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## **Girls will be Girls: An Experimental Study on Female Entrepreneurship**

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# **Girls will be Girls: An Experimental Study on Female Entrepreneurship**

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**January 2013**

## **Abstract**

We experimentally investigate gender- and occupation-specific differences in market entry behavior and test whether female entrepreneurs are more willing to take strategic risk and engage in competition than other women. To facilitate strategic thinking, we induce asymmetric gain and loss experiences. We find that female entrepreneurs react to own gains and losses like other women and to opponents' experiences like male entrepreneurs. Overall entry of female entrepreneurs is much lower than that of male entrepreneurs and does not differ from other women indicating that also female entrepreneurs dislike strategic competition. Risk aversion does not account for this finding.

**Keywords:** gender differences, entrepreneurship, occupational choice, gain and loss experiences

**JEL Codes:** D03, L26

## Zusammenfassung

Wir untersuchen geschlechter- und berufsspezifische Unterschiede im Markteintrittsverhalten und testen experimentell, ob Unternehmerinnen eher bereit sind strategische Risiken einzugehen und am Wettbewerb teilzunehmen als andere Frauen. Um nicht-triviale strategische Überlegungen zu ermöglichen, induzieren wir asymmetrische Gewinn- und Verlusterfahrungen. Wir finden, dass Unternehmerinnen auf eigene Gewinne und Verluste in gleicher Weise reagieren wie andere Frauen, jedoch auf Gewinn- und Verlusterfahrungen Ihrer Gegenspieler wie männliche Unternehmer. Insgesamt treten weibliche Unternehmer wesentlich seltener in den Markt ein als männliche Unternehmer. Sie unterscheiden sich dabei nicht signifikant von anderen Frauen. Dies deutet darauf hin, dass selbst Unternehmerinnen eine Abneigung gegen strategischen Wettbewerb haben. Risikoaversion erklärt dieses Resultat nicht.

**Schlüsselwörter:** Geschlechterunterschiede, Unternehmertum, Berufswahl, Gewinn- und Verlusterfahrungen

**JEL Codes:** D03, L26

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## 1 Introduction

Behavioral economics has documented significant gender differences in several domains of decision making that are related to occupational choice. In particular, women's lower willingness to take risks and to compete has been discussed to explain labor market differences (e.g., Cramer *et al.* 2002, Bonin *et al.* 2007, Niederle and Vesterlund 2007, 2011). This suggests that those women who *do* choose risky and competitive occupations should exhibit a higher willingness to take risk and to compete than other women. To test this hypothesis, we experimentally investigate the decision behavior of women who have self-selected into a highly risky and competitive occupation; i.e., entrepreneurship. We study how female entrepreneurs react to strategic risk and competition and test for gender- and entrepreneurship-specific differences by comparing their decisions with those of female non-entrepreneurs and male entrepreneurs and non-entrepreneurs. To our best knowledge this is the first study to capture gender differences in entrepreneurship in an economic experiment.

In our experiment, we employ the framework of the market-entry game (Selten and Güth 1982, Kahneman 1988) which is widely used to study phenomena related to entrepreneurial decisions (e.g., Rapoport *et al.* 1998, Camerer and Lovo 1999, Moore and Cain 2007, Brandts and Yao 2010). Several players simultaneously decide on whether or not to enter an experimental market with a limited capacity. Individual payoffs from entering decrease with the number of entrants. If too many players enter, all entrants suffer a loss. As players cannot observe, communicate, and collude with their opponents, they face strategic uncertainty about the choices of the other players when making their entry decisions. Capturing people's willingness to take strategic risk and to compete for limited resources, this decision task complements research on tournaments and skill-based competition which address effects of confidence levels (e.g., Camerer and Lovo 1999, Niederle and Vesterlund 2007). We feel that this complementary approach is necessary because it captures the other essential component of competition that is potentially hidden and overlaid in studies involving other strong behavioral drivers such as skill tasks and tournaments, i.e., the willingness to take strategic risk and to engage in strategic competition for limited resources. Our study thus augments research on gender differences in competition by investigating differences that are not driven by gender specific confidence levels.

In the standard market-entry game, players are fully symmetric and face the same information. A potential drawback of this set up is that gender- and/or occupation-specific behaviors involving strategic considerations might only play out in a 'realistic' situation where players have different starting positions and conjectures of counterparts' actions are facilitated. To allow for such considerations, we employ a novel approach by Schade *et al.* (2010) who randomly induce pre-game gain and loss experiences, giving participants the possibility to use their own and their opponents' experiences as a coordination device.



Our findings show that female entrepreneurs exhibit entry patterns of both groups: female non-entrepreneurs and male entrepreneurs. On the one hand, like other women, female entrepreneurs do not show systematic reactions to own gain and loss experiences, while male entrepreneurs and male non-entrepreneurs enter significantly more after a loss experience than after a gain experience. On the other hand, like male entrepreneurs and male non-entrepreneurs, female entrepreneurs enter more when playing against opponents with a gain experience than when playing against opponents with a loss experience, while female non-entrepreneurs do not show systematic reactions to their opponents' experiences. We discuss this finding in the context of an acquired or initial intuition about the reactions of – potentially male – opponents to prior experiences. **Unexpectedly but most importantly, overall entry of female entrepreneurs is much lower than that of male entrepreneurs and does not statistically differ from that of female and male non-entrepreneurs.** This result is robust when controlling for risk-aversion. It suggests that even female entrepreneurs dislike engaging in strategic competition and highlights that female entrepreneurship is an important domain of entrepreneurship research.

## 2 Theory and Hypotheses

### 2.1 Gender Differences in Decision Making and Entrepreneurial Activity

In a meta-analysis of 150 experiments on risk taking, Byrnes *et al.* (1999) conclude that the literature clearly indicates that men are more likely to take risks than are women and that the gender difference in risk taking depends on the domain being considered. Also Weber *et al.* (2002) and Johnson *et al.* (2004) find men to be less risk-averse and more likely to engage in risky activities than women in all of the studied domains but in the social domain. Harris *et al.* (2006) confirm this result. Studying risk taking behavior of students from single-sex and coeducational schools Booth and Nolen (2012) suggest that these gender differences might reflect social learning (nurture) rather than inherent gender traits (nature).

Men and women are also found to differ in tournament performance and in their propensity to enter competitive situations (Gneezy *et al.* 2003; Niederle and Vesterlund 2007, 2011). While men's performance significantly increases with tournament incentives, women's performance does not. The gender gap in performance is larger in mixed-sex tournaments than in single-sex tournaments. When participants are paid according to piece rates, no gender gap in performance is found. Niederle and Vesterlund (2007) examine whether men and women with the same ability differ in their selection into competitive environments. They find a gender gap in tournament entry that cannot be explained by performance. Factors such as risk aversion and feedback aversion play also a negligible role. Instead the tournament entry gap is driven by men being more overconfident than women and by gender differences in preferences for performing in a competition. "The result is that women shy away from competition and men embrace it" (Niederle and Vesterlund 2007, p. 1067).

Aspects of risk aversion, competitiveness, and confidence are also discussed to underlie the lower rates of women engaged in entrepreneurial activities. In most Western countries,

entrepreneurship is still dominated by men, with women deciding for an entrepreneurial career less often (Reynolds *et al.* 2001, Blanchflower 2004, Minniti *et al.* 2004, Allen *et al.* 2007, Bosma *et al.* 2009). Cramer *et al.* (2002) find support for the supposedly negative effect of risk aversion on entrepreneurship selection; however, they do not derive a conclusion concerning the causality of this relationship. Koellinger *et al.* (2011) find that women exhibit lower confidence in their entrepreneurial skills and higher fear of failure than men do, which corresponds to the lower rates of entrepreneurial activity among women. Those women who do decide for an entrepreneurial activity self-select into a risky, competitive, and still widely male-dominated field. Thus, a plausible expectation is that female entrepreneurs react to risk and competition more like male entrepreneurs do, with gender differences being larger in the general population. Studying gender differences in a market-entry game with entrepreneurs and non-entrepreneurs allows analysis into how far self-selection and learning to survive in a competitive environment might affect and reduce gender differences in dealing with strategic risk and competition. Based on the above findings we test the following hypotheses:

HYPOTHESIS 1. *Entrepreneurs enter the market more often than non-entrepreneurs.*

HYPOTHESIS 2. *Women enter the market less often than men.*

HYPOTHESIS 3. *Female entrepreneurs enter the market more often than female non-entrepreneurs.*

HYPOTHESIS 4. *The entry gap is smaller between male and female entrepreneurs than between male and female non-entrepreneurs.*

## 2.2 Simultaneous Market Entry after Gain and Loss Experiences

In our experiment, three players decide whether or not to enter a market with a capacity of two, i.e., a maximum of two players can enter the market without exceeding the market's capacity. If one player enters, his payoff for entering is one experimental currency unit. If two players enter, their payoff is zero. If all three enter the market, all suffer a loss of one experimental currency unit. The payoff function for our decision scenario is given by:

$$u_i(s) = \begin{cases} 0 & \text{if } s_i = 0 \\ r \cdot [2 - N(s)] & \text{if } s_i = 1 \end{cases}$$

where  $u_i(s)$  represents player  $i$ 's payoff given the vector of individual decisions (0 = stay out; 1 = enter) with  $i = 1, 2, 3$ .  $N(s)$  is the total number of players who enter the market. The constant  $r$  represents one experimental unit; i.e., the monetary gain or loss players make by entering. Staying out of the market ( $s_i = 0$ ) leads to a payoff of zero.

In this game, profit-maximizing players should prefer to enter the market as long as nobody else enters. They should be indifferent between entering and staying out if one other player enters since their payoff would be zero in both cases. As soon as two other players enter, a profit-maximizing player should prefer to stay out so as not to suffer losses. In a simultaneous market-entry game, however, players make their entry decisions without knowing their opponents' decisions. Analyzed from the viewpoint of standard game theory, this game has

six pure-strategy Nash equilibria: all situations in which the number of entrants equals the market capacity of two and all situations in which there is only one entrant and the others stay out because they are indifferent between entering and staying out. The mixed-strategy equilibrium is given by all players entering with a probability of  $\frac{1}{2}$  (cf. Rapoport *et al.* 1998).

To test in how far gender- and/or occupation-specific reactions to different starting positions can explain differences in entry behavior into a competitive environment, we test the influence of own and opponents' prior gain and loss experiences on behavior in the simultaneous market entry game. Schade *et al.* (2010) were the first to model and analyze the effect of prior gains and losses on subsequent market entry behavior. They propose subjectively transformed games that integrate elements of prospect theory, aggregation of prior and subsequent payoffs, and social projection; i.e., the assumption that people project others to behave like themselves. Their model predicts that people enter more after a loss experience than after a gain experience and less when playing against opponents' with a loss experience than when playing against opponents with a gain experience. Being based on a mathematical model, these predictions are also intuitive: If someone reacts to a loss with an increased willingness to enter the market, f.i., to make up for the incurred losses, and this person believes others to behave the same way she should decrease her willingness to enter when being confronted with others who have incurred losses. Reversed arguments account for gain experiences. Hypotheses 5 and 6 test the direction of reactions to own and opponents' prior experiences in correspondence with these predictions.

HYPOTHESIS 5. *People enter more after a loss than after a gain.*

HYPOTHESIS 6. *People enter more playing against opponents with a gain experience than against opponents with a loss experience.*

## 3 Experiment

### 3.1 Experimental design and procedure

We employed the described market-entry game and induced random gain and loss experiences prior to the experimental task. Based on the outcome of a draw from a bingo cage, each participant either made a gain or a loss prior to the market-entry game. These gain and loss experiences were common knowledge in the subsequent market-entry game, while all other individual characteristics, including information about the gender of the players, were hidden from the participants during the experiment. All sessions were conducted separately for entrepreneurs and non-entrepreneurs. The entrepreneurs were aware that they were in a session with other entrepreneurs. When the participants arrived at the experimental laboratory, they received a payment for showing up on time. Like all other payoffs, this show-up fee was scaled up by the factor four for the entrepreneurs to account for the potential effects of income differentials between the sample of entrepreneurs and that of non-entrepreneurs consisting of students (cf. Sandri *et al.* 2010)<sup>1</sup>. The show-up fee (14 Euro for the non-entrepreneurs and

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<sup>1</sup> Sandri *et al.* (2010) in an experimental comparison between entrepreneurs and students scaled up the payoffs by a factor of five.

56 Euro for the entrepreneurs) was paid out directly in cash, and participants were asked to pocket it before they were seated at separate computer desks. Before the market-entry game started, a lottery was conducted. For each participant a random draw from a bingo cage determined whether the participant won or lost one experimental unit (6 Euro for the non-entrepreneurs and 24 Euro for the entrepreneurs). Half of the participants in a session won, the other half lost. This created two sub-groups per session: one with a gain experience, the other with a loss experience. The instructions for the experiment were displayed on the computer monitors during the experiment. Additionally, hard copies of the instructions were distributed. Communication between the participants was not allowed.

Participants played 16 rounds of the market-entry game. In each round they were re-matched with two other opponents. The only information they received about their opponents was whether the latter experienced a gain or a loss in the lottery prior to the market-entry game. Participants were confronted with all possible combinations of opponents (gain/gain; gain/loss; loss/loss) in randomized order. All other information like age and gender<sup>2</sup> was unknown to the counterparts. Participants did not receive feedback between rounds to avoid learning effects. The results of each round were presented in a table at the very end of the experiment. Participants were able to explicitly state mixed strategies in the form of entry probabilities. This method is referred to as explicit mixing (cf. Camerer 2003; see also Anderhub *et al.* 2002). In each round participants could determine the proportions of ‘Entry’ balls and ‘No Entry’ balls in a 100-ball urn to state their entry decisions. If an Entry ball was drawn from the urn the player entered the market. If a No Entry ball was drawn the player did not enter the market. After the market-entry game, the participants’ risk propensity was measured in accordance with Holt and Laury (2002) using monetary incentives and participants answered a questionnaire that included basic statistical data like age and gender. At the end of the experiment, one of the sixteen rounds of the market entry game was randomly selected for the final payoff. The final payment included the participants’ payoff from the market entry game and the Holt and Laury (2002) task on risk preferences. Table 1 below gives an overview of the order these parts of the experiment<sup>3</sup>.

**Table 1. Overview Experiment**

Arrival:	Payment of show-up fee
Part 1:	Lottery [inducing random pre-game gain or loss experience]
Part 2:	Market entry game [16 rounds with varying opponents (gain/gain) (gain/loss) (loss/loss)]
Part 3:	Holt and Laury (2002) test on risk aversion
Part 4:	Demographic questionnaire
Part 5:	Overview of all results, random choice of payoff-relevant round, payments

<sup>2</sup> In the single-sex sessions with only female participants which we ran as robustness check the gender of the other players was obvious even though the instructions did not include any information about gender.

<sup>3</sup> A full set of instructions is available from the authors upon request.

### 3.2 Samples and Sessions

The experiment was conducted with 90 participants: 18 entrepreneurs and 36 non-entrepreneurs in mixed-sex sessions and 12 female entrepreneurs and 24 female non-entrepreneurs in single-sex sessions. The control sessions with only female participants served as a robustness check for our results and tested whether women were influenced by the gender composition of the group they interacted with (cf. Gneezy *et al.* 2003). The sample of entrepreneurs consisted of small business owners from the service, consulting, and technology industry. The number of employees per business was between 10 and 50. All of the entrepreneurs were founders and managers of their respective companies. The student samples consisted of undergraduate and graduate students from various fields; no gender specific distributions to different subjects could be found in our sample. The experiments were programmed and conducted using the software z-tree (Fischbacher 2007). All sessions were run in the experimental laboratory of a German university.

## 4 Results

### 4.1 Descriptive Statistics

Across all rounds entrepreneurs enter more often than non-entrepreneurs (mean entry rate entrepreneurs: 49.54%, mean entry rate non-entrepreneurs: 47.16%), however, this difference does not reach statistical significance (Mann-Whitney test:  $p > 0.05$ ). Furthermore, women enter significantly less than men (Mann-Whitney test:  $p < 0.001$ ). Their mean entry rate is 46.19% while the mean entry rate of men is 53.42%. Comparing the different sub-groups, we find that female entrepreneurs do not enter more than female non-entrepreneurs (Mann-Whitney test:  $p > 0.05$ ) and significantly less than male entrepreneurs (Mann-Whitney test:  $p < 0.001$ ). The difference between male and female non-entrepreneurs is not statistically significant (Mann-Whitney test:  $p > 0.05$ ). Finally, male entrepreneurs enter significantly more often than male non-entrepreneurs (Mann-Whitney test:  $p < 0.001$ ). Table 2 reports on mean entry rates of the different sub-groups in total and separately by their pre-game gain or loss experience:

**Table 2. Mean Entry Rates**

Group	Gender	Mean Entry	Own Experience	Mean Entry
Entrepreneurs	Male	61.85 %	Gain Loss	41.00 % 74.36 %
	Female	45.06 %	Gain Loss	41.30 % 49.58 %
Non-entrepreneurs	Male	48.60 %	Gain Loss	47.62 % 49.91 %
	Female	46.72 %	Gain Loss	45.00 % 48.30 %

Considering participants' level of risk aversion, we find that men are marginally less risk averse than women (mean risk aversion men: 5.5; mean risk aversion women: 6.22; Mann-Whitney test:  $p < 0.10$ , one sided) while there was no significant difference in risk aversion between entrepreneurs and non-entrepreneurs (mean risk aversion entrepreneurs: 6.04; mean risk aversion non-entrepreneurs: 6.04, Mann-Whitney test:  $p > 0.05$ ).

## 4.2 Overall Analysis

For the overall analysis we ran random-effects tobit regressions<sup>4</sup> in STATA. The dependent variable *entry* represents the stated entry probability [0%; 100%] of the participants in the respective round. The between-subjects variables are *entrepreneur* (entrepreneurs = 1; non-entrepreneurs = 0), *female* (female = 1; male = 0), and *own experience* (gain = 1; loss = 0). The variable *single-sex group* controls for the gender mix in the respective session (mixed-sex session = 0; female single-sex session = 1) while the variable *risk aversion* captures the participants risk propensity as measured in accordance with the scale by Holt and Laury (2002)<sup>5</sup>. The dummy variable *opponents' experience 1* represents rounds against one opponent with a gain and one opponent with a loss experience, while *opponents' experience 2* represents rounds against two opponents with a gain experience.

Table 3 below shows the results of five random-effects tobit regressions with different model specifications: Model 1 only contains reaction to own and opponents' pre-game experiences. It shows that participants with a gain experience enter less than participants with a loss experience. Furthermore, participants enter more when playing against one opponent with a gain experience and one opponent with a loss experience (*opponents' experience 1*) or when playing against two opponents with a gain experience (*opponents' experience 2*) as when playing against two opponents with a loss experience. Model 2 additionally considers the dummy variables *entrepreneur*, *female*, and the interaction term *female\*entrepreneur*. Being an entrepreneur has a marginally significant, positive effect on the probability to enter the market, while there is no significant effect of gender when controlling for own and opponents' experiences. Furthermore, there is a marginally significant negative interaction effect of *entrepreneur\*female* indicating that being a female entrepreneur decreases the entry rate. Model 3 further includes gender specific reactions to opponents' experiences (e.g., *opponents' experience 1\*female* and *opponents' experience 2\*female*). The results show that these effects are negative and marginally significant. Model 4 further controls for *risk aversion*, which had a significant negative influence on entry. Finally, Model 5 additionally includes the dummy

<sup>4</sup> Tobit regressions like all none-linear regressions are known to be less well suited to analyze interaction effects; however, this problem is less severe with two-way interactions like the ones considered in this paper. Using a linear model is not an alternative in our case as the entry decisions of the participants include substantial numbers of "0%" and "100%" and as the tendency to play these pure strategies ("0%" and "100%") is differently distributed across gender. Given these properties of the dependent variable *entry*, the use of a tobit model appears to be the most appropriate method.

<sup>5</sup> The higher the number of "safe" choices in the lottery choice task, the higher the score in this measure, indicating a higher risk aversion, scores were not transformed into a utility function but used in form of the absolute numbers.

variable *single-sex group* to control for the gender-mix in the respective session, which had no significant influence on entry behavior.

**Table 3. Random-Effects Tobit Models**

Coefficient	(1)	(2)	(3)	(4)	(5)
Own experience	-11.055*(6.659)	-9.929*(6.559)	-9.958*(6.570)	-11.488*(7.184)	-11.448*(7.171)
Opponents' experience 1	7.571**(2.430)	7.569**(2.429)	16.819*** (5.023)	18.089*** (5.453)	18.087*** (5.452)
Opponents' experience 2	8.421** (2.804)	8.421** (2.804)	15.297** (5.770)	16.412** (6.256)	16.409** (6.256)
Entrepreneur		21.470* (13.805)	21.605* (13.830)	21.950* (14.581)	21.920* (14.554)
Female		3.028 (9.529)	11.322 (10.376)	19.193* (11.530)	16.914* (12.271)
Entrepreneur*female		-26.315* (16.012)	-26.476* (16.040)	-27.240* (17.097)	-27.015* (17.069)
Opponents' experience 1*female			-12.079* (5.735)	-14.660* (6.254)	-14.662** (6.253)
Opponents' experience 2*female			-9.004* (6.600)	-9.783* (7.187)	-9.778* (7.187)
Risk aversion				-7.211** (2.463)	-7.273** (2.461)
Single-sex group					4.384 (8.245)
Constant	46.352*** (4.992)	42.771*** (9.316)	36.447*** (9.837)	73.724*** (17.235)	74.063*** (17.216)
$\sigma_u$	30.052*** (2.732)	29.376*** (2.684)	29.435*** (2.689)	30.074*** (2.951)	30.013*** (2.946)
$\sigma_e$	36.000*** (0.851)	36.000*** (0.851)	35.935*** (0.850)	36.830*** (0.949)	36.830*** (0.949)
$\rho$	0.411 (0.045)	0.400 (0.044)	0.402 (0.045)	0.400 (0.048)	0.399 (0.048)
$\chi^2$	14.59	18.15	22.58	31.11	31.43
Number of observations	1440	1440	1440	1264	1264
Number of subjects	90	90	90	79	79

Dependent variable = entry

Random-effects specification = subject id

\*\*\* $p < 0.001$ ; \*\* $p < 0.01$ ; \* $p < 0.10$

### 4.3 Separate Analysis for each Sub-group

Running separate random-effects tobit regressions for the four subgroups, male/female non-entrepreneurs and male/female entrepreneurs, allows analyzing the effect *own experience* and *opponents' experience* as well as *risk aversion* on the entry behavior of participants in each of these subgroups. Table 4 below shows the results of this analysis.

**Table 4. Random-Effects Tobit Models – Separate for each Sub-group**

Coefficient	(A) Male non-entrepreneurs	(B) Female Non-entrepreneurs	(C) Male entrepreneurs	(D) Female entrepreneurs
Own experience	-37.495* (28.891)	-4.267 (6.281)	-36.721** (14.460)	-14.920 (22.257)
Opponents' experience 1	22.163** (7.285)	1.218 (3.600)	13.648** (7.143)	8.206* (6.115)
Opponents' experience 2	27.115*** (8.317)	-3.5801 (4.184)	3.352 (8.201)	30.948*** (6.991)
Risk aversion	-25.540** (9.615)	-4.348* (2.421)	-2.340 (3.136)	-8.898 (8.630)
Constant	182.012** (61.403)	75.502*** (15.476)	84.071*** (18.561)	90.525* (54.785)
$\sigma_u$	45.045*** (11.650)	17.431*** (2.550)	17.703** (5.733)	45.466*** (9.268)
$\sigma_e$	36.026*** (2.675)	26.236*** (1.268)	32.113*** (2.382)	39.688*** (2.229)
$\rho$	0.610 (0.124)	0.188 (0.459)	0.233 (0.117)	0.568 (0.101)
$\chi^2$	19.25	5.68	11.96	23.33
Number of observations	192	640	128	304
Number of subjects	12	40	8	19

Dependent variable = entry

Random-effects specification = subject id

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.10$

(A). Male non-entrepreneurs show a negative effect of own gain experiences on entry while they exhibit positive effects of opponents' gain experiences. This pattern is consistent with hypotheses 5 and 6 and with the assumption that participants use social projection to form beliefs about their opponents' reactions to prior gains and losses. Furthermore, male non-entrepreneurs show a negative effect of risk aversion on entry probability.

(B). Female non-entrepreneurs neither show a significant effect of their own or of their opponents' gain and loss experiences. Thereby, their none-response to own experiences can explain their none-response to opponents' experiences: given that female non-entrepreneurs themselves do not react to own prior gains and losses, it is plausible to assume that they lack an intuition or emotional insight on the effect – and specifically, of the direction of this effect – that prior gains and losses might have on their opponents. Thus, they appear to have a hard time coming up with a behavioral model of their opponents. Furthermore, risk aversion has a negative effect on their entry probability.

(C). Male entrepreneurs show a negative effect of own gain experiences, consistent with hypothesis 5. Furthermore, they show a positive reaction to opponents' gain experience (hypothesis 6), whereby this effect is only significant for the first counterparts' experience. This pattern is similar to that exhibited by male non-entrepreneurs; however, male entrepreneurs are more influenced by their own than by opponents' experiences. This pattern is consistent with the “inside view” (Kahneman and Lovallo 1993). Having an “inside view”, people focus on the case at hand and consider what they know about this case when making a decision. In contrast, an “outside view” would involve focusing on statistics of a class of cases chosen to be similar to the current situation. Koellinger *et al.* (2007) argue that entrepreneurs tend to base their choices on the predictions generated by the inside view and



thus on subjective perceptions. Our result on male entrepreneurs is line with this argument, showing a tendency of male entrepreneurs to react more to their own than to their opponents' experiences.

(D). Female entrepreneurs, like female non-entrepreneurs, do not show significant reactions to own pre-game experiences; however, like male entrepreneurs and male non-entrepreneurs they enter significantly more when playing against opponents with a gain experience as compares with rounds when playing against opponents with a loss experience. It appears that female entrepreneurs have fewer difficulties in systematically reacting to their opponents' gains and losses even though they themselves do not react to pre-game gains and losses systematically. Furthermore, the direction of their response to opponents' experiences equals that of male entrepreneurs and male non-entrepreneurs. Hence, it is plausible to assume that their reaction to opponents' experiences is driven by a (correct) intuition of how their (potentially male) opponents will react to gains and losses. Such an intuition can be either trained by their experience to compete in a male dominated environment, and it could be a result of self-selection mechanism leading only those women to enter an entrepreneurial activity that have fewer difficulties in forming beliefs about the actions of – mainly male – environment.

A further result strengthens this line of argumentation: female non-entrepreneurs use mixed strategies much more often than male non-entrepreneurs. Table A.1 in the appendix shows that the effect of being a woman on the likelihood of using a mixed strategy is significant and positive while being a female entrepreneur significantly reduces the likelihood of using a mixed strategy. This pronounced mixing behavior indicates a potential insecurity of female non-entrepreneurs about their entry decision. This insecurity might plausibly arise from their own none-response to pre-game gains and losses and from a resulting lack of intuition about the possible reactions of their opponents to such experiences. The result that female entrepreneurs mix less often than other women supports the above finding that female entrepreneurs appear to be less insecure about their decision and have fewer difficulties to respond to a competitive environment.

#### 4.4 Profits

Analyzing the outcomes of the different sub-groups, we compare their average profits from the market entry game measured in experimental units (1 experimental unit equals 6 Euro for the non-entrepreneurs and 24 Euro for the entrepreneurs). Accumulated across 16 rounds, male non-entrepreneurs make an average gain of 0.93 experimental units (SD: 2.70), female non-entrepreneurs make an average loss of -0.11 experimental units (SD: 2.48), male entrepreneurs make an average profit of 0.38 experimental units (SD: 2.13), and female entrepreneurs' make an average loss of -0.09 experimental units (SD: 1.72). These results show a tendency of male participants to achieve higher profits than female participants – men's average profits were positive, while women's average profits were negative -, however, these differences did not reach statistical significance.

## 5 Discussion

The results on gender- and occupation-specific differences in entry behavior reveal a complex pattern so that the decision on our hypotheses 1, 2 and 4 is not straightforward. Hypothesis 1 (entrepreneurs enter more than non-entrepreneurs) is only supported because of pronounced entry of male entrepreneurs into the experimental market. The same reason holds for the support for hypothesis 2 (women enter less often than men); it is the male entrepreneurs that drive these findings. Hypothesis 4 (the entry gap is smaller between male and female entrepreneurs as compared to male and female non-entrepreneurs) has to be rejected. Indeed, the expected relationship reverses when looking at our experimental data. Specifically, female entrepreneurs enter the market much less often than male entrepreneurs and not more often than other women (hypotheses 3) while there is no significant entry gap between male and female non-entrepreneurs. Hence, while male entrepreneurs show a pronounced willingness to take strategic risk and to engage in strategic competition, female entrepreneurs do not. They seem to dislike strategic competition as much as other women and thus appear to belong to a different ‘species’ than male entrepreneurs.

An analysis of reactions to own and others’ experiences improves our understanding of the entry behavior of female entrepreneurs: On the one hand, like other women, female entrepreneurs do not show systematic reactions to own gain and loss experiences. On the other hand, like male entrepreneurs, female entrepreneurs enter more when playing against opponents with a gain experience than when playing against opponents with a loss experience, while female non-entrepreneurs do not show systematic reactions to their opponents’ experiences. While men’s reactions to opponents’ experiences can be explained by social projection – like proposed by Schade *et al.* (2010) – female entrepreneurs appear to base their (appropriate) reactions on an acquired or native intuition of the reactions of their opponents to gains and losses. This differentiates them from female non-entrepreneurs who appear to lack such an intuition. This result is in line with findings based on survey data from the Global Entrepreneurship Monitor showing that female entrepreneurs share entry relevant perceptions with male entrepreneurs (Koellinger *et al.* 2011), demonstrating the suitability of economic experiments and their complementarities with other research methodologies for better understanding entrepreneurship and occupational choice. Although some effects reach only marginal significance in the overall regression, mean comparisons and separate regressions on the sub-groups show pronounced behavioral patterns. Together the overall and sub-group regressions draw a clear picture. We have tentative support for hypotheses 5 and 6. Female entrepreneurs take a special role as they react to own gains and losses like other women but react to gains and losses of others in the same way as male entrepreneurs and non-entrepreneurs.

The most important finding is that female entrepreneurs enter the experimental market far less often than male entrepreneurs. This unexpected result indicates that even those women who did decide for an entrepreneurial activity dislike this form of competition. Hence other factors might determine the occupational choice of these women, apparently outweighing their dislike of the competitive aspects of their occupation. This might be consistent with female

entrepreneurs choosing to be active in other industries than male entrepreneurs (e.g., Koellinger *et al.* 2011). All together female entrepreneurship appears to be a special type of activity that cannot be easily subsumed under entrepreneurship in general and deserves attention as an important research domain.

## 6 Conclusion

We experimentally investigate gender differences with entrepreneurs and non-entrepreneurs in a realistic, i.e., asymmetric market-entry scenario with pre-game gain and loss experiences. We find that female entrepreneurs enter the experimental market significantly less often than male entrepreneurs and not more than other women. We interpret this result as indicating that even female entrepreneurs dislike strategic competition. This finding is robust when integrating risk attitudes in the analysis. Our results show how important is a close look at female entrepreneurship as a rare phenomenon in occupational choice.

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## Appendix

### Appendix 1. Tables

**Table A1. Random-effects Logistic Regression,  
Effects on Likelihood to Play Mixed Strategies**

Mixed strategy (0/1)	Coeff. (Std. Err.)
Entrepreneur (0/1)	2.354*(1.353)
Female (0/1)	1.805*(0.954)
Female*entrepreneur (0/1)	-3.760**(1.585)
Risk aversion	-0.242 (0.226)
Constant	1.887 (1.520)
ln $\sigma^2_u$	1.980 (0.254)
$\sigma_u$	2.691 (0.342)
$\rho$	0.688 (0.055)
$\chi^2$	7.64
Number of observations	1264
Number of subjects	79

Dependent variable = use of mixed strategy (0/1)

Random-effects specification = subject id

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.10$

## Appendix 2. Instructions

Explanations of experimental procedures are added in *italics*. All payoffs were scaled up by a factor of 4 for the entrepreneurs (respective values are marked by a \*). The values in parentheses varied depending on the participant's own result and the result of their opponents in the lottery.

*Upon arrival at the experimental laboratory participants were paid a participation fee of 14 Euro\* in cash. After being seated at their computer desks, and before beginning with the actual experiment, they received the following information:*

### Instructions:

Welcome to our experiment!

Lottery

We will now conduct a lottery with the following features:

There are 12 balls with numbers from 1 to 12 in a bingo cage. They will be drawn without replacement, i.e., once drawn a ball will not be placed back into the cage.

A draw of a ball with the numbers 1-6 will result in a gain of 6 Euro\* for you.

A draw of a ball with the numbers 7-12 will result in a loss of 6 Euro\*.

The draws will take place in private at each participant's seat and will only be seen by that participant.

The experimenter will now conduct the random draws. Please wait until the experiment continues.

*The individual lotteries were then conducted using a bingo cage and the respondents were informed about their outcome (gain or loss).*

### Instructions:

Your ball has the number  $\{X\}$ . Hence, you *{won / lost}* 6 Euro\*.

You are now starting with the experiment.

Please note:

- You will receive a payment at the end of this experiment. Your payment depends on your own decisions in this experiment and on luck.
- The experiment consists of several rounds.
- You will not receive feedback on the results after each round. Instead, a summary of the all results will be provided at the end of the experiment.
- Out of all rounds, one round will randomly be selected. Your result in this randomly chosen round will then be paid out to you.
- At the end of the experiment, your payment will be settled.
- You will find a red button at the bottom of each screen. When you have understood and completed all tasks on that screen, press to continue.
- All information is anonymous and will be kept confidential.

Good luck.

In the following, you will play a three-player game. Your opponents will change from round to round as randomly determined by the computer.

Reminder: You have *{won / lost}* 6 Euro\* in the lottery that was played before the experiment. This money will be *{added to / subtracted from}* your payment at the end of the experiment. Thus, your current account balance is *{- 6 Euro\* / + 6 Euro\*}*.

You and your two opponents have the choice of entering a market with limited demand. If all three of you decide to enter the market, everyone will suffer a loss of 6 Euro\*. If two of you decide to enter the market, the two entering players as well as the player not entering will receive 0 Euro. If only one of you decides to enter the market, he receives 6 Euro\* and the other two players who did not enter receive 0 Euro. If none of you decide to enter the market, all three players receive 0 Euro.

In the lottery at the beginning of the experiment, your two opponents in this round had the following results:

One of your opponents *{suffered a loss/ gained a profit}* of 6 Euro\*.

Your other opponent *{suffered a loss/ gained a profit}* of 6 Euro\*.

Your decision:

You will make your decision using of a virtual raffle drum. You will decide about the tickets in this drum. You can fill it with a total of 100 tickets (Entry tickets and NoEntry tickets). If an Entry ticket is drawn, you will enter the market. If a NoEntry ticket is drawn, you will not enter the market. Please, specify the content of the drum by stating the number of Entry and NoEntry tickets to be included:

Please indicate the number of Entry tickets to be placed in the drum: \_\_\_\_\_

Please indicate the number of NoEntry tickets to be placed in the drum: \_\_\_\_\_

*Subsequently, multiple rounds with changing opponents were played. To ensure that participants noticed that conditions changed from round to round, the following screen was shown before to each round.*

Attention: In this round, the conditions of the game have changed. Please pay close attention to the information concerning the outcomes.



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