiguous advantage	8.0	12.6**	10.3**
	(7.8)	(5.5)	(4.8)
Panel B. Competitive disadvantage			
Legitimate disadvantage - Hard benchmark	-9.0	-25.2**	-15.4**
	(9.7)	(11.5)	(7.2)
Ambiguous disadvantage - Hard benchmark	-8.2	-38.8***	-21.0***
	(10.0)	(11.3)	(7.5)
Legitimate disadvantage - Ambiguous disadvantage	0.4	9.3	3.4
	(10.4)	(13.3)	(8.2)

Notes: The dependent variable is competition entry. Each estimate reports the difference in predicted competition entry between the two environments listed in the row, expressed in percentage points. Robust standard errors are reported in parentheses below the estimates. Stars indicate tests of whether the corresponding difference differs from zero. The women and men columns report gender-specific differences; the pooled column reports the average difference in the pooled sample. Each row is estimated from a probit model restricted to the two environments compared in that row. All specifications include controls for baseline task performance, risk preferences, competitiveness, age, and math experience. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

comparison between legitimate and ambiguous advantage is 10.3 percentage points and statistically significant ($p = 0.030$). Thus, entry is higher when a favorable task is assigned by a transparent random mechanism than when the same apparent advantage arises through a private reporting channel.

The gender-specific estimates indicate that this difference is driven primarily by men. Legitimate advantage increases men's entry by 23.9 percentage points relative to the easy-task benchmark ($p = 0.005$). Men's entry under ambiguous advantage is 11.3 percentage points above the easy-task benchmark, a difference that is not statistically significant ($p = 0.158$). The direct contrast between legitimate and ambiguous advantage is 12.6 percentage points for men and statistically significant ($p = 0.023$). Women's corresponding estimates are smaller and not statistically significant: 5.3 percentage points for legitimate advantage relative to the easy-task benchmark ($p = 0.555$), 0.2 percentage points for ambiguous advantage relative to the easy-task benchmark ($p = 0.981$), and 8.0 percentage points for legitimate relative to ambiguous advantage ($p = 0.304$). These estimates are consistent with the pattern in Figure 5: the entry differences associated with competitive advantage are larger for men than for women, especially under legitimate advantage.

Panel B shows that entry is lower under competitive disadvantage than in the hard-task benchmark, but the source of disadvantage is less important than the source of advantage. In the pooled sample, legitimate disadvantage lowers entry by 15.4 percentage points relative to the hard-task benchmark ($p = 0.032$); entry under ambiguous disadvantage is 21.0 percentage points below the hard-task benchmark ($p = 0.005$). These differences are larger among men than among women. For men, legitimate disadvantage lowers entry by 25.2 percentage points ($p = 0.029$), and men's entry under ambiguous disadvantage is 38.8 percentage points below the hard-task benchmark ($p = 0.001$). The corresponding estimates for women are smaller and not statistically significant. However, the direct comparison between legitimate and ambiguous disadvantage is small and not statistically significant in the pooled sample, 3.4 percentage points ($p = 0.675$). The main source-of-environment pattern therefore comes from the advantage side: entry differs by whether a favorable competitive position is transparently assigned or privately reported, while the corresponding distinction is weaker for unfavorable positions.[2]

Result 2 *The institutional source of competitive advantage matters: entry is higher under legitimate advantage than under ambiguous advantage, especially among men.*

Hypothesis 3 distinguishes absolute task difficulty from competitive advantage and disadvantage. The preceding result shows that entry differs across environments with the same task difficulty but different sources of competitive advantage or disadvantage. We now ask the complementary question: whether entry is explained by absolute task difficulty itself, or by whether the environment creates competitive advantage or disadvantage. Table 2 separates three components: whether the subject faces the easy task, whether the subject is in an advantage environment, and whether the subject is in a disadvantage environment. The omitted category is the hard-task benchmark. All three variables are interacted with gender.

Panel A shows that absolute task difficulty by itself does not explain competition entry. In the pooled sample, being assigned to, or reporting, the easy task is associated with an entry difference of only -2.6 percentage points, and the estimate is not statistically significant ($p = 0.665$). The corresponding estimates are also small and statistically insignificant for women, 1.2 percentage points ($p = 0.895$), and for men, -7.2 percentage points ($p = 0.316$). Thus, subjects do not simply enter competition more often because the task is easier.

Panel B shows that competition entry varies more strongly with whether the environment creates competitive advantage or disadvantage. Entry is 8.0 percentage

[2]The source-of-advantage contrasts are robust to alternative specifications. The pooled legitimate-advantage minus ambiguous-advantage contrast remains positive in a linear probability model and under session-clustered inference, and the same qualitative pattern obtains when using relative-ability controls; see Appendix Tables A.7, A.8, and A.6. Section 6.3 further shows that the contrast is not explained by the selected composition of the reported-easy cell or by beliefs about the matched partner's task. Appendix Table A.13 reports randomization-inference p-values and Westfall–Young stepdown adjustments for the full family of environment contrasts: the key pooled and male contrasts are confirmed by unadjusted randomization inference (e.g., legitimate minus ambiguous advantage, RI $p = 0.030$ pooled and $p = 0.024$ for men), and under stepdown adjustment within the six-contrast subfamilies the male legitimate-advantage and male ambiguous-disadvantage contrasts remain significant at the 5 percent level while the pooled contrasts become marginal (adjusted $p \approx 0.07$–0.09). We therefore treat the gender-specific contrasts beyond these as exploratory.

Table 2: Absolute Task Difficulty and Competitive Environment

	Women	Men	Pooled	Male interaction
Panel A. Absolute task difficulty				
Easy task	1.2	-7.2	-2.6	-0.317
	(9.4)	(7.2)	(6.0)	(0.410)
Panel B. Advantage and disadvantage environments				
Advantage environment	1.6	15.5**	8.0	0.489
	(7.2)	(7.5)	(5.2)	(0.340)
Disadvantage environment	-8.1	-29.4***	-17.9***	-0.668*
	(8.4)	(9.2)	(6.1)	(0.380)

Notes: The dependent variable is competition entry. The women, men, and pooled columns report average marginal effects, expressed in percentage points, from a probit model. Easy task equals one for subjects with the easy task: Easy benchmark, legitimate advantage, and ambiguous advantage. Advantage environment equals one for legitimate advantage and ambiguous advantage. Disadvantage environment equals one for legitimate disadvantage and ambiguous disadvantage. The hard-task benchmark is the omitted category. All three variables are interacted with the male indicator. Robust standard errors are reported in parentheses below the estimates. For the women, men, and pooled columns, standard errors are in percentage points. The final column reports the corresponding male-interaction coefficient from the probit index, with robust standard errors in parentheses. Stars indicate tests of whether the corresponding estimate differs from zero. Controls are baseline task performance, risk preferences, competitiveness, age, and math experience. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

points higher in advantage environments in the pooled sample, although this estimate is not statistically significant ($p = 0.121$). The pattern is concentrated among men: men's entry is 15.5 percentage points higher in advantage environments ($p = 0.038$), compared with 1.6 percentage points for women ($p = 0.819$). The male interaction is positive but not statistically significant at conventional levels ($p = 0.147$).

The strongest pattern is on the disadvantage side. Entry is 17.9 percentage points lower in disadvantage environments in the pooled sample ($p = 0.004$). The difference is especially large among men: men's entry is 29.4 percentage points lower in disadvantage environments ($p = 0.001$), compared with an 8.1 percentage-point difference for women ($p = 0.338$). The male interaction is negative and marginally significant ($p = 0.079$), indicating that the entry difference associated with competitive disadvantage is larger for men than for women.

Taken together, these estimates show that entry is not governed by task difficulty alone. The easy-versus-hard distinction has little independent explanatory power once competitive advantage and disadvantage are accounted for, while entry is substantially lower in disadvantage environments, especially among men.[3]

Result 3 *Absolute task difficulty alone does not explain competition entry. Entry varies more strongly with whether the environment creates competitive advantage or disadvantage, with the largest differences occurring under competitive disadvantage.*

Finally, we test Hypothesis 4, which states that the private-reporting channel is associated with selection into competition. In the Die Roll condition, subjects privately report whether they received the easy or hard task. A reported easy task creates ambiguous advantage: it may reflect the true die-roll outcome, but it may also reflect self-serving reporting.

Table 3 reports four pieces of evidence. Panel A compares the Die Roll and Random conditions. The estimated effect of the Die Roll condition on competition entry is -6.1 percentage points and is not statistically significant ($p = 0.144$). Because

[3]This decomposition is robust to alternative specifications. In both the linear probability model and the session-clustered probit specification, the easy-task indicator remains small and statistically insignificant, while the disadvantage-environment coefficient remains negative and statistically significant; see Appendix Tables A.9 and A.10.

Table 3: Ambiguous Advantage and Selection into Competition

	Estimate
Panel A. Die Roll versus Random	
Die Roll versus Random	-6.1
	(4.2)
Panel B. Easy-task reporting in Die Roll	
Overall	79.7***
	(2.4)
Women	75.5***
	(3.5)
Men	84.5***
	(3.2)
Panel C. Selection within Die Roll	
Reported easy versus reported hard	22.7***
	(6.6)
Panel D. Predictors of easy-task reporting in Die Roll	
Baseline ability	-1.2
	(3.1)
Risk preference	2.9**
	(1.1)
Competitiveness	2.5**
	(1.0)

Notes: Panel A reports the average marginal effect of the Die Roll condition relative to the Random condition on competition entry, in percentage points. Panel B reports the share of subjects reporting the easy task in the Die Roll condition; stars indicate exact binomial tests against the 50 percent truthful-reporting benchmark. Panel C reports the average marginal effect of reported easy status on competition entry within the Die Roll condition. Panel D reports average marginal effects on reporting the easy task within the Die Roll condition. Reported easy equals one for subjects who report the easy task. Baseline ability is standardized using baseline task performance. Standard errors are reported in parentheses below the estimates. Panel B reports binomial standard errors; Panels A, C, and D report robust standard errors for average marginal effects. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

treatment assignment is exogenous, this treatment-level comparison is the design's intention-to-treat contrast and is unaffected by selection into reported task types. Thus, the private reporting channel does not primarily operate through a simple average reduction in competition entry.

Panel B shows that the Die Roll condition creates substantial scope for ambiguous advantage. Overall, 79.7 percent of subjects report the easy task, significantly above the 50 percent benchmark implied by truthful reporting of a fair die roll ($p < 0.001$). This pattern appears for both women and men: 75.5 percent of women report the easy task ($p < 0.001$), as do 84.5 percent of men ($p < 0.001$). Appendix Figure B.2 reports the full distribution of reported die outcomes, which departs sharply from the uniform distribution implied by truthful reporting ($\chi^2(5) = 99.3$, $p < 0.001$): reports are concentrated on the easy-task outcomes one through three, while the hard-task outcomes four through six are reported far less often than chance would imply. Men are 9.0 percentage points more likely than women to report the easy task ($p = 0.064$), consistent with evidence that men misreport more often than women in comparable private-reporting environments (Dreber and Johannesson, 2008; Erat and Gneezy, 2012; Capraro, 2018). This gender difference in reporting also matters for interpreting gender comparisons within the Die Roll cells, a point we return to in Section 6.3.

Panel C then examines whether reported easy status predicts entry into competition. Within the Die Roll condition, subjects who report the easy task are 22.7 percentage points more likely to enter competition than subjects who report the hard task ($p < 0.001$). Thus, ambiguous advantage is strongly associated with competition entry.

Panel D asks whether easy-task reporting is simply explained by baseline ability. The estimated association between baseline ability and reporting the easy task is small, -1.2 percentage points, and not statistically significant ($p = 0.707$). By contrast, reporting the easy task is positively associated with risk preferences and competitiveness: a one-unit increase in risk preferences raises the probability of reporting the easy task by 2.9 percentage points ($p = 0.012$), and a one-unit increase in competitiveness raises it by 2.5 percentage points ($p = 0.014$). These patterns suggest that the reporting channel is associated with selection into competition, but not because higher-ability subjects are more likely to report the easy task.

Taken together, the evidence shows that ambiguous advantage is associated with selection into competition rather than a uniform treatment effect on entry. The Die Roll condition does not significantly reduce entry on average relative to Random. Instead, it creates an ambiguous-advantage group, and subjects in that group are substantially more likely to enter competition. At the same time, reported easy status is not predicted by baseline ability, suggesting that ambiguous advantage does not simply select higher-performing subjects into competition.[4]

Result 4 *Ambiguous advantage is associated with selection into competition: subjects who report the easy task are substantially more likely to enter, but easy-task reporting is not explained by baseline ability.*

6 Additional Evidence on Selection into Competition

The main results provide evidence on the four hypotheses. We next ask whether these entry patterns are aligned with ex post payoff incentives and whether they are accounted for by measured beliefs. These exercises are diagnostic rather than causal.

6.1 Selection Quality and Ex Post Payoff Calibration

We first compare observed competition entry with an ex post profitable-entry benchmark. Because subjects made their entry decisions before knowing their matched partner's realized performance, we do not interpret the ex post benchmark as measuring the information available at the time of choice. Instead, it provides a diagnostic comparison between observed entry and realized tournament profitability, conditional on Part 3 being selected for payment.

[4] The positive association between reported easy status and competition entry is robust to clustering standard errors by session; see Appendix Table A.11.

Table 4 compares actual competition entry with an ex post profitable-entry benchmark. A subject is classified as someone for whom tournament entry would have been profitable if, given realized performance against the matched partner, the tournament payment in Part 3 would have exceeded the piece-rate payment. Positive values of "Gap" indicate that the observed entry rate exceeds the share for whom tournament entry was profitable ex post; negative values indicate entry below that benchmark.

Table 4: Ex Post Payoff Calibration of Competition Entry

	Women			Men		
	Entry	Prof.	Gap	Entry	Prof.	Gap
Fixed Easy	50.0	41.3	8.7	70.6	67.6	2.9
Random Easy	49.2	47.5	1.6	84.9	74.0	11.0
Die Roll Easy	45.9	55.9	-9.9	73.4	65.1	8.3
Fixed Hard	36.0	52.0	-16.0	73.8	54.8	19.0
Random Hard	34.7	34.7	0.0	47.8	34.8	13.0
Die Roll Hard	25.0	16.7	8.3	30.0	20.0	10.0

Notes: The table compares actual competition entry with an ex post Part 3 payoff benchmark, separately by competitive environment and gender. Entry is the observed competition-entry rate in Part 3. Prof. is the share of subjects for whom tournament entry would have generated a higher Part 3 payoff than piece rate, given realized performance against the matched partner. Gap is Entry − Prof. All quantities are expressed in percentage points. At the end of the experiment, one of the three incentivized parts was randomly selected for payment; the payoff comparison in this table is therefore conditional on Part 3 being selected. This table is descriptive and is intended as a supporting diagnostic rather than a causal estimate.

We use this comparison to separate two forces: payoff-relevant selection into competition and responses to how competitive advantage or disadvantage is generated. Entry in disadvantage environments is partly aligned with realized tournament profitability. In the legitimate-disadvantage environment, women's entry is exactly aligned with the ex post benchmark: 34.7 percent enter, and 34.7 percent would have benefited from tournament entry. Men's entry in the same environment is higher than the benchmark, but both entry and profitability are lower than in the advantage environments. In the ambiguous-disadvantage environment, ex post tournament profitability is low for both women and men, and entry is correspondingly low. Thus, the decline in entry under disadvantage is not simply a behavioral response disconnected from payoffs.

The central advantage contrast, however, is not explained by ex post payoff calibration. Among women, entry is almost exactly calibrated under legitimate advantage: 49.2 percent enter, compared with 47.5 percent for whom tournament entry is profitable ex post. Under ambiguous advantage, women enter at a lower rate, 45.9 percent, even though a higher share, 55.9 percent, would have benefited from tournament entry ex post. Thus, the weaker female response to ambiguous advantage is not explained by lower realized payoff returns to tournament entry. If anything, the ex post profitability benchmark moves in the opposite direction.

For men, the advantage-environment choices are more closely aligned with payoff-relevant selection, but still show entry above the ex post benchmark. Men's entry is lower under ambiguous advantage than under legitimate advantage, and ex post tournament profitability is also lower: 65.1 percent in ambiguous advantage compared with 74.0 percent in legitimate advantage. At the same time, men enter above the ex post profitable-entry benchmark in both advantage environments. The fixed hard benchmark provides a further contrast: men enter at a high rate, 73.8 percent, even though only 54.8 percent would have benefited from tournament entry ex post. Women, by contrast, enter below the ex post benchmark in the same environment, 36.0 percent versus 52.0 percent.

The payoff-calibration exercise therefore helps distinguish payoff-relevant selection from institutional responses to the competitive environment. Some responses, especially the decline in entry under disadvantage, are partly aligned with realized tournament profitability. But the key female advantage contrast is not reducible to ex post payoff selection: women in the ambiguous-advantage environment are more likely to be profitable tournament entrants than women in the legitimate-advantage environment, yet they enter less often. Entry therefore varies with the institutional source of competitive advantage in ways that extend beyond realized payoff profitability.[5]

6.2 Belief Analyses and Alternative Explanations

The payoff-calibration exercise compares observed entry with realized incentives. We now turn to stated beliefs. A natural alternative interpretation is that the institutional differences in entry reflect differences in beliefs about task performance or about the matched partner's behavior. Because beliefs were elicited after the competition-entry decision, we do not use them to identify a causal belief mechanism. Instead, we use them diagnostically, asking whether the main institutional patterns are accounted for by measured beliefs.

The belief elicitation contains two types of measures. First, all subjects reported beliefs about average performance on the easy task and on the hard task. These performance-belief measures are elicited consistently across treatments and can therefore be used in cross-treatment robustness checks. Second, subjects reported beliefs about their matched partner. These partner-belief measures were elicited to match the information structure of each environment, and are therefore not directly comparable across all treatments. In the Fixed Easy, Fixed Hard, and Die Roll conditions, subjects guessed whether the matched partner chose the competitive payment scheme. In the Random condition, where the partner's task assignment was uncertain, subjects instead reported conditional beliefs about whether the partner would choose competition if assigned the easy task and if assigned the hard task. In the Die Roll condition, subjects also guessed whether the partner reported the easy or hard task; no corresponding partner-task guess was elicited in the Random condition. For this reason, we do not construct a single harmonized partner-belief measure across all environments. Instead, we use partner beliefs as condition-specific diagnostics.

Table 5 reports the belief analyses. Panel A first asks whether the main results are

[5]Appendix Table A.12 reports complementary ex post selection checks that split each environment-gender cell by actual entry choice. Entrants generally have higher realized Task 3 performance and higher ex post tournament profitability than non-entrants, especially in the easy-task and advantage environments. Selection is nevertheless imperfect: in the ambiguous-advantage environment, some women who choose piece rate would have benefited from tournament entry ex post.

robust to controlling for the belief variables that are common across treatments: beliefs about average performance on the easy and hard tasks. The source-of-advantage result is essentially unchanged. Legitimate advantage increases competition entry by 14.5 percentage points relative to the easy benchmark ($p = 0.017$), while entry under ambiguous advantage is 5.2 percentage points above the easy benchmark and remains statistically insignificant ($p = 0.353$). The direct contrast between legitimate and ambiguous advantage remains 10.1 percentage points and statistically significant ($p = 0.033$). The task-difficulty decomposition also remains similar: the easy-task indicator is small and statistically insignificant ($p = 0.806$), while the disadvantage-environment coefficient remains negative and statistically significant ($p = 0.005$). Within the Die Roll condition, reported easy status remains associated with a 23.1 percentage-point increase in competition entry after controlling for average-performance beliefs ($p < 0.001$). Thus, the main institutional patterns are not accounted for by beliefs about average easy-task and hard-task performance.

Panel B examines the conditional partner-entry beliefs elicited in the Random condition. Subjects strongly expect the partner's entry decision to depend on the partner's task assignment. The perceived probability that the partner enters competition is 85.0 percent if the partner has the easy task, compared with 15.0 percent if the partner has the hard task. The within-subject difference is 69.9 percentage points and is statistically significant ($p < 0.001$). These beliefs are consistent with the premise that competitive advantage and disadvantage are strategically relevant: subjects expect an easy-task competitor to be much more likely to enter competition than a hard-task competitor.

Panel C then examines Die Roll-specific strategic beliefs. These checks ask whether reported easy status continues to predict competition entry after accounting for beliefs about the partner in the Die Roll condition. Without belief controls, subjects who report the easy task are 22.7 percentage points more likely to enter competition than subjects who report the hard task ($p < 0.001$). Adding common performance-belief controls leaves this estimate almost unchanged. Adding the belief that the partner enters competition reduces the estimate to 18.3 percentage points ($p = 0.008$), and adding both the partner-entry belief and the partner-task belief

Table 5: Beliefs and Competition Entry

	Estimate
Panel A. Common performance-belief controls	
Legitimate advantage - Easy benchmark	14.5**
	(6.1)
Ambiguous advantage - Easy benchmark	5.2
	(5.6)
Legitimate advantage - Ambiguous advantage	10.1**
	(4.7)
Easy task	-1.5
	(6.1)
Advantage environment	8.0
	(5.1)
Disadvantage environment	-17.5***
	(6.1)
Reported easy - Reported hard	23.1***
	(6.6)
Panel B. Random partner-entry beliefs	
Partner enters if easy	85.0
	(2.5)
Partner enters if hard	15.0
	(2.5)
Easy - hard belief	69.9***
	(4.1)
Panel C. Die Roll strategic-belief controls	
Reported easy - Reported hard	22.7***
	(6.6)
Add performance beliefs	23.1***
	(6.6)
Add partner-entry belief	18.3***
	(7.0)
Add partner-task belief	23.1***
	(6.6)
Add both strategic beliefs	17.6**
	(7.1)

Notes: Estimates are percentage points. Panel A reports AMEs from probit entry models with common performance-belief controls. Panel B reports Random-condition conditional partner-entry beliefs and their within-subject difference. Panel C reports Die Roll AMEs for reported-easy status under alternative belief controls. Robust SEs are in parentheses; specifications include the text controls. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

reduces it to 17.6 percentage points ($p = 0.013$). The estimate remains statistically significant in all specifications. Strategic beliefs therefore attenuate the reported-easy effect, but they do not explain it away.

Finally, Appendix Table A.14 examines whether the competitive environments shift the common performance-belief measures themselves. We do not find evidence of systematic environment effects on beliefs about average easy-task or hard-task performance. The competitive-environment indicators are not jointly significant for beliefs about average easy-task performance ($p = 0.123$), beliefs about average hard-task performance ($p = 0.509$), or the perceived easy-minus-hard performance gap ($p = 0.129$). The environment-by-gender interactions are also not jointly significant for any of these outcomes. Overall, we do not interpret these analyses as ruling out a role for beliefs. Instead, we show that the institutional variation in entry, including the gender-specific patterns documented above, is not absorbed by the belief measures available in the experiment. This distinction is important because beliefs and confidence are prominent explanations for gender differences in competition entry. We therefore interpret the evidence as pointing to the institutional source of competitive advantage and disadvantage as an additional margin shaping competition entry.

6.3 Selection Bounds and Belief-Composition Robustness

The ambiguous-advantage and ambiguous-disadvantage environments are defined by the subject's own report. The reported-easy cell in the Die Roll condition is therefore a selected group: it mixes subjects who truthfully rolled the easy task with subjects who misreported to obtain it. The treatment-level comparison between the Die Roll and Random conditions is unaffected by this selection, and it shows no significant average difference in entry (Table 3, Panel A). This section asks a sharper question: does the source-of-advantage contrast in Table 1 survive once the selected composition of the reported-easy cell is taken into account? We address this with two complementary exercises: partial-identification bounds on the entry behavior of truthful easy-roll reporters, and a reweighting exercise using elicited beliefs about the matched partner's task.

The bounds exercise exploits the mixture structure of the private-reporting institution (Fischbacher and Föllmi-Heusi, 2013). Under a fair die, 50 percent of subjects truly roll the easy task, and because no subject has an incentive to report the hard task falsely, all of them report it truthfully. With a reported-easy share of q, the reported-easy cell therefore contains a share $s = 0.5/q$ of truthful reporters and a share $1-s$ of misreporters. Writing observed entry in the cell as $p_E = s\,h + (1-s)\,\ell$, where h and ℓ denote the entry rates of truthful reporters and misreporters, the entry rate of truthful reporters is not point identified, but it is bounded. Imposing only $\ell \in [0,1]$ yields unrestricted bounds on h. A natural additional restriction is monotonicity, $\ell \geq h$: subjects who misreported precisely to obtain the competitive advantage should be at least as likely to act on it as subjects who obtained it by chance. Under monotonicity, $h \leq p_E$.

Table 6 reports the results. In the pooled sample, 79.7 percent report the easy task, so the reported-easy cell contains an estimated 62.7 percent truthful reporters. Observed entry in the cell is 59.5 percent, so under monotonicity truthful easy-roll reporters enter at most 59.5 percent of the time. Entry under legitimate advantage is 68.7 percent, which exceeds this upper bound by 9.1 percentage points (bootstrap 95 percent confidence interval $[-1.1, 18.9]$). The pattern is concentrated among men, 11.5 percentage points ($[-0.4, 23.0]$), and is small among women, consistent with the gender-specific results in Table 1. A complementary way to state the result uses the mixture identity directly: if truthful reporters in the Die Roll condition entered at the legitimate-advantage rate of 68.7 percent, the implied entry rate of misreporters would be 44.2 percent—misreporters entering *less* often than truthful reporters, which contradicts the premise that misreporting is motivated by the competitive advantage it creates. Although the bounds comparison is imprecise, both readings point in the same direction: subjects holding a genuinely chance-generated advantage appear to enter less often when that advantage arises inside a private-reporting institution than when it is transparently assigned. The source-of-advantage contrast is therefore not an artifact of the misreporter composition of the ambiguous-advantage cell.

Table 6: Bounds on Competition Entry Among Truthful Easy-Roll Reporters in the Die Roll Condition

	Pooled	Women	Men
Panel A. Composition of the reported-easy cell			
Reported-easy share (q)	79.7	75.5	84.5
Truthful share of reported-easy ($0.5/q$)	62.7	66.2	59.2
Misreporter share of reported-easy	37.3	33.8	40.8
Panel B. Entry rates and bounds on h			
Entry, reported easy (p_E)	59.5	45.9	73.4
	[220]	[111]	[109]
Bounds on h, unrestricted	[35.5, 94.9]	[18.4, 69.4]	[55.0, 100.0]
Bounds on h, monotone	[35.5, 59.5]	[18.4, 45.9]	[55.0, 73.4]
Entry, legitimate advantage	68.7	49.2	84.9
	[134]	[61]	[73]
Panel C. Legitimate advantage vs. upper bound on h			
Difference (pp)	9.1	3.2	11.5
Bootstrap 95% CI	[−1.2, 19.2]	[−12.3, 18.4]	[−0.5, 23.0]
Implied ℓ if h = legit. entry	44.2	39.6	56.7

Notes: The table reports partial-identification bounds on competition entry among Die Roll subjects who truthfully rolled and reported the easy task. Under truthful reporting of a fair die, 50 percent of subjects would report the easy task; because no subject has an incentive to report the hard task falsely, the reported-easy cell is a mixture of truthful easy-roll reporters (share $s = 0.5/q$) and misreporters (share $1 - s$), where q is the observed reported-easy share. Writing observed entry in the reported-easy cell as $p_E = s\,h + (1 - s)\,\ell$, where h and ℓ are the entry rates of truthful reporters and misreporters, the unrestricted bounds impose only $\ell \in [0, 1]$; the monotone bounds additionally impose $\ell \geq h$, that is, that subjects who misreported to obtain the competitive advantage enter at least as often as truthful reporters. Entry rates are in percent; observation counts are in square brackets. "Entry, legitimate advantage" refers to the Random condition, easy task. Panel C compares this legitimate-advantage entry rate with the monotone upper bound on h; the confidence interval is from a nonparametric bootstrap with 5,000 replications resampling the Die Roll and Random-easy samples. The final row reports the misreporter entry rate ℓ implied by the mixture identity if truthful reporters entered at the legitimate-advantage rate; values below h would contradict the premise that misreporting is motivated by the competitive advantage it creates.

The second exercise addresses beliefs about the matched partner's task. Because subjects were never informed of assignment probabilities or reporting distributions, beliefs about the partner's task are formed endogenously within each institution, and the realized easy-task shares differ across conditions (79.7 percent in Die Roll versus 65.0 percent in Random; Appendix Table A.4). A mechanical concern is that an easy-task subject in the Die Roll condition may perceive a smaller relative advantage - because the partner is more likely to also hold the easy task—and enter less for that reason alone. The elicited partner-task guesses in the Die Roll condition speak directly to this concern. First, 85.9 percent of Die Roll subjects guessed that their partner reported the easy task, far above the 50 percent benchmark implied by truthful reporting ($p < 0.001$; Table 7, Panel A). Subjects therefore perceived the ambiguity of the reporting institution: they expected others to hold, or claim, the easy task at rates well above chance.

Second, and more importantly, the belief-specific entry rates run against the mechanical prediction. If perceived relative advantage were driving entry, subjects who believe the partner holds the hard task should enter more often. Instead, entry in the ambiguous-advantage cell is 60.5 percent among subjects who believe the partner reported the easy task and 53.3 percent among subjects who believe the partner reported the hard task (Table 7, Panel B). This ordering yields a bracketing result. Reweighting the belief-specific entry rates to any alternative partner-task belief composition - including the composition matching the Random condition's realized 65 percent easy share, a uniform 50-50 composition, or any other mixture - produces a counterfactual ambiguous-advantage entry rate of at most 60.5 percent, which remains below the legitimate-advantage entry rate of 68.7 percent (Panels C and D). Because subjects' beliefs in the Random condition were not elicited, this exercise brackets those unobserved beliefs rather than estimating them; the conclusion holds for every possible belief composition. Two caveats apply: partner-task beliefs were elicited after the entry decision, and the believe-hard cell contains only 30 subjects, so the exercise is diagnostic rather than causal.

Taken together, the two exercises show that the source-of-advantage contrast documented in Table 1 is not explained by the two most natural selection-based

Table 7: Partner-Task Beliefs and the Source-of-Advantage Contrast

	Estimate	N
Panel A. Partner-task beliefs in the Die Roll condition		
Share believing partner reported easy	85.9***	276
Panel B. Entry in the ambiguous-advantage cell, by partner-task belief		
Observed entry, ambiguous advantage	59.5	220
Entry if partner believed easy	60.5	190
Entry if partner believed hard	53.3	30
Panel C. Counterfactual entry under alternative belief compositions		
At Die Roll reported shares (79.7% easy)	59.1	
At Random assigned shares (65.0% easy)	58.0	
At uniform composition (50.0% easy)	56.9	
Upper envelope over all compositions	60.5	
Panel D. Comparison with legitimate advantage		
Entry, legitimate advantage	68.7	134
Legitimate advantage minus envelope	8.1	
Bootstrap 95% CI	[−5.6, 17.5]	

Notes: Panel A reports the share of Die Roll subjects who guessed that their matched partner reported the easy task; stars indicate an exact binomial test against the 50 percent benchmark implied by truthful reporting of a fair die ($p < 0.001$). Panel B reports raw competition-entry rates within the ambiguous-advantage cell (Die Roll, reported easy), overall and separately by the subject's guess about the partner's reported task. Panel C reports counterfactual entry rates obtained by reweighting the belief-specific entry rates in Panel B to alternative partner-task belief compositions; because entry is higher among subjects who believe the partner reported the easy task, the counterfactual entry rate cannot exceed the upper envelope of 60.5 percent under any belief composition. Panel D compares entry under legitimate advantage (Random condition, easy task) with this upper envelope; the confidence interval is from a nonparametric bootstrap with 5,000 replications. Because subjects were not informed of assignment probabilities in any condition and partner-task guesses were elicited only in the Die Roll condition, this exercise brackets the unobserved beliefs of Random-condition subjects rather than estimating them. Beliefs were elicited after the entry decision, so the exercise is diagnostic rather than causal. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

alternatives. It is not driven by the misreporter composition of the ambiguous-advantage cell, because entry under legitimate advantage exceeds even the upper bound on truthful reporters' entry in the Die Roll condition. And it is not driven by differences in perceived partner composition, because no belief composition can raise counterfactual ambiguous-advantage entry to the legitimate-advantage level. The gender difference in reporting documented in Section 5.2 also implies that the ambiguous cells mix truthful reporters and misreporters differently for women and men; the gender-specific bounds in Table 6 account for this directly. These results reinforce the interpretation that the institution generating competitive advantage - transparent assignment versus private reporting - shapes entry over and above the composition of who holds the advantage.

7 Discussion and Conclusion

Competition is often defended as a mechanism for allocating rewards to those who perform best. Yet competition also depends on who chooses to enter, and entry may depend on how the competitive environment is organized. In this paper, we study one institutional margin that is difficult to isolate in observational data: whether competitive advantage and disadvantage arise through transparent assignment or through a private-reporting channel. Our results show that this margin matters. Competition entry varies not only with task difficulty and expected performance, but also with whether the competitive position is legitimate or ambiguous.

Our main findings can be summarized as follows. First, the gender gap in competition entry is institutionally contingent. It is largest under legitimate advantage, remains statistically significant under ambiguous advantage, and is small or statistically insignificant under competitive disadvantage. Second, the source of competitive advantage matters. Entry is higher under legitimate advantage than under ambiguous advantage, especially among men, and this contrast is not explained by the selected composition of the reported-easy group. Third, absolute task difficulty alone does not explain entry. Subjects do not enter simply because the task is easier; entry varies more strongly with whether the environment creates competitive advantage or disadvantage. Fourth, the private-reporting channel is associated with selection into competition. In the Die Roll condition, reported easy status strongly predicts competition entry, but easy-task reporting is not explained by baseline ability.

We interpret these findings as contributing to a broader shift in how gender differences in competition should be understood. A large literature studies whether women and men differ in preferences for competition, confidence, risk tolerance, or beliefs about relative performance. These mechanisms are important, and our results do not imply otherwise. But our evidence shows that the gender gap is not a fixed individual-level parameter. It varies with the competitive environment. This suggests that the policy question should not be limited to how to make women more willing to enter existing competitive systems. It should also ask how those systems are designed, what kinds of advantage they create, and whether the source of advantage is transparent, legitimate, and verifiable.

This interpretation is consistent with a growing body of evidence showing that gender gaps in competition and opportunity-seeking are sensitive to institutional design. A recent meta-analysis shows that gender differences in tournament entry are heterogeneous across experimental settings rather than a single stable effect (Markowsky and Beblo, 2022). Field evidence also shows that competitive compensation schemes can affect who applies for opportunities: women are disproportionately deterred by relative-performance compensation in both a large-scale job-entry experiment (Flory et al., 2015) and a university-wide field experiment (Samek, 2019). Other studies show that gender gaps can be reduced or eliminated when individuals compete against their own past performance rather than against others (Apicella et al., 2017), when competition occurs in teams (Healy and Pate, 2011), when the competitive environment includes prosocial incentives (Cassar and Rigdon, 2021), when the reward is aligned with benefits for others (Cassar et al., 2016), or when competition-entry decisions are made on behalf of someone else (Fornwagner et al., 2023). Related evidence on application decisions shows that qualified women may be less likely than similarly qualified men to apply for higher-return, more challenging opportunities in male-typed domains (Coffman et al., 2024). Our paper adds to this evidence by showing that the legitimacy and transparency of competitive advantage are themselves relevant features of institutional design.

Our results also speak to debates about fairness and uneven playing fields. Existing work shows that many individuals are willing to compete when they hold an advantage over others, even when the advantage creates fairness concerns (Buser et al., 2025). We show that the source of that advantage matters. An advantage assigned by transparent chance is associated with different entry behavior than an apparently identical advantage arising through private reporting, and this difference is not an artifact of who selects into reported advantage (Section 6.3). This distinction is important because unequal positions in real-world competitions often have ambiguous origins. Advantages may reflect ability, accumulated opportunity, access to information, favorable assignment, or strategic reporting. Our experiment does not reproduce the full complexity of these environments, but it isolates one feature that is common to many of them: the same apparent advantage can be perceived differently depending on how it is created.

The private-reporting treatment also connects our paper to work on dishonesty and private information. We do not identify individual cheating, and our results should not be interpreted as evidence about the moral type of any particular subject. Instead, our design creates an environment in which the source of task advantage is difficult to verify. This allows us to study how entry differs when advantage is ambiguous rather than transparent. The evidence suggests that private-reporting institutions can affect selection into competition even when the formal payoff rule is unchanged.

Several limitations are worth emphasizing. First, our experiment is a stylized laboratory setting. It is designed to isolate causal variation in the source of competitive advantage, not to reproduce the full institutional richness of labor markets, promotions, procurement, education, or organizational contests. Second, the belief measures are elicited after the competition-entry decision. Our belief analyses therefore do not establish causal mediation. They show only that the main institutional patterns are not absorbed by the belief measures available in the experiment. Third, we do not decompose ambiguous advantage into moral costs, beliefs about others' reporting, self-image concerns, or perceived legitimacy. These mechanisms are likely related, and distinguishing among them is an important direction for future research. Fourth, the ambiguous-advantage and ambiguous-disadvantage environments are defined by the subject's own report. Cell-level comparisons involving these environments therefore combine institutional responses with selection into reported task types, and we interpret them descriptively; the treatment-level Die Roll–Random comparison and the bounds analysis in Section 6.3 provide the corresponding selection-robust evidence.

The main implication of our findings is that institutions shape selection into competition. When competitive environments are unequal, the consequences for entry depend not only on who is advantaged or disadvantaged, but also on whether the source of that position is transparent and legitimate. Policies aimed at reducing gender gaps in competitive selection may therefore need to look beyond individual willingness to compete. Training, encouragement, and information interventions may be useful, but they leave the competitive environment itself largely unchanged. Evidence on affirmative action in tournaments shows that changing the rules of competition can affect entry behavior (Balafoutas and Sutter, 2012; Niederle et al., 2013). Our findings point to a complementary institutional margin: transparency, verifiability, and the allocation of competitive advantage. These features may shape selection into competition even when the formal payoff rule is held fixed.

More broadly, our paper highlights a tension in competitive allocation mechanisms. Competition can reward performance, but it can also amplify institutional asymmetries that affect who enters. If advantaged and disadvantaged individuals respond differently depending on whether advantage is legitimate or ambiguous, then the design of competition influences not only incentives conditional on entry, but also the composition of those who select into competition. Understanding this selection margin is important for evaluating competitive institutions and for designing environments in which rewards depend less on opaque advantage and more on performance.

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Appendix

A Additional Tables

Table A.1: Balance across Treatment Conditions

	Fixed Easy	Random	Die Roll	Fixed Hard	p-value
Male share	42.5	46.6	46.7	45.7	0.922
Age	19.85	19.72	20.05	19.76	0.049
Risk perception	6.96	6.35	6.34	6.13	0.038
Attitude towards competition	7.99	7.22	7.23	6.76	0.002
Math experience	63.8	65.5	56.5	70.7	0.054
Task 1 correct	18.52	16.37	18.27	17.57	<0.001
Task 2 correct	9.66	9.88	10.04	10.11	0.748

Notes: The table reports treatment-level means. Male share and math experience are reported in percent. The final column reports the p-value from an F-test of equality across the four treatment conditions.

Table A.2: Sample Counts by Competitive Environment and Gender

Competitive environment	Women	Men	Total
Easy benchmark	46	34	80
Legitimate advantage	61	73	134
Ambiguous advantage	111	109	220
Hard benchmark	50	42	92
Legitimate disadvantage	49	23	72
Ambiguous disadvantage	36	20	56

Notes: The table reports the number of observations in each analysis cell. The six competitive environments combine the four treatment conditions with the task assigned or reported in Task 3.

Table A.3: Performance and Competition Entry by Competitive Environment and Gender

Competitive environment	Gender	N	Entry	Task 1	Task 2	Task 3
Easy benchmark	Women	46	50.0	17.2	9.0	20.8
Easy benchmark	Men	34	70.6	20.3	10.5	24.5
Legitimate advantage	Women	61	49.2	15.5	9.5	18.7
Legitimate advantage	Men	73	84.9	17.8	10.2	21.4
Ambiguous advantage	Women	111	45.9	17.5	9.3	21.1
Ambiguous advantage	Men	109	73.4	19.3	10.7	22.3
Hard benchmark	Women	50	36.0	16.6	9.8	11.0
Hard benchmark	Men	42	73.8	18.8	10.5	12.1
Legitimate disadvantage	Women	49	34.7	16.1	9.6	9.8
Legitimate disadvantage	Men	23	47.8	14.8	10.3	10.9
Ambiguous disadvantage	Women	36	25.0	16.5	9.4	9.6
Ambiguous disadvantage	Men	20	30.0	20.1	11.9	11.8

Notes: The table reports raw descriptive statistics by competitive environment and gender. Entry is the observed competition-entry rate in Part 3, in percent. Task 1 is the pre-choice easy task, Task 2 is the pre-choice hard task, and Task 3 is the post-treatment task used for the piece-rate-versus-tournament entry decision. Task 1, Task 2, and Task 3 report the mean number of correct answers.

Table A.4: Task Assignment and Reporting Shares

Group	Fixed Easy	Fixed Hard	Random	Die Roll	Random − Die Roll
Overall	100.0	0.0	65.0	79.7	-14.7***
	[80]	[92]	[206]	[276]	(4.1)
Female	100.0	0.0	55.5	75.5	-20.1***
	[46]	[50]	[110]	[147]	(5.9)
Male	100.0	0.0	76.0	84.5	-8.5
	[34]	[42]	[96]	[129]	(5.4)

Notes: The Fixed Easy, Fixed Hard, Random, and Die Roll columns report the percentage of subjects assigned to, or reporting, the easy task; observation counts are reported in square brackets on the following row. Fixed Easy and Fixed Hard are compliance checks because task type is fixed by design. In the Random treatment, the easy/hard assignment probabilities were chosen to approximate the easy/hard reporting distribution in the Die Roll treatment. The final column reports the Random-minus-Die Roll difference in easy-task share, in percentage points, with standard errors in parentheses. Stars indicate p-values from Fisher exact tests of equality between the Random and Die Roll shares. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

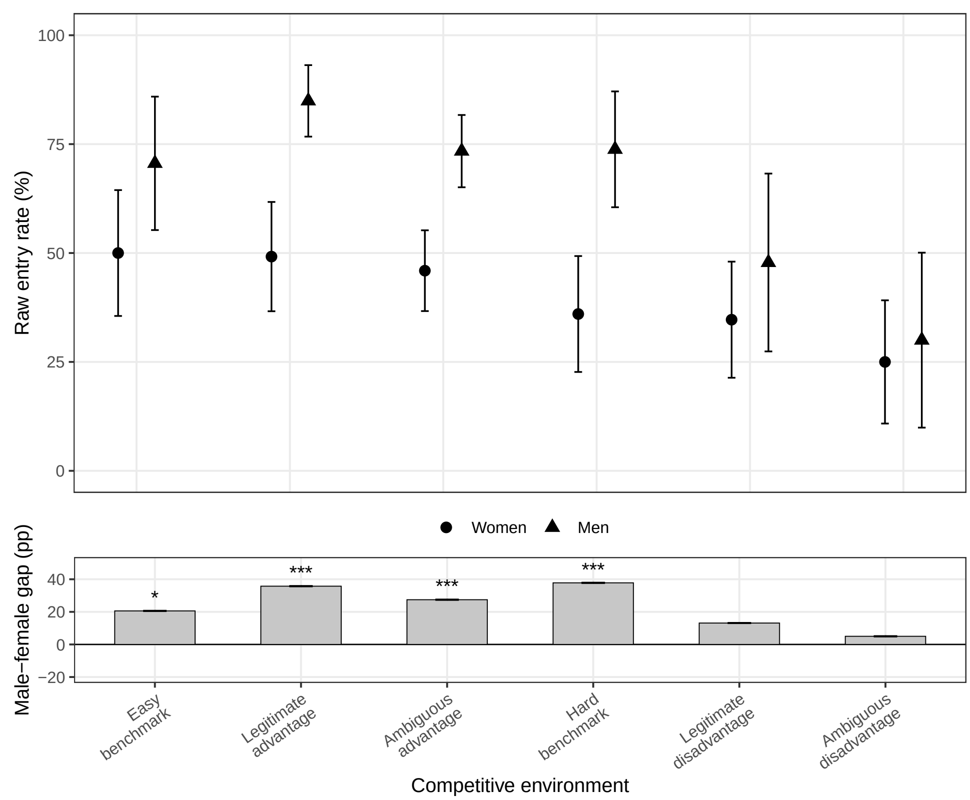
B Additional Figures

Table A.5: Competition Entry by Competitive Environment and Gender

Environment	Women	Men	Male − female
Fixed Easy	50.2	56.3	5.9
	(6.4)	(7.7)	(9.7)
Random Easy	55.5	81.7	26.0***
	(6.7)	(4.4)	(7.9)
Die Roll Easy	49.7	67.2	17.3***
	(4.3)	(4.3)	(6.1)
Fixed Hard	49.1	65.7	16.6*
	(7.1)	(6.0)	(9.6)
Random Hard	41.1	42.5	1.5
	(7.0)	(8.5)	(11.5)
Die Roll Hard	40.4	27.9	-11.2
	(7.8)	(8.2)	(10.0)
Observations	353	301	654

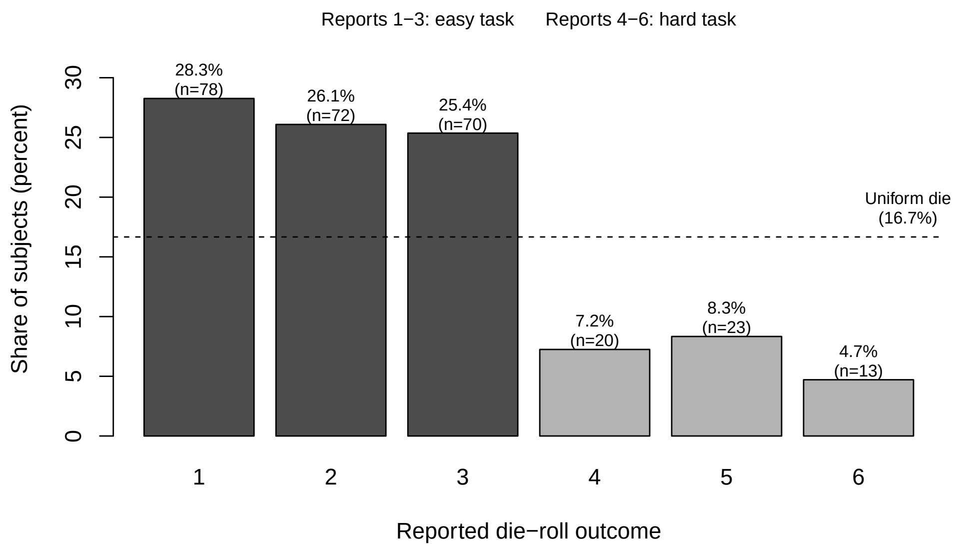
Notes: The dependent variable is competition entry. Predicted rates for women and men are competition entry rates, in percent. The final column reports the male–female difference in percentage points. Robust standard errors are reported in parentheses below the estimates. Stars in the final column indicate tests of whether the male–female difference differs from zero. The Observations row reports the number of women, men, and total observations in the estimation sample. Predictions are from a probit model with indicators for the six competitive environments, a male indicator, interactions between the environment indicators and the male indicator, and controls for baseline task performance, risk preferences, competitiveness, age, and math experience. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Figure B.1: Raw Competition Entry by Competitive Environment and Gender



Notes: The upper panel reports raw competition-entry rates by competitive environment and gender. Thin vertical bars denote 95 percent confidence intervals. The lower panel reports the corresponding raw male–female gap in percentage points; bars show the gender gap and thin vertical bars denote 95 percent confidence intervals. Stars indicate tests of whether the environment-specific gender gap differs from zero. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Figure B.2: Distribution of Reported Die-Roll Outcomes in the Die Roll Condition



Notes: Bars report the share of Die Roll subjects reporting each die outcome ($N = 276$). Outcomes one through three correspond to the easy (Type A) task; outcomes four through six correspond to the hard (Type B) task. The dashed line marks the 16.7 percent share implied by truthful reporting of a fair die. A chi-square test rejects the uniform distribution, $\chi^2(5) = 99.3$, $p < 0.001$.

Table A.6: Relative-Ability Robustness for Source-of-Advantage Contrasts

	Women	Men	Pooled
Panel A. Competitive advantage			
Legitimate advantage - Easy benchmark	5.3	23.9***	14.6**
	(9.0)	(8.6)	(6.1)
Legitimate advantage - Ambiguous advantage	8.0	12.6**	10.3**
	(7.8)	(5.5)	(4.8)
Panel B. Competitive disadvantage			
Legitimate disadvantage - Hard benchmark	-9.0	-25.2**	-15.4**
	(9.7)	(11.5)	(7.2)
Legitimate disadvantage - Ambiguous disadvantage	0.4	9.3	3.4
	(10.4)	(13.3)	(8.2)

Notes: The dependent variable is competition entry. Estimates are average marginal effects expressed in percentage points; standard errors are reported in parentheses. Specifications replace absolute baseline performance controls with relative-ability controls for Tasks 1 and 2. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

C Instructions

All treatments share the instructions for Part One and Two of the experiment (see, Figure C.1 - C.4), as well as the demographic survey (Figure C.17) and payment (Figure C.18). Figure C.5 - C.8 are the screens for task 3 in the Die Roll treatment. Figure C.9 - C.11 are the screens for task 3 in the Random Treatment. Figure C.12 - C.14 are the screens for task 3 in the Fixed Easy Treatment. Finally, Figure C.15 - C.16 are the screens for task 3 in the Fixed Hard Treatment.

Table A.7: LPM Robustness for Source-of-Advantage Contrasts

	Women	Men	Pooled
Panel A. Competitive advantage			
Legitimate advantage - Easy benchmark	4.6	25.1***	14.8**
	(9.2)	(8.4)	(6.2)
Ambiguous advantage - Easy benchmark	0.3	11.1	5.4
	(7.9)	(7.8)	(5.6)
Legitimate advantage - Ambiguous advantage	6.4	14.1**	10.4**
	(7.6)	(5.7)	(4.7)
Panel B. Competitive disadvantage			
Legitimate disadvantage - Hard benchmark	-9.4	-25.1**	-15.6**
	(9.8)	(11.4)	(7.1)
Ambiguous disadvantage - Hard benchmark	-6.8	-37.5***	-19.6***
	(9.9)	(11.2)	(7.4)
Legitimate disadvantage - Ambiguous disadvantage	-0.7	9.9	2.9
	(10.2)	(13.7)	(8.2)

Notes: The dependent variable is competition entry. Estimates are average marginal effects expressed in percentage points; standard errors are reported in parentheses. Specifications are linear probability models with HC2 robust standard errors and the same controls as Table 1. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.8: Session-Clustered Robustness for Source-of-Advantage Contrasts

	Women	Men	Pooled
Panel A. Competitive advantage			
Legitimate advantage - Easy benchmark	5.3	23.9***	14.6**
	(9.2)	(7.4)	(5.9)
Ambiguous advantage - Easy benchmark	0.2	11.3**	5.5
	(6.9)	(5.2)	(4.4)
Legitimate advantage - Ambiguous advantage	8.0	12.6***	10.3*
	(9.7)	(4.2)	(5.7)
Panel B. Competitive disadvantage			
Legitimate disadvantage - Hard benchmark	-9.0	-25.2*	-15.4***
	(11.2)	(14.6)	(5.8)
Ambiguous disadvantage - Hard benchmark	-8.2	-38.8***	-21.0***
	(7.3)	(12.0)	(7.1)
Legitimate disadvantage - Ambiguous disadvantage	0.4	9.3	3.4
	(11.5)	(13.6)	(7.6)

Notes: The dependent variable is competition entry. Estimates are average marginal effects expressed in percentage points; standard errors are reported in parentheses. Specifications are probit models with the same controls as Table 1. Standard errors are clustered by session. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.9: LPM Robustness for Absolute Task Difficulty and Competitive Environment

	Women	Men	Pooled
Panel A. Absolute task difficulty			
Easy task	2.6	-8.9	-2.7
	(9.5)	(8.9)	(6.6)
Panel B. Advantage and disadvantage environments			
Advantage environment	1.3	15.6**	7.9
	(7.5)	(7.4)	(5.3)
Disadvantage environment	-7.8	-30.2***	-18.1***
	(8.2)	(8.7)	(5.9)

Notes: The dependent variable is competition entry. Estimates are average marginal effects expressed in percentage points; standard errors are reported in parentheses. Specifications are linear probability models with HC2 robust standard errors and the same controls as Table 2. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.10: Session-Clustered Robustness for Absolute Task Difficulty and Competitive Environment

	Women	Men	Pooled
Panel A. Absolute task difficulty			
Easy task	1.2	-7.2	-2.6
	(7.5)	(6.9)	(4.6)
Panel B. Advantage and disadvantage environments			
Advantage environment	1.6	15.5***	8.0*
	(6.2)	(5.5)	(4.3)
Disadvantage environment	-8.1	-29.4***	-17.9***
	(8.5)	(10.7)	(5.6)

Notes: The dependent variable is competition entry. Estimates are average marginal effects expressed in percentage points; standard errors are reported in parentheses. Specifications are probit models with the same controls as Table 2. Standard errors are clustered by session. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.11: Session-Clustered Robustness for Ambiguous Advantage and Selection

	Women	Men	Pooled
Panel A. Die Roll versus Random			
Die Roll versus Random	-1.8	-11.0*	-6.1
	(6.4)	(6.6)	(4.5)
Panel B. Selection within Die Roll			
Reported easy versus reported hard	7.2	40.3***	22.7***
	(7.5)	(7.4)	(6.3)

Notes: The dependent variable is competition entry. Estimates are average marginal effects expressed in percentage points; standard errors are reported in parentheses. Specifications are probit models with the same controls as Table 3. Standard errors are clustered by session. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.12: Ex Post Selection by Competitive Environment, Gender, and Entry Choice

Environment	Gender	Choice	N	Task 3	Outperformed	Profitable
Easy benchmark	Female	Competition	23	22.43	52.2	56.5
Easy benchmark	Female	Piece rate	23	19.09	21.7	26.1
Easy benchmark	Male	Competition	24	24.92	70.8	79.2
Easy benchmark	Male	Piece rate	10	23.50	40.0	40.0
Legitimate advantage	Female	Competition	30	20.60	46.7	50.0
Legitimate advantage	Female	Piece rate	31	16.90	41.9	45.2
Legitimate advantage	Male	Competition	62	22.11	71.0	74.2
Legitimate advantage	Male	Piece rate	11	17.55	72.7	72.7
Ambiguous advantage	Female	Competition	51	22.31	60.8	62.7
Ambiguous advantage	Female	Piece rate	60	19.98	45.0	50.0
Ambiguous advantage	Male	Competition	80	23.25	63.7	68.8
Ambiguous advantage	Male	Piece rate	29	19.69	51.7	55.2
Hard benchmark	Female	Competition	18	11.22	38.9	50.0
Hard benchmark	Female	Piece rate	32	10.94	46.9	53.1
Hard benchmark	Male	Competition	31	12.55	51.6	58.1
Hard benchmark	Male	Piece rate	11	10.82	45.5	45.5
Legitimate disadvantage	Female	Competition	17	10.65	29.4	47.1
Legitimate disadvantage	Female	Piece rate	32	9.31	25.0	28.1
Legitimate disadvantage	Male	Competition	11	12.27	27.3	45.5
Legitimate disadvantage	Male	Piece rate	12	9.67	25.0	25.0
Ambiguous disadvantage	Female	Competition	9	9.22	11.1	11.1
Ambiguous disadvantage	Female	Piece rate	27	9.78	14.8	18.5
Ambiguous disadvantage	Male	Competition	6	14.50	50.0	50.0
Ambiguous disadvantage	Male	Piece rate	14	10.57	7.1	7.1

Notes: Task 3 reports mean realized Task 3 performance. Outperformed is the share who outperformed the matched partner. Profitable is the share for whom tournament entry would have generated a higher Part 3 payoff than piece rate, given realized performance against the matched partner. Outperformed and Profitable are reported in percent. At the end of the experiment, one of the three incentivized parts was randomly selected for payment; the payoff comparison in this table is therefore conditional on Part 3 being selected.

Table A.13: Randomization Inference and Multiple-Testing Adjustment for the Main Environment and Gender Contrasts

	Adj. diff. (pp)	RI p	WY (subfam.)	WY (all 18)
Panel A. Male–female entry gap, by environment (family of 6 tests)				
Easy-task benchmark	−0.4	0.963	0.973	
Legitimate advantage	24.3	0.001	0.005	
Ambiguous advantage	15.5	0.008	0.036	
Hard-task benchmark	7.6	0.378	0.754	
Legitimate disadvantage	−2.3	0.842	0.973	
Ambiguous disadvantage	−15.5	0.145	0.459	
Panel B. Source contrasts, pooled (subfamily of 6 tests)				
Legit. advantage − easy bench.	13.6	0.026	0.093	0.259
Ambig. advantage − easy bench.	3.6	0.531	0.776	0.984
Legit. − ambig. advantage	10.0	0.033	0.093	0.309
Legit. disadvantage − hard bench.	−15.7	0.021	0.093	0.258
Ambig. disadvantage − hard bench.	−17.9	0.018	0.082	0.206
Legit. − ambig. disadvantage	2.1	0.781	0.781	0.990
Panel C. Source contrasts, women (subfamily of 6 tests)				
Legit. advantage − easy bench.	5.1	0.563	0.926	0.984
Ambig. advantage − easy bench.	−1.2	0.883	0.986	0.990
Legit. − ambig. advantage	6.4	0.390	0.881	0.958
Legit. disadvantage − hard bench.	−7.3	0.409	0.881	0.959
Ambig. disadvantage − hard bench.	−6.2	0.514	0.926	0.984
Legit. − ambig. disadvantage	−1.1	0.912	0.986	0.990
Panel D. Source contrasts, men (subfamily of 6 tests)				
Legit. advantage − easy bench.	22.4	0.005	0.028	0.086
Ambig. advantage − easy bench.	9.1	0.230	0.407	0.894
Legit. − ambig. advantage	13.3	0.021	0.085	0.259
Legit. disadvantage − hard bench.	−13.6	0.165	0.392	0.819
Ambig. disadvantage − hard bench.	−27.0	0.008	0.037	0.119
Legit. − ambig. disadvantage	13.4	0.243	0.407	0.894

Notes: RI p-values and Westfall–Young (WY) stepdown adjustments for the environment and gender contrasts. Adjusted differences residualize competition entry (Freedman–Lane) on standardized Task 1–2 performance, risk, competitiveness, age, and math experience (plus male in the pooled panels), in percentage points; magnitudes differ slightly from the main-table probit marginal effects but use the same covariates. RI p-values use 10,000 joint permutations: gender within environment (Panel A), or environment within task-difficulty and gender strata (Panels B–D). WY stepdown (Westfall and Young, 1993; Romano and Wolf, 2005) uses studentized statistics on the same draws; "subfamily" adjusts within each six-test panel, "all 18" adjusts jointly across Panels B–D. Adjusted p-values are monotone by construction.

Table A.14: Do Competitive Environments Shift Common Performance Beliefs?

	Avg. easy	Avg. hard	Easy − hard
Panel A. Environment effects on common performance beliefs			
Male	0.73	0.33	0.40
	(0.75)	(0.51)	(0.51)
Legit. advantage	-0.35	-0.11	-0.25
	(0.64)	(0.44)	(0.44)
Ambig. advantage	0.20	0.27	-0.07
	(0.57)	(0.39)	(0.39)
Hard benchmark	-1.20*	-0.16	-1.04**
	(0.68)	(0.46)	(0.47)
Legit. disadvantage	-0.98	-0.47	-0.51
	(0.67)	(0.46)	(0.46)
Ambig. disadvantage	-0.17	-0.20	0.03
	(0.74)	(0.50)	(0.51)
Legit. adv. × male	-0.22	0.21	-0.43
	(0.94)	(0.64)	(0.64)
Ambig. adv. × male	-0.77	-0.35	-0.41
	(0.86)	(0.59)	(0.59)
Hard bench. × male	0.11	-0.35	0.46
	(1.02)	(0.69)	(0.69)
Legit. disadv. × male	-1.16	-0.23	-0.93
	(1.11)	(0.76)	(0.76)
Ambig. disadv. × male	-0.16	0.56	-0.72
	(1.18)	(0.80)	(0.80)
Panel B. Joint-test p-values			
Do beliefs vary across environments?	0.123	0.509	0.129
Do environment effects differ by gender?	0.777	0.727	0.438

Notes: Panel A reports OLS estimates for common performance-belief outcomes. Estimates are in numbers of correct answers; robust standard errors are in parentheses. Panel B reports p-values from Wald tests. The first row tests whether competitive-environment indicators are jointly zero; the second row tests whether environment-by-gender interactions are jointly zero. All specifications include the controls described in the text. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Figure C.1: Screen 1

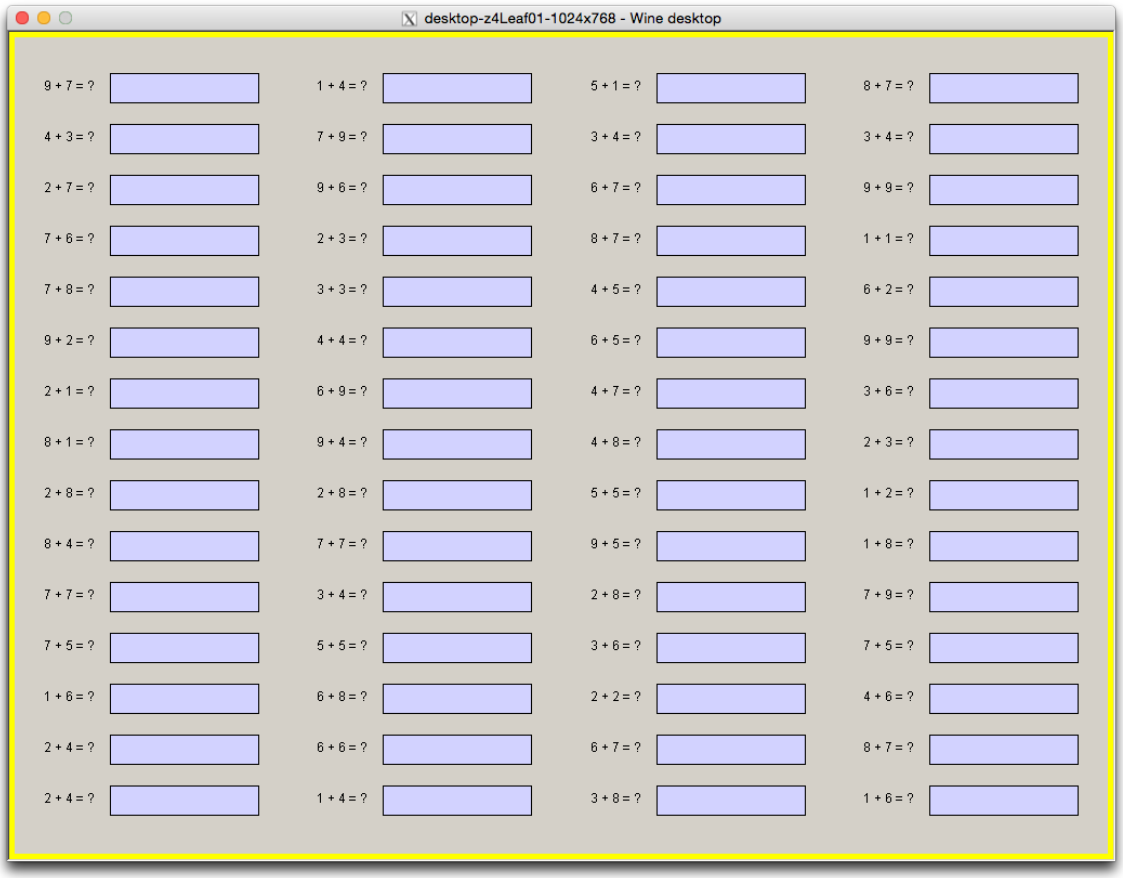


Figure C.2: Screen 2

Figure C.3: Screen 3

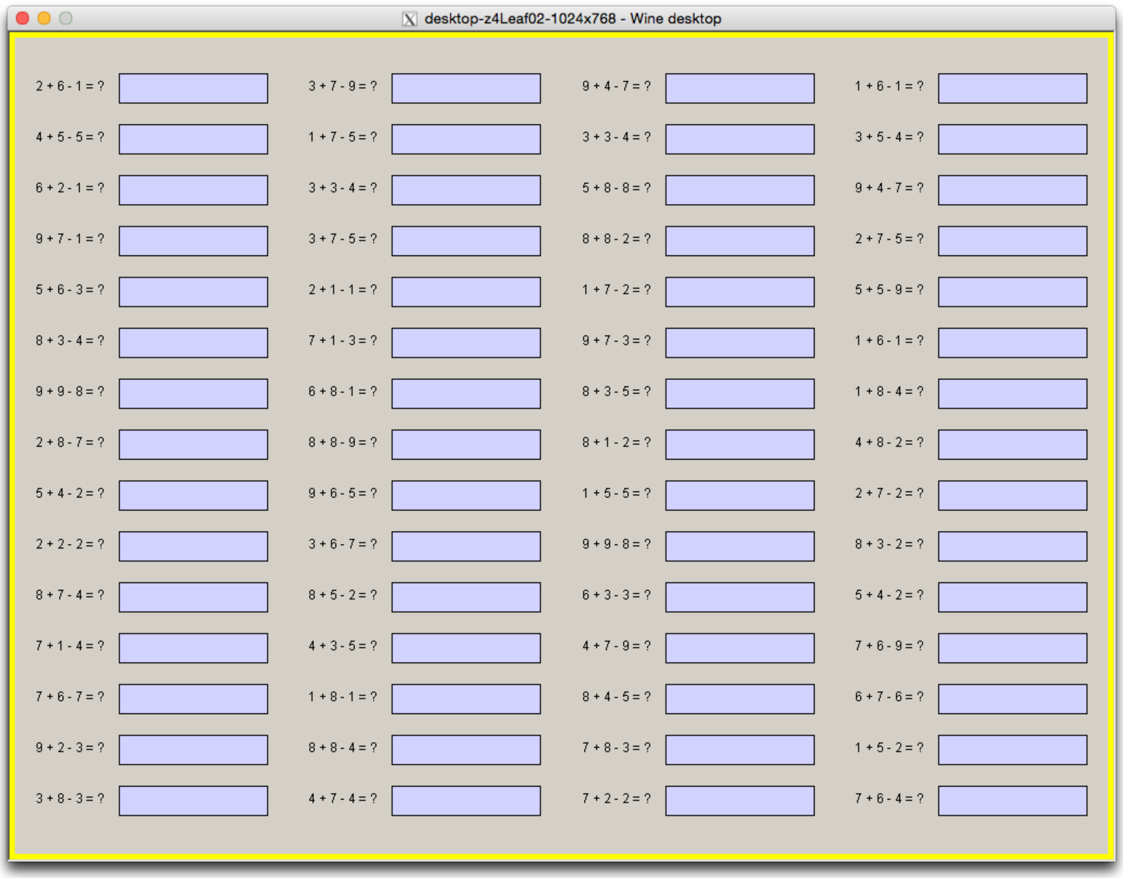


Figure C.4: Screen 4

Figure C.5: Task 3 - Die Roll Treatment - 1

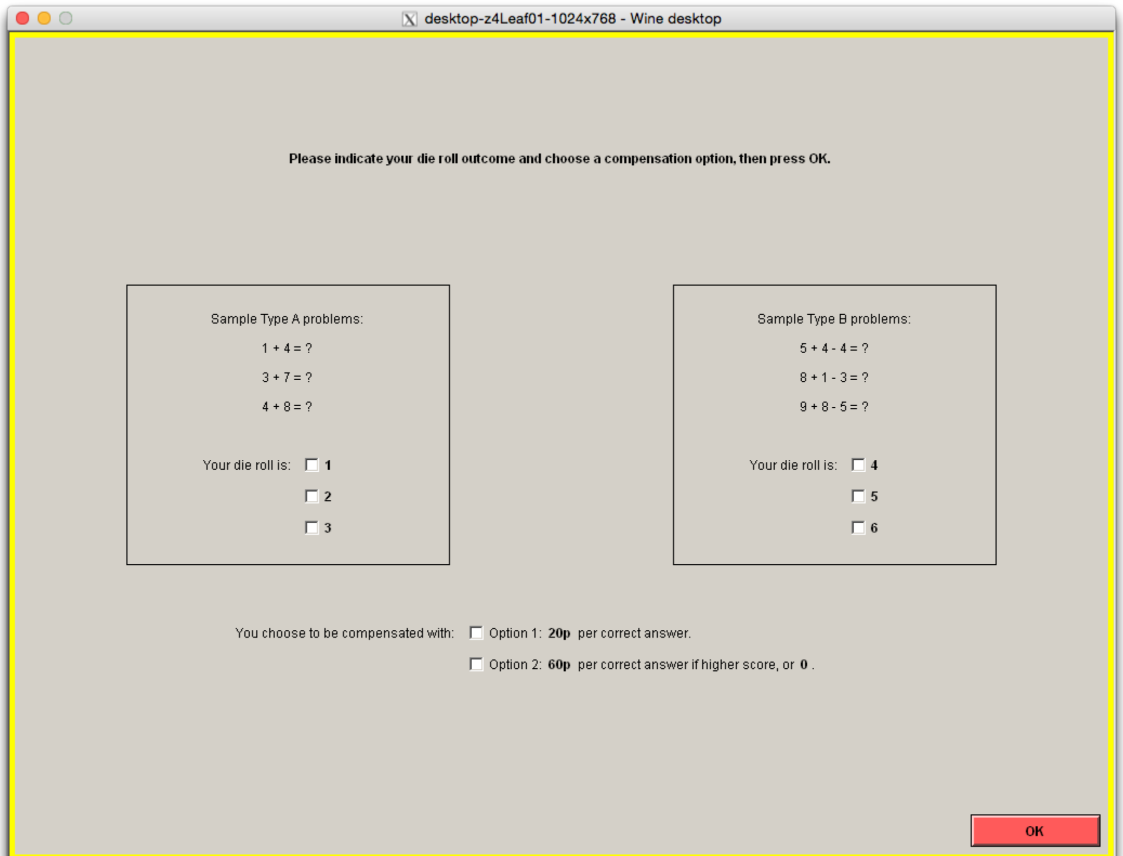


Figure C.6: Task 3 - Die Roll Treatment - 2

Figure C.7: Task 3 - Die Roll Treatment - 3

Figure C.8: Die Roll Treatment - Incentivized Guess

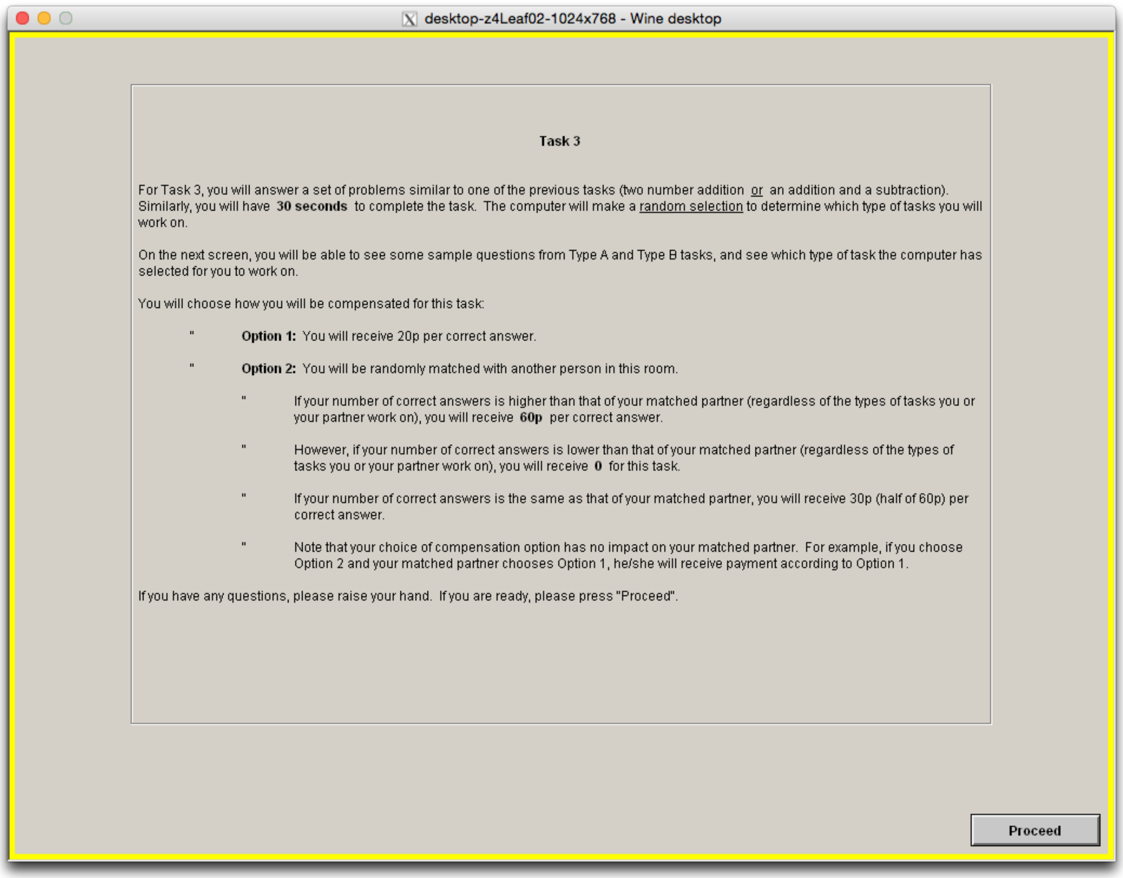


Figure C.9: Task 3 - Random Treatment - 1

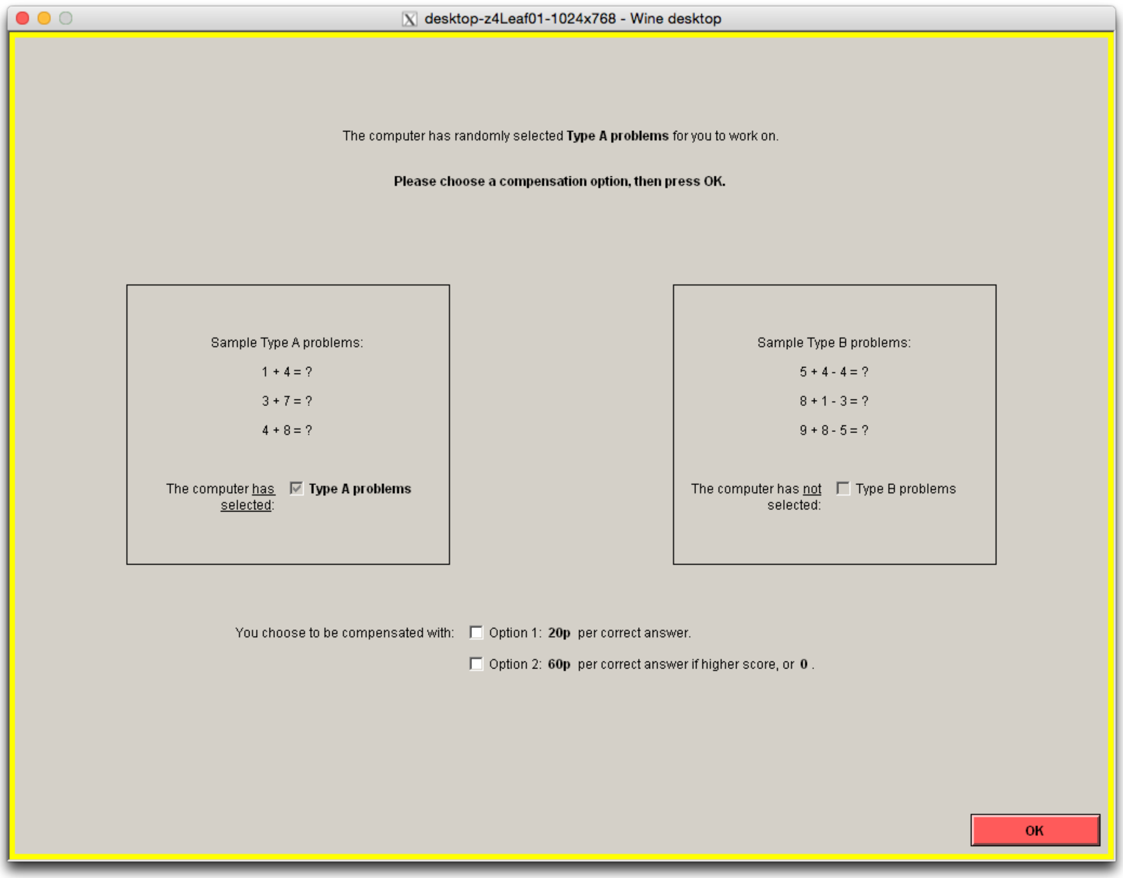


Figure C.10: Task 3 - Random Treatment - 2

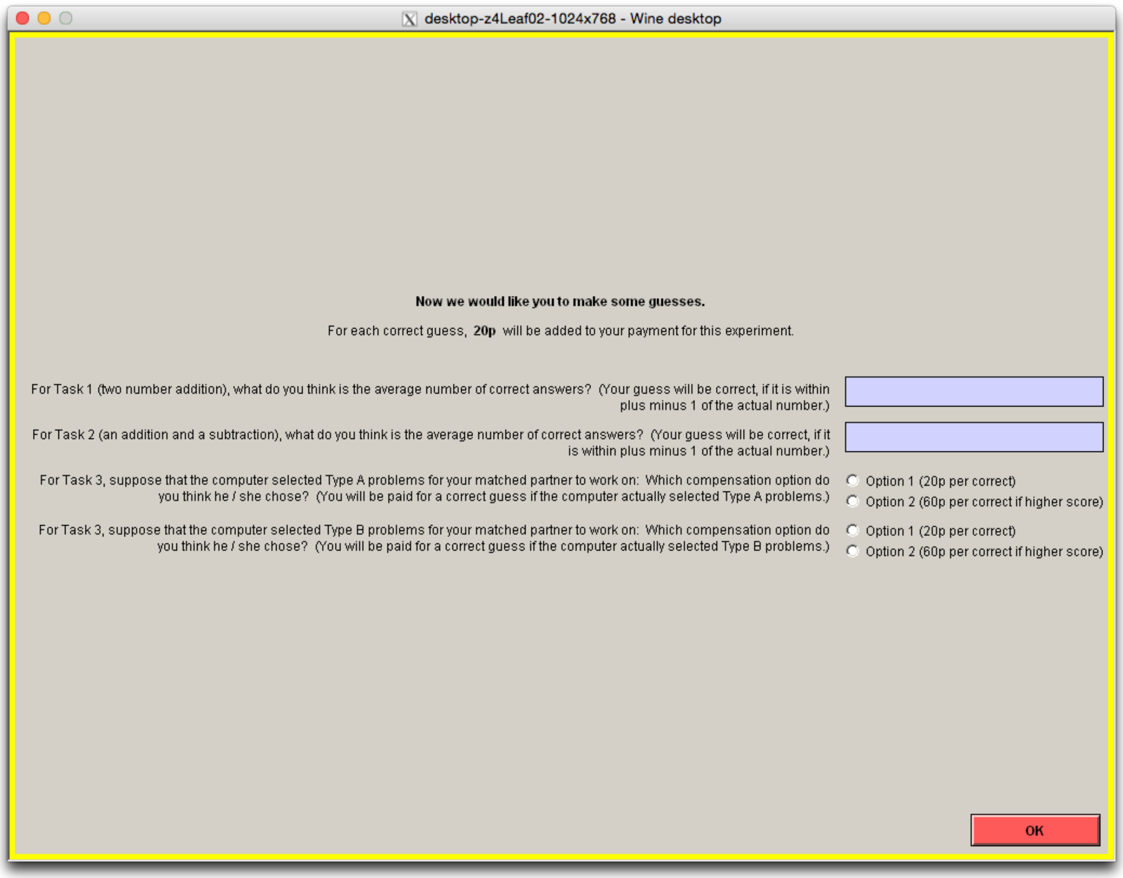


Figure C.11: Random Treatment - Incentivized Guesses

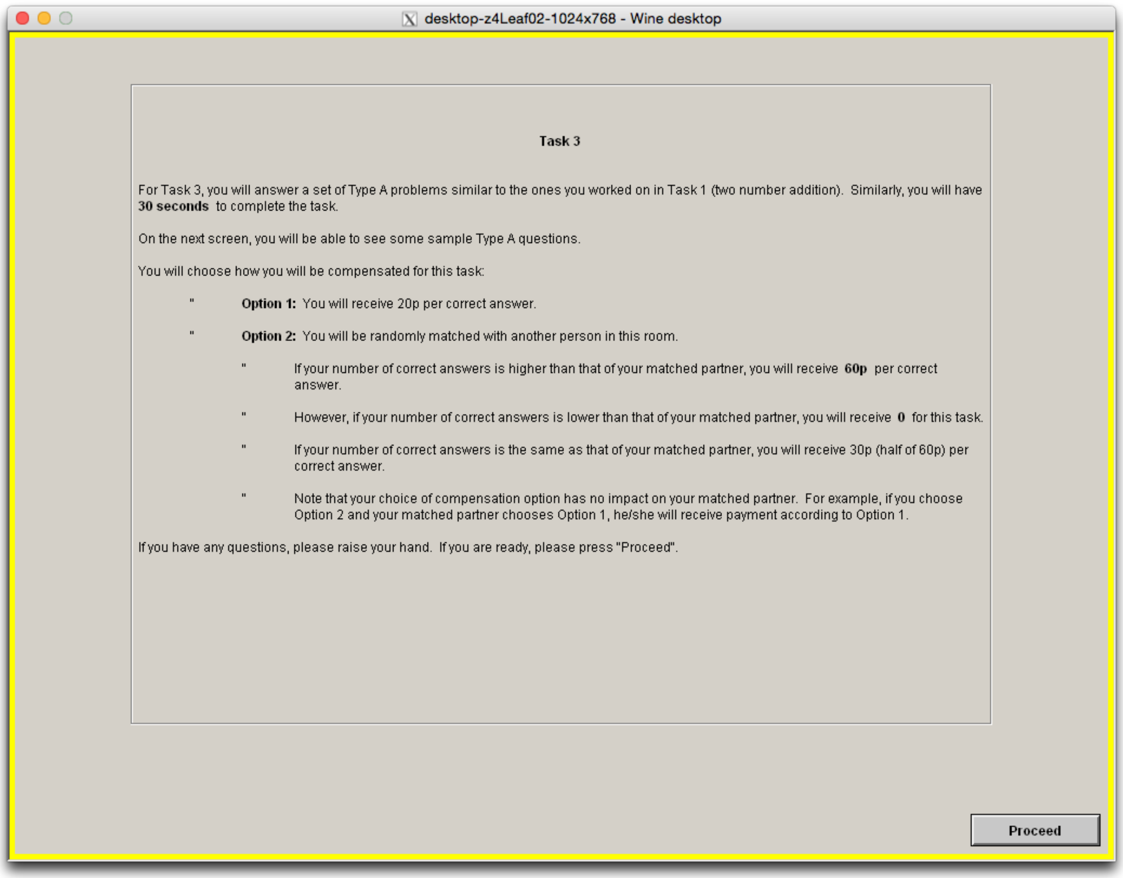


Figure C.12: Task 3 - Fixed Easy Treatment - 1

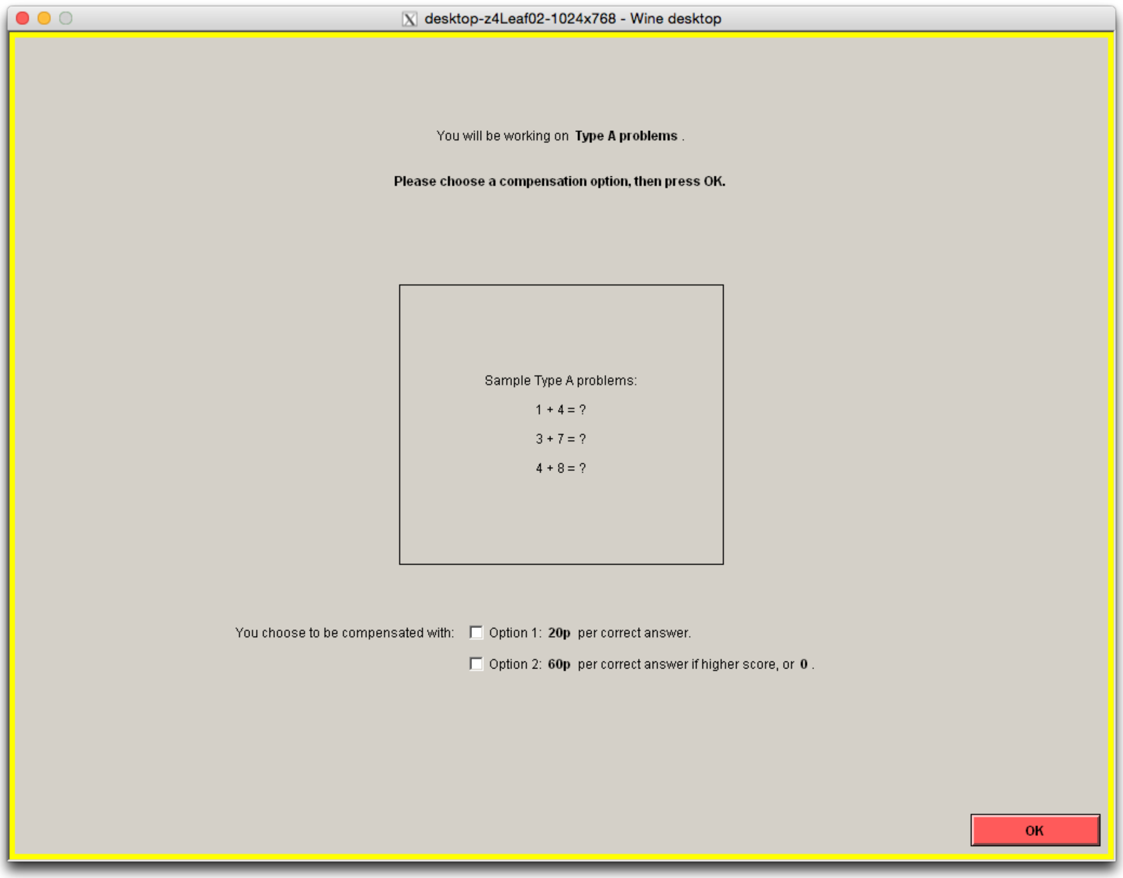


Figure C.13: Task 3 - Fixed Easy Treatment - 2

Figure C.14: Fixed Easy Treatment - Incentivized Guesses

Figure C.15: Task 3 - Fixed Hard Treatment - 1

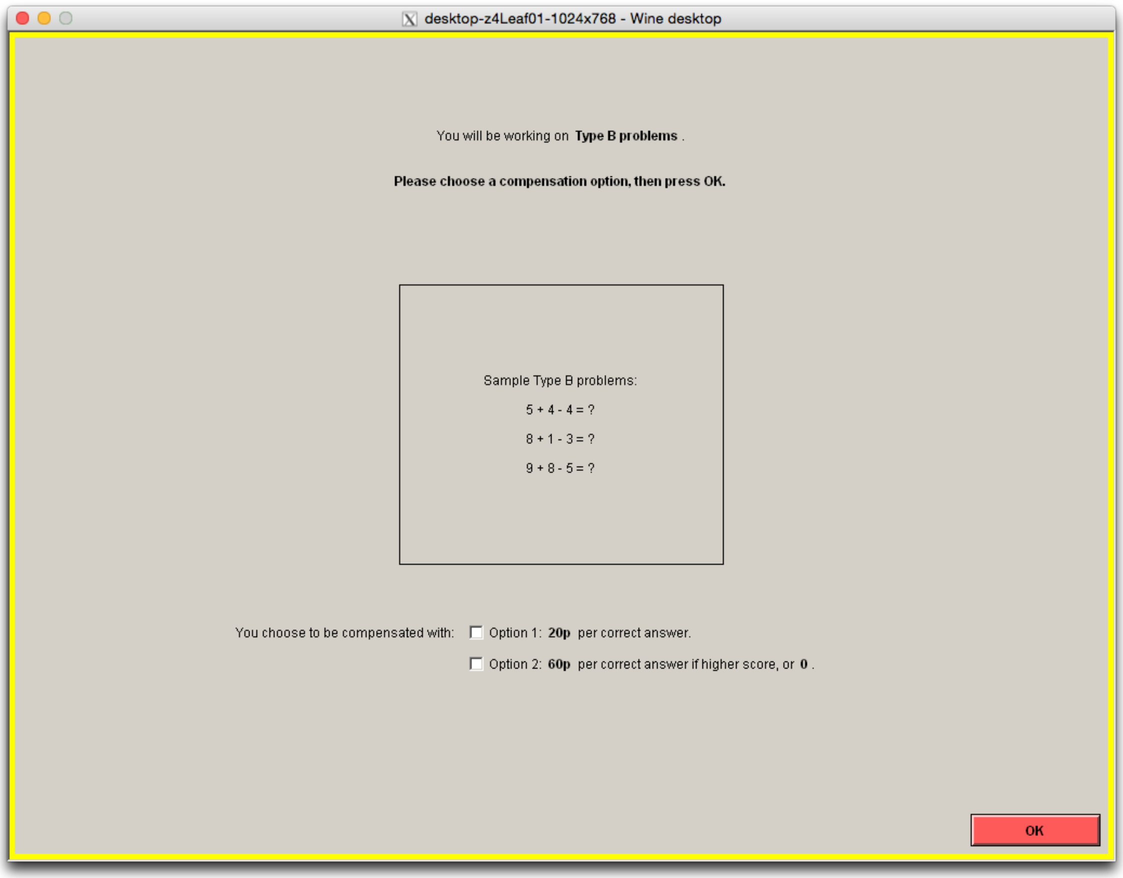


Figure C.16: Task 3 - Fixed Hard Treatment - 2

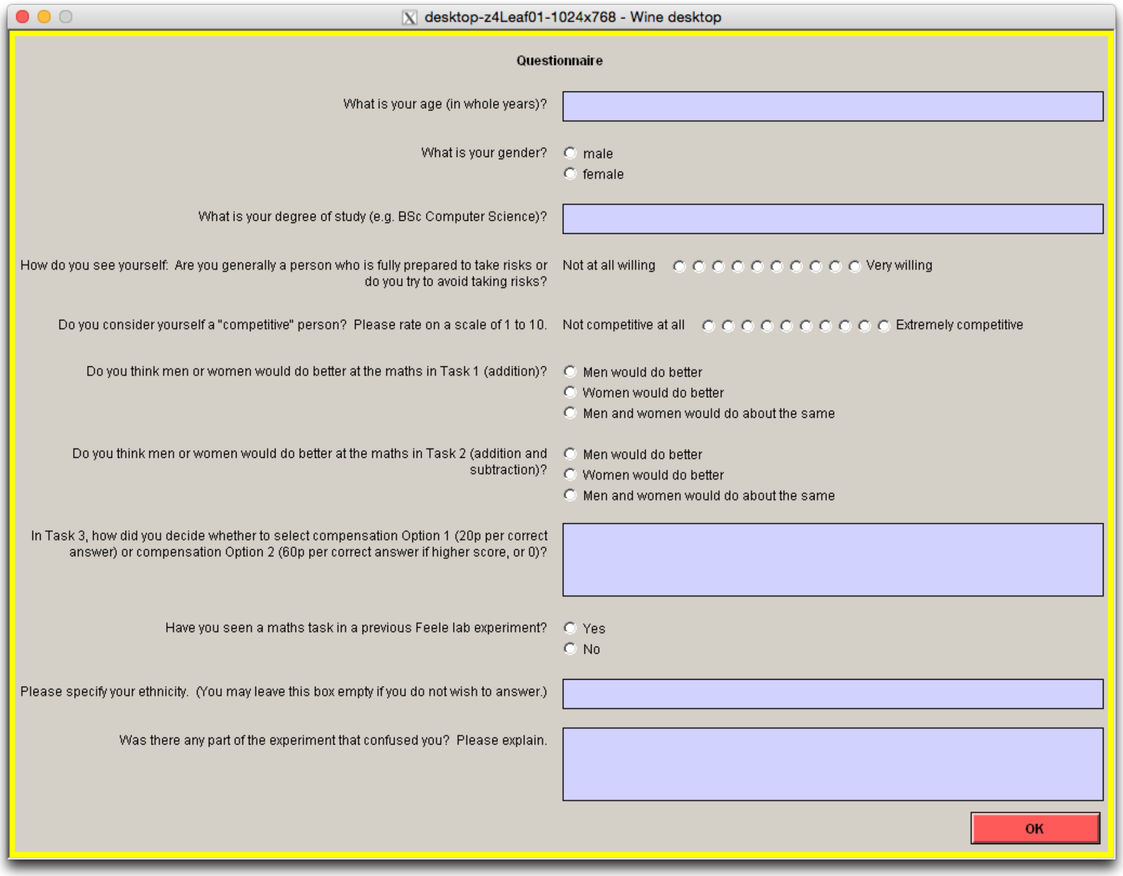


Figure C.17: Post experimental questionnaire

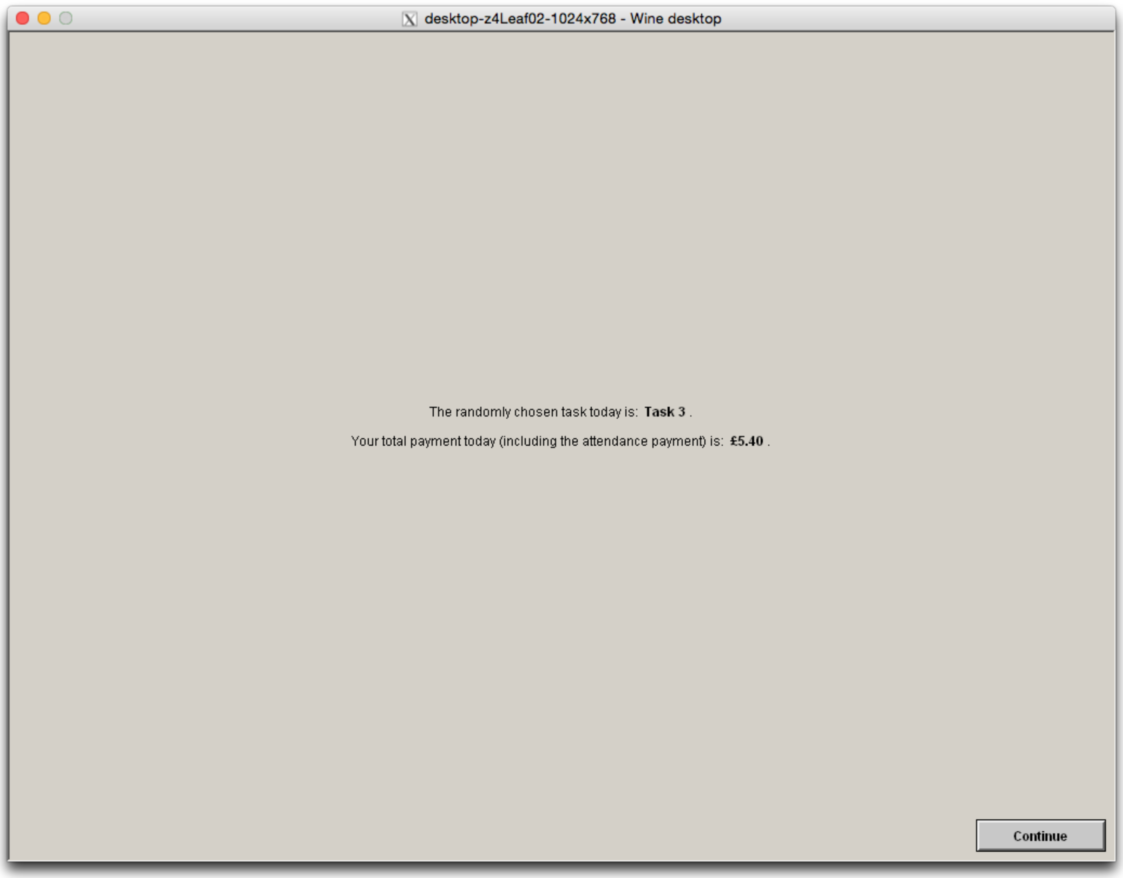


Figure C.18: Sample Payment Page