Intergenerational Attitudes Towards Strategic Uncertainty and Competition: A Field Experiment in a Swiss Bank

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Abstract: With a market entry game inspired by Camerer and Lovallo (1999), we study the attitudes of junior and senior employees towards strategic uncertainty and competition. Seniors exhibit higher entry rates compared to juniors, especially when the market capacity is not too low or when earnings from entry depend on relative performance. This difference persists after controlling for attitudes towards non-strategic uncertainty and for beliefs on others' competitiveness and on relative ability. Seniors are more willing to compete when they predict a higher number of competitors. This contradicts the stereotype of less competitive older employees.

JEL-codes: C91, D83, J14, J24, M5

Keywords: Aging, risk, ambiguity, competitiveness, confidence, experiment

[a] University of Fribourg, Bd de Pérolles 90, CH-1700 Fribourg, Switzerland. E-mail: thierry.madies@unifr.ch.
[b] University of Lyon, F-69007, Lyon, France; CNRS, GATE Lyon St Etienne, 93, Chemin de Mouilles, F-69130, Ecully, France. E-mail: villeval@gate.cnrs.fr

[c] University of Fribourg, Bd de Pérolles 90, CH-1700 Fribourg, Switzerland. E-mail: malgorzata.wasmer@unifr.ch

Acknowledgments: The authors are particularly indebted to the Crédit Suisse for allowing them to run this field experiment, particularly Daniel Python and Anne Ray. They thank the participants and François Magnenat for his assistance. They are also grateful for comments from the editor and two anonymous reviewers and also from L. Goette, A. Hopfensitz, R. Lalive, S. Robin, L. Santos-Pinto, F.C. Wolff and participants at a seminar at the University of Lausanne, at the Fourgeaud seminar in Paris, and at the BEE workshop Toulouse School of Economics - GATE. They also thank S. Ferriol for programming the experiment and A. Brut, T. Bjedov, S. Schnyder, E. Spring and S. Lapointe for research assistance. Financial support from the Research Funds Foundation of the University of Fribourg is gratefully acknowledged.

1. INTRODUCTION

Older workers have a lower employability notably due to a devaluation of their accumulated experience (Chan and Stevens, 2001; Boersch-Supan, 2003; OECD, 2004) and to the belief that they are less adaptable (Taylor and Walker, 1998; Nelson, 2002; MacDonald and Weisbach, 2004). The new knowledge-based organizations require decision-making skills and abilities to cope with uncertainty in more volatile environments, for which the impact of age remains unclear.

On the one hand, some studies show that older people use heuristics leading to more suboptimal choices than younger people in situations with multiple options (Finucane *et al*., 2002; Agarwal *et al*., 2010; Abaluk and Gruber, 2011; Besedes *et al*. 2012). There is also some evidence that older adults are more risk-averse when choosing insurances (Halek and Eisenhauer, 2001) or when investing in stocks (Hunter and Kemp, 2004; Jianakoplos and Bernasek, 2006). Mather *et al*. (2012) find that they weigh certainty more than young adults. On the other hand, it has been shown that seniors are no more risk averse than juniors when facing lottery choices (Charness and Villeval, 2009) and that they are less ambiguity-averse (Sproten *et al*., 2010). Wang and Hanna (1997) also found that seniors' portfolios contain a higher share of risky assets.

If these studies deliver contrasted results on the preferences of juniors and seniors toward environmental risk (when the probabilities of events are known) and uncertainty (when these probabilities are unknown), the difference of attitudes toward *strategic* risk and uncertainty (regarding the actions and beliefs of others) is less explored. Yet, many important economic decisions involve strategic uncertainty, from contributing to a public good to voting or investing in entrepreneurial activities. From a cognitive perspective, it has been shown that the seniors' cognitive abilities in strategic reasoning are not deteriorated (Kovalchik *et al*., 2005; see also

MacPherson *et al*., 2002; Hadi Hosseini *et al*., 2010; Mohr *et al*., 2010). Concerning the relation between strategic risk and uncertainty and competition, we are aware of only two economic studies. While Garatt *et al*. (2013) find that older runners have a lower propensity to compete in highly competitive elite races, Charness and Villeval (2009) find that older employees respond to competition as strongly as younger employees as soon as they opt for entering a two-person tournament instead of choosing a piece-rate payment scheme.[1]

In this study we investigate whether younger and older adults (named "juniors" and "seniors" hereafter for simplicity) differ in their attitudes toward strategic uncertainty when their chance of succeeding in a competitive environment depends either on a random draw or on their ability relative to that of the other players. We also investigate the reasons explaining these attitude differences. To this purpose we conducted an artefactual field experiment using the standard techniques of laboratory experiments with a non-standard pool of participants. This experiment was run with employees of a Swiss bank holding the same occupation (relationship managers) but belonging to different age categories.

Our design is inspired by the market entry game of Camerer and Lovallo (1999), adjusted to study the differences in strategic risk-taking between age categories and complemented by measures of confidence. The players make market entry decisions knowing the composition of their group of ten players in terms of age categories. Given a limited market capacity, only well-ranked players can realize profits by entering the market, while entry beyond the capacity entails a loss. Depending on the "Random" or "Performance" treatment, the rank of entrants is assigned either randomly or according to the players' relative performance in a quiz. This design allows us to study the behavior of people facing strategic uncertainty, and whether entry depends on one's

[1] A negative link has also been found between aging and entrepreneurship (Levesque and Minniti, 2006). For a survey of studies on the aging workforce from a business management perspective, see Streb *et al.* (2008).

attitudes toward uncertainty in general, on beliefs on others' competitiveness and on relative ability. We analyze whether juniors and seniors differ in their decisions and beliefs and how they react to the manipulation of the age composition of the groups of potential competitors.

Market entry games have typically several pure asymmetric Nash equilibria, but also symmetric and asymmetric mixed equilibria, making coordination difficult. When these games are tested in the laboratory with students, players play rarely the equilibrium strategies, although a greater number of repetitions or a larger set of information allows some learning (Erev and Rapoport, 1998; Ochs, 1998; Duffy and Hopkins, 2005; see also the recent choice prediction competition for market entry games by Erev, Ert and Roth, 2010). Camerer and Lovallo (1999) also found evidence of overconfidence about relative ability as players enter significantly more when ranking depends on relative ability instead of a random draw. Our results obtained with a non-standard subject pool are consistent with these previous findings.

We also find that seniors enter the market significantly *more* often than juniors when ranking depends on performance and when ranks are randomly assigned if the market capacity is not too small. Yet, both groups exhibit similar attitudes toward non-strategic uncertainty and perform similarly well in the quiz. Several dimensions explain this gap. Seniors tend to underestimate the willingness of others to compete. But the higher the number of predicted entrants *beyond* market capacity, the more they compete. We interpret this in terms of social signaling.[2] Players of each generation enter in a greater number in the Performance than in the Random treatment. However, for seniors this only occurs when the market capacity is low and the competition is potentially fiercer. Once we account for risk preferences and beliefs on relative ability and on others' competitiveness, we still find that seniors are more likely to compete than juniors. Since for some

[2] Burks *et al*. (2010) suggest that people might behave overconfidently in order to signal a positive image of themselves to others. See also Benabou and Tirole (2002).

market capacities entry is always rational, this suggests that seniors had a better judgment of the situation on average, while juniors used (weakly) dominated strategies more often.

The remainder of this paper is organized as follows. Section 2 presents our experimental design, predictions and procedures. Section 3 develops our results. Section 4 discusses these results and concludes.

2. EXPERIMENTAL DESIGN AND PROCEDURES

2.1. Design of the experiment

The market entry game

Our market entry game is largely inspired by Camerer and Lovallo (1999).[3] Each player is initially endowed with 500 ECU to avoid any net loss. The game consists of two sequences of nine periods each. Each sequence corresponds to one of two treatments: the "Random" and the "Performance" treatments. The order of treatments was counterbalanced across sessions.

Let us describe the Random treatment first. At the beginning of each period, participants are teamed in groups of ten and they are informed on the number of juniors and seniors in their group.[4] The number of players from a generation can be 0, 3, 5, 7 or 10.[5] Players also learn the capacity of the market (c=2, 4 or 6), i.e. the maximum number of players who can make profits by entering the market. Payoffs depend on the market capacity, on the entry decision and on the rank among the entrants, as shown in Table 1. A participant who does not enter earns nothing and loses nothing. The top c entrants share 3000 ECU, with higher earnings accruing to higher-ranked

[3] The differences with their entry game are the number of players, the information on the distribution of group members in terms of generation, the payoff matrix, the number of periods, the task used to elicit performance.

[4] We cannot exclude that revealing the generation of the players in the group may have focused their attention on this dimension. Running all-senior sessions, all-junior sessions and generation-mixed sessions would have ensured more neutrality. However, we were limited in the number of sessions that we could conduct in the firm.

[5] Due to time constraints, we could not observe each participant's decisions for each market capacity with each group composition in each sequence. Therefore, while all participants are observed in groups with 5 juniors and 5 seniors, and with 10 juniors or 10 seniors, half of them are observed in groups with 3 juniors and 7 seniors and the other half in groups with 7 juniors and 3 seniors, for each market capacity.

entrants. All entrants who rank below the top *c* lose 500 ECU. Ranks are assigned randomly to the entrants by the computer program. After being informed on the market capacity and on the group composition, the players have to forecast privately the number of entrants among their group members, excluding their own decision. Then, they decide simultaneously on entering or not. At the end of a period, the only feedback is the total number of entrants. After each period, both the composition of the groups and the capacity of the market are modified.[6]

(*Insert Table 1 about here*)

The Performance treatment is similar to the Random treatment, except that entrants are ranked according to their relative performance in a quiz. Like in Camerer and Lovallo (1999), players took the quiz after the game and not before, so that entry decisions involve a very general a priori belief of players on their relative competence. Players only know that the quiz consists of four questions related to general economic knowledge.[7] When they take the quiz, the players have to indicate an answer and an interval of confidence for their answer (see details in Appendix 1). The quiz is incentivized.[8] The answers to the quiz determine the player's "demerit index". This index is calculated as the mean absolute difference between the correct answers and the player's answers (i.e., a lower index indicates more accurate answers). In the Performance

[6] Because of the limited number of periods, the combination of market capacity and group composition has been predetermined before conducting the experiment. The same combinations were imposed in all sessions.

[7] We chose a general economic knowledge quiz because we expected that the relationship managers in the bank would have a relatively comparable interest in this field regardless of their age, in particular because they self-selected in the same occupation. The actual performance does not differ between age categories (see below). The questions were: How many countries are members of OECD? What was the Swiss public debt as a percentage of GDP in 2009? What was the proportion of Swiss people with a high degree of satisfaction with life in general in 2006 (in percentage)? What was the share of Swiss exports (as percentage of total exports) to EU 27 in 2009? The players know that the answers can take any value between 0 and 100.

[8] For each question, the participant receives 100 ECU. If the correct answer falls outside of the interval defined by the player, the 100 ECU are lost. If not, the payoff is calculated as the difference between 100 ECU and the size of this interval. This procedure motivates people to give their best possible answer. An (under-) overconfident risk-neutral participant should indicate a (larger) narrower interval than a well-calibrated participant. Typically, tests of calibration require the players to report confidence intervals at the 10%, 50% and 90% levels and to predict their number of correct answers (Russo and Schoemaker, 1992; Juslin *et al*., 2000; Cesarini *et al*., 2006; Dargnies and Hollard, 2009). Other tests propose the players to bet on their knowledge (Fischoff *et al.,* 1977; Goodie A. S., 2005; Blavatskyy, 2009). Our procedure is perhaps less rich but it is simpler.

treatment, this index determines the ranking of entrants: the first rank is assigned to the entrant with the lowest index, the second rank to the second lowest index, etc.

The beliefs on the number of entrants indicate how players adjust their behavior to their perception of others' competitiveness. The comparison of entry decisions in the two treatments provides us with information on how the beliefs on relative performance influence behavior. If a player believes he will be better than another randomly chosen player, he should be more likely to enter in the Performance than in the Random treatment, for given market capacity and belief on the others' decisions. The design also identifies whether players condition their entry decisions on the others' generation.

At the end of the experiment, one period out of the 18 is randomly selected for payment. A player is paid 100 ECU if his forecast on the number of entrants in this period was accurate, plus his payoff from his entry decision. Entrants are informed on their rank in this period.

Measurement of risk attitudes and beliefs

In the first part of the sessions, before the market entry game is played, the players' attitudes toward non-strategic risk and uncertainty are elicited (see Fox and Tversky, 1995, and details in Appendix 1). Players make two sets of 20 decisions between accepting a certain payoff, which increases in each decision, and extracting a ball from an urn. The composition of the urn is common knowledge in the first set of decisions and unknown in the second set. The switching point from the lottery to the certain payoff in the first set indicates the subject's attitude toward risk and the difference in switching points between the risky and the ambiguous lotteries indicate their attitude toward uncertainty.[9] No feedback is given before the end of the session.

[9] A risk-averse (risk-seeking, resp.) player should switch to the certain payoff earlier (later, resp.) than a risk-neutral participant. An ambiguity-averse (-seeking, resp.) participant should switch for lower (higher, resp.) certain amounts in the second set of decisions than in the first set. This assumes that the subjects have the prior belief that the

In the fourth part of the sessions, once the entry game (part 2) and the quiz (part 3) have been completed, we elicit each participant's beliefs about his demerit index, the mean demerit index of juniors and seniors in the session, and his ranking in the quiz among the 10 participants of his generation and among the 20 participants in the session. Each correct belief pays 50 ECU. The answers inform us on the player's beliefs on his relative ability.[10] Moreover, if a player believes that the distribution of abilities is similar in the two groups, he should report a belief on his rank category in the group of 20 that is exactly twice the value reported in his age group of 10. Reporting an expected rank category in the group of 20 that is less than twice the value reported in the group of 10 indicates a belief that the players of the other age group are less able.

2.2. Predictions

The market capacity should influence the entry decision. Under the assumption of risk neutrality, there are several asymmetric Nash equilibria in pure strategy in which c+5 or c+6 players should enter the market in the Random treatment. For c=2 and c=4, the $c+6^{th}$ player is indifferent because his expected payoff from entering is 0. Above c+6 entrants, the expected payoff of entry is negative. With our parameter values, all risk-neutral players should enter when c=6, regardless of others' decisions since the expected payoff of entry is positive. When c=4, 9 or 10 players should enter, with the 10^{th} player being indifferent as the expected payoff of entry is null. Finally, when c=2, 7 or 8 players out of 10 should enter. Since it is not easy to coordinate in the absence of communication, we anticipate that the equilibrium play will be less frequent when c=2. However, risk- and ambiguity-averse players may be less willing to enter to avoid potential losses and to keep their initial endowment. We state the following hypothesis:

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ambiguous urn contains the same number of balls of each color, like in the first set of decisions. In case of multiple switches, we calculate the mean of the switching points to determine the player's attitude.

[10] Since reporting precise estimations is not easy, we propose categories of indices and ranks. Indices are grouped by five (0-5, 6-10, …) with a last large category (45 and more). Ranks are grouped by two (1-2, 3-4, …).

Hypothesis 1: Risk- and ambiguity-aversion reduces entry. If a generation has different attitudes toward risk and uncertainty than the other generation, their mean entry rates may differ.

We expect a higher predicted number of entrants above the market capacity to reduce the probability of a risk-neutral player to enter, since a fiercer competition reduces the expected profits from entry. This holds when c=2, i.e. when not all players enter in equilibrium.

Hypothesis 2: A higher expected number of entrants above the market capacity should reduce the entry of risk-neutral players when c=2. If the two generations hold different beliefs on others' entry decisions, their entry rates may differ.

Players who believe that their ability is close to the average should behave similarly in the Random and the Performance treatments. In contrast, those who are pessimistic on their relative ability should enter less in the Performance treatment, and optimistic beliefs should encourage players to enter more at least when c=2.

Hypothesis 3: Entry rates in the Performance treatment depend on the players' beliefs regarding their relative ability. If seniors and juniors hold different beliefs about their relative ability, their entry rates may differ in the Performance treatment.

Finally, if players have a group identity defined by their generation, their behavior may differ according to whether they interact with a majority of players from the same generation (in-groups) or a majority of players from the other generation (out-groups) (in social psychology, see Tajfel and Turner, 1979, and Kite and Smith-Wagner, 2002). If individuals have more social preferences with in-groups (see Chen and Li, 2009), they may be more competitive against out-groups than against in-groups. This leads to our last hypothesis.

Hypothesis 4: The composition of the group in terms of generations may influence the entry decision of players who have a group identity.

2.3. Procedures in the field

80 employees of a large private bank in Lausanne, Switzerland, participated in a total of four sessions.[11] 10 "juniors" (between 22 and 30 years old, mean=28) and 10 "seniors" (between 48 and 62 years old, mean=55) participated in each session, for a total of 40 juniors and 40 seniors.[12] All participants had the same occupation (relationship managers, i.e. clients' advisors) and 82.5% of them had no supervisory functions.[13] The Human Resources department recruited volunteers via emails and phone calls from 57 offices located in French-speaking cantons in Switzerland in order to minimize the likelihood that several people interacting daily at work would participate in the same session. The invitation mentioned participation in a scientific experiment initiated and managed by academic researchers during working time. The HR department was aware of not revealing the purpose of the experiment or details of the protocol. We can exclude the existence of a self-selection bias as only one person turned down the invitation.

We reconstituted an experimental laboratory in the bank thanks to our REGATE Mobile Lab (see Appendix 2). The experiment was computerized using the REGATE software. Upon arrival, participants drew a tag from a bag assigning them to a specific terminal. Before signing a consent form, they were reminded that decisions were anonymous, that no individual data would be communicated to the company, and that the earnings made during the session were funded by University research funds. The instructions for each part were distributed and read aloud after completion of the previous part (see Appendix 1). At the end of the session, participants received

[11] Crédit Suisse is a leading global financial services company, offering financial advice in private banking, investment banking, and asset management. It employs 49,900 employees in 405 offices in 55 countries.

[12] 48 years old as a cutout age for being considered as senior may seem too young to measure age. It was not possible to find a sufficiently large sample of older employees. That being said, the mean age of the players is higher (55). In many European countries, 48 years old is considered as a relatively old age to get a job on the labor market.

[13] A discussion with the HR department indicates that the senior relationship managers are not a special group of employees who would not have been promoted to higher positions because they were less competitive. There are several ladders in this occupation, corresponding to different business volumes and degrees of complexity of clients' portfolios. There is no reason to believe that these senior players had a different profile in terms of preferences toward risk.

a feedback on random draws in part 1 and on their payoffs in each part. They were informed on their demerit index and ranking in the quiz if they chose to be informed. Each session lasted between 110 and 120 minutes. On average, the participants earned CHF 45.08 (about €37.40), with a CHF 15 (about €12.45) show-up fee.[14]

3. RESULTS

3.1. Summary statistics

Table 2 shows descriptive statistics on the participants' characteristics, decisions, and beliefs by age category. Figure 1 displays the mean percentage of entrants by market capacity, age category, and treatment.

(*Insert Table 2 and Figure 1 about here*)

Table 2 indicates that the mean entry rate of seniors is higher than that of juniors both in the Random treatment (68.06% and 64.17%, respectively) and in the Performance treatment (70.83% and 60.56%, respectively). The difference in entry rate in the first period of the game (with c=4) –the only independent observation- is statistically significant only in the latter treatment (Mann-Whitney test, p=0.019). Figure 1 shows that the mean entry rate increases with the market capacity in each treatment and for each age category. While it always exceeds the market capacity, it is always lower than the equilibrium for risk-neutral individuals. Except when c=2 in the Random treatment, the mean entry rate of the seniors always exceeds that of the juniors.

3.2. Determinants of the entry decision

We explore the influence of five dimensions on the entry decision: *i*) the player's age category; *ii*) the players' preferences for risk and uncertainty in general; *iii*) their beliefs on the willingness

[14] We acknowledge that this represents a modest stake for bank employees. However, we must account for the fact that all participants were given a half-day leave to participate in the experiment. In a post-experimental questionnaire, we asked participants to rate the seriousness of their decisions on a scale graduated from 0 to 10. The average score is 8.83 for both generations, indicating that the game has been taken seriously.

of others to enter the market; *iv*) their beliefs on their relative ability in the Performance treatment; *v*) and the group composition in terms of age category. To study the influence of each dimension in general and on each generation separately, we have estimated individual random-effects Probit models of the decision to enter the market with session fixed effects to control for serial correlation within each session. Random-effects are justified as each player made 18 decisions. Tables 3a and 3b show marginal effects measured by five regressions when the market capacity is equal to 2 and when it is higher than 2, respectively, as the predictions differ in these two cases. Models (1) in each table pool the data from both treatments and both generations. Models (2) consider the sub-sample of juniors and models (3) the sub-sample of seniors. Models (4) and (5) report the estimates on the data from the Random treatment and from the Performance treatment separately, pooling the data from both generations.

The independent variables include dummy variables for the Performance treatment and for belonging to the older age category. The degree of risk preference is indicated by the number of the decision at which the player switched from the risky lottery to the certain payoff. The higher this number, the less risk averse is the player. The degree of ambiguity aversion is captured by a positive value of the difference between the switching points in the risky lottery task and in the ambiguous lottery task. The independent variables also include the player's belief on the number of entrants in his group. In the Performance treatment, the beliefs on relative performance are captured both by the expected rank in the quiz in one's age category and the belief that one is better than the other age category (*i.e.* the belief that one's rank among the 20 participants is less than twice one's rank in one's own age category). The influence of the group composition is measured by dummy variables indicating the presence of a majority of juniors and of a majority of seniors. We also include a time trend. Finally, all the regressions control for the player's gender and supervisory functions, and for multiple switches in the risk elicitation task.[15]

(*Insert Table 3 about here*)

The impact of generation. Ceteris paribus, Tables 3a and 3b show that the likelihood of entry is similar for juniors and seniors when the market capacity is low and it is 18.44% higher for seniors than for juniors when the capacity is medium or high (models (1)).[16] In the Random treatment (models (4)), being a senior increases the likelihood of entry by 14.02% when $c>2$ and in the Performance treatment (models (5)), it increases this likelihood by 28.02% when $c=2$ and by 23.87% when $c>2$.[17] Since the Nash equilibria in pure strategy state that all the players should enter when c>2 (with an indifferent 10th player when $c=4$), these results suggest that seniors dealt better with strategic uncertainty than juniors. This supports our first result:

Result 1. Seniors are more likely to enter the market than juniors when $c>2$ or when rank depends on relative performance. Seniors deal better with strategic uncertainty than juniors who use dominated strategies more often.

Next, we examine the other determinants of entry in relation with age categories.

[15] It is important to control for multiple switching since many subjects of each generation are in this situation. Indeed, 22.5% of the juniors and 40.0% of the seniors switch more than once in the risky task (the difference is borderline significant according to a t-test, p=0.094). 25.0% of the juniors and 32.5% of the seniors switch more than once in the ambiguous task (the difference is not significant according to a t-test, p=0.465). There is no reason to exclude these individuals from the analysis both because they have interacted with the other subjects and because multiple switching is unlikely due to misunderstanding. Indeed, these employees are bankers whose job is to advise clients on how to invest their assets; those who have a supervisory position do not switch less than the other employees (*t*-test, $p=0.696$). In addition, the understanding of participants was checked before they made their decisions. Finally, those who switch several times have the same demerit index in the quiz than the other subjects (Mann-Whitney tests, $p=0.959$ for the whole sample; $p=0.858$ for the seniors; $p=0.923$ for the juniors). We believe that multiple switching behavior is mainly motivated by a certain type of gambling behavior.

[16] In models (1), if we exclude the players who switched back and forth between the certain payoff and the lottery in the risk task, we still find that the likelihood of entry is not different when $c=2$ and that it is 13.36% higher for seniors than juniors when $c>2$, but the level of significance of the generation variable is 10% instead of 1%.

[17] When we estimate models (4) and (5) on the first period of the game, we find that seniors are more likely to compete than juniors in the Performance treatment (marginal effect = 0.470, $p=0.010$; if one excludes multiple switchers in the risk task, marginal effect = 0.476, $p=0.032$) but no difference is found in the Random treatment ($p>0.10$ both with and without multiple switchers). These regressions are available upon request.

Preferences regarding non-strategic risk and uncertainty. Juniors and seniors hold the same preferences toward non-strategic risk or uncertainty (see Table 2).[18] Table 3a shows that when the market capacity is low (c=2, Table 3a), a lower preference for risk and uncertainty decreases the likelihood of entry (model (1)), both in the Random and in the Performance treatments (models (4) and (5)). This result is driven mostly by juniors' behavior, as indicated by separate regressions on the sub-samples of juniors (model (2)) and seniors (model (3)), and this result is not affected when one excludes the multiple switchers.[19] Indeed, only the ambiguity aversion influences the seniors' likelihood of entry and this effect even vanishes if one excludes the seniors who switched several times in the elicitation task. When the market capacity is higher than 2 (Table 3b), preferences for risk and uncertainty no longer influence the entry decision, except for juniors whose risk preference has still a marginal impact (model (2)). Our second result supports Hypothesis 1.

Result 2. Juniors and seniors hold the same preferences toward non-strategic risk and ambiguity. However, risk aversion influences negatively and significantly the entry decisions of the juniors in all market conditions but not that of the seniors. Ambiguity aversion reduces significantly the likelihood of entry of both generations but only when the market capacity is low.

Beliefs on others' willingness to enter. We find evidence of a reference group neglect that is more pronounced for seniors, as 50% of seniors and 39% of juniors underestimate the actual number of entrants. An examination of the mean expected profits of entry[20] confirms that in both treatments

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[18] Only 15% of juniors and 20% of seniors are qualified as risk-averse and 62.50% of juniors and 55% of seniors are ambiguity-averse. Risk-aversion is low compared to a standard subjects pools. This may be due to the stakes in the lottery that are very low relative to the employees' wages, the self-selection of less risk averse individuals in the profession of bankers, and the expertise of bankers for decisions relative to risk. But we are more interested in the comparison between age categories within the same population than in the level of risk-taking itself.

[19] Note that the switching points of the multiple switchers in the risky lottery do not differ from that of the other subjects (Mann-Whitney test, p=0.617). In contrast, the switching points of the multiple switchers in the ambiguous lottery are significantly higher than that of the other subjects (Mann-Whitney test, p=0.007). These multiple switchers are less ambiguity averse.

[20] Since the maximal total profit on the market amounts to 3000 ECU (see Table 1), when one forecasts more entrants (including oneself) than the market capacity, the expected profit per entrant is: [3000 – 500 (predicted number of entrants - market capacity)]/ predicted number of entrants. If one forecasts fewer entrants (including

senior entrants await higher gains than junior entrants because they anticipate less entrants. In the Random treatment, the expected profit is 331.60 for senior entrants and 256.16 for junior entrants; in the Performance treatment, its values are 336.35 and 272.85, respectively. This discrepancy in expectations peaks in the Performance treatment when the group includes 7 juniors and 3 seniors; then, junior entrants expect a profit of 244 compared to 468 expected by senior entrants.

While seniors are more prone to competitive blind spots, strikingly they are significantly *more* likely to enter when the expected number of competitors is higher: each expected entrant in excess of the capacity increases their likelihood of entry by 4.98% when c=2 and by 2.72% when c>2 (see models (3)).[21] Additional regressions (available upon request) show that the marginal effect of an additional expected entrant on seniors' likelihood of entry is 5.25% in the Random treatment (p=0.001) and 4.56% in the Performance treatment (p=0.001) when all market capacities are considered. This variable exerts no impact on the juniors' decisions regardless of the treatment and the market capacity. An interpretation is that seniors do not want to look less competitive than others: when they believe that competition is the norm, they enter more. Our third result rejects Hypothesis 2.

Result 3. Seniors expect significantly higher profits from entry than juniors. While juniors' entry is independent on the predicted number of entrants, seniors are generally *more* willing to enter the more they expect others to enter.

Beliefs on relative ability. Tables 3a and 3b indicate that juniors are significantly more likely to enter the market in the Performance than in the Random treatment regardless of the market

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oneself) than the market capacity, then the expected mean profit is the sum of positive profits of all predicted entrants divided by the predicted number of entrants.

[21] When one excludes multiple switchers, the number of predicted entrants still increases significantly the probability of seniors to enter the market when c=2; each predicted entrant above the capacity increases the likelihood of entry by 6.47% (instead of 4.98% when they are included). In contrast, when c>2, the predictions are no longer significant for seniors. This may suggest that the multiple switchers (that we characterize as gamblers and who are less ambiguity averse than the other subjects) are those who are especially more willing to compete when they believe that others are entering the market. For the juniors, excluding the multiple switchers does not affect the results.

capacity; seniors also enter more in the Performance than in the Random treatment but only when *c*=2 (models (2) and (3)). These results hold even when multiple switchers are excluded. This indicates that both generations are generally more confident when the outcome depends on their relative performance rather than in a random draw.

Models (5) show that in the Performance treatment the likelihood of entry is reduced by more pessimistic beliefs regarding one's performance rank (this result is not affected by excluding the multiple switchers). They also show that the likelihood is increased by the belief that one is better than the other generation but only when *c*=2 (insignificant when we exclude the multiple switchers). Additional regressions conducted on each generation separately in the Performance treatment (available upon request) show that the marginal impact of increasing the expected rank category by one on the juniors' entry is -0.541 when *c*=2 (*p*=0.015) and -0.217 when *c*>2 (*p*=0.022); for seniors it is -0.287 when *c*=2 (*p*=0.005) and insignificant when *c*>2.[22] [23]

Our next result supports Hypothesis 3:

Result 4. Beliefs on relative performance influence the entry decisions. Juniors are more likely to enter the market in the Performance than in the Random treatment. This is also true for seniors but only when *c*=2.

Group identity. Holding beliefs on others' decisions and on relative performance constant, the majority composition of the group in terms of generation does not generally influence the entry decisions. It is only when *c*=2 and when the group includes a majority of seniors that the group composition matters (model (1), Table 3a). Separate regressions by generation show that this

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[22] We remain cautious about this point as these beliefs were elicited after the players answered the quiz. When players made their entry decision, their expected performance was possibly different from the post-quiz evaluation.

[23] While juniors and seniors performed equally well in the quiz (p=0.761) and ranked similarly (p=0.516), juniors are more confident than seniors. 30% of juniors compared to 10% of seniors expect a better demerit index than the actual one and they expect a better rank category within their generation than seniors (2.83 vs. 3.33, p=0.018, see Table 2).

effect is significant only for seniors (with a marginal effect of 0.206, model (3)).[24] Contrary to Hypothesis 4, seniors tend to compete more against in-groups than against out-groups.

Result 5. Group identity has an overall limited influence. Seniors are more likely to compete against in-groups than against out-groups when the market capacity is low.

4. DISCUSSION AND CONCLUSION

Contrary to stereotypes and to Garatt *et al*. (2013), the senior employees who participated in this field experiment are more willing to take strategic risk than juniors, as measured by a higher entry on the market especially when earnings are determined by relative performance. Beliefs and preferences explain this difference in behavior, although both age categories exhibit similar preferences towards non-strategic risk and uncertainty and similar ability in the knowledge test. Seniors hold higher expectations than juniors on the return from entry because they underestimate the others' competitiveness. But interestingly, they are also more willing to compete when they expect a higher competitiveness of group members, although this drives the expected profit of entry downwards. This finding may be interpreted in terms of social signaling, as taking more risk in the presence of many competitors could allow seniors to express their intrinsic value. Incidentally, this suggests that social signaling could be regarded as an additional explanation of entry in this type of game in addition to overconfidence (Camerer and Lovallo, 1999) or a feeling of competence (Grieco and Hogarth, 2004). Finally, since the equilibria of the game are that all players should enter when the market capacity increases, the results suggest that seniors dealt better with strategic uncertainty than juniors. However, the payoffs obtained by juniors and

[24] When multiple switchers are excluded, these results hold but they are less significant, possibly due to the lower number of observations. In particular, when c=2, being in a group with a majority of seniors increases entry but the level of significance of the variable is now 11.4% for the whole sample (model (1)) and 10% for the sole seniors (model (3)). When c>2, the results are unaffected.

seniors do not differ significantly (random-effect Tobit model with session fixed effects, p=0.854).

We acknowledge some limitations of our study. While seniors are older, they earn more money than junior employees and this could have influenced behavior. However, inviting participants of different ages but earning the same salary would have required mixing employees from different occupations; in addition, the generation wage differential seems relatively limited. We also acknowledge that we cannot disentangle the impact on seniors' behavior of ageing, of generation and of the evolution of selection processes in the bank over time. Separating the influence of age from that of generation would require longitudinal data. Moreover, giving information on the generation of group members may have focused attention on the age issue. While we cannot reject this possibility, our design cannot be held responsible for the stronger (modest) impact of this information on seniors. Moreover, our players are certainly not representative of the working population. Field experiments are more "realistic" than lab experiments but it is difficult to measure how general their results can be (on the generalizability of experimental results, see Levitt and List, 2007, and Camerer, 2011). Finally, our sub-sample of multiple switchers in the risky lotteries has specific characteristics (they are less ambiguity averse) that lead them to be more willing to compete in this uncertain environment, especially when they believe that others are more competitive and when there are more seniors in their group. Without further investigation, it is not possible to identify more precisely the motivation of these individuals. In the field, the proportion of multiple switchers in lottery tasks is usually more important than in standard laboratory experiments and although we believe that our bank employees understood the task, it remains an interesting issue to investigate from a methodological point of view. These limitations suggest directions for further research. In particular, a replication across a large span of field settings would test the stability of our results.

Despite these limitations, we believe that these results bring useful insights on some behavioral dimensions that may help in better dealing with the employment of seniors in the labor market. Better understanding how individuals manage strategic uncertainty is certainly an important, but little understood, phenomenon when assigning responsibilities in companies.

Reference list

Abaluk, J., Gruber, J. (2011). Choice Inconsistencies among the Elderly: Evidence from Plan Choice in the Medicare Part D Program. *The American Economic Review*, 101, 1180-1210.

Agarwal, S., Driscoll, J., Gabaix, X., Laibson D. (2009). The Age of Reason: Financial Decisions over the Life Cycle and Implications for Regulation. *Brookings Papers on Economic Activity*, Fall, 51-117.

Benabou, R ., Tirole, J. (2002). Self-Confidence and Personal Motivation. *The Quarterly Journal of Economics*, 117 (3), 261-292.

Besedes, T., Deck, C., Sarangi, S., Shor, M. (2012). Age Effects and Heuristics in Decision-Making. *The Review of Economics and Statistics*, 94, 580-595.

Blavatskyy, P.R. (2009). Betting on own knowledge: experimental test of overconfidence. *Journal of Risk and Uncertainty*, 38, 39-49.

Boersch-Supan, A. (2003). Labor market effects of population ageing. *Labour*, 17, 5-44.

Burks, S.V., Carpenter, J.P., Goette, L., Rustichini, A. (2010). Overconfidence is a Social Signaling Bias. IZA Discussion Paper, 4840, Bonn.

Camerer, C. F., Lovallo, D. (1999). Overconfidence and excess entry: An experimental approach. *The American Economic Review*, 89(1), 306-318.

Camerer, C.F. (2011). The promise and success of lab-field generalizability in experimental economics: A critical reply to Levitt and List. Mimeo.

Cesarini, D., Sandewall, O., Johannesson, M. (2006). Confidence interval estimation tasks and the economics of overconfidence. *Journal of Economic Behavior and Organization*, 61, 453–470.

Chan, S., Stevens, A.H. (2001). Job Loss and Employment Patterns of Older Workers. *Journal of Labor Economics*, 19(2), 484-521.

Charness, G., Villeval, M.C. (2009). Cooperation and Competition in Intergenerational Experiments in the Field and in the Laboratory. *The American Economic Review*, 99(3), 956-978.

Chen, Y., Li, S.X. (2009). Group Identity and Social Preferences. *The American Economic Review*, 99(1), 431-457.

Dargnies, M.P., Hollard, G. (2009). Incentives to learn calibration: a gender-dependent impact. *Economics Bulletin*, 29(3), 1820-1828.

Duffy, J., Hopkins, E. (2005). Learning, information, and sorting in market entry games: theory and evidence. *Games and Economic Behavior*, 51, 31-62.

Erev, I., Rapoport, A. (1998). Coordination, "magic," and reinforcement learning in a market entry game. *Games and Economic Behavior,* 23, 146–175.

Erev, I., Ert, E., Roth, A.E. (2010). A choice prediction competition for market entry games: An introduction. *Games*, 1(2), 117-136.

Finucane, M.L., Slovic, P., Hibbard, J.H., Peters, E. , Mertz, C.K., MacGregor, D.G. (2002). Aging and Decision-Making Competence: An Analysis of Comprehension and Consistency Skills in Older Versus Younger Adults Considering Health-Plan Options. *Journal of Behavioral Decision Making* 15(2), 141–164.

Fischoff, B., Slovic P., Lichtenstein S. (1977). Knowing with certainty: The appropriateness of extreme confidence. *Journal of Experimental Psychology: Human Perception and Performance*, 3, 552–564.

Fox, C.R., Tversky , A. (1995). Ambiguity Aversion and Comparative Ignorance. *The Quarterly Journal of Economics,* 110(3), 585-603.

Garatt, R.J., Weinberger, C., Johnson, N. (2013). The State Street Mile: Age and gender Differences in Competition-Aversion in the Field. *Economic Inquiry*, 51(1), 806-815.

Goodie, S.A. (2005). The Role of Perceived Control and Overconfidence in Pathological Gambling. *Journal of Gambling Studies*, 21 (4), 481-502.

Grieco, D., Hogarth, R.M. (2004). Excess entry, ambiguity seeking, and competence: An experimental investigation, WP Universitat Pompeu Fabra, Barcelona.

Grund, C., Westergaard-Nielsen, N. (2008). Age Structure of the Workforce and Firm Performance. *International Journal of Manpower*, 29 (5-6), 410-422.

Hadi Hosseini, S.M., Rostami, M., Yomogida, Y., Takahashi, M., Tsukiura T., Kawashima, R. (2010). Aging and decision making under uncertainty: Behavioral and neural evidence for the preservation of decision making in the absence of learning in old age. *NeuroImage*, 52(4), 1514-1520.

Halek, M., Eisenhauer, J. G. (2001). Demography of risk aversion. *Journal of Risk and Insurance*, 68, 1-24.

Hunter, K., Kemp, S. (2004). The personality of e-commerce investors. *Journal of Economic Psychology*, 25, 529-537.

Jianakoplos, N.A., Bernasek, A. (2006). Financial risk taking by age and birth cohort. *Southern Economic Journal*, 72, 981-1001.

Kite, M.E., Smith-Wagner, L. (2002). Attitudes towards Older Adults. In T.D. Nelson (Ed.), Ageism: Stereotyping and Prejudice Against Older Persons. Cambridge, MIT Press, 129-161.

Kovalchik, S., Camerer, C.F., Grether, D.M., Plott, C.R., Allman, J.M. (2005). Aging and Decision-making: A Comparison between Neurologically Healthy Elderly and Young Individuals. *Journal of Economic Behavior and Organization*, 58(1), 79–94.

Lévesque, M., Minniti, M. (2006). The effect of aging on entrepreneurial behavior. *Journal of Business Venturing,* 21(2), 177-194.

Levitt, S., List, J.A. (2007). What do Laboratory Experiments Measuring Social Preferences Reveal about the Real World. *Journal of Economic Perspectives*, 21(2), 153-174.

MacDonald, G., Weisbach, M.S. (2004). The economics of Has-beens. *Journal of Political Economy*, 112(1), S289-S310.

MacPherson, S.E., Phillips, L.H., Della Sala, S. (2002). Age, Executive Function, and Social Decision Making: A Dorsolateral Prefrontal Theory of Cognitive Aging. *Psychology and Aging*, 17(4), 598–609.

Mather, M., Mazar, N., Gorlick, M.A., Lighthall, N.R., Burgeno, J., Schoeke, A., Ariely, D. (2012). Risk preferences and aging: The "Certainty Effect" in older adults' decision making. *Psychology and Aging*, forthcoming.

Mohr, P.N.C., Li, S.-C., Heekeren, H.R. (2010). Neuroeconomics and aging: neuromodulation of economic decision-making in old age. *Neuroscience & Biobehavioral Reviews*, 34(5), 678-688.

Nelson, T. D. (Ed.) (2002). *Ageism: stereotyping and prejudice against older persons*. Cambridge: MIT Press.

Ochs, J. (1998). Coordination in market entry games. In Budescu, D.V., Erev, I., Zwick, R. (Eds.), *Games and Human Behavior*. Erlbaum, Mahwah, 143–172

OECD (2004). Paris. Ageing and Employment Policies. Paris.

Russo, J. E., Schoemaker P. J. (1992). Managing overconfidence, *Sloan Management Review*, 33, 7–17.

Sproten, A., Diener, C., Fiebach, C., Schwieren, C. (2010). Aging and decision making: How aging affects decisions under uncertainty. Discussion Paper Series, 508, University of Heidelberg.

Streb, C.K., Voelpel, S.C., Leibold, M. (2008). Managing the aging workforce: Status quo and implications for the advancement of theory and practice. *European Management Journal*, 25(1), 1-10.

Tajfel, H., Turner, J. (1979). An Integrative Theory of Intergroup Conflict, in W. G. Austin and S. Worchel (Eds.), *The social psychology of intergroup relations*, Monterey, CA: Brooks/Cole, 33–47.

Taylor, P., Walker, A. (1998). Policies and practices towards older workers: a framework for comparative research. *Human Resources Management Journal*, 8(3), 61-76.

Wang, H., Hanna, S. (1997). Does risk tolerance decrease with age? *Financial Counseling and Planning*, 8(2), 27-31.

Table 1. Payoff matrix in the market entry game (in ECU)

Rank among the entrants	Market capacity, *c*		
	c = 2	*c* = 4	*c* = 6
1	1,900	1,400	900
2	1,100	900	700
3	- 500	500	500
4	- 500	200	400
5	- 500	- 500	300
6	- 500	- 500	200
7	- 500	- 500	- 500
8	- 500	- 500	- 500
9	- 500	- 500	- 500
10	- 500	- 500	- 500

Table 2. Descriptive statistics on decisions, ability, and beliefs

	Juniors	Seniors	*p*-values
Age	28.67 (0.362)	55.28 (0.571)	0.000***
Entry rate in the 18 periods (in %)	62.36 (48.48)	69.44 (46.10)	0.040**
Entry rate in the Random treatment	64.17 (48.02)	68.06 (46.69)	0.681
Entry rate in the Performance treatment	60.56 (48.94)	70.83 (45.52)	0.019**
Predicted nb entrants in excess of capacity	1.80 (1.34)	1.30 (2.11)	0.844
Switching point in the risky lottery	11.19 (0.410)	12.25 (0.653)	0.331
Switching point in the ambiguous lottery	9.66 (0.598)	10.28 (0.740)	0.363
Demerit index in the quiz	16.15 (1.139)	15.68 (1.060)	0.761
Rank among the 20 participants	10.92 (0.948)	10.08 (0.893)	0.665
Reported confidence interval in the quiz	23.63 (1.207)	21.54 (1.529)	0.095*
Belief on one's demerit index category	4.70 (0.289)	5.80 (0.378)	0.028**
Belief on juniors' mean demerit index category	4.83 (0.248)	6.15 (0.363)	0.010***
Belief on seniors' mean demerit index category	4.60 (0.306)	5.80 (0.332)	0.010***
Belief on one's rank category within own generation	2.83 (0.143)	3.33 (0.149)	0.013**
Belief on one's rank category out of 20	5.68 (0.289)	6.25 (0.286)	0.139
Belief on rank category better than other generation	0.25 (0.069)	0.375 (0.077)	0.231

Note: Values and means and standard deviations are in parentheses. *p*-values are for two-tailed two-sample Mann-Whitney rank-sum tests. For the entry rates and the predicted number of entrants, these tests have been conducted only on the data from the first period since only the first period gives independent observations. For the other variables, each individual is taken as one unit of independent observation. Beliefs on the demerit indices are elicited by intervals of five points and beliefs on ranks by intervals of two ranks.

Table 3a. Determinants of the entry decision when the market capacity is 2

Dependent variable: Decision to enter	All (1)	Juniors (2)	Seniors (3)	Random tr. - All (4)	Performance tr. – All (5)
Performance treatment	0.672*** (0.132)	0.717***(0.198)	0.784***(0.143)	-	-
Senior	-0.078 (0.142)	-	-	-0.240 (0.153)	0.280* (0.165)
Risk preference	0.053*** (0.020)	0.170***(0.042)	0.020 (0.023)	0.062***(0.022)	0.035* (0.021)
Ambiguity aversion	-0.056*** (0.019)	-0.051* (0.027)	-0.067** (0.028)	-0.064***(0.022)	-0.044** (0.021)
Multiple switches in the risk task	0.058 (0.142)	-0.049 (0.193)	0.207 (0.177)	0.083 (0.153)	0.053 (0.157)
Belief on nb of entrants in excess of capacity	0.018 (0.022)	-0.012 (0.036)	0.050* (0.029)	0.016 (0.030)	0.040 (0.031)
Belief on rank within own generation in PT	-0.302*** (0.071)	-0.420***(0.133)	-0.294*** (0.094)	-	-0.462*** (0.117)
Belief on rank better than other generation in PT	0.376*** (0.107)	0.618*** (0.106)	0.150 (0.165)	-	0.320** (0.162)
Majority of juniors	0.099 (0.082)	0.100 (0.100)	0.152 (0.168)	0.007 (0.158)	-0.055 (0.168)
Majority of seniors	0.199** (0.082)	0.122 (0.188)	0.206** (0.094)	0.184 (0.156)	-0.069 (0.161)
Time trend	0.004 (0.006)	0.003 (0.010)	0.006 (0.009)	-0.016 (0.33)	-0.051 (0.036)
Session fixed effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Control for demographics (male, supervision)	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Number of observations	480	240	240	240	240
Log-likelihood	-242.041	-107.087	-120.054	-136.464	-117.812
Wald Chi^2	40.97	31.29	26.79	16.73	27.59
Prob> Chi^2	0.000	0.008	0.030	0.212	0.024

Note: The models are random-effects Probit models. The Table reports the marginal effects of each independent variable (standard errors in parentheses). *** indicate significance at the 0.01 level, ** at the 0.05 level, and * at the 0.10 level. The variable for gender is never significant. The dummy variable for supervisory function is only significant in model (3) (at the 0.05 level, positive, marginal effect = 0.376).

Table 3b. Determinants of the entry decision when the market capacity is 4 or 6

Dependent variable: Decision to enter	All (1)	Juniors (2)	Seniors (3)	Random tr. - All (4)	Performance tr. – All (5)
Performance treatment	0.145* (0.086)	0.352***(0.136)	-0.054 (0.101)	-	-
Senior	0.185***(0.067)	-	-	0.140**(0.071)	0.239***(0.083)
Risk preference	0.003 (0.009)	0.038* (0.022)	-0.009 (0.008)	0.006 (0.009)	-0.001 (0.010)
Ambiguity aversion	-0.010 (0.008)	-0.001 (0.016)	-0.011 (0.008)	-0.009 (0.008)	-0.013 (0.009)
Multiple switches in the risk task	-0.063 (0.069)	-0.067 (0.133)	-0.033 (0.64)	-0.090 (0.073)	0.007 (0.073)
Belief on nb of entrants in excess of capacity	0.023** (0.010)	0.009 (0.017)	0.027**(0.011)	0.029**(0.013)	0.025* (0.013)
Belief on rank within own generation in PT	-0.063** (0.028)	-0.156***(0.050)	0.017 (0.032)	-	-0.087* (0.046)
Belief on rank better than other generation -PT	0.104*** (0.036)	0.182*** (0.051)	0.031 (0.052)	-	0.032 (0.072)
Majority of juniors	0.021 (0.034)	0.014 (0.049)	0.067 (0.046)	-0.026 (0.065)	0.082 (0.054)
Majority of seniors	-0.059 (0.039)	-0.097 (0.100)	-0.030 (0.034)	-0.102 (0.072)	0.006 (0.060)
Capacity of market=4	-0.165*** (0.031)	-0.206*** (0.047)	-0.128*** (0.037)	-0.179***(0.040)	-0.157***(0.040)
Time trend	-0.005* (0.003)	-0.003 (0.004)	-0.006* (0.003)	-0.004 (0.009)	-0.012 (0.009)
Session fixed effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Control for demographics (male, supervision)	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Number of observations	960	480	480	480	480
Log-likelihood	-431.325	-226.791	-193.175	-227.402	-217.655
Wald Chi^2	68.01	46.66	35.77	37.02	35.09
Prob> Chi^2	0.000	0.000	0.003	0.000	0.004

Note: The models are random-effects Probit models. The Table reports the marginal effects of each independent variable (standard errors in parentheses). *** indicate significance at the 0.01 level, ** at the 0.05 level, and * at the 0.10 level. The variables for gender and supervisory functions are never significant.

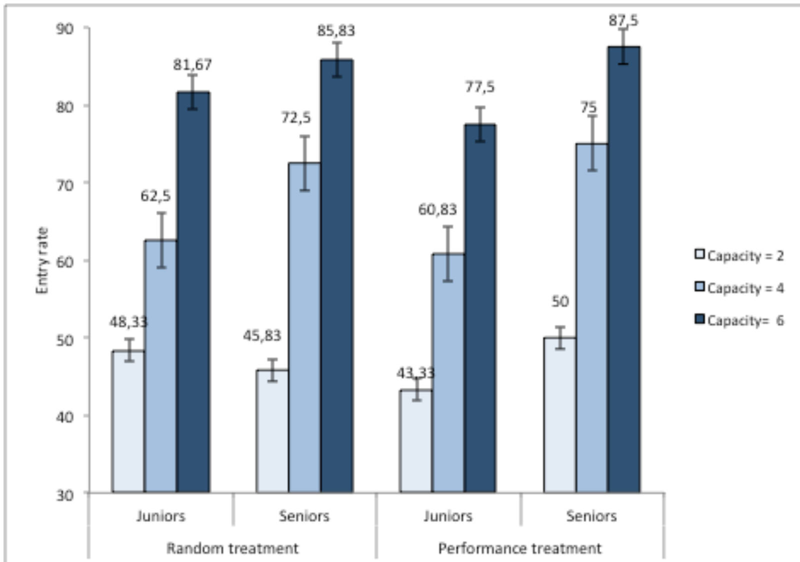

Figure 1. Market entry rates, by market capacity, generation, and treatment

APPENDIX 1. Instructions (translated from French)

We thank you for participating in this experiment on decision-making. Throughout the session, your earnings are expressed in ECU (Experimental Currency Units) with the following conversion rate:

100 ECU = CHF2

This session consists of several parts. We have distributed the instructions for the first part; you will receive the instructions for the next parts once the first part will be completed. Please read these instructions carefully.

At the end of the session, your payoffs in ECU from the different parts will be added up and converted into Swiss Francs. You will also receive a show-up fee of CHF15. You will be paid individually and in private.
Throughout the session, it is strictly forbidden to communicate with the other participants.

Part 1

Part 1 consists in two sub-parts.

- **Description of the 1st sub-part**

Imagine an urn that contains 10 balls, **5 yellow balls and 5 blue balls**.

You must make 20 successive choices between extracting a ball from this urn with replacement (for each decision, there are always the same 10 balls in the urn) or earning a certain amount of money.

If you extract a yellow ball from the urn, you earn 500 ECU; if you extract a blue ball from the urn, your earn 0 ECU.

We propose you **20 certain amounts possible, from 25 ECU to 500 ECU**; the certain amount increases by 25 ECU at each new decision.

You must indicate on your computer screen for each decision if you prefer receiving the certain amount or extracting a ball from the urn.

The following Table will appear on your screen:

1	O I choose the certain amount of 25 ECU	O I choose to extract a ball
2	O I choose the certain amount of 50 ECU	O I choose to extract a ball
3	O I choose the certain amount of 75 ECU	O I choose to extract a ball
4	O I choose the certain amount of 100 ECU	O I choose to extract a ball
5	O I choose the certain amount of 125 ECU	O I choose to extract a ball
6	O I choose the certain amount of 150 ECU	O I choose to extract a ball
7	O I choose the certain amount of 175 ECU	O I choose to extract a ball
8	O I choose the certain amount of 200 ECU	O I choose to extract a ball
9	O I choose the certain amount of 225 ECU	O I choose to extract a ball
10	O I choose the certain amount of 250 ECU	O I choose to extract a ball
11	O I choose the certain amount of 275 ECU	O I choose to extract a ball
12	O I choose the certain amount of 300 ECU	O I choose to extract a ball
13	O I choose the certain amount of 325 ECU	O I choose to extract a ball
14	O I choose the certain amount of 350 ECU	O I choose to extract a ball
15	O I choose the certain amount of 375 ECU	O I choose to extract a ball
16	O I choose the certain amount of 400 ECU	O I choose to extract a ball
17	O I choose the certain amount of 425 ECU	O I choose to extract a ball
18	O I choose the certain amount of 450 ECU	O I choose to extract a ball
19	O I choose the certain amount of 475 ECU	O I choose to extract a ball
20	O I choose the certain amount of 500 ECU	O I choose to extract a ball

- **Description of the 2nd sub-part**

This sub-part is similar to the previous one, except that we use a new urn and you do not know its composition.

You must again make 20 decisions between receiving a certain amount or extracting a ball from the new urn. The certain amounts are the same as in the previous sub-part. The new urn also contains 10 balls, yellow balls and blue balls.

However in contrast with the previous sub-part, you do not know the number of yellow balls and blue balls in the urn.

How are payoffs determined in this part?
At the end of the session, the computer program will randomly draw one of your 20 decisions in the first sub-part and one of your 20 decisions in the second sub-part. Each decision has the same chance to be selected. You should therefore give the same attention to each decision.

For each randomly selected decision:

- If you have chosen the certain amount, we will add this amount to your other earnings in the experiment;
- If you have chosen the random draw, the computer program will extract one ball. If it is yellow, 500 ECU will be added to your other payoffs; if it is blue, you will earn 0 ECU.

If you have any question regarding these instructions, please raise your hand and do not speak aloud. We will answer your questions in private.

Part 2 *(distributed after Part 1 was completed)*

You receive an initial endowment of 500 ECU in this part.
This part consists of 18 periods during which you must decide to enter or not a market.
These 18 periods are grouped in two sequences of 9 periods each.

- The “random draw” sequence,
- The “performance” sequence.

Your computer screen will indicate if you start with the Random sequence or the Performance sequence. The two sequences will succeed automatically. You are informed on your screen of the current sequence.

1. Description of the Random sequence

- **Description of each period**

1. At the beginning of each of the 9 periods of this sequence, you are grouped with 9 other participants. You do not receive any information about these participants except for their generation (« junior » ou « senior »).

2. Then, each group member is informed on the value of a number “C”. Imagine that C is the market capacity, i.e. the number of participants who can make profits on this market. C can take values 2, 4 or 6. For example, if C = 4, then 4 participants who decided to enter the market will be able to make benefits. The other participants who decided to enter will lose 500 ECU.

3. Next, we will ask you to estimate the number of the other group members who will enter the market (between 0 and 9, you excluded).

4. Then, you have to decide if you enter or not the market.

* If you decide not to enter, you do not earn anything and you do not lose anything either.

* If you enter, your payoff depends on the market capacity and your rank among the participants from your group who have decided to enter (the “entrants”). We explain below how your rank is assigned to you.

The Table that has been distributed indicates for each market capacity the payoffs of the entrants (in ECU) according to their rank. Please look at this Table.

For example, suppose the market capacity is 2 (C=2) and you have decided to enter. If you have the first rank among the entrants, you earn 1900 ECU. If you have the second rank among the entrants, you earn 1100 ECU. If you have the third rank and beyond, you lose 500 ECU.

5. At the end of each period, you are informed on the number of other members of your group who have decided to enter the market during this period (between 0 and 9).

- **Determination of ranks**

In the Random sequence, the ranks of the entrants are randomly determined by the computer program. For example, if there are 5 individuals who decide to enter the market in a period, the program will assign randomly a rank between 1 and 5 to these entrants. If the market capacity is 4 (C=4) and your randomly determined rank is 5, then you make a loss.

You do not know your rank when making your entry decision.

- **What does change from one period to the other in this sequence?**

- the composition of your group of 10 participants,
- the market capacity, C (i.e. the number of entrants who can make on the market),
- the payoffs associated with each rank as indicated in the Table we have distributed. We invite you to consult this Table throughout the game,
- your rank if you decide to enter the market.

2. Description of the « performance » sequence

This sequence consists also of nine periods. Each period is similar to the Random sequence except for one thing: **the ranks of the entrants do not depend of a random draw any more**.

The ranks of the entrants depend on their relative performance in a quiz of general economic knowledge that will be presented to you in Part 3.

For a given period, the computer program will compare at the end of the session the performance in the quiz of each entrant on the market. The entrant who will have given on average the answers the closest to the correct answers will get the first rank. The entrant who will have given on average the worst answers to the quiz will get the last rank among the entrants. In case of ties, ranks are assigned randomly among the ex-aequo entrants.

In the quiz, the questions are similar to the following ones:
* What is the current rank of Switzerland in the world in terms of Gross Domestic Product?
* Which percentage of its GDP does the deficit of Greece represent in 2009?
Since the quiz is administered in the next part, you do not know your rank when you decide to enter the market or not. You can just have a belief on your rank.

3. Determination of payoffs in this part

At the end of the session, the computer program will select randomly one period out of 18. Each period has the same chance to be selected for payment. It is therefore important to give the same attention to each of your 18 decisions.

- For this period, the program calculates the number of participants who decided to enter the market in your group of 10 participants. If your prediction of the number of entrants in this period is exact, you earn 100 ECU.
- If you decided to enter, the program assigns you a rank and compares your rank to the rank of the other entrants in your group. If your rank is lower or equal to the capacity of the market, C, you make a benefit and you earn the amount corresponding to your rank for this capacity. If your rank is higher than the market capacity you lose 500 ECU.
- If you decided not to enter, you do not earn and you do not lose anything.
- Your total payoff in this part is therefore equal to:

  500 ECU (your initial endowment)
  + 100 ECU if your prediction of the number of entrants in the selected period is exact
  + the ECU earned /or/ the ECU lost due your decision to enter the market in the selected period.

At the end of the session, you are informed on your payoffs. If you entered the market, we also inform you about your rank among the entrants.

You are not informed on whether, in this period, your rank depended on a random draw or on your relative performance in the quiz.

We invite you to read again these instructions and to answer the comprehension questionnaire that has been distributed. If you have any question, please raise your hand and we will answer your questions privately.

Table for the determination of payoffs in Part 2 (in ECU)

Rank among the entrants	Market capacity, C		
	C = 2	C = 4	C = 6
1	1,900	1,400	900
2	1,100	900	700
3	- 500	500	500
4	- 500	200	400
5	- 500	- 500	300
6	- 500	- 500	200
7	- 500	- 500	- 500
8	- 500	- 500	- 500
9	- 500	- 500	- 500
10	- 500	- 500	- 500

Note: The market capacity indicates the number of participants in the group of 10 who can make profits if entering the market. C = 2 indicates that 2 entrants can make profits; C = 4 indicates that 4 entrants can make profits; C = 6 indicates that 6 entrants can make profits.

Please refer to this Table during the 18 periods of this part.

Part 3 *(distributed after Part 2 was completed)*

This part consists of 4 questions on general economic knowledge.
Your performance in this quiz allows you to make additional earnings. It also serves to the determination of your performance rank in the previous part.

- **The task**

- For each question, you must provide an answer that is comprised in between 0 and 100 (included) by moving a scrollbar on your screen.
- You must also define a confidence interval for your answer. Please indicate a minimum value such that you think that the correct answer cannot be lower than this value. Please also indicate a maximum value such that the correct answer cannot be higher than this value. Your answer must be included in this interval, otherwise it will be rejected by the program.

Here is an example of the scrollbar that will be displayed on your screen below each question:

- **Determination of payoffs in this Part**

For **each** question, you receive an initial endowment of 100 ECU.

Your payoff for each question is determined by the size of the interval that you have defined and the inclusion of the correct answer in this interval.
Thus,

- If the interval that you have defined does not include the correct answer that has been registered in the computer program, you lose your 100 ECU for this question.
- If the interval includes the correct answer, your payoff for this question is equal to: 100 ECU – the width of the chosen interval.

For example, suppose the correct answer to a question is 19.

a) If your answer is 12 and your interval is defined between 10 and 20 (its width is 10), your payoff is: 100 – 10 = 90 ECU.
b) If your answer is 12 and your interval is defined between 5 and 50, your payoff is: 100 – 45 = 55 ECU.
c) If your answer is 12 and your interval is defined between 10 and 15, you lose your 100 ECU.

Therefore, the more precise your answers, the higher your payoffs.

Your total payoff in this part is given by the sum of your payoffs for the four questions.

How are calculated the ranks of the entrants in the Performance sequence of the precious part?

We calculate your **« distance index».**

This distance index is equal to the mean difference in absolute value between the correct answers and the answers you have given to the four questions in this part. The intervals you have indicated are not taken into account in the calculation of your distance index.

The better your responses, the lower (thus, the better) your distance index. An index of 0 means that all your answers are exact.

To determine the entrants' ranks in their group in each period of the Performance sequence of the previous part:

- The computer program compares and ranks the entrants' distance indices in each group;
- It assigns ranks to entrants as a result of this comparison, from the best rank (the 1st) assigned to the entrant with the lowest distance index in his group to the last rank assigned to the entrant with the highest index.

Let's take the previous example where the correct answer is 19.

a) If your answer is 12, then the difference in absolute value between the correct answer and your answer is equal to: |19-12| = 7.
b) If your answer is 30, then the difference is: |19-30| = 11.

The distance index is the mean value of these differences in the four questions.

Information

At the end of the session,

- You are informed on your total payoff in this part;
- You are informed of your distance index only if you ask to know it in a further part.

If you have any question, please raise your hands and we will answer your questions in private.

Part 4 *(distributed after Part 3 was completed)*

Please indicate, among the proposed categories, your expectations about:

- your distance index (i.e. the mean difference in absolute value between the correct answers and your answers to the four questions in the previous part)
- the average distance index of the 10 juniors in the session
- the average distance index of the 10 seniors in the session
- your performance rank in the quiz among the 10 participants of your generation (i.e. juniors or seniors) given by the comparison between the distance indices

- your performance rank in the quiz among the 20 participants in the session.

Each correct prediction pays you 50 ECU.
At the end of the session, you will be only informed of your total payoff in this part.

Part 5 *(distributed after Part 4 was completed)*

1) Please indicate on your computer screen if you are willing to know or not to know, at the end of the session, your distance index.

2) Please indicate if you are willing to know or not to know, at the end of the session, your performance rank in the quiz among the 20 participants given by the comparison of the distance indices.

3) Please indicate if you accept or not that we disseminate to the other participants the three following pieces of information:

- the number of times (between 0 and 9) you decided to enter the market in the Performance sequence in Part 2 (when your rank depended on your relative performance)
- your performance rank in the quiz among the 20 participants
- your generation.

A Table will disseminate anonymously these pieces of information relative to those who have accepted this dissemination. In this Table, you will not be able to see any information concerning you personally.

After answering a final questionnaire, you will be informed on your screen of your earnings in each part of this session.
Please remain seated until we invite you to leave your cubicle and do not communicate with the other participants.

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APPENDIX 2. The experimental laboratory in the company

Our *REGATE Mobile Lab* enabled us to reconstitute a standard laboratory in the bank. Mobile partitions separated each seat from the next such that the confidentiality of decisions was guaranteed. The different colors of the partitions were not associated with generations.