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Gender and willingness to compete for high stakes[☆]

Thomas Buser[a,b], Martijn J. van den Assem[b,c], Dennie van Dolder[d,*]

[a] Amsterdam School of Economics, University of Amsterdam, The Netherlands
[b] Tinbergen Institute, The Netherlands
[c] School of Business and Economics, Vrije Universiteit (VU) Amsterdam, The Netherlands
[d] Department of Economics, University of Essex, United Kingdom

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ABSTRACT

We examine gender differences in willingness to compete, using data from a TV game show where in each episode the winner of an elimination competition in expectation wins hundreds of thousands of euros. At several stages of the elimination competition, contestants face a choice between continuing to compete and opting out in exchange for a comparatively modest prize. When there is no strategic interaction embedded in this choice, we observe the well-known pattern that women compete less than men, but this difference derives entirely from women avoiding competition against men. When there is strategic interaction and contestants should factor in their opponents' willingness to compete, women again tend to avoid competing against men; men then seem to anticipate the lower competitiveness of female opponents, as evidenced by their greater propensity to compete against women. Ability differences are unlikely to explain these results. Our findings show that the gender difference in willingness to compete that is well-documented in the experimental economics literature also occurs in a quasi-experimental real-world setting with exceptionally high stakes, and underline the importance of the gender of competitors.

1. Introduction

Despite a considerable decline of the gender wage gap over the last decades, gender differences at the top have proven to be highly persistent. For example, Blau and Kahn (2017) report that in the US, the gender gap at the top of the wage distribution has declined much less than the gap at the middle and bottom of the distribution. Also, the higher rungs of the career ladder are disproportionately populated by men. The Global Gender Gap Report 2020 states that worldwide only 36 percent of senior private sector managers and public sector officials are women, and that only 18 percent of firms are led by a woman. According to the Fortune Global 500 list of 2022, only 4.8 percent of the world's largest companies are run by a female CEO.

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* Corresponding author.
E-mail addresses: t.buser@uva.nl (T. Buser), m.j.vanden.assem@vu.nl (M.J. van den Assem), d.vandolder@essex.ac.uk (D. van Dolder).

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A large literature primarily based on lab experiments suggests that these gender gaps can be partially explained by a gender difference in willingness to compete. According to this literature, women are more reluctant to compete than men (for surveys, see Croson and Gneezy, 2009, and Niederle and Vesterlund, 2011). Most studies base their experimental design on that of Niederle and Vesterlund (2007). In this design, participants determine how they are compensated for their performance in a series of math problems where they have to add up sets of two-digit numbers. They can choose between a noncompetitive piece rate and a competitive tournament incentive scheme. If they opt for the piece rate, they earn $0.50 per correct answer; if they opt for the tournament, they compete against three others, with the highest performer receiving $2 per correct answer and the others receiving nothing. In most studies, male and female subjects perform equally well on the math problems, but men are more likely to choose the competitive option.[1]

Compared to the financial interests that are at stake in career competitions, the money amounts in willingness-to-compete experiments are typically very small. Notwithstanding the copious experimental evidence for the existence of a gender difference in willingness to compete, this raises the question of whether the observed behavior can be generalized to consequential real-world decisions.

The present paper uses the Dutch version of the globally successful TV game show format Deal or No Deal to investigate whether the gender difference in willingness to compete also occurs when the stakes are high. In the final part of every episode, one person plays a game of chance with an expected payoff of hundreds of thousands of euros. This finalist is selected from an audience of 500 through a series of elimination games centered around quiz questions. Similar to the tasks that are typically used in willingness-to-compete experiments, these quiz questions are often numerical or arithmetic in nature. In every episode, multiple contestants are offered the option to opt out of the elimination competition in exchange for a substantial but comparatively small prize. These high-stakes choice situations almost appear to be designed by an economist as an experiment to analyze competitiveness differences under substantial incentives.

With the combination of high stakes and a quasi-controlled setting we complement recent work that attempts to assess the external validity of competitiveness differences found in the lab. Previous research has employed two approaches to this end, but neither of these is without limitations. The first builds on the idea that competitiveness is a personality trait, and investigates whether the decision to compete or not compete in the laboratory correlates with real-world decisions or outcomes such as education choices, career choices, and labor market success (Zhang, 2013; Buser et al., 2014, 2017b, 2018, 2021a, 2022; Berge et al., 2015; Almås et al., 2016; Reuben et al., 2017; Kamas and Preston, 2018; Reuben et al., 2019). Although this line of empirical research confirms that competition decisions in the lab do correlate with real-life consequential decisions and outcomes, none of the studies directly and unequivocally demonstrates the existence of a gender difference in entering high-stakes competitions.

The second approach is to study people's willingness to compete outside the laboratory. Flory et al. (2015) and Samek (2019) conduct field experiments where individuals apply for real jobs. In line with the results from the laboratory, these two studies find that women are less willing to work under competitive incentive schemes than men. In the context of labor market choices, however, the stakes in these studies are still relatively low (the jobs were short-term administrative positions, paying roughly $15 an hour). The present paper similarly analyzes gender differences in willingness to compete outside the lab, but instead uses a naturally occurring quasi-experimental setting. A downside of the setting of our TV game show is that in some ways the tasks are relatively distant from those in typical labor market settings, but an important benefit is that it offers exceptionally high stakes: contestants make decisions for potentially life-changing amounts of money.

We focus on two different elimination games, which differ in strategic complexity. In the first, contestants who most accurately answered an estimation question have to choose between competing in the next elimination game and opting out for a comparatively modest prize. This decision resembles the tournament-entry decision that subjects typically make in lab experiments. We find that women are more than twice as likely as men to opt out of the competition. Interestingly, the higher opt-out rate of women derives entirely from situations where the majority of their opponents in the next stage would be male. This latter result corroborates experimental findings of Booth and Nolen (2012) and Geraldes (2021).[2] We find no evidence that men condition their behavior on the gender of their opponents.

The second game is a head-to-head confrontation at the end of the elimination competition. One quiz question determines the last elimination, unless one of the two contestants voluntarily accepts an opt-out prize. This decision is more complex than the previous one, because the optimal choice strongly depends on the expected behavior of the opponent. In the previous game, the number of competitors in the next stage is predetermined, and people who want to compete do not directly benefit from others' reluctance to compete (contestants who opt out are replaced by another, randomly selected contestant). In this second game, however, those who choose to compete automatically win the competition if the other opts out. Such strategic interaction similarly plays an important role in many real-life competition choices. For example, if

[1] Differences in willingness to compete can be driven by differences in risk attitudes, confidence, and attitudes towards competition. The terms "willingness to compete" and "competitiveness" are sometimes used in a narrow sense and then specifically refer to the latter driver. We follow Niederle and Vesterlund (2011) and use these two terms interchangeably to refer to the overall propensity to compete.

[2] Sutter and Glätzle-Rützler (2015) and Dariel et al. (2017) find no evidence of a dislike of competing against males among young girls from Austria and among women from the United Arab Emirates, respectively. In a field experiment on job-entry decisions, Flory et al. (2015) neither detect such a pattern. Kirgios et al. (2020) show that in a context where performance is judged subjectively, women may even prefer to compete against men if they believe that being distinct will lead their performance to stand out.

two colleagues are eligible for a job promotion but only one can actually get the position, both should not only factor in their comparative advantage when they consider whether or not to compete for the position, but also the likelihood that the other will shy away from the competition. Likewise, contestants who choose to compete in the second game are not only betting on their relative performance, but also on the possibility that their opponent will bow out.

For this second game, we find that opt-out decisions occur approximately equally often in male and female single-sex pairs. In mixed-gender pairs, however, we do observe a large difference: women are about twice as likely as men to be the one who opts out. These results are consistent (i) with a lower propensity among women to compete against men than against women, as we also found for the first game, (ii) with a higher propensity among men to compete against women than against men, and (iii) with a combination of both (i) and (ii). To disentangle these explanations, we exploit the temporal aspect of the game. Contestants have a limited amount of time to decide. Every second that passes until someone opts out or until the time is up is informative about the two contestants' individual opt-out propensities: the longer they wait, the more they risk that they have to compete. Second-by-second analysis of contestants' behavior shows that both men and women have a higher propensity to compete against women.

The results for the two games confirm that the gender difference in willingness to compete also occurs in situations where the stakes are very high. The stereotypical image that women are generally more competition averse than men, however, appears to be overly simplistic. Combined, our results suggest that women have a particular dislike of competing against men, and that men believe and strategically exploit that female opponents are less likely to compete. In both games, women avoid competing against men. In the first and relatively simple game, there is no evidence that men care about the gender of their opponent. In the second game, where contestants should take their opponent's willingness to compete into account, however, men display a greater tendency to compete against women than against men. There is little reason to believe that these results are driven by gender differences in the ability to correctly answer the questions of the various games, because men and women perform roughly equally well in the different tasks.

These findings shed new light on the persistent gender gaps at the higher rungs of the career ladder. Typically, the competitor pool gradually becomes more male-dominated the closer one gets to the top. If women are more likely to give up when faced with a male competitor and men compete harder when faced with a female competitor, male dominance in professional environments can be self-perpetuating.

The findings also demonstrate the importance of considering the gender composition of the competitor base and the presence of strategic interaction when investigating gender differences in willingness to compete. Only few of the many studies on gender differences in willingness to compete address the potential importance of the gender of competitors for decisions to enter or not enter competitions (Booth and Nolen, 2012; Datta Gupta et al., 2013; Flory et al., 2015; Sutter and Glätzle-Rützler, 2015; Dariel et al., 2017; Geraldes, 2021; Kirgios et al., 2020).[3] This is surprising in the light of the extant evidence that women perform worse when competing against men (Gneezy et al., 2003; Günther et al., 2010; Booth et al., 2018; Booth and Yamamura, 2018; Backus et al., 2022; de Sousa and Hollard, 2022), which may reflect a reluctance among women to compete against men. Strategic interaction is typically ruled out by design in experimental analyses of competition-entry decisions, and how gender differences play out when the optimal choice directly depends on the expected behavior of competitors has therefore received even less attention.[4]

One limitation of our study is that the quasi-experimental field setting is not rich enough to disentangle the underlying determinants of the gender differences that we observe. Yet, even in controlled laboratory experiments this has proven to be methodologically challenging. Experimental studies typically attribute the overall gender gap in willingness to compete to differences in risk attitudes, confidence, and intrinsic attitudes towards competition. The dominant approach is to control for laboratory measures of risk attitude and confidence in a regression analysis, and then attribute any remaining gender difference to intrinsic attitudes towards competition. Gillen et al. (2019) and van Veldhuizen (2022), however, show that this approach is problematic and that measurement error in the laboratory measures leads to overestimation of the importance of the intrinsic reluctance to compete (and underestimation of the importance of risk attitudes and confidence). Moreover, because gender differences in propensities to compete can have far-reaching socioeconomic consequences, studying whether such differences also occur under conditions that are markedly different from laboratory conditions is important in itself, regardless of whether or not it is possible to separate the roles of underlying determinants.

Our paper adds to a long list of papers that have employed TV game shows for the study of decision making. Starting in the 1990s, researchers have used the behavior of contestants to investigate, for example, risky choice (Gertner, 1993; Metrick, 1995; Post et al., 2008), strategic reasoning (Bennett and Hickman, 1993; Berk et al., 1996; Tenorio and Cason, 2002; Klein Teeselink et al., 2022), discrimination (Levitt, 2004; Antonovics et al., 2005; Belot et al., 2012), cooperation (List, 2006; Oberholzer-Gee et al., 2010; van den Assem et al., 2012; Turmunkh et al., 2019), and bargaining (van Dolder et al., 2015).

Somewhat related to our study, Sjögren et al. (2011), Jetter and Walker (2018), and Säve-Söderbergh and Sjögren Lindquist (2017) examine the effect of the gender of opponents on risk taking in American and Swedish versions of the

[3] Subjects in competition-entry decision experiments typically face a situation where the gender composition of the competitor group is either balanced and known, or unknown.

[4] An exception is Datta Gupta et al. (2013). They conduct an experiment with a game that resembles Game Two in the present paper, but small sample sizes limit the interpretation of the results. For the treatment where the gender of the opponent is explicitly stated, they find some evidence that men compete more against women: out of the eight males who faced a female opponent, five chose to compete (62.5%), whereas out of the twelve males who faced a male opponent, only four chose to compete (33.3%).

game show Jeopardy! and find mixed results. Antonovics et al. (2009) use data from American episodes of The Weakest Link to analyze the impact of the gender of opponents on performance. They find some evidence that male contestants perform better when they face a female opponent than when they face a male opponent. The existing game show study that is closest to ours is Hogarth et al. (2012). They analyze the Colombian game show "El Jugador", which is built around a game that closely resembles the elimination game that we examine in Appendix B (for reasons explained in the next section). In line with our results, they report that women voluntarily exit the game more often than men, especially when in a minority.[5]

The paper proceeds as follows. Section 2 describes the game show and its elimination competition in more detail. Sections 3 and 4 cover the descriptions and analyses of the two different games of interest. Section 5 asks whether the results can be explained by gender differences in performance. Section 6 concludes.

2. Game show and elimination competition

The common and main part of all editions of the globally successful game show format Deal or No Deal is a high-stakes game that involves stop-go choices between accepting a sure amount and risky continuation. The Dutch edition is called "Miljoenenjacht" (translated: "Chasing Millions"). This edition is unique because of the elimination competition that precedes the main game, and because the prizes are considerably larger than those in any other edition. The show is hosted by Linda de Mol, a Dutch actress and television personality. Each episode starts with 500 contestants, and after various elimination games, the one remaining contestant plays the main game and in expectation takes home hundreds of thousands of euros. The Dutch edition owes the large stakes to the Dutch Postcode Lottery, which pays out all prizes as a part of their payout scheme. All 500 initial contestants have won their ticket through this lottery.[6] In addition to the lucrative possibility of becoming the finalist who plays the main game, contestants can win several other large prizes. These are awarded randomly, or as opt-out or consolation prizes.

The first episode was broadcast on December 22, 2002. At the time of writing, the game show is still running. Our analysis uses the complete set of 183 episodes aired between inception and March 31, 2019. In this time span, there were 33 short series of weekly episodes, and 6 individual episodes on either New Year's Eve or New Year's Day. We recorded most episodes ourselves, and obtained videotapes of early episodes from a Dutch broadcasting company.

The main game is played by one contestant, who "owns" one sealed briefcase out of a larger set of 26 sealed briefcases that each contain a money prize. The set of prizes are known at the start. The expected value varied between €391,411 in early episodes and €516,122 in later episodes. The smallest prize was always €0.01, the largest €5000,000. Each round, the contestant opens a given number of briefcases and consequently learns which amounts are not in their own briefcase. At the end of each round, a hypothetical "banker" makes an offer to buy their briefcase, which they can then accept ("Deal") or decline ("No Deal"). These stop-go decisions continue until either an offer is accepted, or all briefcases are opened and the contestant receives the prize in their own briefcase. Most finalists at some point accepted a sure amount that was lower than the expected value of continuing. On average, finalists took home €233,761.[7]

At the start of every elimination competition, the 500 contestants are seated in the audience together with a friend or relative. Fig. A1 in Appendix A gives a schematic overview of the many different elimination games and how these were combined over time and episodes to reduce the number of contestants down to one. Out of the elimination games that have a built-in opt-out opportunity, only three are suited for our study; Appendix A explains why we do not consider the other games.

The games featuring the opt-out decisions that we analyze in the next two sections are represented in Fig. A1 as F and H1–3. Game F (henceforth "Game One") reduced the initial crowd from 500 to five, and is described and analyzed in Section 3. Games H1–3 (henceforth "Game Two") are variants of the two-person game that determined the last elimination of every elimination competition, and are described and analyzed in Section 4.

Game D1 (henceforth "Game Three") narrowed a group of six contestants down to two. The analysis of this game is in Appendix B for two reasons. First, the sample size is relatively small (17 episodes, 68 opt-out opportunities). Second, a censoring problem makes it impossible to draw clear conclusions. Nevertheless, the patterns that we observe in this third game are in line with the results for the two games that are the focus of our study.

The financial consequences of the decisions that we study are high. Contestants are competing for the unique opportunity to play a game that offers life-changing amounts of prize money, and are offered substantial prizes to exit this competition. Would we have run the two main elimination games that we analyze and the subsequent finals as an experiment ourselves, the total cost in subject payoffs alone would have been nearly €50 million (accepted opt-out prizes: €4.8m; money won in the final: €42.8m).

[5] Using a naturally occurring setting other than a TV game show, Garratt et al. (2013) find that female runners who must choose between two different levels of competition are less likely than male runners to enter the more competitive one.

[6] A substantial fraction of the Dutch population take part in the Dutch Postcode Lottery. In 2017, for example, there were 7.8 million Dutch households, of which 2.9 million participated. Sources: Annual Report 2017 Dutch Postcode Lottery, CBS Statline.

[7] The game can be considered as a naturally occurring risky choice experiment and has been exploited as such by many, including Deck et al. (2008), Post et al. (2008), Brooks et al. (2009), Blavatskyy and Pogrebna (2010), de Roos and Sarafidis (2010), Bombardini and Trebbi (2012), and Baltussen et al. (2016).

3. Game One: from 500 to 5

3.1. Description and data

From 2013 onwards, the initial crowd of 500 contestants was reduced to five through five estimation questions. Examples are “How many ambulances are there in the Netherlands?” and “How many words does the first verse of the Dutch national anthem have?”. After each of the five questions, the person closest to the correct answer (and the fastest in the case of a tie) was offered a choice between one of the five seats in the next elimination game and one of the remaining opt-out prizes hidden in five large numbered briefcases. The smallest and the largest opt-out prize were always a monetary amount of €500 and an expensive car (mostly worth roughly €50k), respectively. The other three varied across episodes, and had a value between approximately €2k and €10k (examples are gift cards, holidays, electronics, and city cars). If the winning contestant opted out, the seat left vacant was randomly assigned to someone else in the audience.[8] Everything that happened during the game was visible to all, and contestants facing the opt-out opportunity therefore knew the identities of people who had already won a seat in the next round. Contrary to the opt-out decisions in the game in the next section, there is no strategic interaction here. In this sense, the decisions are close to the tournament-entry decisions in typical willingness-to-compete experiments.[9]

We collected the data for all 344 choices between a seat and an opt-out prize made in the 69 episodes featuring this elimination game.[10] The average age of the contestants was 49 years (min: 21, max: 81).[11] The majority was male (208 out of 344, or 60.5%).

3.2. Analyses and results

Most contestants prefer taking the seat in the next stage over picking an opt-out prize: the overall opt-out rate is 18.9%. As illustrated by Fig. 1a, women are approximately twice as likely as men to opt out (women: 27.9%, men: 13.0%; $Chi^2(1) = 12.010$, $p = 0.001$).[12]

We estimate a multivariate linear probability model to control for variation in contestants’ age, the attractiveness of the remaining opt-out prizes, and the question number. The dependent variable takes the value of one if the contestant opts out (and zero otherwise). We include a quadratic specification for age, because the raw data suggest a u-shaped relationship.[13] Age is an integer, measured in years and centered on the mean. We use two variables to control for the attractiveness of the set of remaining opt-out prizes: the probability of winning the expensive car, and the probability of winning the small cash prize of €500. Last, we include question-number fixed effects because seats allocated after earlier questions offer a better starting position in the next round and are therefore more valuable. We correct the standard errors for clustering at the episode level.

Table 1, Model 1 presents the results. The regression results closely match the raw comparison of the opt-out rates: after controlling for the effects of age, the attractiveness of the remaining prizes, and question-number fixed effects, women are 15.6 percentage points more likely to opt out than men. The regression results in addition confirm the u-shaped effect of age: the estimates imply that the opt-out rate decreases with age if the contestant is younger than 43 years, and increases with age for older contestants. As expected, contestants are more likely to opt out if the chance of winning the car is higher, and less likely to opt out if the chance of winning the small cash prize is higher.

After the first estimation question, the contestant who is offered the opportunity to opt out does not yet know the gender of any of the competitors in the next game, but those who make their choice after the other four estimation questions do know the gender of some (questions 2–4) or all (question 5). To investigate whether men and women condition their opt-out decision on the gender composition of the already-known set of competitors, we distinguish between situations where

[8] Similarly, if the winning contestant chose the seat, one of the remaining briefcases was randomly assigned to someone else in the audience.

[9] Strategic considerations (or, more specifically, beliefs about others’ willingness to compete) become potentially important only in Game Two. The two contestants who reach this final elimination game are guaranteed to be able to lock in tens of thousands of euros and in expectation win more than €100k. Because reaching Game Two is attractive anyhow, and because people often fail to look strategically ahead (Johnson et al., 2002; Gabaix et al., 2006; Mantovani, 2015; Rampal, 2022), it is unlikely that the strategic considerations that are relevant for the final elimination game will carry back to the present game.

[10] In every episode there normally were five choices between an opt-out prize and a seat in the next stage of the elimination competition. In one episode, however, there were only four: one contestant gave the best response to two different estimation questions, and because she took a seat after the first, she was automatically awarded an opt-out prize after the second.

[11] The age of the contestant was often mentioned in the episode itself or in a press release about the episode, or provided to us by the producer (213 cases in total, or 61.9%). In the remaining cases (131, or 38.1%), we estimated the contestant’s age on the basis of physical appearance and other helpful information that was revealed in the episode or could be found on the internet, such as when they went to secondary school or the age of their children.

[12] Note that the opt-out rates cannot be directly compared with the rates of competition avoidance in other studies. The choice between competing and not competing constitutes a trade-off between two prospects. In most experimental studies that use the Niederle and Vesterlund (2007) design, the average payoff of competing equals that of not competing. In our games, the average payoff of competing is much higher than that of not competing. Dohmen and Falk (2011), Ifcher and Zarghamee (2016), and Petrie and Segal (2017) study how willingness to compete depends on the relative payoffs of competing and not competing.

[13] The opt-out rate is 19.0% for contestants younger than 40 years, 8.3% for contestants between 40 and 50 years, 18.2% for contestants between 50 and 60 years, and 35.2% for contestants 60 years or older.

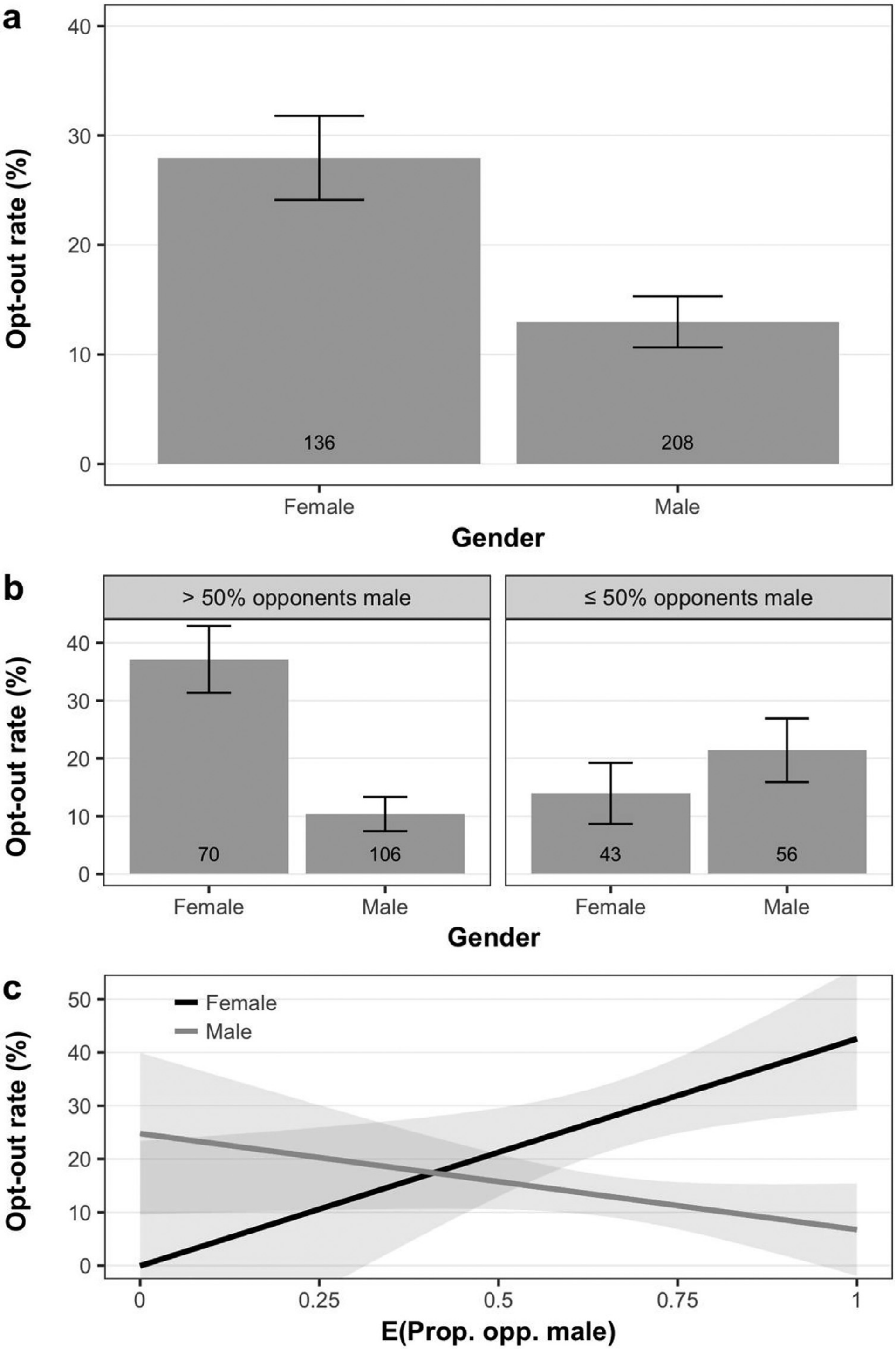

Fig. 1. Opt-out rates for men and women in Game One. (a) displays the opt-out rates for male and female contestants, measured across all questions. (b) displays the opt-out rates for male and female contestants across questions 2–5, conditional on whether more than half of the previously selected competitors for the next stage of the elimination competition are male (> 50% opponents male), and conditional on whether half or more of the previously selected competitors are female (≤ 50% opponents male) at the time the contestant makes their opt-out decision. The number of observations is at the bottom of each bar. Error bars depict standard errors around the mean. (c) displays the univariate linear relationship between the opt-out rate and the expected proportion of male opponents, estimated across all questions, for male and female contestants separately. The shaded areas represent 90% confidence intervals.

Table 1
Regression results for Game One
The table displays results from regression analyses of contestants' decisions to opt out (1) or not (0) in Game One. *Female* is a dummy variable that takes the value of 1 if the contestant is female. *Age* is the contestant's age, measured in years and centered on the mean (48.7y). *Majority opp. male* is a dummy variable that takes the value of 1 if the majority of the already-selected opponents are male, and is missing if no opponents are selected yet. *E(Prop. opp. male)* is the expected proportion of male opponents, centered on the mean (0.66). *P(Car)* is the probability that the contestant wins the expensive car if they opt out. *P(Small prize)* is the probability that the contestant wins the small prize of €500 if they opt out. Table C1, Panel A in Appendix C provides summary statistics for the variables. All models include question-number fixed effects. Standard errors (in parentheses) are corrected for clustering at the episode level. Asterisks denote statistical significance at the one ***, five ** and ten * percent level, respectively.

	Model 1	Model 2	Model 3	Model 4	Model 5
Female	0.156***	0.148**	−0.033	0.156***	0.156***
	(0.051)	(0.060)	(0.078)	(0.051)	(0.046)
Age	0.004**	0.004**	0.004**	0.004**	0.004**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Age^2 / 100	0.035***	0.031***	0.027**	0.035***	0.033***
	(0.010)	(0.010)	(0.011)	(0.010)	(0.010)
Majority opp. male		0.012	−0.109		
		(0.043)	(0.066)		
Female x Majority opp. male			0.289***		
			(0.108)		
E(Prop. opp. male)				0.054	−0.158
				(0.096)	(0.148)
Female x E(Prop. opp. male)					0.495**
					(0.247)
P(Car)	0.309***	0.305***	0.311***	0.310***	0.304***
	(0.100)	(0.101)	(0.102)	(0.102)	(0.103)
P(Small prize)	−0.202***	−0.204***	−0.202***	−0.199***	−0.204***
	(0.074)	(0.073)	(0.073)	(0.073)	(0.074)
Question-number fixed effects	yes	yes	yes	yes	yes
Data included	all	questions 2–5	questions 2–5	all	all
R^2	0.153	0.152	0.180	0.153	0.165
No. of observations	344	275	275	344	344
No. of episodes	69	69	69	69	69

most of the occupied seats in the next game are taken by men (> 50% male) and situations where half or more are taken by women (≤ 50% male).[14] Because of the higher proportion of male contestants in the initial crowd and because of the higher opt-out rate among women, a majority (177 out of 276, or 64.1%) was facing predominantly male opponents when they had to make their decision.

Fig. 1b depicts the opt-out rates for men and women across questions 2–5, conditional on whether most of the previously selected competitors are male and conditional on whether half or more are female. The differences are large. Women are significantly more likely to opt out than men if the majority of filled seats are occupied by men (women: 37.1%, men: 10.4%; $Chi^2(1) = 18.191$, $p < 0.001$). If at least half of the seats are taken by women, however, the opt-out rates of men and women are statistically not significantly different (women: 14.0%, men: 21.4%; $Chi^2(1) = 0.913$, $p = 0.339$). Based on these opt-out rates, both men and women appear to dislike competing against the opposite sex: if more than half of the previously selected opponents are male, women are significantly more likely to opt out (> 50% male: 37.1%, ≤ 50% male: 14.0%; $Chi^2(1) = 7.056$, $p = 0.008$), and men are marginally significantly less likely to opt out (> 50% male: 10.4%, ≤ 50% male: 21.4%; $Chi^2(1) = 3.674$, $p = 0.055$).

Table 1, Model 2 adds a dummy variable to the regression analysis that takes the value of one if more than half of the previously selected opponents are male (and zero otherwise), and shows that there is no significant main effect of the gender composition on opt-out rates ($p = 0.782$). Model 3 adds the interaction of this dummy variable with the contestant's own gender. In line with the raw statistics, men and women respond significantly differently to the gender composition ($p = 0.009$). Women are 18.0 percentage points more likely to opt out if the majority of the already-selected contestants are male as compared to situations where half or more are female ($-0.109 + 0.289 = 0.180$; $p = 0.013$). Men, in contrast, are 10.9 percentage points less likely to opt out when the majority of selected opponents are male as compared to situations where half or more are female, but statistically this difference is not significant ($p = 0.104$). The opt-out rates differ significantly between men and women in male-dominated environments only: women are 25.6 percentage points more likely to

[14] A player who makes their opt-out decision after question *i* knows the identity of *i*-1 competitors. The majority of seats are therefore filled by male contestants if 1/1 is taken by a man after question 2, if 2/2 are taken by men after question 3, if 2/3 or 3/3 are taken by men after question 4, and if 3/4 or 4/4 are taken by men after question 5.

opt out than men when the majority of selected opponents are male ($-0.033 + 0.289 = 0.256$; $p = 0.001$), but statistically neither more nor less likely to opt out when half or more are female (-0.033; $p = 0.676$).

The binary division of whether more or less than half of the already-selected opponents are male is rather crude, and also neglects that the ultimate composition depends on the gender of the opponents who take the remaining vacant seats. We therefore also investigate the effect of gender composition by looking at the expected proportion of males among the total of four competitors in the next elimination game. Across all episodes, 219 out of the 345 contestants who proceed to the next stage are male (63.5%). To calculate the expected number of male opponents at the moment a contestant makes their opt-out decision, we adopt this proportion and assume that the likelihood that a vacant seat is taken by a man (woman) is 0.635 (0.365).[15] Fig. 1c shows the linearly fitted relationship between the opt-out rate and the expected proportion of male opponents, for male and female contestants separately. The graph indicates that the difference in opt-out rates between men and women reaches statistical significance only if the expected proportion of male opponents is high.

Table 1, Model 4 includes the expected proportion of male opponents (centered on the mean) as a regressor, and shows again that there is no significant main effect of the gender composition on contestants' opt-out propensity ($p = 0.575$). Model 5 adds the interaction of the expected proportion of males and contestants' own gender, and confirms that men and women respond differently to the expected gender composition ($p = 0.049$). If the expected proportion of male opponents increases by 0.25—an increase that corresponds to one additional male opponent—women become 8.4 percentage points more likely to opt out (0.25 x $-0.158 + 0.25 \times 0.495 = 0.084$; $p = 0.045$), while the opt-out propensity of men is not significantly affected (0.25 x $-0.158 = -0.040$; $p = 0.289$). The opt-out rates of men and women are significantly different at the five percent level if the expected proportion of male opponents exceeds fifty percent.

In summary, the results for this first game confirm that the gender difference in willingness to enter competitions—robustly found in lab and classroom experiments with low stakes—is also present in a setting with very high monetary stakes: 13 percent of men and 28 percent of women choose to opt out of the competition in return for a relatively modest prize. Interestingly, the comparatively high opt-out rate of women derives entirely from situations where the majority of their opponents are (or are expected to be) male, which suggests that women have a particular dislike of competing against men, rather than a higher general aversion to competition.

4. Game Two: head to head

4.1. Description and data

At the very last stage of every elimination competition there are two contestants left. Between them on the stage is a desk with a light bulb and two buttons. One final question determines the last elimination, unless one of the two contestants accepts an opt-out prize to avoid this confrontation and the risk of leaving empty-handed. The opportunity to opt out starts as soon as the light bulb turns green, and lasts only briefly. As long as the light bulb is green, one contestant can accept the prize by being the first to hit their button. If no one moves and the light turns red, indicating that the possibility to opt out is over, the two contestants proceed to the decisive question.

In contrast to the previous section, the opt-out decisions studied here are of a highly strategic nature. If one of the contestants opts out, the other automatically proceeds to the lucrative final. Contestants should therefore, in addition to their willingness to bet on their ability to beat their opponent, also give considerable weight to the likelihood that their opponent will opt out.

All 183 episodes featured a variant of this game. In Fig. A1 in Appendix A these variants are represented as H1, H2 and H3. Owing to the introductory talk of the game show host with the two contestants, our data for this final elimination game includes an estimate of each contestant's level of education. Education is usually not explicitly mentioned, but often clear from the stated profession. We coded education as a dummy variable, with a value of one assigned to contestants with a bachelor's degree level or higher (including students) or equivalent work experience. The majority of the contestants were male (255 out of 366, or 61.9%). The average age was 46 years (min: 21, max: 86), and 38.0 percent were high-educated (139 out of 366).[16]

In the first 62 episodes (H1 and H2), the exact opt-out prize was unknown to the contestants, but guaranteed to be worth at least €20,000. Frequently, the prize turned out to be an expensive car (mostly worth roughly €50,000). Other common prizes were luxurious trips, electronics packages, and gift cards for traveling, jewelry, or furniture. In 23 episodes with this variant (37%), one of the two contestants opted out. This happened after 3 s on average (min: 1 s; max: 9 s). When no one budged (39 episodes; 63%), the maximum time available for opting out varied between 6 and 17 s (avg: 9 s).

In the remaining 121 episodes (H3), contestants could opt out for a cash prize that increased stepwise from €1000 to a predetermined maximum. This maximum was unknown to the contestants, and ranged between €20,000 and €108,000 (avg: €51,470). The first contestant to press their button stopped the clock and received the then-shown cash prize. In 78

[15] This implicitly assumes that the gender composition of the pool of contestants who proceed to the next stage is stable over time. Empirically this assumption seems to hold: in none of the years the percentage of male contestants was more than eight percentage points removed from the overall average of 63.5 percent, and the hypothesis that the distribution is stable cannot be rejected ($Chi^2(6) = 3.747$, $p = 0.711$).

[16] Age was known for 207 (56.6%) and estimated for 159 (43.4%) contestants; sources and procedures were identical to those used for the previous game, see footnote 10.

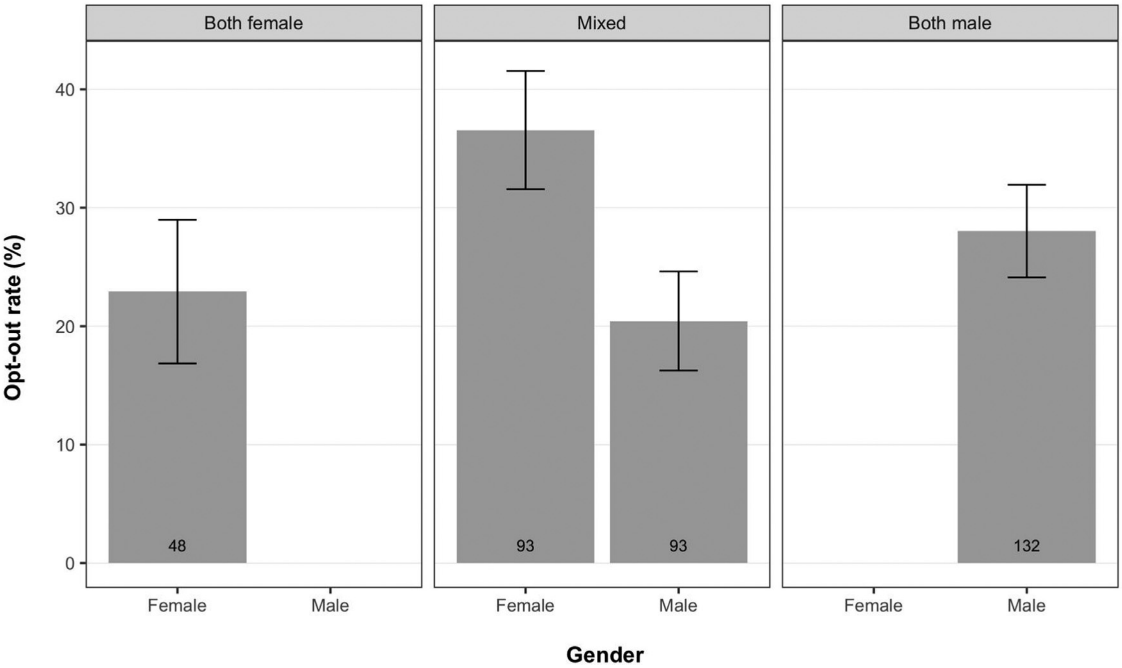

Fig. 2. Opt-out rates for men and women in Game Two. The figure displays the opt-out rates for male and female contestants, separately for female-female (both female), female-male (mixed), and male-male (both male) pairs. The number of observations is at the bottom of each bar. Error bars depict standard errors around the mean.

episodes (64%), one of the two contestants opted out, for an amount between €16,600 and €70,900 (avg: €38,712). This happened after 28 s on average (min: 8 s; max: 45 s). In the other 43 episodes, in which nobody pressed the button, the time window during which the opt-out prize kept increasing lasted for between 19 and 55 s (avg: 32 s).

In 143 episodes (H1 and H3), the decisive question was (or would have been) a relatively simple math problem. Examples are "356 + 147 = ?", "4 × 44 = ?", and "314 – 118 = ?". The first contestant to press their button had to give the solution instantly. If their answer was correct, this contestant was the winner and subsequently played Deal or No Deal. If their answer was incorrect, this contestant was eliminated and their opponent played the final game. Contestants' answers were correct in 39 out of 54 attempts (72%).

In the remaining 40 episodes (H2), the decisive question was (or would have been) an estimation question. Contestants could choose from three possible answers. The first to press their button chose first. If the chosen answer was correct, this contestant was the winner. If the chosen answer was incorrect, their opponent chose one of the two remaining answers. If that choice was correct, this second contestant was the winner. If it was incorrect, the first contestant would proceed to the final game. First attempts were correct 7 out of 28 times (25.0%), second attempts 11 out of 21 times (52.4%).

4.2. Analyses and results

Across all episodes combined, an opt out occurs 55.2 percent of the time (101 out of 183 episodes). Women opt out more frequently than men, but this difference is not statistically significant: 45 out of 141 women (31.9%) and 56 out of 225 men (24.9%) at some point press their button ($Chi^2(1) = 2.14$, $p = 0.143$).

Of the 183 pairs that we observe, 24 consist of two women (13.1%), 66 consist of two men (36.1%), and 93 are mixed (50.8%). Fig. 2 depicts the opt-out rates of men and women for the different kinds of pairs. In mixed-gender pairs, women are almost twice as likely to opt out as men (women: 36.6%, men: 20.4%; $Chi^2(1) = 5.937$, $p = 0.015$). On the other hand, women facing a woman do not opt out significantly more frequently than men facing a man (women vs. woman: 22.9%, men vs. man: 28.0%; $Chi^2(1) = 0.471$, $p = 0.493$). This suggests that opt-out decisions depend on the gender of the opponent.

These simple comparisons, however, may provide a distorted picture of how men and women respond to the gender of their opponent. The game comes with a censoring problem: at most one of the two contestants can opt out, and we do not observe what a contestant whose opponent opts out would have done if their opponent had not opted out. Consequently, the observed opt-out rates do not only depend on contestants' own opt-out propensity, but also on that of their opponents. For example, if women always immediately opt out when they face a man, we would mechanically observe an opt-out rate of zero for men who face a woman. If the opt-out intentions of men are not affected by the gender of their opponent, then a simple comparison of the behavior of men in the two possible situations—men facing a man vs. men facing a woman—would wrongly suggest that such a dependency does exist.

Table 2
Regression results for Game Two
The table displays hazard ratios from Cox proportional hazards model analyses of contestants' decisions to opt out (1) or not (0) in Game Two. The estimation is stratified such that the baseline hazard is allowed to vary between the variant with an unknown prize (H1 and H2) and the variant with the increasing cash prize (H3). *Age* is the contestant's age, measured in years and centered on the mean (46.4y). *High educ.* is a dummy variable that takes the value of 1 if the contestant has completed or is enrolled in higher education (bachelor's degree or higher), or has equivalent working experience. *Opp. male* is a dummy variable that takes the value of 1 if the opponent is male. *Sum* is a dummy variable that takes the value of 1 if the final question is a sum. *Maximum prize (log)* is the natural logarithm of the predetermined maximum opt-out cash prize in the increasing-cash-prize variant in euros. *Total time at risk* is the total number of seconds during which contestants could opt out. Table C1, Panel B in Appendix C provides summary statistics for the variables. Standard errors are corrected for clustering at the episode level; *z*-values are in parentheses. Other definitions are as in Table 1.

	Model 1	Model 2	Model 3	Model 4	Model 5
Female	1.126	1.853**	0.654	1.049	1.109
	(0.591)	(2.186)	(−1.098)	(0.230)	(0.268)
Age	1.001	0.986	1.008	0.999	0.999
	(0.136)	(−1.184)	(0.609)	(−0.167)	(−0.172)
Age^2 / 100	1.145***	1.242***	1.039	1.163***	1.163***
	(3.394)	(4.485)	(0.367)	(3.508)	(3.497)
High educ.	0.780	0.556*	0.708	0.736	0.734
	(−1.105)	(−1.742)	(−1.001)	(−1.330)	(−1.354)
Opp. male				1.649**	1.701**
				(2.404)	(2.001)
Female x Opp. male					0.924
					(−0.173)
Maximum prize (log)	3.625***	2.784**	5.273***	3.485***	3.531***
	(3.414)	(2.224)	(3.300)	(3.353)	(3.420)
Sum	1.803	1.853	1.639	1.750	1.745
	(1.424)	(1.218)	(0.817)	(1.359)	(1.354)
Data included	all	mixed-gender	single-gender	all	all
Log-likelihood	−454.77	−198.33	−181.19	−452.16	−452.14
Total time at risk	7777	3919	3858	7777	7777
No. of contestants	358	181	177	358	358
No. of opt-outs	101	53	48	101	101
No. of episodes	183	93	90	183	183

To deal with this censoring issue, we analyze the behavior of contestants on a second-by-second basis. Contestants can wait for an ex-ante unknown amount of time in the hope that the other opts out. Every second that passes until either someone opts out or time runs out is informative about the two contestants' opt-out propensities: the longer a contestant waits, the more this contestant risks having to compete.

We exploit this temporal aspect of the game with a Cox proportional hazards approach (Cox, 1972), and study contestants' decisions to opt out or not during all seconds in which they could make this decision.[17] The format of the elimination game with the unknown prize (H1 and H2) differs substantially from the elimination game with the increasing cash prize (H3), and we therefore allow the baseline hazard to differ between these two variants. Furthermore, the models include a dummy variable to distinguish between episodes where the decisive question is (or would be) a sum and those featuring a multiple-choice estimation question, and a variable that equals the natural logarithm of the predetermined maximum opt-out cash prize for games where the opt-out prize increased (H3).[18] We include a quadratic specification for age, and a dummy variable for education that differentiates between those with at least a bachelor's degree and those without. Last, we correct the standard errors for clustering at the episode level.

Table 2 presents the results. Note that the reported coefficients are hazard ratios, and that a value above (below) one indicates that the opt-out propensity increases (decreases) with the variable in question. Model 1 considers all pairs and confirms the descriptive result that there is no significant gender difference in opt-out rates ($p = 0.555$). As expected, contestants facing a stepwise increasing opt-out prize are more likely to opt out if there is more money on offer. We again find a u-shaped relation with age: the estimates imply that the opt-out rate decreases with age if the contestant is younger than 46 years, and increases with age for older contestants. Education and type of decisive question do not significantly affect opt-out rates.

[17] We omit the second in which a contestant's opponent opted out, because it is unknown whether or not the contestant would otherwise have opted out herself in that second. As a consequence, eight contestants cannot be included in the analysis, because their opponent opted out in the very first second. We find similar results if we do not omit these seconds (and assume no opt out by the contestant).

[18] For variant H1 and H2 we set the value of the maximum opt-out prize variable to zero. The results do not depend on this choice, as long as the same value is applied for all H1 and H2 episodes.

Model 2 exclusively considers mixed-gender cases, and confirms the descriptive result that women are significantly more likely to opt out than men in these situations. At any given moment, women are 85.3 percent more likely to opt out ($p = 0.029$). Model 3 exclusively considers single-gender pairs, and confirms that women facing a woman are not significantly more likely to opt out than men facing a man. In fact, the estimated hazard rate implies that women facing a woman are, at any given moment, 34.6 percent *less* likely to opt out than men facing a man. This difference, however, is statistically insignificant ($p = 0.272$).

The nonsignificant gender effects in Models 1 and 3 suggest that men and women are roughly equally willing to compete in this game with strategic interaction, but at the same time the significant coefficient in Model 2 shows that there is a large difference when they face an opponent of the opposite sex. This combination of findings is consistent (i) with a lower propensity among women to compete against men than against women, as we also found for Game One, (ii) with a higher propensity among men to compete against women than against men, and (iii) with a combination of both (i) and (ii).

To disentangle these possible explanations, Models 4 and 5 use the data of all pairs of contestants and include a dummy variable that captures the gender of the opponent. Model 4 shows that contestants are 64.9 percent more likely to opt out when facing a man than when facing a woman ($p = 0.016$). Model 5 adds the interaction of the contestant's own gender and the opponent's gender, and indicates that there is no significant evidence that men and women respond differently to the gender of the opponent ($p = 0.863$). Altogether, the results for this game with strategic interaction suggest that men and women are roughly equally willing to compete, and that both avoid competing against a male opponent.[19]

Combined, the analyses of the different games suggest that women have a particular dislike of competing against men: women consistently avoid competing against men. Men appear to be aware of this preference and use it to their advantage when there is direct strategic interaction: when contestants should take their opponent's willingness to compete into account, men display a greater tendency to compete against women than against men; there is no evidence that men care about the gender of their opponent when such strategic interaction is absent.

5. Do the quiz questions favor men?

A possible explanation for some of our results is that women perform worse on the type of questions that are used in the elimination contest. If the questions favor men, it is rational for both men and women to respond to the gender composition of the competitor base, by being more likely to opt out if the pool is more male-dominated. Note that we did observe such behavior for both men and women in Game Two, but not in Game One.

A priori, there is little reason to believe that there will be substantial gender differences in performance among the contestants. First, the picture emerging from the literature is that there are little to no gender differences in semantic memory (storing factual information) and math ability, the two basic skills that are fundamental to answering the type of questions in the elimination games (Herlitz et al., 1997; Nilsson, 2003; Hyde et al., 2008; Lindberg et al., 2010; Miller and Halpern, 2014). Second, almost all contestants in the games that we study made it up to that point because they performed better than others. Hence, if there were any gender difference in skill among our audience members to begin with, then this difference would arguably be less pronounced among the people that we observe in the games of interest.

We can also use our data to explore whether men and women perform similarly or not. For Game One, studied in Section 3, we can compare the gender composition of contestants who provided the best answer to one of the five estimation questions—which are similar in nature to questions used in other games—with the gender composition of randomly selected contestants who were given a seat in the next stage if the opt-out prize was chosen. In other words, we can examine whether the gender composition of the pool of successful contestants matches the gender composition of the population they are from (the 500 contestants seated in the audience). If one gender were better at the task, we would expect that gender to be overrepresented among the successful contestants. In total, there were 345 winners in the 69 episodes that featured this game. Among those winners there were 208 men (60.3%). The number of contestants who received a seat in the next stage at random was 66. Among these lucky contestants, 38 were male (57.6%). The similarity of the two proportions suggests that the estimation questions did not particularly favor either men or women ($Chi^2(1) = 0.170$, $p = 0.680$).

We can also compare the overall performance of men and women in Game G (see Fig. A1 in Appendix A). This elimination game starts with five contestants and ends with two after three rounds of trivia quiz questions, with no possibility to opt out. The pool of 345 contestants who entered this game from Game One (F in Fig. A1) was composed of 219 (63.5%) men and 126 (36.5%) women. Out of the 138 survivors, 91 (65.9%) were men and 47 (34.1%) were women. These statistics suggest that Game G did not favor one gender: considered ex-post, men and women had a similar chance of survival (men: 41.6%, women: 37.3%; $Chi^2(1) = 0.602$; $p = 0.438$).[20] Note, however, that prior to entering Game G many of the contestants

[19] A difference with the previous game is that before they entered this game, many contestants had been offered (and declined) one or more opportunities to opt out of the elimination competition. Consequently, it is likely that there was some degree of self-selection on competitiveness among the contestants that we observe here, which may have led to underestimation of the possible gender difference. However, it is unclear how self-selection could explain why both men and women avoid competing against men in this game. The game that we analyze in Appendix B has the same kind of strategic interaction but no prior self-selection, and similarly yields evidence that both men and women avoid competing against men.

[20] We obtain a similar result when we run a multivariate linear probability model where the dependent variable takes the value of one if the contestant survived (and zero otherwise), and where we include fixed effects for the contestant's seat number (lower numbers are more advantageous) and a quadratic specification for age. The coefficient for the contestant's gender in this regression is nonsignificant ($p = 0.372$).

were offered but denied the possibility to opt out. If opting-out contestants anticipated poor performance and those who continued believed they are good enough, then the comparison may provide a biased assessment of the true gender difference in performance. Reassuringly, the same picture emerges when we focus exclusively on the 66 contestants who received their seat in Game G at random and hence were not given the opportunity to opt out: 12 of the 38 men (31.6%) and 8 of the 28 women in this subgroup survived (28.6%; $Chi^2(1) = 0.069$, $p = 0.793$).

The notion that the quiz questions might favor men should be less of a concern for Game Three, the game analyzed in Appendix B. Contestants gave their answers to the estimation questions in that game before they made the decision to opt out or not, and our regressions control for whether the contestant's answer ranked worst (which meant elimination if no one opted out). Moreover, our data does not yield compelling evidence of a gender difference in performance for this game. In the first round, where all 102 contestants answered the question, the frequencies by which men and women gave the worst answer are statistically indistinguishable (men: 19.2%, women: 14.0%; $Chi^2(1) = 0.502$, $p = 0.479$). Combining all the data for this game in a regression—where we include fixed effects for the round number and a quadratic specification for age, and where we correct standard errors for clustering both at the contestant and at the episode-round level—similarly yields no convincing evidence of a performance difference: women are 7.4 percentage points more likely to give the worst answer, but this effect is nonsignificant ($p = 0.108$).

In Game Two, the head-to-head confrontation studied in Section 4, gender differences in ability are least likely to occur: all of those who made it up to there survived the previous stages of the elimination competition, and all can therefore be expected to be relatively strong contestants. Nevertheless, for the subset of 82 cases where neither of the two contestants opted out we can empirically examine whether there is a gender difference in performance. This sample comprises 98 (59.8%) men and 66 (40.2%) women. Out of the 82 cases, 54 were decided through a sum and 28 through a multiple-choice estimation question. There is no significant gender difference in performance among the contestants who were the first to answer, neither when we consider the sum nor when we consider the multiple-choice estimation question: in the former case, 26 out of 34 men (76.5%) and 13 out of 20 women (65.0%) gave the correct answer ($Chi^2(1) = 0.826$, $p = 0.363$); in the latter case 3 out of 17 men (17.7%) and 4 out of 11 women (36.4%) gave the correct answer ($Chi^2(1) = 1.248$, $p = 0.264$). Additionally, we can use the mixed-gender pairs to explore whether men and women differ in their propensity to press the button and be the first to give an answer. Any such difference could reflect a gender difference in competitiveness, but also a gender difference in the ability to give the correct answer. The data, however, suggest that men and women are roughly equally likely to be the first to press the button. Out of the 26 mixed-gender cases where the final question was a sum, the man (woman) was the fastest 14 (12) times ($Chi^2(1) = 0.308$, $p = 0.579$). Out of the 14 mixed-gender cases with a multiple-choice question, the man (woman) took the initiative 8 (6) times ($Chi^2(1) = 0.571$, $p = 0.450$).

In conclusion, our data provide no compelling evidence that men and women perform markedly different on the tasks that are central in the elimination competition, and it is therefore unlikely that the results in the previous sections are driven by a difference in the ability of men and women to answer the questions.

6. Conclusion and discussion

The present paper examines gender differences in willingness to compete for high stakes, using a TV game show where the winner of an elimination competition with several opt-out opportunities ultimately plays a game of chance worth hundreds of thousands of euros. The amounts that are at stake in this real-life setting are much closer to the sums involved in promotion competitions at the top of the labor market than the financial rewards that are commonly employed in laboratory experiments.

We focus on the opt-out opportunities that are part of two different elimination games. In the first, contestants choose between competing in the next elimination game and a comparatively modest prize. This decision resembles the tournament-entry decision that subjects typically make in lab experiments. In line with the picture that emerges from the experimental literature, we find that women are much more likely than men to avoid the competition. The relatively high opt-out rate of women, however, derives entirely from situations where their opponents would have been predominantly male. This suggests that women have a particular dislike of competing against men, rather than a more general dislike of competition. Men do not appear to condition their choice on the gender of their opponents in this game.

In the second game, one question determines the last elimination, unless one of the two remaining contestants voluntarily accepts an opt-out prize. The decision in this game is relatively complex, because the optimal choice strongly depends on the expected behavior of the opponent. The results show that, in this strategic setting, both men and women are more likely to compete against women than against men. The same pattern arises in the game with strategic interaction that is analyzed in Appendix B. This corroborates the result for the first game that women avoid competing against men, and on top of that suggests that in strategic interactions men anticipate a lower willingness to compete among their female opponents.

Altogether, the results confirm that gender differences in willingness to compete are not limited to the behavioral laboratory, and also occur in situations where the stakes are very high. At the same time, our results indicate that the stereotypical image that women in general dislike competing more than men is too simplistic.[21] Our findings show the importance

[21] Various recent studies challenge this notion in other ways, by showing that women are roughly as likely to compete as men when the payoffs benefit their children rather than themselves (Cassar et al., 2016; Cassar and Zhang, 2022), when people choose competition on behalf of someone else

of both the gender of competitors and the presence of strategic interaction. Hitherto, the literature on gender differences in competition-entry decisions has largely ignored these two factors.

The few previous studies that do examine the importance of the gender of opponents on willingness to compete report somewhat mixed results. Using small-stake laboratory experiments, Booth and Nolen (2012) and Geraldes (2021) find that women avoid competing against men. Sutter and Glätzle-Rützler (2015) and Dariel et al. (2017), however, find no such evidence. In a field experiment on job-entry decisions, Flory et al. (2015) similarly find no evidence. Combined, these results seem to suggest that women's distaste of competing against men is relatively weak, and perhaps easily dwarfed by higher incentives to compete. Our study shows that this is not the case, and provides the first high-stakes field evidence that women particularly avoid competing against men.

Strategic interaction is typically ruled out by design in willingness-to-compete experiments, but plays an important role in many real-life competition choices. Studies into performance under competition naturally do involve strategic interaction, and frequently observe that women perform worse against men (Gneezy et al., 2003; Günther et al., 2010; Booth et al., 2018; Booth and Yamamura, 2018; Backus et al., 2022; de Sousa and Hollard, 2022). Research somewhat removed from the competitiveness literature shows that in strategic interactions both men and women respond to the gender of their opponent in a way that corresponds to our findings. Booth and Yamamura (2018) study Japanese speedboat races and find that men adopt a more aggressive racing style in mixed-gender races than in single-gender races, whereas women act less aggressively in mixed-gender races than in single-gender races. Babcock et al. (2017) show that both men and women are less likely to volunteer for an undesirable task when there are more women in the group.

The present paper complements the copious experimental evidence from the behavioral laboratory for the existence of a gender difference in willingness to compete and the relatively recent literature that attempts to assess the external validity of these results. It is impossible to study behavior under each and every possible set of conditions, and therefore the optimal approach is to study behavior in a limited number of diverging ways. The elimination competition of the game show that we use is one of these. Complementary to conventional experiments and field research, it allows the study of the willingness to compete of a diverse subject pool in a quasi-controlled high-scrutiny field setting where the stakes are consequential.

A benefit of the diverse pool of contestants is that we can explore how competitiveness varies with age.[22] We consistently find a u-shaped relation, with people who are in their forties displaying the lowest opt-out propensity. Mayr et al. (2012) find a similar relation between age and competitiveness among subjects in an incentivized experiment. Flory et al. (2018) and Buser et al. (2021a), however, report different age patterns.[23]

Contestants' decisions are observed by many and subject to considerable public scrutiny. A benefit of the public nature of the competition is that this feature is shared by many consequential real-world competitions. In the political arena and upper echelons of the corporate world, for example, people face considerable public scrutiny when they compete for top positions. This is another argument for why our naturally occurring setting is more similar to such real-world situations than anonymous, low-stakes laboratory experiments. Because opting out of the competition ends public observability and choosing to compete extends it, any systematic difference in the attitudes of men and women towards public observability would obfuscate the relation between gender and competitiveness. To the best of our knowledge, the only study into the impact of public observability on competitiveness is Buser et al. (2021b). They find suggestive evidence that public observability increases men's willingness to compete, but conclude that public observability does not alter the magnitude of the gender gap in willingness to compete in an economically or statistically significant way.[24] Note that the possible confound also occurs in many real-life settings, and that it cannot explain why women display a particular dislike of competing against men and why men display a greater propensity to compete against women only when there is direct strategic interdependence.

Similar to the tasks that are typically used in willingness-to-compete experiments, the questions that are central in the elimination competition are often numerical or arithmetic in nature. This similarity facilitates the comparison of results. Research on competitiveness often intentionally uses such tasks because mathematics is a stereotypically male area, which brings the research closer to competitive situations in male-dominated workplaces or male-connotated areas such as management (Niederle and Vesterlund, 2011). Although we cannot entirely rule out that our results are partly driven by a gender difference in the ability to answer the questions, none of the analyses in Section 5 provide convincing evidence that the quiz questions actually favor men. Second, based on research into math performance and into recall of factual information, there is little reason to believe that such a difference holds true for the general population (Herlitz et al., 1997; Nilsson, 2003; Hyde et al., 2008; Lindberg et al., 2010; Miller and Halpern, 2014). Last, even if any gender difference would exist among

(Fornwagner et al., 2022), and when there is a possibility to share some of the winnings with the losers afterwards (Cassar and Rigdon, 2021a, 2021b). Other recent studies show that the gender difference diminishes or disappears when people are asked to compete against their own past performance instead of the performance of others (Apicella et al., 2017; Bönte et al., 2018; Carpenter et al., 2018; Klinowski, 2019).

[22] The diversity of our subject pool is limited in terms of cultural background. Research has shown that attitudes towards competition are partly determined by the culture in which people grew up (Gneezy et al., 2009; Andersen et al., 2013; Booth et al., 2019; Zhang, 2019).

[23] The literature on the relationship between age and risk preferences shows compelling evidence of a u-shaped pattern, with risk aversion decreasing during adolescence, reaching its lowest point in young adulthood, and increasing afterwards (Tymula et al., 2013; Josef et al., 2016; Mata et al., 2016; Dohmen et al., 2017; Frey et al., 2021). As contestants in our show are all adults, this pattern of risk preferences would lead to the prediction of a monotonically decreasing willingness to compete, rather than a u-shaped pattern.

[24] In line with these results, Cahlíková et al. (2020) find that psychosocial stress induced by speaking before a committee of experimenters does not affect the gender gap in willingness to compete. Buser et al. (2017a) and Halko and Sääksvuori (2017) similarly show that differences in stress reactions cannot explain the gender difference in willingness to compete.

the initial pool of contestants, it would be relatively small among those we study because weaker contestants are less likely to reach the choice situations that we analyze.

Of course, contestants may have held non-rational expectations about their own ability and that of others, possibly inspired by stereotypes about the performance of men and women on math questions (Niederle and Vesterlund, 2010). Indeed, in experimental work that uses a neutral or stereotypically female type of task, competitiveness differences between men and women are sometimes, but not always, weak or absent (Shurchkov, 2012; Dreber et al., 2014; Wozniak et al., 2014; Buser et al., 2022; Halladay and Landsman, 2022). Many of our elimination games use questions that are arithmetic or have a mathematical component, and hence stereotype-biased beliefs about performance may explain why women display a relatively low propensity to compete against men, and why men display a relatively high propensity to compete against women when there is strategic interaction. This explanation, however, is not supported by the behavior of men in Game One. For this game we find no evidence that men are especially eager to compete against women. If anything, men tend to be more likely to opt out when the proportion of women among the people they would have to compete against is higher.

A possible concern about our findings is that their generalizability might be limited because of selection effects. Selection procedures are inevitable in any lab experiment or field setting, and could potentially bias comparisons of the behavior of men and women (Larkin and Pines, 2003; Reback and Stowe, 2011; Hogarth et al., 2012; Dariel et al., 2022). Unlike contestants in most other game shows, however, contestants in our elimination competition do not need to self-select into auditions and are not screened and then selected by producers prior to their participation. All have won their ticket through the popular Dutch Postcode Lottery. Even for competition-averse individuals, using this ticket is attractive: in addition to the lucrative possibility of becoming the finalist, contestants can win many other large prizes. Nevertheless, subjects in our study are not selected perfectly at random: all are lottery players who were able to attend the recording, and couples might send the best or most competitive of the two of them. Still, as a group our subjects do resemble a cross-section of the general population much more closely than subjects in most lab experiments and other field studies do. More importantly, it is not clear how selection mechanisms could explain that the competitiveness of men and women depends on the gender of their opponents.

Differences in reluctance to compete can be driven by differences in risk attitudes, confidence, and intrinsic attitudes towards competition. Each of these specific factors may explain the gender interaction effects that we observe: women could be more risk averse in the presence of men, less confident about their performance when they compete against men, or have an intrinsic aversion to competing against men. Our quasi-experimental field setting is not rich enough to disentangle the underlying determinants of the patterns that we observe. Yet, even in controlled laboratory experiments disentangling the possible determinants of competitiveness has proven to be methodologically challenging (Gillen et al., 2019; van Veldhuizen, 2022).

Regardless of the possible psychological mechanisms, the question of whether gender differences in willingness to compete generalize from low-stakes laboratory environments to high-stake field settings is important in the light of persistent gender gaps in the labor market. Furthermore, the finding that women particularly avoid competing against men has the important implication that male dominance in a professional environment becomes self-perpetuating. This is especially the case if there is strategic interaction, where those who want to compete are better off when others abstain from competing. In such a setting, women can expect more pushback from both male and female competitors. At the higher rungs of the career ladder, where overrepresentation of men and strategic interaction are both ubiquitous, affirmative action may therefore be necessary to alter the status quo (Balafoutas and Sutter, 2012; Niederle et al., 2013).

Declaration of competing interest

We declare no competing interest.

Data availability

Data will be made available on request.

Appendix A. Overview elimination games

Fig. A1 gives a schematic overview of the different games and how these were combined over time and episodes; thumbnail descriptions are in the notes. Games marked with one or two asterisks featured at least one opt-out opportunity. We analyze the games that are marked with two asterisks: F and H1–3 (main body of the paper), and D1 (Appendix B).

We exclude the games labeled A1 and A3 because of small sample sizes and lack of choice variation. In Game A1, which lasted for 33 episodes, one randomly selected eliminated contestant was offered the choice between re-entering the competition and a prize worth between approximately €5k and €10k. This option to re-enter was absent in the very first episode, leaving a total of 32 observations for this game. Only two males (out of 21, or 10%) and two females (out of 11, or 18%) opted out. Similarly, in Game A3, three randomly selected eliminated contestants could either re-enter the competition or accept a prize package worth between approximately €1k and €15k. That game lasted for only five episodes, and in all fifteen occasions the contestant chose to re-enter.

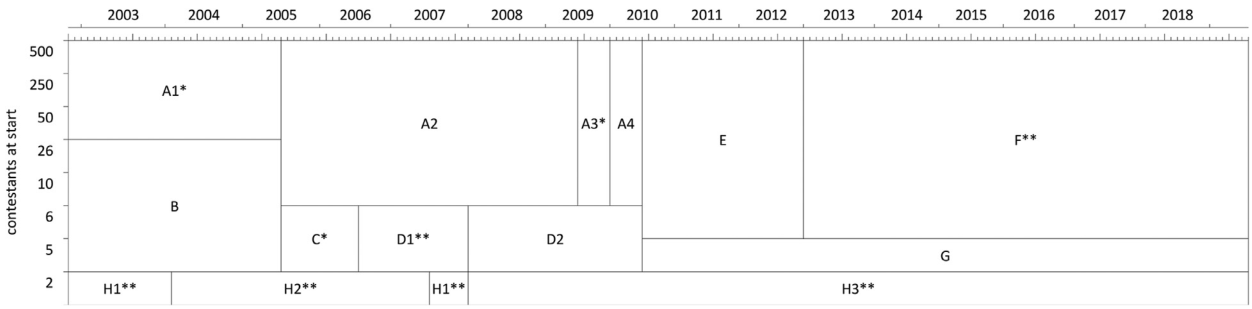

Fig. A1. Schematic overview of elimination games across time and episodes. Asterisks indicate that the elimination game featured one or more opt-out options, and whether we analyze it (**) or not (*). **A1*** (33 eps.): The crowd is divided into five red and five blue blocks of 50 contestants each. Blocks consist of two subblocks of 25 contestants. Contestants answer series of multiple-choice questions. In the first phase, either all red or all blue blocks are eliminated. In the second phase, four of the five remaining blocks are eliminated. The third phase determines the winning subblock. All 25 contestants in the winning subblock proceed to the next game. One previously eliminated person is randomly selected, and chooses between re-entering the competition and a known prize worth between approximately €5k and €10k. If this contestant takes the prize, another randomly selected person re-enters the competition. **A2** (46 eps.): Six contestants proceed to the next game: the five best-performing contestants from the winning subblock and one randomly selected eliminated contestant (no opt-out option). Otherwise identical to A1. **A3*** (5 eps.): Six contestants proceed to the next game. After each of the three phases, one previously eliminated person is randomly selected and chooses between re-entering the competition at the start of the next game and a known prize package worth between approximately €1k and €15k. The maximum of three re-entering contestants are complemented by the best-performing contestants from the winning subblock. Otherwise identical to A1. **A4** (5 eps.): Six contestants proceed to the next game. After each of the three phases, one randomly selected eliminated person gets a one-in-three chance of re-entering the competition at the start of the next game (no opt-out option). The maximum of three re-entering contestants are complemented by the best-performing contestants from the winning subblock. Otherwise identical to A1. **B** (33 eps.): The 26 contestants answer a series of multiple-choice questions. The two best-performing proceed to the next game, all others are eliminated. **C*** (12 eps.): The game starts with six contestants, and features four quiz questions. Only the contestant first to press their button answers. If their answer is incorrect, this contestant is eliminated. If their answer is correct, this contestant must vote off one of their opponents. Prior to the revelation of the vote, these contestants can voluntarily leave the competition in exchange for a monetary opt-out prize. Only the contestant first to press their button opts out. If someone opts out, the vote is revealed but remains inconsequential. If no one opts out, the contestant voted against is eliminated. The total opt-out prize money available is €40k, divided unequally across four sealed cases. Opting-out contestants receive the prize in the case they select. Two contestants proceed to the next game. **D1**** (17 eps.): The game starts with six contestants, and features four estimation questions. Contestants answer simultaneously and privately. Prior to identification of the contestant with the worst guess, they can voluntarily leave the game in exchange for a monetary opt-out prize. Only the contestant first to press their button opts out. If no one opts out, the contestant with the worst guess is eliminated. The total opt-out prize money available is €40k, divided unequally across four sealed cases. Opting-out contestants receive the prize in the case they select. Two contestants proceed to the next game. **D2** (27 eps.): No opt-out options. Otherwise identical to D1. **E** (25 eps.): The crowd of 500 contestants is divided into ten blocks of 50 contestants. In the first phase, contestants individually answer five multiple-choice questions. All but the best-performing contestant of each block are eliminated. In the second phase, the ten remaining contestants answer an estimation question in a head-to-head duel. The five winners proceed to the next game. **F**** (69 eps.): The 500 contestants answer five estimation questions. Five opt-out prizes—the smallest always being €500 in cash and the largest always being an expensive car—are hidden in sealed cases. The contestant closest to the correct answer chooses between participation in the next game and one of the remaining hidden prizes. If this contestant opts out, a randomly selected person takes the vacant place in the next game. In total, five contestants proceed to the next game. **G** (94 eps.): The game starts with five contestants, and features three rounds of trivia quiz questions. In each round, one contestant is eliminated. Two proceed to the next game. **H1**** (22 eps.): Head-to-head final elimination game. Throughout a short period of time, contestants can accept an unknown opt-out prize guaranteed to be worth at least €20k. The first to press their button receives the opt-out prize, the other then wins the elimination competition. If no one opts out, a sum is presented. The contestant first to press their button has to give the solution instantly. If their answer is correct (incorrect), this contestant is the winner (eliminated). **H2**** (40 eps.): If no one opts out, an estimation question and three possible answers are presented. The contestant first to press their button chooses one answer. If the chosen answer is correct, this contestant is the winner. If it is incorrect, their opponent chooses one of the remaining answers. If that choice is correct (incorrect) the opponent (the first contestant) is the winner. Otherwise identical to H1. **H3**** (121 eps.): Contestants can accept a cash opt-out prize that increases stepwise from €1k to an unknown maximum. The first to press their button fixes and receives the money amount, the other then wins the elimination competition. Otherwise identical to H1.

We leave Game C out of consideration because of its complexity and relatively small sample size. At the start of this game there were six contestants left. In each of four rounds, the contestant first to press their button answered a quiz question. If their answer was incorrect, this contestant was eliminated. If their answer was correct, they designated one of the other contestants for elimination. Prior to the revelation of the name of the targeted opponent, all opponents had to choose between a monetary opt-out prize (average value: €10k) and continuing with the risk of being the one sent home empty-handed. This game was part of twelve episodes, and in total there were 41 cases where contestants faced the possibility to opt out. A proper analysis of this game takes account of differences in contestants' probability of being nominated for elimination, but the sample size is too small to reliably perform such an analysis.

Appendix B. Game Three (from 6 to 2)

Description and data

Between November 2006 and December 2007, the elimination competition featured a game that reduced the number of remaining contestants from six to two in four rounds (Game D1 in Fig. A1 in Appendix A). The six contestants who played this game were selected from the larger crowd through a series of multiple-choice questions (Game A2 in Fig. A1). This preceding game did not have any opt-out options, and therefore no self-selection on competitiveness had occurred yet.

In each round, contestants were given an estimation question. Examples are “How many pieces does the largest jigsaw puzzle sold in ordinary stores contain?” and “How many items of clothing does a woman on average have in her wardrobe, according to onepoll.com?”. All had to privately give their best guess by entering it into their terminal, and the correct answer was then publicly revealed. Prior to the identification of the player with the worst guess, contestants were given the opportunity to voluntarily leave the game in exchange for a monetary opt-out prize. The total opt-out prize money available for the four rounds was always €40,000 per episode, divided unequally across four sealed briefcases. Opting-out contestants were rewarded with the contents of one of these cases, selected by themselves. Only one contestant, the fastest, could opt out. If no contestant opted out, the player with the worst guess was sent home empty-handed. In contrast to the second game analyzed in the main text, where contestants who wanted to opt out could wait for an unknown but considerable amount of time in the hope that the other opts out, contestants in the present game needed to do so almost instantly.

We collected the data for all 17 episodes that featured this elimination game. The overall gender distribution at the start was balanced, with 50 of the 102 (49.0%) contestants being male. The average age was 48 years (min: 23, max: 83). In 41 of the total of 68 rounds (60.3%) one of the contestants opted out. Contestants who opted out had given the worst answer 61.0 percent of the times. In the other 27 rounds (39.7%) no one opted out, and consequently the contestant with the worst answer was automatically eliminated. The expected value of the remaining opt-out prizes varied between €4000 and €16,000.

Analyses and results

Across all rounds combined, the opt-out rate is 13.4 percent.[25] As illustrated in Fig. B1a, women are about twice as likely to opt out as men (women: 17.6%, men: 9.8%; $Chi^2(1) = 4.041$, $p = 0.044$).

We estimate a multivariate linear probability model to control for differences in contestants' age, the expected value of taking an opt-out prize, and round-number fixed effects. The dependent variable takes the value of one if the contestant opts out (and zero otherwise). As in the analyses of the other games, we use a quadratic specification for age. In addition, we include round-number fixed effects. Controlling for the round is important, because the possible range of the opt-out rate differs: in the first round one out of six contestants can opt out, whereas in the last round one out of three can do so. We correct the standard errors for clustering at the contestant level and at the episode-round level (Cameron et al., 2011; Thompson, 2011).

Table B1, Model 1 presents the results. Controlling for age, expected value of opting out, and round number, women are 9.4 percentage points more likely to opt out than men. As in the other games, there is a u-shaped relation between the opt-out rate and age; the coefficients imply that the rate is lowest at 41 years. Contestants do not appear to be very concerned with the expected value of the cash opt-out prize.

Model 2 includes a dummy variable that takes the value of one if the contestant provided the worst guess in that round, and zero otherwise. When contestants make up their mind about whether they should opt out or not, they probably factor in their subjective impression of the likelihood that they are the one who has given the worst answer to the estimation question. Contestants know both their own guess and the correct answer, but they do not know the guesses that others have entered and how likely these others are to give up. The dummy variable is a strong predictor: contestants who provided the worst guess are 28.7 percentage points more likely to opt out than those who did not provide the worst guess, and incorporating this variable increases the R^2 from 0.053 to 0.173. Importantly, the effect of gender is largely robust to including the worst-guess variable. As compared to Model 1, the coefficient of the gender variable decreases from 0.094 to 0.072, which can be attributed to women's slightly worse—but statistically not significantly worse—performance (see Section 5).

Given the strategic nature of this game—if someone opts out, the rest are safe—contestants should condition their choices on the likelihood that one of their opponents will opt out. If contestants' beliefs are based on the stereotypical view that women are less willing to compete than men, then both men and women will be more likely to compete against women than against men. The same prediction follows from a dislike among women to compete against men—as we observed in the Game One—and men being aware of women's reluctance to compete against them.

Fig. B1b shows the opt-out rates of men and women, and distinguishes between situations where more than half of the opponents are male and situations where half or more are female. Both men and women are somewhat more likely to opt out when most of their opponents are male as compared to situations where half or more of their opponents are female, but statistically the two differences are insignificant (women: 20.3% vs. 15.7%; $Chi^2(1) = 0.520$, $p = 0.471$; men: 10.7% vs. 8.8%, $Chi^2(1) = 0.180$, $p = 0.672$). In Table B1, Model 3 incorporates the binary distinction between male and female dominated competition in the regression analysis through the inclusion of a dummy variable that takes the value of one if more than half of the opponents is male (and zero otherwise), and shows that there is no significant effect of this dummy variable on the opt-out rates of men and women combined ($p = 0.228$). Model 4 adds the interaction of the dummy variable with the

[25] The highest possible opt-out rate is 16.7 percent in round one (1 out of 6 contestants can opt out), 20.0 percent in round two (1 out of 5), 25.0 percent in round three (1 out of 4), and 33.3 percent in round four (1 out of 3). Across all choices combined, the opt-out rate could not have been higher than 22.2 percent.

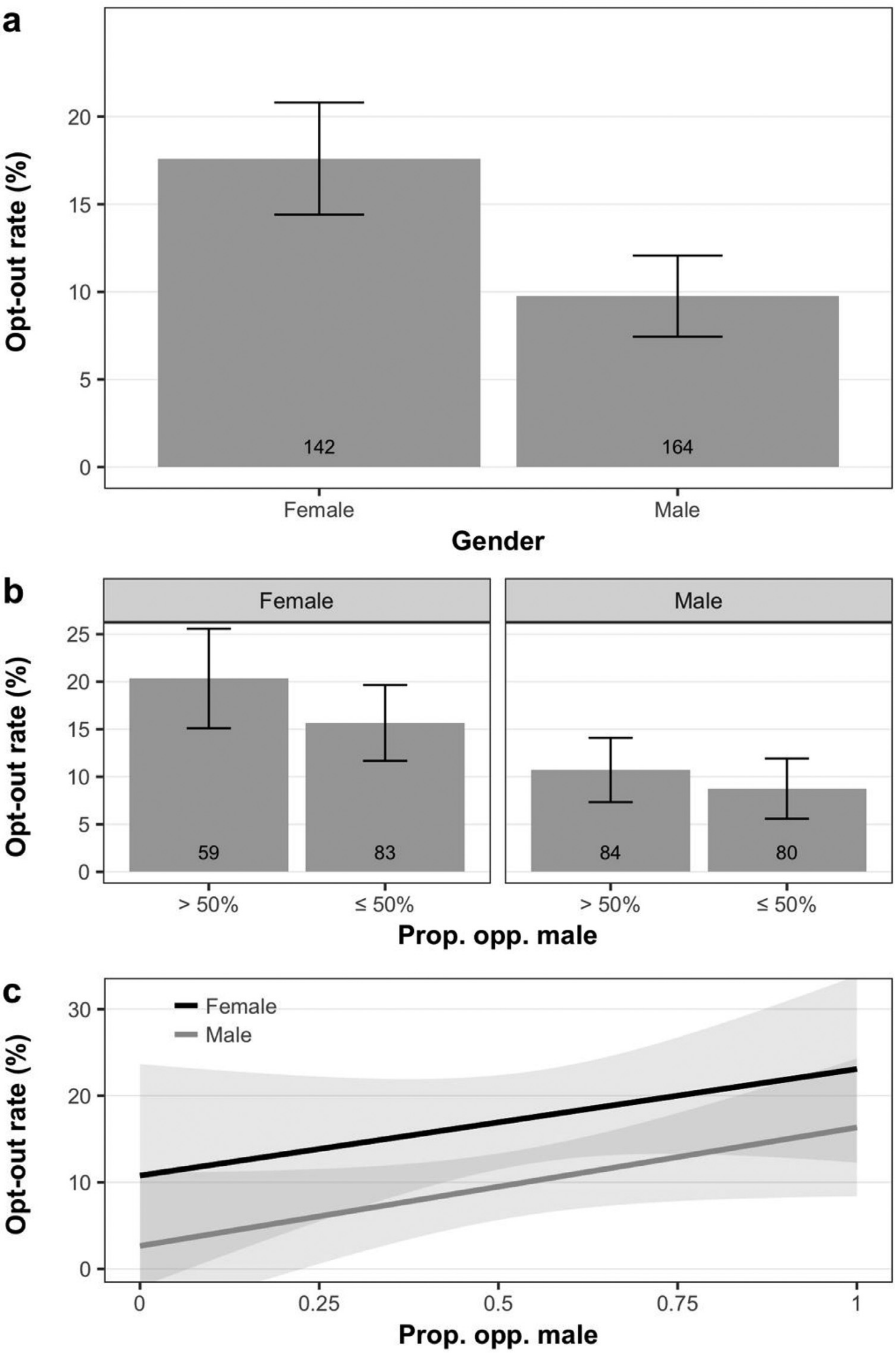

Fig. B1. Opt-out rates for men and women in Game Three. (a) displays the opt-out rates for male and female contestants. (b) displays the opt-out rates for male and female contestants, conditional on whether more than half of the remaining opponents are male (> 50% opponents male), and conditional on whether half or more of the remaining opponents are female (≤ 50% opponents male). The number of observations is at the bottom of each bar. Error bars depict standard errors around the mean. (c) displays the univariate linear relationship between the opt-out rate and the proportion of male opponents, for male and female contestants separately. The shaded areas represent 90% confidence intervals.

Table B1
Regression results for Game Three
The table displays results from regression analyses of contestants' decisions to opt out (1) or not (0) in Game Three. *Age* is the contestant's age, measured in years and centered on the mean (46.9y). *Prop. opp. male* is the proportion of male opponents, centered on the mean (0.54). *Worst guess* is a dummy variable that takes the value of 1 if the contestant provided the worst guess in the given round. *EV opt out* is the expected value of opting out in euros. All models include round-number fixed effects. Table C1, Panel C in Appendix C provides summary statistics for the variables. Standard errors (in parentheses) are corrected for clustering at the contestant level and at the episode-round level. Other definitions are as in Table 1.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Female	0.094**	0.072**	0.076**	0.073	0.068*	0.068*
	(0.039)	(0.036)	(0.038)	(0.046)	(0.036)	(0.036)
Age	0.003	0.003*	0.003*	0.003*	0.003	0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Age^2 / 100	0.029*	0.028*	0.029**	0.029**	0.031**	0.031**
	(0.017)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Majority opp. male			0.038	0.035		
			(0.032)	(0.044)		
Female x Majority opp. male				0.007		
				(0.075)		
Prop. opp. male					0.126**	0.139*
					(0.059)	(0.073)
Female x Prop. opp. male						−0.030
						(0.135)
Worst guess		0.287***	0.287***	0.287***	0.284***	0.284***
		(0.061)	(0.062)	(0.062)	(0.062)	(0.062)
EV opt out / 1000	0.008	0.008	0.009	0.009	0.009	0.009
	(0.010)	(0.010)	(0.009)	(0.009)	(0.009)	(0.009)
Round-number fixed effects	yes	yes	yes	yes	yes	yes
R^2	0.053	0.173	0.176	0.176	0.182	0.182
No. of observations	306	306	306	306	306	306
No. of contestants	102	102	102	102	102	102
No. of rounds	68	68	68	68	68	68
No. of episodes	17	17	17	17	17	17

contestant's own gender, and shows that the effect of the dummy variable does not differ significantly between men and women ($p = 0.927$).

The latter binary distinction is rather crude, which likely limited the statistical power. We therefore repeat the analyses with the (demeaned) exact proportion of male opponents. Fig. B1c shows the linearly fitted relationship between the opt-out rate and this continuous measure, for male and female contestants separately. The graph suggests that both men and women are more likely to opt out when the proportion of male opponents is higher. Table B1, Model 5 includes this proportion in the regression analysis, and confirms that opt-out rates vary significantly with the gender composition: contestants are 12.6 percentage points more likely to opt out if they exclusively face male competitors, as compared to the situation where they exclusively face female competitors ($p = 0.034$). The stand-alone effect of contestants' own gender is now marginally significant: women are 6.8 percentage points more likely to opt out than men ($p = 0.059$). Model 6 adds the interaction of the proportion of male opponents and the contestant's own gender. The results suggest that men and women respond similarly to the gender composition ($p = 0.823$).

In summary, in this game where beliefs about others' willingness to compete matter for the decision to opt out, we observe that women are marginally significantly more likely than men to be the one who opts out, and that both men and women opt out more often when the proportion of male opponents is larger. The results, however, have to be interpreted with caution. If one contestant opts out, it remains unknown what the others would have done. As a consequence of this censoring problem, the opt-out choices that we observe for individual contestants are not only determined by individuals' own opt-out propensity, but also by those of their opponents. The relatively high opt-out rate among women, for example, can reflect a higher general opt-out propensity. At the same time, it can also derive from censoring: if people are less likely to opt out when they face a woman, then a female contestant with a given propensity to opt out will more often be the one who actually opts out than a male contestant with the exact same propensity, simply because less often someone else was quicker to opt out.

Notwithstanding this caveat, the results for this game imply that men are better off than women in a setting where people who choose to compete have higher chances to be successful if others abstain from competing.

Appendix C. Summary statistics

Table C1 displays summary statistics for the variables in the regression analyses of contestants' decisions to opt out or not, for each of the three games.

Table C1
Summary statistics
The table displays summary statistics for the variables in the regression analyses of contestants' decisions to opt out or not, for each of the three games. *Opts out* is a dummy variable that takes the value of 1 if the contestant opts out of the competition. *Female* is a dummy variable that takes the value of 1 if the contestant is female. *Age* is the contestant's age, measured in years. *Majority opp. male* is a dummy variable that takes the value of 1 if the majority of opponents are male (Game One: missing if no opponents selected yet). *E(Prop. opp. male)* is the expected proportion of male opponents. *P(Car)* is the probability that the contestant wins the expensive car if they opt out. *P(Small prize)* is the probability that the contestant wins the small prize of €500 if they opt out. *Time at risk* is the total number of seconds during which the contestant could opt out. *High educ.* is a dummy variable that takes the value of 1 if the contestant has completed or is enrolled in higher education (bachelor's degree or higher), or has equivalent working experience. *Opp. male* is a dummy variable that takes the value of 1 if the opponent is male. *Sum* is a dummy variable that takes the value of 1 if the final question is a sum. *Maximum prize* is the predetermined maximum opt-out cash prize in the increasing-cash-prize variant in euros. *Prop. opp. male* is the proportion of male opponents. *Worst guess* is a dummy variable that takes the value of 1 if the contestant provided the worst guess in the given round. *EV opt out* is the expected value of opting out in euros.

	N	Mean	SD	Min	Median	Max
Panel A: Game One						
Opts out	344	0.19	0.39	0	0	1
Female	344	0.40	0.49	0	0	1
Age	344	48.70	13.24	21	48	81
Majority opp. male	275	0.64	0.48	0	1	1
E(Prop. opp. male)	344	0.66	0.18	0	0.66	1
P(Car)	344	0.19	0.21	0	0.20	1
P(Small prize)	344	0.21	0.24	0	0.20	1
Panel B: Game Two						
Time at risk	366	21.25	12.48	0	24	55
Opts out	366	0.28	0.45	0	0	1
Female	366	0.39	0.49	0	0	1
Age	366	46.39	12.12	21	45	86
High educ.	366	0.38	0.49	0	0	1
Opp. male	366	0.61	0.49	0	1	1
Sum	183	0.78	0.41	0	1	1
Maximum prize / 1000	121	51.47	21.84	20	49	108
Panel C: Game Three						
Opts out	306	0.13	0.34	0	0	1
Female	102	0.51	0.50	0	1	1
Age	102	47.66	11.69	23	45	83
Majority opp. male	306	0.47	0.50	0	0	1
Prop. opp. male	306	0.54	0.26	0	0.50	1
Worst guess	306	0.23	0.42	0	0	1
EV opt out / 1000	68	9.56	2.51	4	10	16

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