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They are watching you:
Social facilitation in institutions

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Abstract

Social facilitation describes the effect on performance due to the mere presence of others. Here we study the effect of the mere presence of an audience on the behavior of people involved in a strategic interaction and on the performance of institutions. In our laboratory experiment, two active participants play the game and receive payoffs determined by their choices, while inactive participants receive a share of this outcome. In our 2x2 design, bystanders may or not be physically present during play, and active and inactive participants may or not be immediately informed of the outcome of the game just played.

We find significant differences in behavior across treatments: When bystanders are present, players are more likely to choose the strategy favorable to the audience. Withholding immediate feedback about play weakens this effect substantially, but not completely. These results suggest that social facilitation extends to strategic environments.

Introduction

In most jobs, we conduct tasks while co-workers can observe us. School children perform their daily activities before an audience of classmates, unlike their home-schooled counterparts. Law firms often bring more lawyers to a meeting than needed for bargaining; this sympathetic audience may intimidate the opposing side. Professional athletes perform for their spectators; the home-field advantage shows the importance of a partisan audience.

These examples have two common features: the effect of an audience, and people performing in an interactive, social environment. While game theory and economics are very useful tools in analyzing behavior in social interaction, they are silent on the impact of the audience unless its presence directly changes payoffs. To correctly evaluate the functioning of institutions (such as the classroom versus home-schooling), we need to know the precise effect of the social dimension of the environment.

The effect, positive or negative, that the mere presence of an audience can have on the performance of an individual is called *social facilitation,*[1] and it has long been recognized in humans and animals alike. In an extreme example of the ubiquity of social facilitation, Zajonc, Heingartner, and Herman (*2*) find that the performance of cockroaches conducting a simple task (finding food in a straight maze) is facilitated by the presence of other cockroaches, while their performance of a complex task (finding food in a maze with several turns) was impaired by that audience.

Here, we test whether the mere presence of spectators can influence behavior and outcomes in institutions *where people interact strategically*. We show how the presence of interested bystanders affects the choices made by players in a game. In particular, spectators

induce better performance of 'home' players and worse performance of 'visiting' players. Furthermore, the presence of an audience can improve efficiency.

Our experiment

"Battle of the Sexes" is a game in which the players have competing interests between the equilibrium outcomes.[2] Two players (identified as Row and Column) have two possible strategies (A and B). If both choose A, Row's payoff is $3 and Column's is $1; if both choose B, the monetary amounts are reversed; payoffs are $0 when different letters are chosen (coordination fails).

This game has two Nash equilibria in pure strategies, (A,A) and (B,B), as well as a Nash equilibrium in mixed strategies (where players choose a probability distribution over their possible choices).[3] In such games, theory says little about how play will actually occur. In real life, however, players often interact in front of others. We study whether and how the players' choices in the game differ when made in the presence of interested, but passive, observers.

Social facilitation in institutions

In contrast to the classical psychology experiments on social facilitation, each of our subjects is a player in a game. Although each player's choice is made individually, the ultimate consequences of the choice also depend on another player's choice. All players know the other players know this, and may try to evaluate how the presence of an audience is going to affect the behavior of fellow players. In contrast, the subjects' performance in previous social-facilitation experiments is only influenced by their own behavior. In our environment, social facilitation occurs in economic institutions, and interacts with them.

The mere presence of an audience should, according to game theory, have no effect on the outcomes. Our experiment, on the other hand, shows that it does and, therefore, whether an audience is present should be considered part of the description of the game or the institution.

Main results

When an audience with a direct interest in the outcome is watching, players tend to make choices in agreement with the audience's desires. This effect is substantially enhanced when spectators and players can immediately observe the outcome of the play.

To clarify how the audience affects behavior in our experiment, we define two possible strategies in the game. "Aggressive" behavior aims at the most favorable equilibrium for the player, while "accommodating" behavior aims at the opponent's most favorable equilibrium. The audience has the effect of facilitating both aggressive play from its partisans and accommodating play from its opponents. Fans in the stands help win games, extra lawyers help win discussions.

This effect is strong, and players act as if they expect others to be affected as well. In an institution where success depends upon coordination, we observe substantially greater overall coordination when a partisan audience is present and the outcome is immediately verifiable.

Experimental Design

Participants are randomly divided into Row and Column players. Each group goes to a separate room, in which "Room R" or "Room C" is written on a blackboard. An experimenter reads the instructions aloud. These explain that Row and Column choosers can select A or B, possible outcomes of the game are rewarded with actual dollar amounts, and inactive players

(those not currently making a choice) also have a material interest in this game's outcome, each receiving 1/3 of the outcome that corresponds to their role (either $1.00, $0.33, or nothing).

Play proceeds as follows: One player from each room visits his or her 'away' room, and then sits across the table from a designated 'home' player. These players each have two cards, marked "A" and "B", in front of them on the table. They each then decide to pass one of the cards (face hidden) to the experimenter. The visitor exits from the room, and a new period follows, with new visitors and designated home players. The experiment ends when each player makes two choices, one in each room.[4] Participants are paid (privately) according to the numbers on their cards.

We use a 2x2 experimental design. In the *audience* condition, Row players are spectators in the Row room, and similarly for Column players. In the *no-audience* condition, only one Row player, one Column player, and an experimenter are present in each room; inactive Row and Column players wait in separate supervised waiting areas. In the *feedback* condition, the experimenter announces the outcome to everyone present.[5] In the *no-feedback* condition, the experimenter says nothing to the players; thus, the game's outcome is revealed only after all play stops and payments are (privately) made.

We conducted 12 sessions, three for each of our treatments, on the UC-Berkeley (4) and UC-Santa Barbara (8) campuses. Students were recruited by e-mail from the general student population. A total of 228 students participated, earning an average of $17 in about an hour.

Results

The main result is that the presence of an interested audience has a strong effect on the players' choices. This is statistically significant even if we consider only data from the first round of play, thereby minimizing issues related to independence among observations.

Room and audience effects

Consider the following two dummy variables: *Aggressive Host* equals one if Row chooses A in Room R or Column chooses B in Room C, otherwise it equals zero. *Accommodating Guest* equals one if Row chooses B in Room C or Column chooses A in Room R, otherwise it equals zero. Table 1 presents the value and frequency of these two variables.

Table 1: Room-favored play, with and without an audience

		No Audience	Audience
Aggressive Host	0	45 (40%)	19 (16%)
	1	67 (60%)	97 (84%)
Accommodating Guest	0	69 (62%)	41 (35%)
	1	43 (38%)	75 (65%)

The host chooses her preferred strategy 84% of the time when an audience is present, compared to 60% of the time when no audience is present. The guest chooses his least-preferred strategy 65% of the time when an audience is present, versus 38% of the time when no audience

is present. A test of the null hypothesis that behavior is unaffected by the audience gives $p=0.000$ for both host and guest behavior.[6]

Result 1 *When an audience is present, hosts choose the aggressive strategy more frequently and guests choose the accommodating strategy more frequently. These differences are both statistically significant.*

The tests above assume observations are independent, which is a rather strong assumption. Therefore, we perform tests of the null hypothesis that behavior with an audience is the same as behavior without an audience, using only first-round data. These tests give $p=0.001$ for Host choices and $p=0.028$ for Guest choices.

Result 2. *The effects in Result 1 (when an audience is present, hosts play the aggressive strategy more and guests play the accommodating strategy more) hold even if we only consider the first round of play.*

Audience and feedback

We now study how the audience effect interacts with information about the outcome of play. The data show the latter matters only when spectators are present. Table 2 subdivides the previous data into our four treatments:

Table 2: Aggressive host and accommodating guest play, by treatment

	No Audience - No Feedback	Audience – No Feedback
0	26 (46%)	16 (27%)
1	30 (54%)	44 (73%)

Aggressive Host

	No Audience – Feedback	Audience – Feedback
0	19 (34%)	3 (5%)
1	37 (66%)	53 (95%)

	No Audience - No Feedback	Audience – No Feedback
0	33 (59%)	29 (48%)
1	23 (41%)	31 (52%)

Accommodating Guest

	No Audience – Feedback	Audience – Feedback
0	36 (64%)	12 (21%)
1	20 (36%)	44 (79%)

The frequency of aggressive-host play increases dramatically when there is an audience, with and without feedback (from 54% to 73% and from 66% to 95%, respectively). The frequency of accommodating-guest play also increases greatly when audience is present (from 36% to 79%), but the same effect is smaller when players don't immediately learn the outcome of play (from 41% to 52%).

These observations are confirmed by tests of the audience effect performed separately on data from the feedback and no-feedback treatments. With feedback, $p=0.000$ for both Aggressive Host and Accommodating Guest. Without feedback, $p=0.028$ for Aggressive Host, but $p=0.255$ for Accommodating Guest. Tests of the null hypothesis that players' choices are unaffected by feedback, using audience data ($p=0.002$ for Hosts and $p=0.003$ for Guests) and no-

audience data (p=0.179 for Hosts and p=0.562 for Guests) show feedback impacts choices only when there is an audience.

Result 3. *When no audience is present, providing feedback has little effect on behavior. However, providing feedback when an audience is present substantially increases the likelihood of aggressive-host play and accommodating-guest play.*

Audience and outcomes

The previous results highlight how an audience influences individual choices. Table 3 shows the outcomes of play. The frequency of coordination outcomes is affected only when an audience is present *and* feedback is provided. The 'type' of coordination is very different with an audience, however. Coordination predominantly favors the host (and the audience).

Table 3: Who coordination favors and overall coordination rates, by treatment

		No Audience - No Feedback	Audience – No Feedback	Total with No Feedback
Coordination favors	Guest	18 (55%)	9 (27%)	27 (41%)
	Host	15 (45%)	24 (73%)	39 (59%)
	Coordination %	59%	55%	57%

		No Audience – Feedback	Audience – Feedback	Total with Feedback
Coordination favors	Guest	15 (48%)	0 (0%)	15 (21%)
	Host	16 (52%)	41 (100%)	57 (79%)
	Coordination %	55%	73%	64%

		Total with No Audience	Total with Audience
Coordination favors	Guest	33 (52%)	9 (12%)
	Host	31 (48%)	65 (88%)
	Coordination %	57%	64%

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While an audience affects the pattern of coordination even without feedback, overall coordination improves only when both an audience and feedback are provided. A Wilcoxon test using session-level data finds that the coordination rate in the audience-feedback treatment is significantly higher than in the other three treatments (p=0.018).

Result 4. *With an audience, coordination favors the hosts. Furthermore, coordination rates increase if and only if an audience is present and immediate feedback is provided.*

Conclusions

We provide laboratory evidence of two social-facilitation effects in strategic environments. First, spectators make a difference for the performance of individuals. Second, overall economic efficiency, measured by total payoffs, is higher with interested spectators and immediate feedback. In other words, the institution in which individuals interact performs better. In view of our results, the presence or absence of an audience (and feedback) cannot be ignored or left to chance in institutional design.

In our experiment the players face a dilemma: they wish to coordinate on one of the two efficient outcomes, but the game is symmetric. Players need a coordination device, and assigning a room to each group could provide it.

Our results, however, indicate that coordination needs more than just a label (a simple cognitive marker). The room is clearly assigned to a particular group, but outcomes favor that group only when a partisan audience is present. This gives social value to the marker and transforms the label into something close to a property right: Room C 'belongs' to Column players, as stated by their physical presence. This interpretation suggests that social conventions

and norms may have more influence on behavior when an interested audience witnesses an individual's action.

Further research now must clarify the nature of the process inducing this effect. A well-known result in the theory of the social facilitation of individual behavior is the Zajonc (*6*) proposition that social facilitation improves the performance of familiar tasks, while it reduces that of unfamiliar ones. Is a similar generalization possible for the theory of social facilitation in institutions? What is the process that determines the social facilitation in the game we have considered here, and more generally, in economic institutions?

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Notes

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[1] Guerin (*1*), page 1: "Social facilitation is said to occur when one animal increases or decreases its behavior in the presence of another animal which does not otherwise interact with it." The book provides an extensive review of experiments and theories.

[2] See Shelling (3) on this and other related games.

[3] Cooper DeJong, Forsythe & Ross (4) and Straub (5) find experimentally that the frequency of coordination for this game is close to that predicted by the mixed-strategy equilibrium: 0.375, equally distributed between (A,A) and (B,B). Also, see Camerer (6) for experimental results on the Battle of the Sexes.

[4] We had ten rounds of play with 20 participants, nine rounds with 18 participants, and eight rounds with 16 participants (the number of people who actually showed up for a session varied).

[5] In the *no-audience* and *feedback* treatments the player who returned to their waiting areas indicated the choices made by both parties to the other people present

[6] All tests are two-tailed Wilcoxon-Mann-Whitney rank-sum tests, with *p*-values rounded to three decimals.