Towards an understanding of the endogenous nature of identity in games

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Towards an Understanding of the Endogenous Nature of Identity in Games[*]

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Abstract

We test the assumption that preferences are unchanged throughout a strategic game in the absence of feedback. To do so, we study the relationship between the strategic nature of a game and players' identification in social groups. We present evidence that the strategic nature of the game affects the strength of identity. We also show when the change in identity occurs and what causes this change. In our experiment, the subjects play one of two versions of the Prisoner's Dilemma game where the attractiveness of the uncooperative action is manipulated. We refer to the version with a relatively attractive uncooperative action as the "Mean Game" and the other as the "Nice Game." We place each subject into one of two groups. Throughout the experimental procedure we measure identity, as standard in the psychology literature, in order to assess the extent to which subjects identify with their group. First, we find evidence of an interaction between the strategic nature of the game and the action selected in the game as affecting the identity of the subject. We find that in the Mean Game, there is little difference in the change in identification of those playing cooperatively against an ingroup member and those playing uncooperatively. However, in the Nice Game, those playing cooperatively against an ingroup member exhibit a significantly stronger change in identification than those playing uncooperatively. We find that the opposite is true for outgroup matches. Also, we show that the change in identity does not occur after initial inspection of the game but rather largely after the action choice has been made. Finally, we present evidence of an explanation of the effect: identity is enhanced by actions which are perceived to be less competitive and more cooperative.

1 Introduction

The preferences of players in a strategic game are of fundamental importance in the analysis of that game. Even if players consider the welfare of other players, it is assumed that preferences are unchanged throughout the play of a one shot game without feedback. In this paper, we test the assumption that preferences are indeed unchanged. Specially, we ask whether other-regarding preferences can be affected by the strategic nature of the game, even without feedback concerning the action of the opponent.

Generally speaking, we seek to better understand the relationship between the strategic nature of a game and other-regarding preferences. We measure these preferences by seeking a measure of identity, as is standard in the psychology literature. Consistent with this literature, we view the measure of identity as suggesting the extent to which the subject values material outcomes of others in their social group.

In the experiment described below, each subject plays one of two versions of a prisoner's dilemma game and we measure their identity. In both versions of the game, each player simultaneously decides to take a "cooperative" action or an "uncooperative" action. In one version of the game, the attractiveness of the uncooperative action is larger than that in the other version. We refer to the former as the "Mean Game" and the latter as the "Nice Game."

We allocate subjects into groups based on a trivial criterion. Before the subjects are aware of the strategic setting, we take a baseline measure of identity. Subjects are then presented with either the Mean or Nice Game. Before the subjects decide on their action, their group identity is again measured. The subjects then make a choice of action in the game and we subsequently take final identity measure.

We find evidence of an interaction between the game type and action choice as affecting identity. Specifically, we find that when playing another member of the group (or ingroup member), the change in identity for Nice Game is larger than that for the Mean Game (Result 1). However, the opposite is true when the subject plays a member of the other group, or outgroup member (Result 5). We present evidence that the change in identity which does occur, does not happen upon initial inspection of the game but rather primarily after the action choice has been made (Result 2). We present evidence that identity is enhanced by actions which are considered to be less competitive and more cooperative (Result 3). We interpret Result 3 as a possible explanation for Result 1. Finally, the results presented in this paper suggest that measuring preferences through SVO or $GARP$ could possibly affect the preferences which the techniques are designed to measure.

1.1 Identity and Psychology (for economists)

For some time, psychologists have known that allocating people into groups will often induce behavior which favors ingroup members at the expense of outgroup members.[1] A typical such

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[1] For instance see Tajfel (1970), Tajfel et. al. (1971), Tajfel (1978), Tajfel and Turner (1979) and Tajfel and Turner (1986).

experiment would allocate subjects into a group and observe ingroup favoritism or outgroup discrimination. Such behavior was thought to be more pronounced when identity was more effectively manipulated. However, in order to verify the effectiveness of the manipulation, experimenters would seek to measure the identity of the subject.[2] An economist can interpret the identity measure as indicating the extent to which the subject positively values the material outcomes of ingroup members or negatively values the material outcomes outgroup members.[3]

Subsequent identity research sought to clarify which features of the group or the environment would induce such behavior and what motivates subjects to categorize themselves in terms of the social group. Research has indicated that group distinctiveness (Brewer, 1991), group prestige (Ellemers et. al. 2002), similarity (Ip, Chiu and Wan, 2006), common fate (Brown and Wade, 1987), interpersonal interaction (Pettigrew, 1998) and group homogeneity (Vanbeselaere, 1991) can all affect the identification of a person with a social group. Our research suggests that the strategic nature of the game should be added to the list.

In our experiment we placed the subjects into groups which did not exist prior to the experiment and for which membership was based on a trivial criterion: the last digit of their student identification number. In the psychology literature, this experimental technique is often used because it is thought that observing identity motivated behavior in groups uncontaminated by history and based on trivial criteria indicates that identification with a social group is a fundamental human trait and that categorization alone can imply ingroup favoritism and outgroup discrimination.[4] Such social groups are referred to as "minimal groups", although the term has a somewhat more specific meaning in the psychology literature.[5] However, the groups in this paper are designed to be in the spirit of the minimal group therefore we refer to our groups as "minimal."

As we do here, psychologists have conducted experiments examining the role of identity on the outcomes of games. For instance, see Kramer and Brewer (1984), Brewer and Kramer (1986), Dawes, Van De Kragt and Orbell (1988) and Wit and Wilke (1992). As is common in the literature, the authors manipulate some aspect of the environment, which is thought to affect the identity of the subject, and observe its effect on behavior. We contrast the present paper with this literature as not only do we make explicit measurements of identity but we make several measurements throughout the experiment.

Related to identity, Social Value Orientation (SVO)[6] seeks to learn the preferences of subjects by soliciting choices in a series of dictator games. It seems that SVO is better suited as a measure of the general disposition of a subject rather than as a measure of the disposition towards a particular opponent.[7] An advantage of measuring social preferences

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[2] See Abrams and Hogg (1999).

[3] Examples of such a scale include include: Brown et. al. (1986), Gaertner et. al. (1989), Grieve and Hogg (1999), Hogg et. al. (1993), Hogg and Grieve (1999), Hogg and Hardie (1991,1992), Reid and Hogg (2005) and Swann et. al. (2003).

[4] Turner and Bourhis (1996).

[5] See Diehl (1990).

[6] Developed by Griesinger and Livingston (1973).

[7] De Cremer and Van Vugt (1999), De Cremer and Van Dijk (2002) and De Cremer et. al. (2008).

through techniques such as SVO and $GARP$[8] is that the responses are incentive compatible: a subject receives payment on the basis of their decisions and therefore has a material incentive to respond truthfully. One drawback of these techniques is that the the subjects are classified into one of only a few possible categories, such as "competitive", "egoistic" and "altruistic." By contrast, the standard measure of psychology provides a more rich characterization of the social preferences of the subject. For instance, the measure of identity in our data ranges from a minimum of 2 to a maximum of 7. Another potential drawback of the SVO and $GARP$ techniques is that they tend to ignore the nature (or identity) of the "other" subject. Therefore, little is known about the properties of SVO and $GARP$ when the identity of the other subject is taken into account. However, by using the psychologists measure of identity we can access the huge literature associated with the advances made in that regard. Finally, the results presented here suggest that it is possible that eliciting preferences through SVO or $GARP$ might affect the very preferences which they are designed to measure.

1.2   Identity and Economics

Like psychologists, economists have known for some time that material payoffs accruing to one person can affect the well being of another person.[9] This strand of literature is often referred to as "other-regarding preferences" or "social preferences." Specicially, if x_{own} are the material payoffs accruing to a person and x_{other} are the material payoffs accruing to another person, the utility of a person $u(x_{own}, x_{other})$ is influenced by both terms. There exist many economic theory papers which model such social preferences by adopting different forms of $u(x_{own}, x_{other})$.[10]

Research has suggested that, in settings similar to that in our experiment, there is a link between group identification and bias.[11] For instance, Perrault and Bourhis (1999) find that in the minimal group setting the subjects who identify more strongly with the group treated ingroup members more favorably and outgroup members less favorably in allocation tasks.[12] Consistent with the literature, we interpret the identity literature as indicating that material payoffs are a function of an identity parameter, let's say β: $u(x_{own}, x_{other}; \beta)$. Consider two allocations x and y where own has a higher material payoff from x. If according to some level of identification the agent is indifferent between x and y and other is an ingroup member then an increase in identification implies that the agent strictly prefers y over x. Or more formally, suppose that $x_{own} > y_{own}$, $x_{other} < y_{other}$ and $u(x_{own}, x_{other}; \beta) = u(y_{own}, y_{other}; \beta)$. If other is an ingroup member then $u(x_{own}, x_{other}; \beta') < u(y_{own}, y_{other}; \beta')$ for $\beta < \beta'$ and if other is an outgroup member then $u(x_{own}, x_{other}; \beta') > u(y_{own}, y_{other}; \beta')$ for $\beta < \beta'$.

Although we hesitate to ascribe much meaning to the absolute measure of identity, we

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[8] Like SVO, $GARP$ measures preferences through posing a series of dictator games. $GARP$ was developed by Andreoni and Miller (2002).

[9] See Deutsch (1958).

[10] For instance, see Akerlof (1997), Akerlof and Kranton (2000), Bolton and Ockenfels (2000), Falk and Fischbacher (2006), Fehr and Schmidt (1999), Gul and Pesendorfer (2007) and Levine (1998) for theoretical modeling of social preferences. Each paper models preferences as a function of the material payoffs accruing to both own and other. Some of the above also model preferences as a function of the action of "other."

[11] There is no consensus regarding the applicability of the link between group identification and bias in general psychological settings. See Turner (1999) and Brown (2000) for a spirited discussion on this matter.

[12] Also see Ando (1999), Branscombe and Wann (1994) and Voci (2006).

do view the change in identity as a measure useful in predicting behavior. Due to possible idiosyncratic interpretations of the items in the measure, we view the absolute measure with some scepticism. However, we measure identity several times and so we can account for these idiosyncrasies by taking the difference in the measures of identity.

There is a recent interest in identity research in experimental economics. Within this literature, it is not uncommon for the experimenter to manipulate some feature of the environment, which the authors ascribe as having affected the identity of the subject. The authors typically observe the influence of this manipulation on the behavior in games. For instance, Charness, Rigotti and Rustichini (2007) manipulate the saliency of groups by allowing ingroup members to view behavior or by connecting the payoffs of ingroup members. Eckel and Grossman (2005) observes that subjects in treatments with strong identity manipulations contribute more in repeated public goods games than in treatments with weak manipulations. Ahmed (2007), Chen and Li (2007) and McLeish and Oxoby (2007) observe the difference in outcomes of games played between ingroup and outgroup members.[13] We primarily distinguish between our paper and these papers in two respects. First, we do not directly manipulate identity. Second, we examine the relationship between social identification and the strategic nature of a game.

Although there is a large and increasing literature of identity in economics, to our knowledge, Guth, Levati and Ploner (2008) is the only other economics paper which measures identity. The authors investigate the role of identity in behavior in an investment game. Specifically, the authors manipulate identity by placing subjects into groups (X or Y) and directing some to play a public good game. This second step is designed to manipulate the identification of the subjects, which they subsequently measure.[14] The authors find that subjects who contribute more in the public goods game are significantly more trusting in the subsequent investment game. We present a result with a similar flavor: those who play cooperatively against an ingroup member in the Nice Game have a significantly larger change in identity than those playing uncooperatively in the Nice Game.

Carpenter (2005) is one of the few economics papers to explicitly investigate the extent to which a competitive strategic environment can affect social preferences.[15] However, there are fundamental methodological differences between our paper and Carpenter (2005). First, the subjects in Carpenter receive feedback regarding the action of their opponents. In our paper, there is no feedback therefore the change in identity which we find can only be attributed to the nature of the game and the action selected by the subject. Second, Carpenter uses Value Orientation (VO)[16] and $GARP$ to measure the social preferences of the subjects. By contrast, we measure other-regarding preferences via identity as is standard in the psychology literature. Like Carpenter, we measure preferences both before and after the actions have

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[13] For work involving real social groups, see Benjamin et. al. (2007), Ben-Ner et.al. (2006), Goette et. al. (2006) and Hoff and Pandey (2006).

[14] Although Guth et. al. (2008) use items adapted from Gaertner et. al. (1989) rather than, as we do, Grieve and Hogg (1999).

[15] See Canegallo et. al. (2008) for a related paper. Also, Schotter et. al. (1996) examines the effect of framing on judgements of fairness and is motivated by questions related to endogenous identity. Finally, see Bowles (1998) for more on endogenous preferences.

[16] Another measure of social preferences, similar to SVO.

been selected, however we use the identical measure. By contrast, Carpenter uses VO to obtain an ex-ante measurement and $GARP$ to obtain an ex-post measurement.

2 Study 1

A total of 130 undergraduate students from a public university in the Northeast United States participated in the experiment for course credit and entry into a lottery for a cash prize. The trials were conducted in six classes of 19, 34, 37, 10, 11 and 19 students. In each trial, the same male experimenter provided the instructions to the subjects. In accordance with the minimal group literature, we placed students into groups labeled[17] "X" and "Y", where the allocation was based on the last digit of the student's identification number. Students with digits $0-4$ were placed into group X and students with digits $5-9$ were placed into group Y.

Before the subjects played the game, we provided a quick lesson on the basics of 2×2 games. Our experimental manipulation was the nature of the prisoner's dilemma game. Roughly half of each class was given the Mean Game and half the Nice Game.[18]

<div align="center">

Mean Game

Someone Else

		C	D
You	C	$100, 100$	$0, 150$
	D	$150, 0$	$50, 50$

Nice Game

Someone Else

		C	D
You	C	$100, 100$	$45, 105$
	D	$105, 45$	$50, 50$

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Subjects were told that they were to play the game with every student in their class, in the same group who received the same game. The subjects were notified that the points attained in these matches would be converted into an average which would go towards a lottery for a prize. The subjects were instructed that they were only able to make a single choice to be used against each ingroup opponent. Finally, subjects were told that the experimenters would allocate a prize of $50 by means of a lottery in a future class meeting.

2.1 Identification Measure

Our measure of identity was adapted from Grieve and Hogg (1999). We asked the subjects, how much do you like being a member of a group, how much do you feel that you belong to the group, how strong are your ties to the group, how pleased are you to belong to the group,

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[17] See Oakes and Turner (1980).

[18] The subjects were not aware of our name of the games (ie. Nice Game and Mean Game) as this label could affect behavior in the games. For instance, Liberman et. al. (2004) show that referring to a Prisoner's Dilemma Game as the "Wall Street Game" induces less cooperative behavior than referring to it as the "Community Game."

how important is the group to you and how much do you identify with the group. These 6 questions were asked on a scale of 1 to 7, where 1 indicated a negative preference, 4 indicated "no opinion" and 7 indicated a positive preference. We used these items as they are standard in the psychology literature and appropriate in a minimal group setting.

When constructing a single measure of a latent variable from several survey items we need to be concerned with the reliability of our measure. As is standard, we calculate the Cronbach Alpha for our measure at each time period. (See Cronbach (1951) for more on the calculation of α.)

2.2 Competitive and Cooperative Measures

We also seek a measure of the competitive and cooperative nature of the subjects and their assessment of the competitive and cooperative nature of their choice of action in the game. The items of our competitiveness measure were adapted from Beersma and DeDreu (1999). Subjects were provided the following statements, I selected my action only considering my own welfare and I selected my action so that my outcome is relatively better than the outcome for my opponents. The subjects were asked to respond to these 2 statements on a scale of 1 to 7, where 1 indicated "strongly disagree", 4 indicated "neither agree nor disagree" and 7 indicated "strongly agree."

Likewise, the items of our cooperation measure were adapted from Beersma and DeDreu (1999). Subjects were provided the following statements, I selected my action so that my opponents can depend on me, I selected my action considering how my decisions affect the welfare of my opponents, I selected my action so that my opponents and I received the best joint outcome. The subjects were asked to respond to these 3 statements on a scale of 1 to 7, where 1 indicated "strongly disagree", 4 indicated "neither agree nor disagree" and 7 indicated "strongly agree."

2.3 Timeline

We refer to Time 1 as the period in which the subject has been allocated into a group, but does not know the form of the game to be played (Nice or Mean Game). In Time 1 we ask standard background questions, in addition to seeking a baseline measurement of group identity, competitiveness and cooperativeness. We refer to Time 2 as the period in which the subject has seen the game to be played, but before a choice of action has been made. In Time 2 we measure group identity. In the beginning of Time 3, the subject selects an action for the game. Thereafter, we take a competitive and cooperative measure of the perception of the action of the subject by using an appropriate adaptation of the items. Additionally, in Time 3 we measure group identity a final time.

Every response was entered on paper. In order to minimize biasing the subjects towards previous answers, we collected each sheet after its completion. Additionally, we color coded the pages so that the we could verify that the subject adhered to the procedure.

2.4 Results

Below we pool the data which was acquired at different times and through slightly different means. Specifically, three trials were conducted in Fall 2007 and three in Spring 2008. Additionally in the Spring 2008 trials, we asked an additional question, which composes the content of Study 2 below. To justify pooling the data, we performed a Multivariate Analysis of Variance (MANOVA) with dependent variables: change in identity between time 1 and 3, change in identity between time 1 and 2 and change in identity between time 2 and 3. In the MANOVA, the independent variables were game type, ingroup action selected, a binary treatment variable and the 4 interaction variables. Among the three, the most significant had an $F-$statistic of 0.782 and a significance of 0.378. Table 1 below lists the $F-$statistic and the significance of the relevant parameters in the MANOVA.

[Figure 1 about here]

As a result, Study 1 pools the data from the Fall 2007 and Spring 2008 trials.

The average of the 6 identity questions forms our measure of identity. Our Cronbach alphas for identity in Time 1, Time 2 and Time 3 are 0.810, 0.858 and 0.885 respectively. Our Cronbach alphas for cooperativeness in Time 1 and Time 3 are 0.74 and 0.74 respectively. Our Cronbach alphas for competitiveness in Time 1 and Time 3 are 0.55 and 0.76 respectively.

Table 2 presents a summary of the data by listing the mean identity (and variance in the parenthesis) according to the action selected at Time 3 and the game type which became known to the subject at Time 2.

[Table 2 about here]
[Figure 1 about here]

First, we may ask whether the manipulation induced different action choices. We found that participants in the Mean Game condition were more likely to chose the uncooperative choice (42 of 62, 67.7%) and participants in the Nice Game condition were more likely to chose the cooperative choice (37 of 68, 54.4%), $\chi^2 (1, 129) = 6.465$, $p = .0110$.

We note that the action choice affects the identity of subjects. Time 3 identity is significantly different for those who played C and those who played D. The t-test has significance 0.053 and the Mann-Whitney test has significance 0.036. However, there is no significant difference of identity at Time 1 or Time 2 for those playing C or D.

No significant relationship with identity exists between those received the Nice Game and those who received the Mean Game. However, significant relationships across game types emerge when we restrict attention within an action choice. Figure 1 shows the mean identity over time for subjects within game type and action. For those who received the Nice Game, there is a significant difference ($t = 2.470$, $p = 0.0163$) between the Time 3 identity of those playing C and those playing D. Similarly, among those who received the Nice Game, there is a significant difference ($t = 1.803$, $p = 0.0759$) between the Time 2 identity of those playing C and those playing D. An ANOVA of identity at Time 3, with independent variables game type, choice and an interaction term ($F = 2.019$, $p = 0.115$) indicates that the choice term is

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significant ($F = 3.255$, $p = 0.074$). However, no such significant relationship exists for those who received the Mean Game.

Although we have found a significant relationship between absolute levels of identity, perhaps it is worthwhile to consider the differences in identity. Indeed, among those receiving the Nice Game, there is a significant difference in the change in identity between Time 1 and Time 3 for those who played C and those who played D ($t = 1.862$, $p = 0.0686$). Again, no such significant relationship exists for those who received the Mean Game. We summarize this evidence by the following result.

Result 1: For those who received the Nice Game, the subjects who played C identified significantly more with the group over time than those who played D. For those who received the Mean Game, there was no difference in identification for those who played C or D.

A natural question is then, when do these changes in identity occur? Do they occur between Time 1 and Time 2? Or do they occur between Time 2 and Time 3? If the change occurs between Time 1 and 2, then it would seem that the subjects correctly anticipated their subsequent choice and that the act of executing the choice did not significantly affect their identity. However, if the change occurs between Time 2 and 3, then the act of executing the choice significantly affected their identity. A t-test between the difference in Time 2 and Time 3 identity of those who received the Nice Game and played C and those receiving the Nice Game who played D is significant at the 90% level of a one-sided test ($t = 1.63$, $p = 0.109$). Similarly, a t-test between difference in Time 1 and Time 2 identity of those who received the Nice Game and played C and those receiving the Nice Game who played D is not significant ($t = 0.757$, $p = 0.452$). On the basis of the above we infer that most of the changes occur between Time 2 and Time 3. Therefore, the evidence supports the contention that the act of making the selection affects identity and that the subjects do not correctly anticipate their choice. We summarize this by the following result.

Result 2: The change in identification which did occur, happened primarily between Time 2 and Time 3 rather than between Time 1 and Time 2.

The responses to the competitive and cooperative items suggest a potential explanation for the changes in identity discussed above. Recall that at Time 1 a baseline measurement of competitiveness and cooperativeness is taken. Then at Time 3 we make a measurement of the perception of the competitiveness and cooperativeness of the action taken. We take the difference between these Time 1 and Time 3 measurements to better understand how the subject considers the action undertaken. Table 3 lists the mean values (with variance in parenthesis) in the tables below.

[Table 3 about here]

First, we ask how the subject considers the actions taken. Across both games, playing C is considered to be more cooperative than playing D ($t = 3.75$, $p < 0.001$). Also across both games, playing C is considered to be less competitive than playing D ($t = -6.0636$, $p < 0.001$). Therefore, we regard the choice of C as more cooperative and less competitive than the choice of D.

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Within the Mean Game, playing C is considered to be more cooperative than playing D ($t = 1.315$, $p = 0.197$) although this result is insignificant. Also in the Mean Game, playing C is considered to be less competitive than playing D ($t = -2.594$, $p = 0.0142$). However these effects are stronger in the Nice Game. In the Nice Game, playing C is considered to be more cooperative than playing D ($t = 3.661$, $p < 0.001$). In the Nice Game, playing C is considered to be less competitive than playing D ($t = -5.797$, $p < 0.001$). Within each game, playing C is considered to be more cooperative and less competitive than playing D, however in the Nice game these differences are more pronounced. We summarize this by the following result.

Result 3: The difference in the perception of the competitiveness and cooperativeness of playing C and playing D was larger in the Nice Game.

An implication of the evidence above seems to be that taking an action which is considered to be less competitive or more cooperative tends to be associated with a larger positive change in identity. As playing C is considered to be more cooperative and less competitive than playing D, we see the former exhibiting a stronger identity than the latter. Further, the difference in the perception of cooperativeness and competitiveness for playing C and D is larger in the Nice Game than in the Mean Game. As such, we view Result 3 as a possible explanation for Result 1. Playing C in the Nice Game is perceived to be more cooperative and less competitive than playing D, whereas the relationship within the Mean Game is less significant. As a result, based on the action selected we find a larger change in identity in the Nice Game than in the Mean Game.

3 Study 2

Study 2 uses a subset of the trials from Study 1. Specifically, Study 2 pertains to the data obtained in Spring 2008 with a total of 40 subjects. In addition to asking for a single action for ingroup matches, the trials in Study 2 also requested a single action for outgroup matches. Study 2 subjects were told that they were to play the game with every student in their class, in the same group and the other group, who received the game game. The subjects were notified that the points attained in the ingroup and outgroup matches would be converted into averages, which would go towards a lottery for the $50 cash prize. As the difference between Study 1 and 2 lies in the presence of the choice against outgroup subjects, our results here will primarily focus on the new insights gained from this additional question.

3.1 Results

Table 4 lists the number of subjects who selected each action profile (action against ingroup members, action against outgroup members) and the game in which they made their decision.

[Table 4 about here]

Table 5 presents the summary of the data by listing the mean identity according to the action selected at Time 3 (listed (action against ingroup members, action against outgroup members)) and the game type which became known to the subject at Time 2.

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[Table 5 about here]

As we have data on the choice of action against ingroup opponents and the choice of action against outgroup opponents, we analyze the predictive power of identity on these outcomes. We will say that an action profile which selects different actions for ingroup and outgroup as *discriminatory*. Therefore, profiles of either C for ingroup opponents and D for outgroup opponents or D for ingroup opponents and C for outgroup opponents will be classified as discriminatory. Action profiles which select the same action for both ingroup and outgroup are classified as *nondiscriminatory*. See Figure 2 for an illustration of mean identity over time, sorted by the discriminatory nature of the action profile.

[Figure 2 about here]

A t-test of identity at Time 1 of those who played a discriminatory action ($Mean = 4.304$, $Variance = 0.730$) and identity at Time 1 of those who played a nondiscriminatory action ($Mean = 3.803$, $Variance = 0.517$) is significant ($t = 1.959$, $p = 0.0592$). While the evidence that ex-ante identity can predict subsequent behavior is not very strong, the evidence that ex-ante identity can predict the discriminatory nature of subsequent behavior is quite strong. We summarize this in the following result.

Result 4: Time 1 identity is a significant predictor of discriminatory actions in Time 3.

Recall that the evidence from Study 1 suggested that in the Nice Game, those who played C against in an ingroup member had a significantly stronger identity than those who played D. However in the Mean Game, there was no significant difference in identity of those who played C against an ingroup member and those who played D. Analysis of Study 2 data reveals an analogous finding. Figure 3 illustrates mean identity over time, sorted by the game type and action against outgroup subjects.

[Figure 3 about here]

We now analyze the change in identity given the game type and the choice of action against *outgroup* members. The difference between the change in identity at Time 3 and Time 1 for those in the Nice Game who played C against an outgroup member ($Mean = -0.357$, $Variance = 0.180$) and the the change in identity at Time 3 and Time 1 for those in the Nice Game who played D against an outgroup member ($Mean = -0.0119$, $Variance = 0.485$) is not significant ($t = 1.41$, $p = 0.177$). However, the difference between the change in identity at Time 3 and Time 1 for those in the Mean Game who played C against an outgroup member ($Mean = 0.226$, $Variance = 1.351$) and the the change in identity at Time 3 and Time 1 for those in the Mean Game who played D against an outgroup member ($Mean = -0.867$, $Variance = 0.400$) is significant ($t = 2.51$, $p = 0.0276$). Therefore, actions against outgroup members has a significant effect in the Mean Game, but not in the Nice Game. We summarize this evidence in the following result.

Result 5: For those who received the Mean Game, the subjects who played C identified significantly more with the group over time than those who played D. For those who received the Nice Game, there was no difference in identification for those who played C or D in outgroup matches.

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Therefore, we conclude that the action against ingroup members affects identity in the Nice Game more than in the Mean Game and that the action against outgroup members affects identity more in the Mean Game than in the Nice Game.

4   Conclusion

We have provided evidence related to the endogenous nature of identity in games. We have found that the identity of a subject is affected by the action taken and the strategic setting in which the action was taken. Those subjects who received the Nice Game and played C against an ingroup member has a significantly stronger change in identity than those who played D. We also found that the subjects who received the Mean Game and played C against an outgroup member has a stronger change in identity than those who played D. Additionally, we have found that the identity change which does occur, happens mainly after the subject selects an action. Finally, we present evidence that the change in identity is strengthened by actions which are considered to be less competitive and more cooperative. We view the evidence presented here as challenging the assumption that preferences are constant throughout a one-shot strategic game without feedback.

It is worth reflecting on the limitations of the study and the possibilities for future work. In the present experiment there was no feedback regarding the action of the opponents. It is unclear how feedback, or the anticipation of the feedback, would affect the change in identification. Also, the experiment only contained a single play of the game. It is unclear how the endogenous identity described in this experiment would affect future behavior in a repeated decision setting. It is possible that the new identity would revert back to its original form thus not affecting behavior or perhaps the endogenous identity would have a lasting influence on behavior. It is also not clear how the results of this study apply to other standard games such as chicken, assurance or the stag hunt. Additionally, it is unclear how the results apply to groups which are not minimal. It is possible that minimal group members display either a more or less malleable identity than members of less trivial groups. Hopefully future work can clarify these issues. Finally, note that playing D rather than C in the Mean Game yields the subject a gain 50 points while costing the opponent 100 points. Playing D rather than C in the Nice Game yields the subject a gain 5 points while costing the opponent 50 points. It is unclear exactly how these gains and costs affect the change in identification of the player. We hope that future work can tease out this relationship.

The results of our paper suggests that measuring other-regarding preferences with SVO or $GARP$ might affect the very preferences which they are intended to measure. In our experiment other-regarding preferences, as measured by identity, changed in a manner which depended on the specification of the Prisoner's Dilemma game, the action selected and the group affiliation of the opponent. It is possible that these effects also occur when the subject plays the dictator game, the means of measuring other-regarding preferences via SVO and $GARP$. If this is the case then measuring preferences by SVO or $GARP$ might affect those preferences which they are designed to measure. We hope future work will address this question.

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	$ID\ 3 - ID\ 2$	$ID\ 3 - ID\ 1$	$ID\ 2 - ID\ 1$
Treatment	0.284	0.782	0.270
	(0.595)	(0.378)	(0.605)
Treatment-Game Interaction	0.000	0.238	0.274
	(0.993)	(0.627)	(0.601)
Treatment-Action Interaction	0.606	0.485	1.417
	(0.606)	(0.487)	(0.236)
Treatment-Action-Game Interaction	0.007	0.995	1.336
	(0.934)	(0.321)	(0.250)

Table 1: $F-$statistics and corresponding significance of MANOVA

Mean Identity at Time 1			
ID 1	*M*	*N*	Total
C	4.23167	4.35135	4.14338
	(1.11725)	(1.20800)	(1.15896)
D	4.19444	4.07419	4.30936
	(0.72482)	(0.52213)	(0.63388)
Total	4.20645	4.22500	4.21615
	(0.83548)	(0.90220)	(0.86374)

Mean Identity at Time 2			
ID 2	*M*	*N*	Total
C	4.24583	4.28829	4.27339
	(1.05371)	(0.92230)	(0.95083)
D	4.23810	3.88710	4.08904
	(0.83759)	(0.76183)	(0.82491)
Total	4.24059	4.10539	4.16987
	(0.89119)	(0.87720)	(0.88161)

Mean Identity at Time 3			
ID 3	*M*	*N*	Total
C	4.13333	4.39640	4.30409
	(1.29708)	(1.00980)	(1.10528)
D	4.06667	3.75269	3.93333
	(1.17095)	(1.25902)	(1.21580)
Total	4.08817	4.10294	4.09590
	(1.19202)	(1.21064)	(1.19251)

Table 2: Mean identity by game type and action
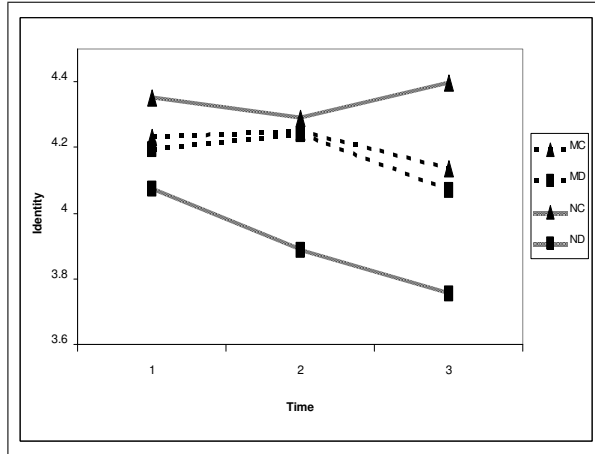
Figure 1: Mean Identity Across Time By Game Type and Ingroup Action

Mean Difference in Competitiveness

$Comp$ $3 - 1$	M	N	Total
C	-0.0167	-0.374	-0.249
	(1.783)	(1.724)	(1.743)
D	0.881	1.430	1.114
	(1.284)	(1.557)	(1.454)
Total	0.5914	0.4485	0.5617
	(1.597)	(2.443)	(2.029)

Mean Difference in Cooperativeness

$Coop$ $3 - 1$	M	N	Total
C	-1.325	-0.831	-1.004
	(2.231)	(2.469)	(2.401)
D	-1.845	-2.218	-2.0034
	(1.890)	(2.378)	(2.102)
Total	-1.6774	-1.4632	-1.5654
	(2.025)	(2.875)	(2.463)

Table 3: Mean Difference in Time 1 and Time 3 Competitiveness and Cooperativeness by action and game type

Total	M	N	Total
CC	4	5	9
CD	1	9	10
DC	5	2	7
DD	9	5	14
Total	19	21	40

Table 4: Number of subjects by action profile (ingroup action,outgroup action) and game type

Mean Identity at Time 1			
ID 1	M	N	Total
CC	3.700	3.667	3.681
CD	3.167	4.519	4.383
DC	4.233	4.083	4.190
DD	3.926	3.800	3.881
Total	3.919	4.103	4.016
Mean Identity at Time 2			
ID 2	M	N	Total
CC	3.938	3.500	3.694
CD	3.000	4.519	4.367
DC	4.400	3.500	4.142
DD	3.389	3.767	3.524
Total	3.750	4.000	3.881
Mean Identity at Time 3			
ID 3	M	N	Total
CC	3.750	3.500	3.611
CD	2.667	4.574	4.383
DC	4.600	3.250	4.214
DD	3.019	3.667	3.250
Total	3.570	3.976	3.783

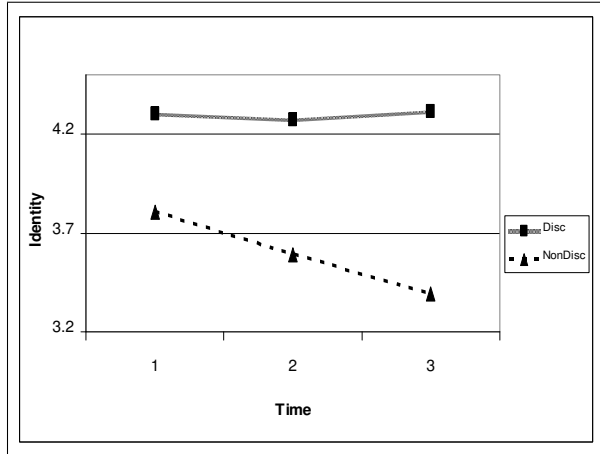Table 5: Mean identity by action profile (ingroup action,outgroup action) and game type
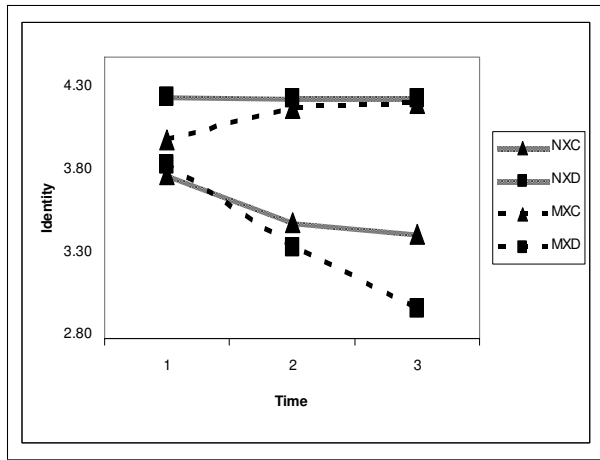
Figure 2: Mean Identity Across Time By Actions

Figure 3: Mean Identity Across Time By Game Type and Outgroup Action