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Training strategic thinking: Experimental evidence ☆

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ABSTRACT

Strategic behavior is crucial for strong firm performance, especially in competitive environments. Thus, designing a good strategy is a key issue for firms. Designing a strategy requires a combination of strategic thinking—which involves analyzing a firm's strategic environment, defining a vision of its future, and devising new ideas to out-think competitors – and strategic planning – which implies using these ideas to formulate a business plan. Although many firms excel at strategic planning, few devote enough resources to strategic thinking, which results in strategic insanity (i.e., firms repeatedly applying the same strategies with the expectation of different outcomes). To foster a strategic environment within a firm, firm managers and other workers must show willingness for active involvement in a firm's strategic decisions. Nevertheless, not everybody has the skills to do so, as many firms lack work force training programs. This study shows, experimentally, how training affects firms' strategic behavior. The starting point is two groups of individuals with initially equal qualifications who play in a sequential game whose rules hinder the calculation of equilibria. The members of only one of the groups previously receive a treatment entailing a process of training and learning that aims at fostering strategic thinking. The results point to a significant increase in the number of strategic decisions in the treatment group in sharp contrast to the control group, confirming the initial hypothesis (i.e., the positive impact of training).

1. Introduction

Strategic behavior is crucial for firms' growth and strong performance, especially when operating in a competitive environment (Bernhut, 2009). Thus, the design of a good firm strategy becomes an essential task for enterprises. This task implies the combination of two elements: strategic thinking and strategic planning (Graetz, 2002). Strategic thinking relates to the processes of analyzing a firm's current strategic environment, defining a perception of the firm's future, and devising new ideas, which enables the company to out-think its competitors (Moon, 2012). Strategic planning involves using these strategic ideas to formulate a business plan, which permits the company to draw up a strategic roadmap (Harris & Ogbonna, 2006).

Many firms have excellent strategic planning skills but pay little or no attention to strategic thinking. This imbalance in their behavior often results in firm strategic insanity, whereby firms repeatedly undertake the same business strategies but expect distinct business results each time. Furthermore, many firms view a strategy as a one-off event in response to changes in their business environment, rather than a daily activity inside the firm (Bonn, 2001).

Properly achieving the right strategic atmosphere at the firm level means that managers and other workers with responsibilities must have considerable involvement in some firm strategic decisions to foster the above process (Ogilvie, 1998). Unfortunately, not all managers and workers (whether qualified or not) develop the skills to do so, as many firms lack training programs for workers.

This research delves into the fundamentals of strategic thinking. Some individuals' decisions depend on strategic thinking, and each individual makes decisions using different mental processes (see, e.g., Benito, Brañas-Garza, Hernández, & Sanchis, 2011a; Bosch-Domènech, Montalvo, Nagel, & Satorra, 2002; Camerer, Ho, & Chong, 2004). Therefore, individuals may learn from thinking strategically, or, conversely, the ability to think strategically may be innate to individuals, as the decision-making process involves an individual's skills.

Acknowledging that different agents have distinct abilities to think strategically in the context of games, this study's focus is on verifying whether individuals learn to think strategically, and whether individuals can learn to compute equilibria in complex situations. The aim of this work, through the use of an experiment, is to test how training can affect strategic behavior at the firm and individual levels. For this purpose, two samples of individuals, with initially equal qualifications, play a sequential game whose equilibrium is very difficult to calculate. To foster strategic thinking among individuals, the experimental

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approach is to administer a treatment (i.e., a process of training and learning) to the members of one group, while the individuals in the other group receive no treatment. Analyzing the different behavior between the treatment and non-treatment groups will reveal how training affects strategic thinking. In anticipation of the results of the experiment, the number of strategic decisions should significantly increase within the treatment group, in sharp contrast to the non-treatment group, confirming the initial hypothesis.

The remainder of the paper has the following structure. Section 2 presents the theoretical models on training strategic thinking and their main equilibrium predictions. Section 3 describes the design and implementation of the experiments. Section 4 analyzes the main results, and Section 5 lays out the conclusions of the study.

2. Training strategic thinking

Leaders with good strategic thinking emerge because of their innate talent (i.e., from nature) or because they develop that talent (i.e., from nurture), or due to a combination of the two. Therefore, a crucial skill for firms or organizations is to be able to discover ways to identify and produce future leaders with the ability to think strategically.

A convenient and appropriate method to develop individuals' strategic thinking ability is game theory training. Game theory proposes games involving intelligent agents with conflicting interests who are able to make moves and countermoves that yield specific payoffs. Game theory can easily seem confusing, as the details of many games involve numerous calculations, which are inapplicable to many real-world situations. Nonetheless, devising strategic situations where individuals can think about how they would behave is possible (Brandenburger & Nalebuff, 1996; Dixit & Nalebuff, 1991).

Game theory is far from being what people commonly consider a game. At the most basic level, game theory relates to the study of how people, firms, or nations (agents or players, in game theory parlance) determine strategies in different situations when facing competing strategies from other agents. This aspect of game theory is what motivates its use as a tool to improve strategic thinking.

To study how training may affect strategic thinking, a repeated game (see Benito, Brañas-Garza, Hernández, & Sanchis, 2011b), deriving from a Schelling (1969) segregation model offers a suitable methodology. This game assumes the existence of a society comprising eight individuals of two types: four black (B) individuals and four white (W). These individuals spread out in a ring (representing society) with the following initial configuration: {B, W, B, W, B, W, B, W}. Denote the individuals' locations from left to right. Each individual accepts up to 50% of unlike neighbors in her neighborhood, which consists of one individual on each side. These parameters help determine whether an individual is happy (if the number of neighbors like her is larger than or equal to one) or unhappy (if the number of neighbors like her is zero). From the initial configuration of society, unhappy agents may move in turns starting from the left, after paying a moving cost of 5 Euros, to the nearest point to their right that fulfills their neighborhood configuration demands. Nearest, in this game, means the place the player can arrive at by passing the smallest number of neighbors on the way. Therefore, each player has two possible actions: either staying at her initial location or moving to the nearest space with a neighbor like her. In this game, each agent has an initial endowment of 5 Euros. If the agent ends up with at least one neighbor like her, she gets a payoff of 20 Euros (without penalization for the moving costs). Unhappy agents receive no payoff at the end, but they have to pay moving costs should they move. Benito et al. (2011b) prove the existence of a unique sub-game perfect equilibrium (i.e., where all individuals end up being happy), in which only players who are initially in positions 4 and 8 move. Fig. 1 illustrates this equilibrium path.

This game facilitates the analysis of strategic thinking, as the game is quite complicated, and because of the high degree of difficulty in computing its equilibrium. Benito et al. (2011b) show that agents playing this game very rarely reach the equilibrium path. Despite its complexity, the equilibrium of this game is trivial with four agents, instead of eight, in a ring with the following configuration {B, W, B, W}. In this four-player game, to obtain the maximum payoff the first three players only have to envisage that, by forcing the last agent to move, everybody ends up happy (see Fig. 2).

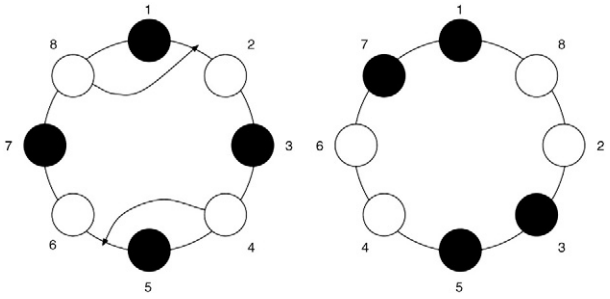

Fig. 1. Equilibrium in a game with 8 players.

Taking these two scenarios into account, the definition of strategic decisions is those decisions in which an unhappy player decides to stay when her best response is to stay (e.g., positions 1, 2, 3, and 7 in Fig. 1; and positions 1, 2, and 3 in Fig. 2).

The study uses the eight- and four-player games to test whether agents learn to think strategically. All individuals in the sample play in the eight-player game, but only some of them previously play the four-player game, as a training procedure, before playing in the eight-player game. Should learning occur, the results of the experiment should show that agents who play in the four-player game before playing in the eight-player one do better, in terms of strategy, than agents who play for the first time in the eight-player scenario.

3. Design and implementation of the experiment

This section describes the design of the experiment that tests for the existence of training strategic thinking. The discussion below explains the designs of the eight- and four-player games.

3.1. Eight-player game

In the eight-player game, to ensure that each of the subjects in the experiment prefers to have someone like her in her neighborhood (therein defining a happy agent), each player who ends up with at least one of her adjacent neighbors like her (either to the left or to the right) receives 20 Euros at the end of the experiment. If none of her adjacent neighbors is of their same type, however, she receives nothing (as the rules of the game deem the individual unhappy in that neighborhood). In this experiment, as in Benito et al. (2011a, 2011b), subjects may move around the ring to a more attractive neighborhood (with agents of their type). Each individual has an initial endowment of 5 Euros that she has to give up should she move to a different neighborhood.

Individuals, in groups of eight, arrange themselves in a circle or ring that represents society. The initial allocation of the participating

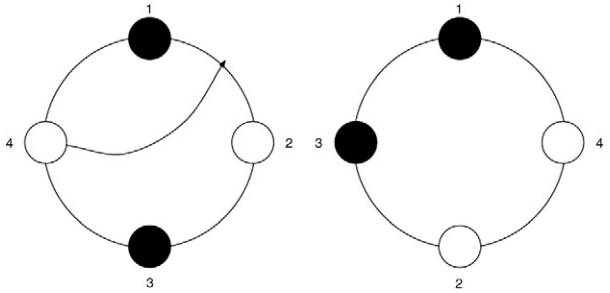

Fig. 2. Equilibrium in a game with 4 players.

individuals in each circle follows a random sorting scheme, whereby the first individual is black, the second individual is white, and so on. Thus, the initial configuration in each circle is {B, W, B, W, B, W, B, W}. Each subjects' type is easily identifiable by a black or white scarf. A fixed prize that a subject earns if her final position is near a neighbor who is alike (20 Euros) represents each individual's utility function. Notice that in the initial configuration nobody is happy. Therefore, subjects have the opportunity to stay or move from their original location when their turn comes. The game has the following structure.

- Subject 1 may decide to stay or move. Should she decide to move, she has to pay the moving cost of 5 Euros.
- After subject 1 takes her decision, subject 2 (directly to the left of subject 1) faces an identical decision problem.
- Subject 3 then follows, and so forth, until subject 8.

The introduction of moving costs in the experiment occurs in a natural way. The money lies on the floor in front of each subject (subjects can see a 5 Euro bill at their feet). The instructions for subjects state that they lose this money if they decide to move.

In the experiments, only some players receive a payment at the end of the game. Random selection of two out of the eight participants for the second set of five rounds determines which subjects receive a payment for playing. Therefore, in each game the following payment structure is in place.

- An individual earns 0 Euros if she ends up unhappy and undergoes a move, or 5 Euros if she ends up unhappy and remains in her starting position.
- An individual gets 20 Euros if she ends up with at least one neighbor like her at the end of the game, and she undergoes a move, or 25 Euros (20 plus 5) if she ends up with a neighbor like her and remains in her starting position.

In summary, random selection chooses two out of the eight participants to receive a payment of 0, 5, 20, or 25 Euros depending on their situation at the end of the round in question. Finally, before starting the real game, subjects play two trial runs to ensure that they understand the structure of the game. Individuals then play the game five times. In each round, a random device replaces subjects in new positions. The color of their scarves changes accordingly.

3.2. Four-player game

The four-player game applies the same conditions as in the eight-player configuration. All individuals play in groups of four and, as in the above game, they have to pay a moving cost of 5 Euros if they move. In these experiments, random selection chooses one out of the four participants to receive payment for one of the five rounds that she plays. Therefore, the possible final payoffs are as follows.

- An individual earns 0 Euros if she ends up unhappy and undergoes a move, or 5 Euros if she ends up unhappy and remains in her starting position.
- An individual earns 20 Euros if she undergoes a move and ends up with a neighbor like her, or 25 Euros (20 plus 5) if she ends up with a neighbor like her and remains in her starting position.

As in the eight-player game, subjects play two trial runs. They then proceed to play the game five times before starting the real experiment (the eight-player game). In each round, random reallocation of the subjects into new positions takes place.

3.3. Implementation

The experiments take place at the Universidad Pública de Navarra (Pamplona, Spain) and involve 128 individuals. Player allocation is as follows.

- Experiments with training: sixty-four subjects in sixteen groups of four subjects play the four-player game. After playing this game, reallocation of the agents into eight groups takes place by joining two groups of four to play the eight-player game.
- Experiments without training: sixty-four subjects in eight groups play the eight-player game.

The first environment reflects a situation in which individuals undergo training to play subsequent rounds strategically, whereas, in the second environment, no such training takes place. In order to maintain similarities in players' qualifications, the experiments run after a regular class in the first year of a Management degree. None of the subjects has any prior knowledge of game theory. Target recruiting of students is not part of the experimental design. All students who participate in the experiments volunteer to play and receive no show-up fee. The task lasts no more than 60 min.

All experimental sessions occur on the same day and at the same time. Subjects undergo random allocation to each ring and subjects stay at the same ring for the duration of the experiment—except those who play the four-player game, who join another group of four to play the eight-player game. Twenty-four associate professors, teaching assistants, and Ph.D. students contribute to the experiments as monitors during the sessions.

4. Results

This section presents the results regarding the individual behavior for the two environments (with and without training). This study focuses on verifying the influence of training to make agents play more strategically. The following sections present a discussion of the results for the eight-player game from the group of individuals who receive no prior training (i.e., those who do not play previously in the four-player game) and the results for the group that receives training. The first step is to measure the proportion of players who play strategically. Subsequently, the second step is to study both environments to observe whether strategic behavior increases round on round.

4.1. Results for the eight-player game without previous training

From the results for the games without training, the proportion of strategic decisions starts low in the first round (23.8%), but this proportion increases with subsequent rounds, reaching a maximum of 51.9%. Without training, however, this percentage never attains a proportion of strategic decisions as high as the percentage when subjects receive training. Therefore, these results point to a substantial improvement, in terms of strategic behavior, between the first and subsequent rounds, although significant learning across rounds is absent, in comparison with the case with training. Seemingly, however, should the game repeat more times, agents would presumably learn more. Fig. 3, where the gray bars reflect the proportions of strategic decisions across rounds, illustrates this phenomenon. This figure also shows plots of the percentages for subjects that receive prior training (black bars).

Further analysis tests for the differences across rounds. Tests confirm that the differences in percentages of strategic decisions are statistically significant for round one compared to all other rounds, with the percentage in round one being smaller. These results indicate that playing implies some type of learning. The bottom panel of Table 1 reports the results of these tests.

4.2. Results for the eight-player game with previous training

The results for the eight-player games, in which agents receive prior training in the four-player game format, indicate that the percentage of agents making a strategic decision is very high in all rounds (60% or more). Fig. 3 displays the percentage of strategic decisions of subjects who participate in the training process (black bars). Upon visual

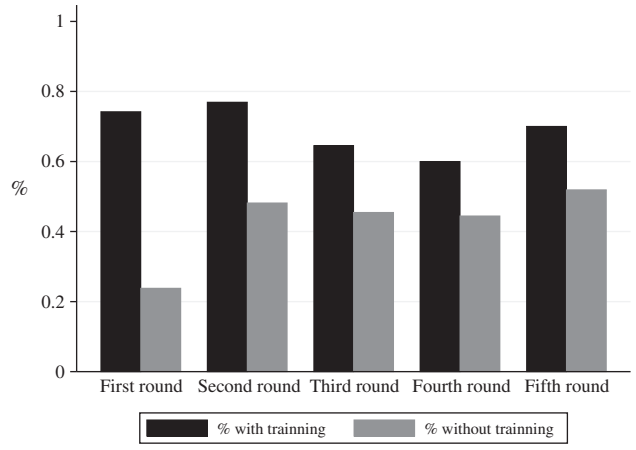

Fig. 3. Proportion of strategic decisions per round (with and without training).

inspection, no learning across rounds takes place when individuals with training play in the eight-player game, as the percentage of strategic decisions is stable over time. Various tests of equality of distributions confirm this result. Table 1 (upper panel) shows that the results of these tests do not provide evidence to reject the null hypothesis of equality of distributions in any case, thus confirming the absence of statistically significant differences in the percentage of strategic decision across rounds. Nevertheless, for the case of players with training, in comparison with non-trained ones, the proportion of strategic decisions is very high from round one onwards. Therefore, this result confirms that players learn about the game in the training process (four-player game), with no further scope to learn when they begin to play in the eight-player game. This explains the absence of learning in this case.

4.3. Comparing the two environments

Comparing the two environments in all rounds, the percentage of strategic decisions is greater and statistically significant when agents receive prior training in comparison with the case where no previous training occurs. Fig. 3 plots the proportions of strategic decisions in the five rounds for the games with training (black bars) and the games without training (gray bars). Furthermore, Table 2 reports the results of the tests of the differences between treatments. The differences of proportions are statistically significant for the five rounds between the two treatments, with proportions being greater for the games with training.

Since individuals in both experiments are a priori similar in terms of qualifications, a logical conclusion is that this difference owes to the training process whereby agents receive treatment in the first environment. This training treatment causes subjects to play more strategically in all games. A further conclusion is that playing the eight-player game repeatedly is irrelevant in making agents play more strategically. This behavior has a link with the difficulty in computing the equilibrium in this eight-player game.

Table 1
Test for the different proportions of strategic players across rounds.

	Difference	*p*-value
With training		
Round 1 versus round 2	0.03	0.72
Round 2 versus round 3	−0.12	0.12
Round 3 versus round 4	0.05	0.60
Round 4 versus round 5	−0.10	0.24
Round 1 versus round 5	0.42	0.60
Without training		
Round 1 versus round 2	0.24***	0.00
Round 1 versus round 3	0.24***	0.00
Round 1 versus round 4	0.21**	0.01
Round 2 versus round 3	−0.03	0.76
Round 3 versus round 4	−0.01	0.91
Round 4 versus round 5	0.07	0.40

Notes:
1. Tests on the equality of proportions for each pair of rounds.
2. ***, **, *, mean significant at 1, 5, and 10%, respectively.

Table 2
Test for the different proportions of strategic players per round across treatments (with and without training).

	Difference	*p*-value
Round 1	0.50***	0.00
Round 2	0.29***	0.00
Round 3	0.19**	0.03
Round 4	0.16*	0.08
Round 5	0.18**	0.04

Notes: Tests on the equality of proportions for the two treatments in each round.

1) ***, **, *, mean significant at 1, 5, and 10%, respectively.

5. Conclusion

The discussion begins by inquiring whether training of agents on strategic thinking is possible. In this paper, experimental evidence shows how training can affect strategic behavior. These results are helpful in the context of everyday firm decision processes. To show this, the analysis examines two samples of individuals, with initially equal qualifications, who have to play in a sequential game. A process of training and learning that aims at fostering strategic thinking among its members previously treats one of these groups while the other group gets no training. The results indicate that the number of strategic decisions significantly increases in the group that receives training in sharp contrast to the control group, confirming the initial hypothesis. Furthermore, players without training learn how to play across rounds in contrast to players with previous training. These agents do not learn across rounds as they learn all they can about the game during the training process, and start to play more strategically from the very beginning. Thus, this evidence confirms that players with training are more strategic than those without training.

Finally, relating these results to strategic thinking at the firm level within the management literature leads to interesting conclusions. Strategic thinking is an important feature of the strategy literature from the last two decades. Porter (1987a, 1987b, 1996) and more recently Besanko, Dranove, and Shanley (2000) point out the crucial need for strategic thinking within firms. Further, strategic thinking is an important challenge facing executive managers and leaders (see, e.g., Bonn, 2001; Zabriskie & Huellmnatel, 1991; Zahra & O'Neill, 1998). Within the management literature, as Gallimore (2007) highlights, an increasing interest in strategic thinking relative to strategic planning is surfacing, especially for SMEs and entrepreneurs (see, e.g., Hisrich & Peters, 2001; Kraus, 2007; Stevenson, Roberts, Grousbeck, & Bhide, 1998; Timmons & Spinelli, 2003). Therefore, these results may be of interest in several aspects of firm strategy, such as training managers and leaders, as well as for strategic planning at the firm level.

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