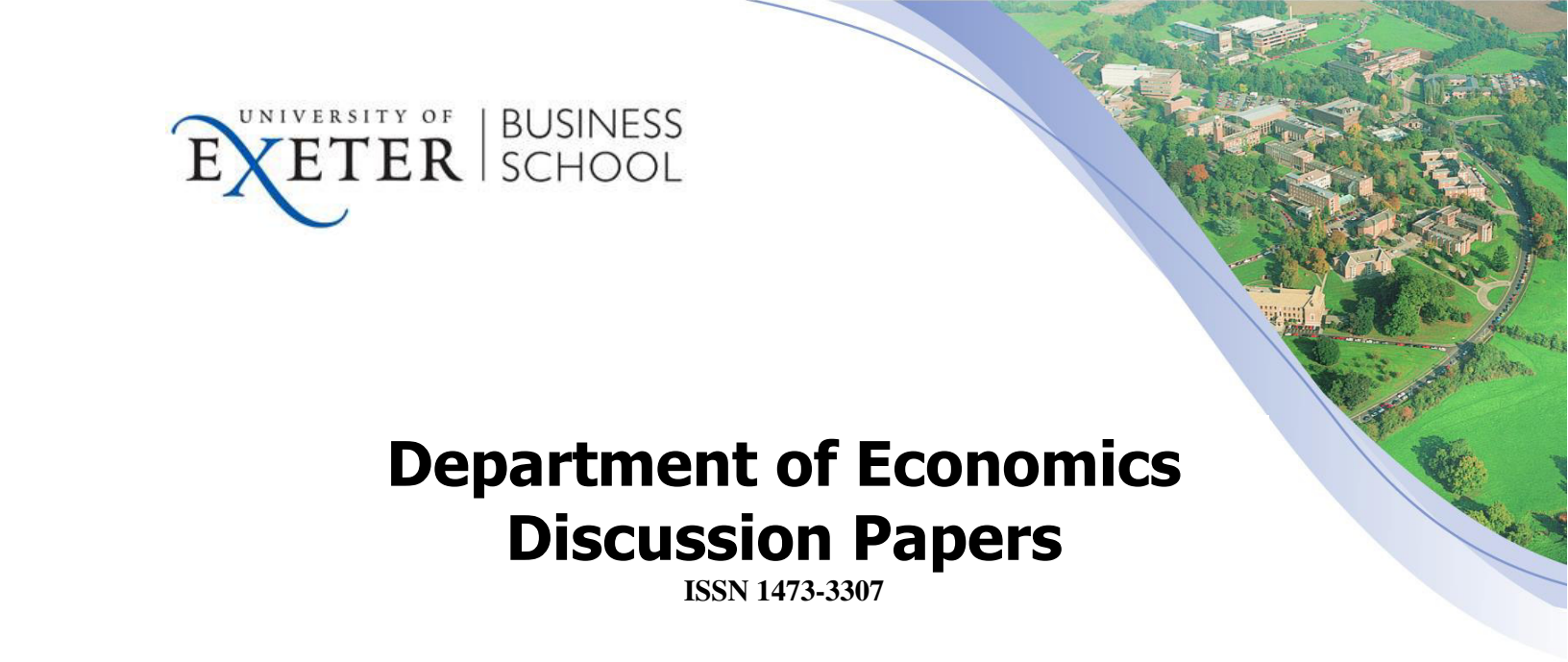

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Predictably competitive?

What faces can tell us about competitive behavior

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Abstract

Competition for limited resources is ubiquitous in social and economic life and has sparked a large body of research on the determinants of competitive behavior. While we know a lot about the role of contextual factors and personality traits, no link has been established between competitive behavior and physical appearance. In this study, we document for the first time a strong positive association between attractiveness, measured through ratings of headshots from experimental participants, and the competitive behavior of female participants in the form of opting for a tournament payment scheme in a real-effort task. We also show that individuals are sometimes better than chance at predicting the competitiveness of experimental participants, just by looking at their headshots. These findings significantly advance our understanding of the factors that underlie competitive attitudes and of the role of observable physical characteristics as telltale signs of behavior.

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1. Introduction

Explaining individual attitudes towards competition has been an important endeavor in research in economics and management over the last two decades. Existing studies have offered substantial evidence that competitiveness, as measured in the economic laboratory, correlates with real-world behavior in several domains, related to education, career choices, and outcomes such as salaries and entrepreneurial success (Kamas and Preston, 2012; Buser *et al.*, 2014; Berge *et al.*, 2015; Reuben *et al.*, 2015). In addition, mounting evidence from economic experiments has documented a gender gap in the willingness to enter competitive environments, with women generally opting for tournament incentive schemes less frequently than men (e.g., Niederle and Vesterlund, 2007; Croson and Gneezy, 2009; Villeval, 2012; Datta Gupta *et al.*, 2013; Flory *et al.*, 2015; Saccardo *et al.*, 2017). It has been argued that differences in competitive attitudes contribute to gender inequalities in the labor market (Shurchkov, 2012; Heinz *et al.*, 2016; Kamas and Preston, 2018).

Besides gender, attitudes towards competition are related to and influenced by contextual factors such as uncertainty and ambiguity (Balafoutas and Sutter, 2019; Berger *et al.*, 2020), affirmative action policies (Balafoutas and Sutter, 2012), ethnicity (Siddique and Vlassopoulos, 2020), or culture (Gneezy *et al.*, 2009; Andersen *et al.*, 2013). At the same time, idiosyncratic factors have been shown to partly explain competitive attitudes. These include ability, risk preferences and confidence (Niederle and Vesterlund, 2007; Buser *et al.*, 2014), self-esteem (Pepitone *et al.*, 1967), distributional preferences (Balafoutas *et al.*, 2012), sexual orientation (Buser *et al.*, 2018) and hormonal factors (Buser *et al.*, 2017; Zhong *et al.*, 2018; Cahlíková *et al.*, 2020). All of these factors are generally very hard or impossible for an observer to ascertain based solely on physical appearance. The question arises: are competitive attitudes related to physical characteristics? And, relatedly, are individuals able to predict the competitive behavior of others based on observable physical characteristics alone?

Motivated by these questions, we first examine in an economic experiment the link between physical attractiveness and competitive behavior. We subsequently ask the distinct but related question of whether individuals are able to predict the competitive behavior of experimental participants by simply looking at their headshots. Very little evidence exists to answer either of those two questions,, and we are unaware of any study that examines the association between competitive behavior in an economic game and any observable physical attributes. Knowing whether a link exists between attractiveness and competitive behavior is important. The ability to form reliable judgments about another individual's willingness to enter

a competitive environment and expend resources in order to win can be a very valuable asset in any context where scarce resources have to be allocated (e.g., in an organizational context where promotions or bonuses are highly contested). To illustrate this with a game theoretic example, consider the hawk-dove game commonly used in economics and biology, in which two individuals compete for a fixed resource (Smith and Price, 1973). If a person knows she is competing against a 'hawk' (i.e., another person who fights intensely in competition), her best strategy is to avoid expending resources. The opposite is true when she expects her counterpart to be a 'dove', i.e., to compete mildly or not at all. Importantly, conflict is costly and efficiency is at its lowest when two hawks meet. One lesson that can be drawn from this analogy is that the presence of physical characteristics or signals regarding individual competitiveness can be individually as well as socially beneficial.

Our experiment initially follows the paradigm of Niederle and Vesterlund (2007) to elicit preferences for competition among a sample of university students. In separate sessions, two additional and distinct groups of subjects were shown headshots of those who participated in the competition experiment (i.e. photos featuring the partipant's face from the shoulders up) and asked to rate the attractiveness of those participants, as well as their perceived competitiveness and their choice in the experiment. We find a strong positive association between attractiveness and competitive choices for women, but not for men – there is, in fact, some evidence of a negative association for male participants. Controlling for a number of potentially relevant factors, a one-point increase in the attractiveness of a female participant's rating is associated with a 10-12% increase in the likelihood of her entering the competition. Our second key result is that individuals are significantly better than chance at predicting the competitive behavior of experimental participants by simply looking at their headshots, but only when they are asked to make a binary guess on a participant's tournament entry choice (and not when they rate the participant's competitiveness on an ordinal scale). Following the binary measure, we show that 59% of participants (64% of the women and 54% of the men) are rated correctly by at least half of their raters, solely based on their headshots.

Our work is related to a body of literature examining whether certain visible facial characteristics can be used to predict the behavior of participants in economic experiments. This includes, among others, rejection rates in the ultimatum game (van Leeuwen *et al.*, 2017), cooperativeness (Brosig, 2002; Yamagishi *et al.*, 2003; Belot *et al.*, 2012; Stirrat and Perrett, 2012; Tognetti *et al.,* 2013; Bonnefon *et al.*, 2017), and trust and trustworthiness (Bonnefon *et al.*, 2013; De Neys *et al.*, 2017). In some existing studies, observers are able to predict behavior at success rates that are statistically better than random, although this is often not the case

(Olivola and Todorov, 2010; Eckel and Petrie, 2011; Efferson and Vogt, 2013; Jaeger et al., 2020). Accordingly, the accuracy and usefulness of appearance-based first impressions has been the object of controversy in the literature (Bonnefon *et al.*, 2015; Todorov *et al.*, 2015). Another related approach is to use specialized software to elicit certain facial metrics and then to relate those metrics to behavior in the lab or in the field (e.g., in sports tournaments). Again, the available evidence sometimes points towards the existence of a relationship between observable facial characteristics – such as facial width-to-height ratio – and (economic) behavior (e.g., Carré and McCormick, 2008; Carré *et al.*, 2009; Haselhuhn and Wong, 2012). This relationship is, however, absent in other studies (Gómez-Valdés *et al.*, 2013; Kosinski, 2017; Wang *et al.*, 2019).[1] Taken together, the available literature leaves the question on whether observable facial characteristics can be used to predict behavior wide open. We contribute to this question by offering data on facial attractiveness and competitive behavior based on an economic game widely used to measure competitiveness in the lab.

Our findings also relate to the literature that examines how physical attractiveness may affect economic outcomes. One reason for such a link is a differential treatment received by individuals depending on their level of attractiveness. The existence of a beauty premium, manifesting itself in higher earnings for more attractive workers, has been proposed by Hamermesh and Biddle (1994) and tested in the economic laboratory (Mobius and Rosenblat, 2006; Andreoni and Petrie, 2008; Rosenblat 2008; Baert and Decuypere, 2014; Deryugina and Shurchkov, 2015). In addition, a small but interesting strand of the literature has provided evidence from correspondence studies, in which fictitious applicants apply for real job openings and the main treatment manipulation varies the attractiveness of the applicant on the application photo. The evidence on a possible attractiveness premium in employment opportunities is less clear-cut than in the dimension of earnings. While applicants who are rated as more attractive sometimes receive higher call-back rates (Bóo *et al.*, 2013), there is some evidence that this attractiveness premium is driven by male applicants (Rooth, 2009), and can even turn into an attractiveness penalty for female applicants (Ruffle and Shtudiner, 2014). Another possibility is that attractiveness correlates with economic preferences and behavior. Existing studies have shown that higher attractiveness is associated with more trusting behavior (Smith *et al.*, 2009) and better negotiation skills (Mobius and Rosenblatt, 2006), while no association is reported for bargaining and cooperative behavior (Solnick and Schweitzer, 1999; Andreoni and Petrie, 2008). Overall, there seems to be only limited evidence for a relationship between attractiveness

[1] A related strand of the literature has identified a causal impact of facial cues on trusting behavior (e.g., Stirrat and Perrett, 2010; Rezlescu *et al.*, 2012).

and economic behavior, even if people often believe that this is the case and even act upon such beliefs (Andreoni and Petrie, 2008).

2. Experimental design and procedures

The experiment was conducted in autumn 2018 with 112 student participants at the FEELE laboratory at the University of Exeter Business School. Before the start of the experiment, we administered online surveys to elicit participants' self-esteem (Rosenberg, 2015), body appreciation (Tylka *et al.*, 2015), and optimism (Chang *et al.*, 1994). Participants had to complete the online surveys on self-esteem, body appreciation, and attractiveness at least 24 hours before participating in the competition experiment and received a flat payment of £4 for completing the surveys.

Upon entering the lab, all participants signed a consent form. They then had their headshots taken by one of the experimenters, assuming a neutral facial expression. The main experiment consisted of the procedure by Niederle and Vesterlund (2007), which is based on a real-effort task of solving as many additions of five randomly selected two-digit numbers as possible within three minutes. In the first stage of the experiment, we implemented a piece rate payment scheme, in which participants received £1 for each correctly solved calculation. In a second stage, we randomly allocated participants into groups of four (two men and two women) and implemented a tournament payment scheme: the group member with the highest performance received £4 per correct calculation, while the remaining three members received no payment. Finally, in the third stage, all participants were asked to choose (before they completed the task) between the piece rate and the tournament scheme for their payment.[2] This binary choice between entering a competitive environment and opting for the piece rate is our main measure of willingness to compete.[3] Participants were informed of their performance in the task after each stage but received no information regarding their rank within their group until the end of the experiment.

In addition to the tournament entry choice, participants were asked to report their beliefs about their rank (between 1 for the highest and 4 for the lowest performer) within their group in Stage 2 of the experiment. Correct guesses were rewarded with £1. This is our measure of

[2] If a participant chose the tournament scheme in Stage 3, his or her performance in this stage was compared to the other group members' performance in Stage 2 to determine if he or she won the tournament. This procedure is common in the literature and is used to ensure that tournament entry is an individual choice task and creates no externalities for other group members.

[3] Instructions for the experiment and all surveys can be found in the online appendix.

self-confidence about one's performance. After completing this first part of the experiment, all subjects participated in a lottery task to elicit risk attitudes, described in the online appendix. Finally, participants filled in a short survey on socio-demographics. Once they were finished, we measured their height and weight before handing them their payment privately and in cash. This payment comprised one randomly selected stage from the number adding task, any payments from the lottery task and the belief elicitation task, as well as the flat payment for completing the online surveys. The mean final payment across all participants was £12.40.

The headshots of the 112 participants in the competition experiment were rated by a different sample of 159 student raters who received a flat payment of £5 and participated in one of seven sessions, conducted at a later time at the FEELE laboratory in Exeter and the BEADS lab of the University of Birmingham.[4] In three sessions, raters were asked to report for each of the depicted persons his or her perceptions on how attractive that person is on a scale from 0 (not attractive at all) to 10 (very attractive). Each rater evaluated between 37 and 38 pictures in randomized order. For each rated subject, we calculated the mean response of all raters. Hence, the attractiveness variable used in the results section ranges from 0 to 10. In four further sessions, raters were asked to report their perceptions on the following: (i) How competitive the depicted person appears to be in general, on a scale from 0 (not competitive at all) to 10 (very competitive); (ii) whether that person decided to enter the tournament in Stage 3 of the main experiment. This last rating was a binary guess of the rater regarding the subject's choice, and it was preceded by a short description of the three stages of the main experiment and the tournament entry choice in Stage 3. Each rater in these additional sessions evaluated 28 pictures in randomized order.

3. Results

Our sample of experimental participants includes data for 56 women and 56 men. Out of those, 23.2% women and 48.2% of men chose the tournament payoff scheme in Stage 3. Hence, in line with the existing literature, the gender gap in competitiveness is very sizeable and statistically significant (p=0.01, Fisher's exact test). The second key variable in the dataset is attractiveness, based on the ratings elicited in the separate lab sessions. This variable ranges

[4] In all rating sessions, we included a question on whether a rater knew any of the subjects that he or she was rating. For all cases when the rater knew the subject (N=29 out of 2,872 individual ratings in total), we dropped that particular rating from the analysis and constructed the average rating based on the entries of the remaining raters.

from 0 to 10, with a mean of 4.79, and it does not differ by the rated subject's gender (p=0.89, Mann-Whitney U test).[5]

3.1. Attractiveness and competitive behavior

Table 1 reports mean attractiveness ratings, disaggregated by tournament entry choice and gender. In the pooled sample and in the male subsample, mean attractiveness does not vary by entry choice (p=0.23 and p=0.39, respectively; Mann-Whitney U tests), while for women, we document a strong association. Those female subjects who enter the tournament in Stage 3 receive 21% higher scores on the attractiveness rating on average, as compared to those who choose the piece rate (5.54 vs. 4.56; p<0.01). Hence, there is a strong positive association between the physical trait of attractiveness and competitive behavior among women in our sample. One possible explanation for this difference is that more attractive women have higher self-esteem and self-confidence, increasing their subjective probability of winning in the tournament or even their objective probability of doing so if higher confidence translates into a stronger performance in the task. Our dataset allows us to use regression analysis to control for several idiosyncratic factors since we have data on participants' beliefs on their self-reported levels of self-esteem, body appreciation, and optimism, as well as on ability in the task at hand and on risk tolerance, elicited by means of the incentivized lottery task.

Table 1. Rated Attractiveness by competitive choices

	Female participants	Male participants	Pooled
Piece rate in Stage 3	4.56 (1.35)	4.92 (1.08)	4.70 (1.25)
Tournament in Stage 3	5.54 (0.81)	4.66 (1.03)	4.95 (1.04)
Pooled	4.79 (1.30)	4.79 (1.06)	4.79 (1.18)

Notes: Entries are mean attractiveness ratings of experimental participants (ranging from 0 to 10), as obtained in the rating sessions. Standard deviations in parentheses.

[5] However, it is worth noting that female raters assign higher attractiveness scores than male raters on average (4.75 vs. 4.29, p<0.01, Mann-Whitney U test). In the attractiveness rating sessions, 58.5% of raters were male and 41.50% were female. In the competitiveness rating sessions, 52.75% of raters were male and 47.25% were female.

In Table 2 we present a series of Probit regressions, with the decision to enter the tournament in Stage 3 as dependent variable. In the first six specifications we split the analysis by gender, in order to assess the effects of attractiveness for each gender separately. The final specification pools both genders. In addition to the attractiveness rating, we follow previous literature and include ability and risk aversion as independent variables in all specifications.

The results in Table 2 paint a very clear picture with respect to the relationship between attractiveness and competitiveness among women. The marginal effect for the coefficient on attractiveness in (1) is 0.10, meaning that a one-point increase in the attractiveness rating is associated with a 10% increase in the likelihood of women entering the tournament in Stage 3. As already pointed out, this positive relationship might be due to more attractive women having stronger confidence, higher self-esteem, and generally feeling better in their own skin. To control for these factors, in columns (3) and (4), we extend the list of explanatory variables by adding elicited beliefs about one's rank in Stage 2, as well as the self-reported measures of self-esteem, body appreciation, and optimism. The size of the marginal effect for attractiveness in (3) not only does not drop but in fact it increases, so that a one-unit increase in attractiveness now implies a 12% higher likelihood of entering the competition. In specifications (5) and (6), we also control for height, weight, age, and the number of siblings. The attractiveness coefficient for women retains its size and statistical significance in (5). Hence, even after controlling for a large number of potentially relevant factors, attractiveness is a strong predictor of competitive behavior among women.

Table 2. Determinants of tournament entry in Stage 3

	(1) Female	(2) Male	(3) Female	(4) Male	(5) Female	(6) Male	(7) Pooled
Attractiveness	0.10***	-0.06	0.12***	-0.05	0.12***	-0.09*	-0.10**
	(0.04)	(0.06)	(0.03)	(0.05)	(0.03)	(0.05)	(0.05)
Ability	0.04**	0.04	-0.04	0.02	-0.02	0.02	0.00
	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)
Lottery choice	0.08	0.13	0.07	0.13	0.07	0.21**	0.15**
	(0.10)	(0.13)	(0.09)	(0.12)	(0.10)	(0.10)	(0.08)
Stage 2 belief			-0.36***	-0.06	-0.28***	-0.10	-0.17***
			(0.10)	(0.08)	(0.09)	(0.08)	(0.05)
Self esteem			-0.04**	0.02	-0.02	0.03	-0.01
			(0.02)	(0.02)	(0.02)	(0.02)	(0.01)
Optimism			0.03**	-0.06***	0.02**	-0.09***	-0.00
			(0.01)	(0.02)	(0.01)	(0.02)	(0.01)
Body appreciation			-0.14	0.24**	-0.09	0.18*	0.02
			(0.11)	(0.11)	(0.11)	(0.10)	(0.07)

Height					0.00 (0.01)	0.02*** (0.01)	0.01** (0.01)
Weight					-0.00 (0.01)	-0.02*** (0.01)	-0.01* (0.00)
Age					0.05 (0.04)	-0.01 (0.04)	0.05* (0.03)
Siblings					0.07* (0.04)	0.07 (0.06)	0.09** (0.04)
Female							-0.62*** (0.04)
Attractiveness x Female							0.24*** (0.07)
N	56	56	56	55	56	55	111

Notes: One male participant was excluded from columns (4), (6) and (7) due to a software problem that did not allow us to store his survey data. The table presents marginal effects of probit coefficients evaluated at the means of the explanatory variables. The dependent variable is *Compete*, equal to 1 if someone entered the tournament in Stage 3 and 0 otherwise. *Attractiveness* is the average attractiveness rating a subject received and varies between 0 (not attractive at all) and 10 (very attractive). *Ability* captures the subject's performance in Stage 2. *Lottery choice* is a binary variable equal to 1 if the subject entered the lottery and 0 otherwise. *Stage 2 belief* measures the confidence on a scale from 1 to 4. *Self esteem*, *Optimism*, and *Body appreciation* summarize the scores from the respective questionnaires, with higher scores indicating higher self esteem, optimism, and body appreciation. *Height* is the subject's height in centimeters, and *Weight* the subject's weight in kilograms. *Age* is the subject's age in years, and *Siblings* the number of siblings. *Female* is a dummy variable equal to 1 for female and 0 for male subjects. Standard errors in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$

For men, the attractiveness coefficient is negative in all specifications. It is insignificant in columns (2) and (4) and weakly significant in (6). Interestingly, the marginal effect is almost as sizeble as that for women, albeit in the opposite direction. Column (7) pools the data from both genders and includes a gender dummy, an interaction term between our main variable of interest (attractiveness rating) and gender, and the full set of controls. All insights from the disaggregated regressions remain unchanged. We document again a significant positive effect of attractiveness on competition entry for women (p=0.01, χ^2 test on the restriction *Attractiveness*+*Attractiveness x Female*=0), while the negative effect of attractiveness on male tournament entry (captured by the coefficient of *Attractiveness* in the pooled specification) is now significant. Hence, in the regressions there is some evidence of a *negative* relationship between attractiveness and competitiveness for men. However, given that this result depends on the econometric specification and is not confirmed by the non-parametric tests, we intrepret it only as suggestive evidence that the relationship between attractiveness and competitiveness is reversed among male participants. In any case, the very sizeable and significant interaction term *Attractiveness x Female* confirms that the effect of attractiveness runs in opposite directions for the two genders.

In line with previous literature, we find a gender gap in competition entry even when all relevant controls are included ($p<0.01$, χ^2 test on the restriction *Female+Attractiveness x Female*=0 in column 7). In terms of further explanatory variables, the perceived rank in Stage 2 is (as expected) a significant predictor of tournament entry, and it is almost entirely driven by female participants. There is a significant effect of risk tolerance in the expected direction in the pooled sample. Among the self-reported survey measures, optimism has the most robust effect for both genders, but in opposite directions: more (less) optimistic women (men) are more likely to enter the tournament. One additional interesting finding is that the coefficients for height and weight are significant for men (and in the pooled sample), with tournament entry being positively correlated with height and negatively with weight. This pattern is consistent with existing literature that documents higher earnings for taller men (Persico *et al.*, 2004).[6]

We conclude this part of the analysis with a remark regarding our sample size and the power of the experiment to detect significant effects. Based on the entries in Table 1, the minimum detectable effect size for female participants (comparing the rated attractiveness of those who chose the piece rate against those who chose compatition) is 0.99, which is essentially identical to the actual observed and statistically significant difference. In the case of men, however, we must acknowledge that the minimum detectable effect size equals 0.81, which is larger than the actual difference. This imples that the absence of a significant effect for male participants could be related to sample size.

3.2. Predictive accuracy of tournament entry

We now turn to the question of whether raters are able to predict the tournament entry decisions taken by the experimental participants. For this purpose, we rely on the ratings described in section 2, regarding a participant's perceived choice to enter the tournament in Stage 3 of the game (henceforth *ratedentry*), and a participant's perceived competitiveness on a scale from 0 to 10 (henceforth *ratedcomp*). Our main measure of predictive accuracy is the percentage of subjects who were rated correctly by at least 50 percent of their raters (van Leeuwen *et al.*, 2017). Using the binary variable *ratedentry*, the definition of correct ratings is straightforward and requires that the rating coincides with what the participant actually did. For *ratedcomp*, we

[6] When considering the various effects reported in the regressions, it is useful to keep in mind that several of the co-variates are likely to display collinearities. In Table A.1 in the online appendix, we show the correlation matrix among all explanatory variables included in Table 1. One observation that stands out is the absence of a significant correlation between the attractiveness ratings and any of the other variables. This absence of collinearity with other factors increases our confidence in the explanatory power of rated attractiveness.

need to create a correspondence between actual entry choices by gender and competitiveness ratings. To do so, we first classify a rating as high if it places the participant into the top 23% (top 48%) in terms of perceived competitiveness for women (men), and as low otherwise; these figures correspond to the actual tournament entry rates from Table 1. Then, correct ratings consist of high ratings for participants who competed in Stage 3, and of low ratings for those who did not.

Table 3 shows that, using the binary rating that directly asks raters to guess the participant's behavior, the percentage of subjects who were rated correctly by at least half of their raters lies at 59%. This is significantly higher than 50% for the pooled sample and for female subjects, but not for male subjects. This analysis suggests that raters are, for the most part, significantly better than chance at predicting the competitive choices of subjects who participated in our experiment. On the other hand, predictive accuracy using the general competitiveness ratings is not significantly different from 50% for any of the two genders or for the pooled sample. Taken together, these findings fit well into a literature that has not delivered a conclusive message on whether facial cues can be reliably used to predict economic behavior. We contribute to this debate by studying predictive accuracy in a competition experiment, but without being able to offer a definitive answer ourselves. One interesting observation is that there is a substantial difference in predictive accuracy between the two ratings, with the binary rating (which asks raters to give a direct answer on the tournament entry choice of experimental participants) performing clearly better.

Table 3. Predictive accuracy of competitive choices

	Female participants	Male participants	Pooled
ratedcomp	0.43	0.54	0.48
ratedentry	0.64 **	0.54	0.59 **

Notes: Entries are the shares of participants in each group who were rated correctly by at least half of their raters, based on the variable shown in the first column. ** $p < 0.05$, *** $p < 0.01$, based on one-sided binomial tests on the directional hypothesis that an entry is greater than 0.5.

As an aside, we note that men are rated as more competitive than women in general and as more likely to enter the tournament. This means that raters correctly anticipate the existence

of a gender gap in competitiveness, and in particular in the willingness to enter a competitive environment (means of *ratedcomp*: 5.97 for women vs. 6.30 for men, p=0.03, Mann-Whitney U test; means of *ratedentry*: 0.45 for women vs. 0.53 for men, p=0.01, Mann-Whitney U test). However, the size of this gap is severely underestimated at 8 percentage points, compared to the actual gap of 25 percentage points.

4. Discussion and conclusion

Using behavioral data from a laboratory experiment conducted with 112 participants and headshots rating data from separate sessions conducted with 159 raters, we have addressed two novel research questions on the relationship between observable characteristics and competitive behavior. First, we have documented a significant positive relationship between attractiveness and the willingness to engage in competition among women, but not among men. In regression analyses, we have controlled for several factors that could be mediating this effect and have found that the positive association between attractiveness and competitiveness remains – and, in fact, slightly increases in magnitude. Second, we have shown that raters have only limited success at predicting whether an experimental participant has entered the competition or not, by looking at the participant's headshot. This predictive accuracy exists when they have to make a direct guess on the participant's choice, but not when they are asked to rate the participant's competitiveness on an ordinal scale. Hence, our findings extend previous literature on factors that correlate with competitive inclinations and on whether and how observable physical characteristics can be used to predict behavior.

Why are more attractive women more likely to compete on average, and why does this finding not extend to men? While our study cannot directly answer these questions, we offer here some thoughts on this matter. Existing evidence on the relationship between attractiveness and professional success points towards a beauty premium for men, while estimates of this premium is mixed in the case of women, ranging from a positive premium (Boo et al., 2013), to a zero premium (Rooth, 2009) or even to a 'beauty penalty' (Ruffle and Shtudiner, 2015). This runs contrary to the commonly held view that more attractive people are universally at an advantageous position in the labor market. In fact, several studies have documented a same-sex attractiveness penalty in employment-related decisions, which is particularly pronounced among women and often attributed to envy and linked to sexual selection theory (Luxen and van de Vijver, 2006; Agthe *et al*., 2011; Ruffle and Shtudiner, 2015). The existence of such a penalty would mean that more attractive women sometimes face a disadvantage in their

professional development, which they need to overcome by adapting their behavior. One possible such adaptation is a stronger competitive inclination, which can help improve one's professional perspectives and outcomes. On the contrary, more attractive men face a lower pressure to compete, since on average they find it easier to achieve professional success. This can help explain why the relationship between attractiveness and competitive behavior among men in our data is, if anything, negative. In any case, we acknowledge that further research is needed to explore the nature of the links we have documented in this study.

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