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Overconfidence and excess entry: a comparison between students and managers

A. Felipe Rodrigues
Federal University of Santa Catarina

Newton Da Costa Jr
Federal University of Santa Catarina

Sergio Da Silva
Federal University of Santa Catarina

Abstract

Overconfidence can lead to excessive business entry. Here we replicate the pioneer experiment finding this nexus (Camerer and Lovallo 1999) and extend it in two major directions: (1) to consider managers as well as student subjects and (2) to explicitly take into account selected characteristics of the manager subjects. We find that managers are more prone to the nexus overconfidence-excess entry than students are. In particular, we find that left-handed, married, and emotionally aroused managers are more prone to excess entry.

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Contact: , Sergio Da Silva - professorsergiodasilva@gmail.com.
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1. Introduction

Perhaps the most robust finding in the psychology of judgment is that people are overconfident (DeBondt and Thaler 1994), and no other problem in judgment in decision-making is more prevalent and more potentially catastrophic than overconfidence. However, overly positive self-evaluations, exaggerated perceptions of control or mastery, and unrealistic optimism are characteristic of normal human thought (Taylor and Brown 1988). For example, people tend to believe they are all less risky and more skillful than their fellow drivers (Svenson 1981).

That entrepreneurs and managers in particular are overconfident is well established (Cooper *et al.* 1988, Busenitz and Barney 1997, Delong *et al.* 1991, Daniel *et al.* 1998, Odean 1998, Bernardo and Welch 2001). Overconfident investors systematically overestimate the precision of their own knowledge and skills, and this implies that they are wrong most of the times when they are confident that they are right (Fischhoff *et al.* 1977). Whenever investor confidence outweighs investor accuracy, financial markets overtrade, under-react to information (Kim and Verrecchia 1991), and become more volatile (Benos 1998). Evidence of overconfidence in questionnaires can be detected whenever the proportion of accurate judgments made by subjects is surpassed by their expected subjective probability of being correct (Gigerenzer *et al.* 1991).

Moreover, most people are future oriented (Gonzales and Zimbardo 1985), and optimism pervades people's thinking about the future (Tiger 1979, Brickman *et al.* 1978, Free and Cantril 1968). However, because not everyone's future can be rosier than their peers,' the extreme optimism that people display ends up unrealistic (Taylor and Brown 1988). Optimistic managers believe that the expected net present value of potential projects is greater than it actually is. Similar to overconfident managers, optimistic managers undertake projects more quickly than do unbiased managers. But unlike overconfident managers, optimistic managers may undertake projects that actually have negative expected net present values (Gervais *et al.* 2004).

Overconfidence and unrealistic optimism may be related to entry and exit rates across industries. Entry and exit rates at one point in time are highly correlated across industries so that industries with higher than average entry rates also tend to have higher than average exit rates (Dunne *et al.* 1988). Overconfidence may cause optimistic overentry (Roll 1986), and such business entry mistakes have been experimentally tested by measuring economic decisions and personal overconfidence simultaneously (Camerer and Lovallo 1999). In the Camerer-Lovallo experimental setting, which replicates the basic features of business entry situations, the success of entering student subjects depended on their relative skills compared to that of other entrants. They found that most subjects who enter think the total profit earned by all entrants will be negative, but their own profit will be positive. Such results are thus consistent with the prediction that overconfidence leads to excessive business entry.

Here we replicate the Camerer-Lovallo experiment and further extend it in two major directions: (1) to consider managers as well as student subjects and (2) to explicitly take into account selected characteristics of the manager subjects, including "biological" ones, following a recent trend in literature (Zindel *et al.* 2010, Moreira *et al.* 2010, Da Silva *et al.* 2012).

The rest of the paper is organized as follows. Section 2 describes the methods employed, Section 3 shows the results, and Section 4 concludes the study.

2. Methods

Following Camerer and Lovallo (1999), n players choose simultaneously, and without communicating, whether or not to enter a market. The market size is set by a preannounced number, c. If the players stay out, they earn a payment K. If the total number of entrants is E, the entrants each earn $K + rK(c - E)$, where $r \in (0,1)$ weighs the prize value and is set constant throughout the game, and so $rK > 0$. Behavior is optimal if the players wish to enter only if the number of expected entrants is less than the capacity c. If they do enter, the players prefer the number of entrants to be as small as possible.

The payoffs also depend on a subject's rank relative to the other entrants. Ranks depend on either chance or managerial skills, which are assessed through a previous questionnaire. Thus, there is a skill rank along with a random rank.

We consider five sessions of 24 rounds each (Camerer and Lovallo considered eight sessions). Similar to Camerer-Lovallo, 12 rounds take into account the skill rank and 12 consider the random rank. Thus, we take 60 skill rounds and 60 random rounds in total. As for the subjects, 67 individuals participated, including undergraduate economics students (26), graduate economics students (15), and managers (26). Table 1 shows more details. (Camerer-Lovallo considered 110 student subjects: 82 undergraduates and 28 MBA students.)

Table 2 shows the selected characteristics of the managers, which were gathered through a questionnaire previously distributed to them.

At the end of each round, the subjects were asked to inform their forecasts regarding the quantity of next round's entrants (including themselves). As in Camerer-Lovallo, this aims to detect whether the forecasts distinguish the hypothesis that too many subjects enter because they underestimate the number of competitors ("blind spots") from the hypothesis that subjects forecast entry accurately but the entrants all think they are above average. As for the other details of the experiments, we closely follow Camerer-Lovallo.

3. Results

We consider the same rank-based payoffs for successful entrants as a function of market size as in Camerer-Lovallo (Table 3). The rank-based condition assumes risk neutrality. In Table 3, if the market capacity $c = 2$, the highest-ranked entrant receives \$33, the second highest-ranked entrant receives \$17, and any lower-ranked entrant loses \$10, because the subjects are staked \$10 initially. In contrast, a random-rank condition gives an empirical estimate of observed equilibrium without imposing any assumptions of risk aversion.

The first result found was that there is more entry (and lower industry profit) when the subjects are betting on their own relative skill rather than on a random decoy. In the majority of the random-rank rounds in our experiments, 80 per cent (that is, 48/60) of the industry profit is strictly positive, and the total profit is negative only in 8 rounds (13 per cent). The average industry profit (that is, the sum of the subjects' profits each round divided by the number of rounds) in the random-rank rounds is \$23.28. In contrast, in the skill-ranked rounds the industry profit is strictly positive in 39 rounds (65 per cent) and negative in 16 rounds (26 per cent). The average profit across the skill-ranked rounds is \$17.71. The difference in average profits between the two conditions is \$5.56. This means that at each 2 skill-rank round about one participant experiences losses. In 41 (out of 60) random-rank rounds the industry profits surpass those of the skill-rank rounds. Overall, our results are quite similar to those of Camerer-Lovallo.

The results of a significance t test between the profits each round in both the skill- and random-rank conditions for each market size show a coefficient 0.73, which means that a \$1-profit increase in the random-rank rounds corresponds to a \$0.73 increase in the skill-rank rounds.

The second result found was that reference group neglect makes the overconfidence effect stronger, thereby confirming Camerer-Lovallo. In the sessions with undergraduates (experiments 3 and 4), the average per-round industry profit was \$26.62 and \$20.37 for the random- and skill-rank conditions respectively. This means a difference of \$6. In the sessions with graduate students (experiments 1 and 2), the profit was \$30.04 for the skill-rank rounds and \$39.08 for the random-rank rounds. The difference of \$9.04 means about one extra entrant in the skill-based rounds. In the sessions with managers (experiment 5), the average per-round industry profit was negative in the random condition: −\$13.33. In the skill condition, the loss was −\$20.00. Table 4 shows the results for experiments 1 to 5 regarding several rounds.

Now we test whether we can dismiss the blind spots hypothesis referred to earlier that excessive entry in the skill conditions may be due to players underforecasting how many others will enter. Following Camerer-Lovallo, we use subject *j*'s forecast F_{ijt} to compute the profit that subject *j* expects the average entrant to earn in round *t* of experiment *i*. If the market capacity is c_{it} in that particular period, the amount of profit subject *j* thinks the average entrant will earn, that is, the "expected average profit" is given by

$$E_j(\pi_{ijt}) = \frac{50 - 10(F_{ijt} - c_{it})}{F_{ijt}}.$$

For the details on how the method above effectively separates the blind spots from the overconfidence hypothesis, see the original work by Camerer and Lovallo (1999).

If the entering subjects are more overconfident in the skill-rank rounds, $E_j(\pi_{ijt})$ will be smaller than in the random-rank rounds because the skilled expect to earn more than the average entrant. Thus, the skilled are willing to enter even when the expected average profit is low. Table 5 presents the differences between expected average profits in random-rank rounds (E_r) and in skill-rank rounds (E_s). Three different measures are considered for each session: (1) the mean difference $\pi_r - \pi_s$ averaged across the entering subjects, (2) the number and percentage of subjects who expect less average profit in skill periods, and (3) the number and percentage of subjects with negative profit on average across skill periods. Table 5 shows that roughly 70 per cent of the subjects expect to earn less in skill periods, but only 9 per cent actually expect losses in skill periods. Thus, the majority of the subjects decide to enter despite the fact that they expect losses in the skill-rank rounds. As Camerer and Lovallo observe, here most subjects seem to think: "I expect the average entrant to lose money, but not me."

Table 6 shows the results of a binary logit regression of entry decisions. The dependent variable is subject *j*'s 0-1 entry decision (enter = 1) in round *t* of experiment *i*, D_{ijt}. As can be seen, market size positively influences the entry decision. As in Camerer-Lovallo, when the subjects expect high average profit, they enter less often (that is, $E(\pi_{ijt})$ has negative sign), a result somewhat intriguing. Most importantly, however, the effect of the skill-rank variable increases as an experiment includes more subjects. For instance, in experiment #5, which involves all types of subjects, the *z*-statistic is 2.49. The dummy variables graduates and managers have positive sign, thus suggesting that being either a graduate or a manager increases the chances of a subject to entry.

Table 7 shows the results of a binary logit regression of entry decisions of the managers in particular, considering the dummy variables lefthander (= 1), married (= 1), emotional anxious state (= 1), university degree (= 1), age below 25 (= 1), and father/mother (= 1). The results suggest that those who are more prone to enter are lefthanders, married (despite the low *z*-statistic), emotionally excited, and aged above 25. The standard deviations (not shown) fall below 0.7, and in particular, age and emotional state present the lesser standard deviations.

4. Conclusion

We replicate the findings of Camerer and Lovallo (1999) with a distinct sample in time and space and inclusion of managers as well as students. We also pay particular attention to some characteristics of managers. Thus, we find that most subjects who enter a market think the total profit earned by all entrants will be negative, but their own profit will be positive. The majority of the subjects seem to think: “I expect the average entrant to lose money, but not me.” As a result, overconfidence leads to excessive business entry. Managers who enter also tend to be lefthanders, married, emotionally excited, and aged above 25.

Table 1. Description of the experiments

Experiment #	*Sample*	*n*
1	Graduate students	8
2	Graduate students	7
3	Undergraduates	9
4	Undergraduates	17
5	Managers	26

Table 2. Profile of the managers (*n* = 26)

Characteristic	*Quantity*
Business with more than 10 employees	9
Married	14
Average age	34
Have children	13
Lefthanders	2
With a university degree	13
Negative experience as an entrepreneur	9
In an anxious emotional state	18

Table 3. Rank-based payoffs for successful entrants as a function of market size, $

	Market size, c			
	2	4	6	8
Rank				
1	33	20	14	11
2	17	15	12	10
3		10	10	8
4		5	7	7
5			5	6
6			2	4
7				3
8				2

Table 4. Reference group neglect makes the overconfidence effect stronger

	Profit for the random-rank condition													
	Rounds													
Experiment #	*n*	1	2	3	4	5	6	7	8	9	10	11	12	Total
1	8	40	50	20	50	30	30	35	43	40	48	45	40	471
2	7	40	48	20	35	30	43	40	43	30	48	50	40	467
3	9	20	48	50	30	40	50	20	48	40	48	45	40	479
4	17	20	10	30	20	10	0	20	0	20	0	20	10	160
5	26	−40	−20	−50	0	−60	20	−10	30	−30	−30	−10	40	−160
	Profit for the skill-rank condition													
	Rounds													
Experiment #	*n*	1	2	3	4	5	6	7	8	9	10	11	12	Total
1	8	20	40	30	40	40	40	45	20	50	0	30	30	385
2	7	20	50	20	30	0	40	30	−10	30	48	45	33	336
3	9	−10	43	50	35	0	43	40	43	0	45	40	20	349
4	17	−10	−20	−10	10	10	0	30	30	20	50	−10	40	140
5	26	0	−30	−80	−40	−20	−20	−10	30	0	−20	−30	−20	−240

Table 5. Average difference in expected profits per entrant between the random and skill conditions

Experiment #	1	2	3	4	5	
Measure						Total
$\pi_r - \pi_s$	1.083	1.768	0.303	−1.758	−1.201	0.039
Subjects with $\pi_r - \pi_s < 0$	3/8	4/7	4/9	15/17	21/26	47/67
	37.5%	57.1%	44.4%	88.2%	80.8%	70.1%
Subjects with $\pi_s < 0$	0/8	0/7	1/9	2/17	3/26	6/67
	0%	0%	11.1%	11.8%	11.5%	9%

Table 6. Binary logit estimation of entry decisions (experiments 1–5, *n* = 1608)

Dependent variable: entry = 1			
Variable	*Estimate*	*z-statistic*	*p-value*
Intercept	−0.3185	−2.4549	0.0141
Market size	0.1142	6.2066	0.0000
$E(\pi_{ijt})$	−0.0411	−6.3204	0.0000
Skill-rank	0.1281	1.6765	0.1387
Dummy graduate	0.5686	4.0345	0.0001
Dummy manager	0.8555	5.2453	0.0000

Chi-square: 1061.11 *p*(chi-square): 0.0000 Log-likelihood: −1061.36 Restr. log-likelihood: −1013.46

Table 7. Binary logit estimation of managers' entry decisions (experiment 5, *n* = 264)

Dependent variable: entry = 1			
Dummy variable	*Estimate*	*z-statistic*	*p-value*
Intercept	2.3105	1.8386	0.0660
Lefthander	2.2384	3.3224	0.0009
Married	0.4483	0.8736	0.3823
Emotional anxious state	−0.5551	−3.5858	0.0003
University degree	−0.6053	−1.4907	0.1360
Age below 25	−0.0750	−2.4348	0.0149
Father/Mother	0.4767	0.9114	0.3621

Chi-square: 22.71 *p*(chi-square): 0.0009 Log-likelihood: −167.54 Restr. log-likelihood: −181.90

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