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Group Identity in Markets*

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Group Identity in Markets

Abstract:

We present a laboratory experiment that measures the effects of group identity – one's perceived membership in social groups – on market transactions in an oligopoly market with a few sellers and buyers. We artificially induce group identity using art preferences and college majors in different treatments, respectively. Subjects are randomly assigned into the roles of buyers and sellers and interact repeatedly. We find that the presence of groups influences both the selection of trade partners and the determination of prices. All else equal, sellers are more likely to make offers to ingroup buyers, but this ingroup favoritism depends on the profile of seller-buyer intrinsic values. We also find that whenever buyers are more likely to accept offers from ingroup sellers, there are considerable ingroup-outgroup price differentials with outgroup sellers charging a *lower* price than ingroup sellers.

JEL codes: C91, D61, D63, L13, L14

Key words: group identity, experiments, markets; bargaining

Group Identity in Markets

1. Introduction

It is well established in the economic literature that other-regarding preferences play important roles in individual economic decision making. Nevertheless, markets are still typically modeled as interactions between self-interested agents. Our study contributes to the literature by experimentally examining an oligopolistic market with a few sellers and buyers who share social ties that are built on group identity – perceived membership in a social group. We induce group identity using subjects' painting preferences or priming their identity of being certain college majors. The research questions include how group identity influences agents' choice of partners in transactions and the determination of prices. Results of this paper offer insights that may help researchers better understand market matches and welfare implications in the presence of social groups.

Group identity theory was developed in a seminal work by Tajfel and Turner (1979) who seek to understand the psychological basis for intergroup discrimination. Group identity has been a central concept in understanding phenomena such as ethnic and racial conflicts, discrimination, and political campaigns (see McDermott, 2004, for a review). The concept of identity is systematically introduced into economic analysis by Akerlof and Kranton (2000) who apply the theory to analyses of gender discrimination, the economics of poverty and social exclusion, and household division of labor. A growing number of experimental studies investigate the effect of group identities on individual economic decision making. One strand of the literature uses natural pre-existing identities, such as ethnicity (e.g., Fershtman and Gneezy, 2001). Other studies follow the minimum group paradigm by inducing group identities in the laboratory and investigate their impact on prices and earnings in markets (Ball et al., 2001), cooperation (Eckel and Grossman, 2005; Charness et al., 2007), and social preferences (Chen and Li, *forthcoming*). Goette, Huffman, and Meier (2006) use randomly assigned real social groups to study the impact of group membership on cooperation and norm enforcement.

The influence of group identity has not yet been addressed in market settings, however, with a few notable exceptions including Akerlof and Kranton (2005) who study a principal-agent framework where workers may develop a social bond with their

employers, and Ball *et al.* (2001) who study how the artificially created social status affects market prices and earnings of buyers and sellers. Group identity may play a limited role in markets where there are many anonymous buyers and sellers. However, it becomes more important when the number of buyers and sellers is relatively small, e.g., in an oligopoly market, since some buyers and sellers may share social ties with each other and have heterogeneous non-pecuniary preferences over each other. In essence, when group differentiation is present a price-based market now includes matching considerations. Markets with matching considerations have been modeled by Hatfield and Milgrom (2005), Bulow and Levin (2006), Niederle (2007), and Crawford (2008). The presence of social ties may affect behaviors of those buyers and sellers who are part of these social ties. In addition, the information on the presence of social ties may also affect *other* buyers and sellers' behaviors, price determination and the rate of successful transactions in the market. Our study focuses on these research questions. Specifically, we measure the degree to which group identity affects buyers and sellers' choices of transaction partners, as well as the transaction prices.

In this study, we design a lab experiment involving an oligopoly market with three sellers and three buyers who share some social ties. The social ties are built on perceived group membership that is induced in the lab. In one treatment, we adopt the minimal group paradigm in the psychology literature to artificially induce group identity based on subjects' art preferences. In another treatment, we adopt a technique from psychology by priming subjects' identities of being certain college majors. Subjects are then assigned with the roles of buyers and sellers who have different intrinsic preferences over each other and interact repeatedly. Our investigation identifies the impact of group identity on partner selection and price offers. We find that all else being equal, sellers are more likely to make offers to ingroup buyers, but this ingroup favoritism depends on the profile of seller-buyer intrinsic preferences. We also observe considerable ingroup-outgroup price differentials with outgroup sellers charging a *lower* price than ingroup sellers, whenever buyers are more likely to accept offers from ingroup sellers. Although ingroup match is in general more likely to yield a higher rate of successful transactions than outgroup match, the overall rate of transactions is not significantly different in the identity treatments compared to the control where there is no group differentiation.

The paper is organized as follows. Section 2 discusses the setting we investigate and outlines the research questions. Section 3 presents the experimental design. Section 4 presents the analysis and main results. Section 5 concludes.

2. Setting and Research Questions

Before we discuss the research questions, we briefly describe the setting under investigation. Prior to the market exchange, buyers and sellers are assigned to groups. This group affiliation does not change over the span of time we study. There are three buyers and three sellers in fixed roles. Buyer and sellers make decisions repeatedly during 50-round market with differentiated buyers and sellers. Differentiation means that buyers and sellers have different intrinsic values over each other and that all else equal, buyers and sellers could strictly rank each other in order of preferences. In each round, every seller chooses a buyer and makes a price offer. Each buyer then decides whether to accept any offer he has received. Buyers can accept only one offer or reject all. We will discuss the experiment design in detail in section 3.

The main research questions we are interested in include whether and how group identity influences partner selections on both the demand and supply sides, and the determination of prices. Our setting links to the literature on bargaining games with multiple proposers and responders (for studies with multiple responders see Güth et al., 1997; Grosskopf, 2003, and Gneezy et al., 2003 for bargaining games with multiple responders). In our setting, each seller can be thought of as a proposer facing multiple responders and each buyer can be thought of as a responder facing multiple offers. If the responder deems none of the offers to be fair, he can reject all. A subject would lose one token if unmatched in a market. Since there are equal numbers of proposers and responders, in later stages of the game, offers will be made one-to-one, resulting in a structure very similar to the basic bargaining game.

Since this game can be solved by backwards induction, we begin our investigation with the second mover (i.e., the buyer) and then examine first mover's (i.e., the seller) behavior. Hypothesis 1 stems from studies of bargaining games with group identity (e.g., Chaserant, 2006). In these studies, it is found that responders are more likely to accept offers from members of the same social group, all else equal. We conjecture that this pattern would extend to the present setting.

H1. Other things being equal, offers from ingroup sellers are more likely to be accepted.

Next question we investigate is whether in the market setting sellers would consider buyers' group identity in their strategies on whom to make an offer to and at what price. The existing evidence is mixed in the literature. Fershtman and Gneezy (2001) reject ethnic group effects in a dictator game experiment conducted in Israeli Jewish society. In contrast, Wilson (2007) conducts a dictator game experiment in Bosnia and finds that participants from three ethnic groups – Bosniak, Croat and Serb – show strong ingroup favoritism by offering significantly more economic awards to recipients from their own ethnic groups. Kramer, Shah and Woerner (1995), in a bargaining game involving members of two rival business schools, find that responders are more willing to accept an unfair offer by an ingroup member. Kahneman et al. (1986) observe that psychology students paired with commerce students make less generous offers and are less willing to accept unfair offers relative to pairing with other psychology students. Robert and Carneval (1997) find that proposers more often offer a fair share to a member of their own class. Chaserant (2006) investigates bargaining game experiments with a minimal group paradigm, separating people into groups by preferences over art works. They find discriminatory behavior in only one of the two groups and in the opposite direction to Kramer et al. (1995). That is, subjects in that group reject the majority of unfair offers coming from the ingroup. Charness, Haruvy and Sonsino (2007) find that people are less generous to members of a different geographical group in a lost wallet game.

Therefore, hypotheses 2 and 3 propose that in the present setting sellers would consider group identity in their strategies.

H2. Sellers are more likely to make offers to ingroup buyers.

H3. Prices offered to ingroup buyers will differ from those to outgroup buyers.

Hypothesis 3 is two-directional. On the one hand, sellers may make favorable price offers to ingroup buyers because of ingroup favoritism. On the other hand, sellers may expect buyers to behave in an ingroup favorable way and, when making offers to outgroup buyers, will offer lower prices to compete with the buyers' ingroup sellers. Or

alternatively, opportunistic sellers, in anticipation for buyers' ingroup favoritism, may take advantage of this and charge ingroup buyers higher prices.[1] In either case, we expect to observe ingroup-outgroup price differentials, but the direction of the differentials is ambiguous.

3. Experimental Design

We adopt two major experimental methods from social identity research: (1) priming *natural* social identities, and (2) inducing *artificial* group identity in the laboratory using an approach known as minimal group paradigm.[2] Priming is an experimental technique by which a stimulus, such as a list of words, a questionnaire, posters, or an article, is given to subjects to sensitize them to the later presentation of a similar stimulus. Research in psychology finds that subtly activating one's natural social identity through priming can affect behaviors and outcomes, such as test performance (Aronson, Quinn and Spencer, 1998), walking speed (Bargh, Chen and Burrows, 1996) or person perception (Bargh and Pietromonaco, 1982). The second method induces artificial group identity using the minimal group paradigm. In the classical application of the minimal group paradigm (Tajfel and Turner, 1979), subjects are assigned to groups based on stated preferences for paintings by two artists, Wassily Kandinsky and Paul Klee. The typical finding is that group membership creates ingroup enhancement in ways that favor the ingroup at the expense of the outgroup (Tajfel and Turner, 1979, Brown, 1986, and Wetherell, 1996, for reviews). In our study, we adopt both methods as complementary to each other, and investigate three experimental treatments: (1) induced group identity through the minimal group paradigm using paintings (Tajfel and Turner, 1979) – hereafter the *Paintings* treatment, (2) natural group identity through classification of

[1] Chen and Li (*forthcoming*) find that in two-person response games the responders are more forgiving towards an ingroup proposers' behavior out of a bad intention to lower the former's payoffs.

[2] Studies based on natural classifications of identities (e.g., gender, race, age) usually yield results that can be easily generalized. The potential drawback, however, is that the results may be subject to noise due to the multi-dimensionality of natural identities (that is, people have multiple affiliations with different degrees of saliency) and hence be affected by heterogeneity in individuals' perceptions during the experiment. Priming makes salient the dimension of identity that interests the researchers and hence can avoid potential confounds. In comparison, the approach of artificially inducing identities gives experimenters better control over the participants' guiding identity during the experiment. As a tradeoff, the results may not have straightforward generalizations to real-life cases. We adopt both approaches as complementary to each other.

college majors – hereafter the *Majors* treatment, and (3) a control treatment with no group identity.[3]

The identity treatment sessions contained two stages. The first stage involved group assignment based on participants' art preferences or college majors. In the second stage, subjects were randomly assigned with a role of buyer or seller, and participated in a series of trading tasks. Sellers made price offers to buyers, and buyers decided whether and which offer to accept. The control contained only the trading tasks without having subjects assigned to groups. All sessions consisted of six subjects.

Group Assignment

In the *Paintings* treatment, we followed the minimal group design in the social psychology literature and created two groups in the laboratory based on participants' preferences over paintings by two modern artists, Wassily Kandinsky and Paul Klee. Specifically, subjects indicated their preferences over five pairs of paintings on a web site constructed for the experiment recruiting. Each pair included one painting by Wassily Kandinsky (1866-1944) and one painting by Paul Klee (1879-1940). Although both artists are considered pioneers in abstraction in modern painting, they have very distinct styles. Subjects were classified as Kandinsky-group if they indicated preferences for Kandinsky paintings in at least three pairs, and Klee otherwise. Four out of six sessions had two balanced groups whereas the other two sessions had four Kandinsky-classified and two Klee-classified participants.[4] To make the group identity salient, the experimenter started the sessions by briefly introducing the two artists' biographies and contrasting the styles of their work. Subjects were then reminded of their preferences and encouraged to reflect how their painting preferences related to their personalities.

In the *Majors* treatment, we used the natural pre-existing group identity distinguished by college majors. In recruiting, we invited only subjects who were either

[3] Note that our group assignment process differs slightly from that of the minimal group paradigm experiments in social psychology. In psychology, group assignment is usually done randomly even though participants are led to believe it is based on their painting preferences. To avoid using deception, we categorized subjects to groups truly based on self reported painting preferences as in Chen and Li (2009).

[4] Since we categorized subjects truly based on their self reported painting preferences or college majors, this usually led to unbalanced group sizes. We tried to mitigate the problem by soliciting subjects' preferences in advance during online recruiting, and later inviting equal numbers of both types to the experiment. Despite our effort, for two sessions, we still ended up having more of one type than the other. However, the group size (i.e., 3 vs. 3, or 2 vs. 4) did not seem to affect their decisions.

business or engineering majors. Four sessions had an equal number of participants from each major, whereas the other two sessions had four people from one major and two from the other major since more students showed up from one major than the other. We adopted research designs of group identity studies in social psychology to make the college major identity salient (Aronson et al.1998, Steele 1997, Shih, Pittinsky and Ambady 1999). At the beginning of the experimental sessions, participants were greeted by the experimenter and asked to fill out a questionnaire that contained questions on the comparison and contrast of their major with the other major. They were also asked to indicate their agreement, on a scale from 1(Strongly Disagree) to 5 (Strongly Agree), with three statements on how strongly they identified with their major. These statements include *i*) "Being a business/engineering major is an important part of who I am"; *ii*) "Being a business/engineering major is an important part of the image that I project"; and *iii*) "Being a business major is a source of pride for me". Participant responses to all these three statements vary from 1 to 5 with mean between 3.5 and 4, median 4 and standard deviation between 1.1 and 1.3. The survey and summary statistics are included in Appendix A.

Trading Tasks

At the beginning of the second stage, six subjects were assigned with a role of buyer or seller. There were always three buyers and three sellers per session. Their roles were fixed for the rest of the experiment. For the sessions with three subjects for each painting type or major, group differentiation was preserved among sellers (or buyers). In other words, there was at least one seller (or buyer) who came from a different group than the rest of sellers (or buyers) in each round.

Sellers and buyers interacted repeatedly in a series of trading tasks for 50 rounds. In each round, each seller chose one buyer to make a price offer first, and then buyers responded. Each seller can only make one price offer per round. The price offer, if accepted, was paid out by the buyer to the seller. After the offers were made, each buyer chose whether to accept any offer he had received; she could accept only one offer or reject all.

Sellers and buyers have exogenous and heterogeneous preferences over each other, as shown in the value profiles presented in Table 1. The first number in each cell is

seller value – how much a seller would earn, in addition to the price, by matched with a buyer; the second number is buyer value – how much a buyer would earn, before the price is paid out, by matched with a seller. For example, in profile 1, seller 1 would earn 35, 25 and 15 tokens from buyers 1, 2 and 3, respectively, and hence prefers buyer 1 to buyer 2 and buyer 2 to buyer 3, based on intrinsic values. On the other hand, buyer 1 prefers seller 3 to seller 2 and seller 2 to seller 1, based on intrinsic values. All sellers (or buyers) differ in their preference rankings. Since when an offer was accepted the buyer would have to pay the seller the proposed price, buyer payoff would be the buyer value minus the price, and seller payoff would be the seller value plus the price in that round. It was public information that unmatched subjects in a round would lose one token for that round. Every subject was given an endowment of 10 tokens at the beginning of the experiment.[5] For buyers who receive at least one offer with a positive net payoff, rejection is a myopically dominated strategy in a given round but it might lead to better offers in future rounds.

Table 1. The Value Profiles

		Buyer 1	Buyer 2	Buyer 3
Profile 1	Seller 1	35, 15	25, 15	15, 35
	Seller 2	25, 25	35, 35	15, 15
	Seller 3	15, 35	35, 25	25, 25
Profile 2	Seller 1	15, 35	35, 15	25, 35
	Seller 2	15, 15	25, 25	35, 25
	Seller 3	25, 25	35, 35	15, 15

Note: In each cell, the first number is seller value and the second number buyer value.

We used two value profiles with profile 1 used in rounds 1-25 and profile 2 used in rounds 26-50 as shown in Table 1. In the instructions presented in Appendix B, the buyer values and seller values were presented in two separate tables for each profile to make the information easier for subjects to follow.

One important part of our design is to adopt value profiles from the matching literature in order to introduce sellers and buyers' heterogeneous preferences over each other. The parameters in the profiles are selected such that no one shares the same preference rankings with anyone else, as shown in Table 2. We selected two value

[5] There was no one who made no transaction for ten consecutive rounds.

profiles with the first profile relatively simpler than the second one. In the absence of prices (or all prices being equal), the first profile theoretically converges in two steps (one step after the initial offer), assuming each seller makes an offer to the buyer with the highest valuation for him who has not yet rejected him.[6] More complexity is added to the structure of the second profile, and it theoretically converges in four steps – three steps after the initial offer. The two profiles allow us to examine and compare the effects of social identity in relatively simple market environments and increasingly more complex market environments.

Table 2. Sellers and buyers' intrinsic preferences

	Profile 1	Profile 2
Seller preferences over buyers	$B_1 \succ_{S_1} B_2 \succ_{S_1} B_3$	$B_2 \succ_{S_1} B_3 \succ_{S_1} B_1$
	$B_2 \succ_{S_2} B_1 \succ_{S_2} B_3$	$B_3 \succ_{S_2} B_2 \succ_{S_2} B_1$
	$B_2 \succ_{S_3} B_3 \succ_{S_3} B_1$	$B_2 \succ_{S_3} B_1 \succ_{S_3} B_3$
Buyer preferences over sellers	$S_3 \succ_{B_1} S_2 \succ_{B_1} S_1$	$S_1 \succ_{B_1} S_3 \succ_{B_1} S_2$
	$S_2 \succ_{B_2} S_3 \succ_{B_2} S_1$	$S_3 \succ_{B_2} S_2 \succ_{B_2} S_1$
	$S_1 \succ_{B_3} S_3 \succ_{B_3} S_2$	$S_1 \succ_{B_3} S_2 \succ_{B_3} S_3$

The structure of the profiles also imposes certain degree of competition among sellers. For example, in profile 1, both sellers 2 and 3 prefer buyer 2 most based on their intrinsic values. This design allows us to study whether and to what extent an introduction of groups may maneuver competition on the supply side. Specifically, we ask what role, if any, the presence of group identity plays in sellers' selection of buyers and their choices on price offers. On the demand side, the design makes it possible for some buyers to receive multiple price offers. In a neutral identity environment, buyers may act rationally by accepting the offer that brings them the highest monetary payoffs.[7]

[6] Matching theory typically ignores prices. This is because prices add a level of complexity, add ties and often destroy the lattice structure. One purpose of the present study is to fill this vacuum in a setting with group identity. Recent works on matching with prices include Hatfield and Milgrom (2005), Bulow and Levin (2006), Niederle (2007), and Crawford (2008).

[7] Empirically, there may be errors when subjects make these decisions.

In an environment with group differentiation, however, buyers' decision making process may become more complex when there are tradeoffs between monetary payoffs and intergroup preferences. For example, a buyer may favor an ingroup seller when deciding between comparable offers, in which case the group differentiation facilitates buyers' selection of sellers. In other cases, the presence of group differentiations may interfere with rational response of buyers and induce deviation from it. A buyer may be willing to forego a certain amount of monetary payoff and accept an ingroup offer that charges a higher price in order to acknowledge her group identity.

Procedure

Subjects were seated in front of computers at partitioned desks, and made decisions in private. Communications was not permitted among subjects. Hard copies of the instructions were distributed, and also read aloud by the experimenter. Both value profiles were included in the instructions and subjects had access to them at any time during the experiment.

When subjects were making their decisions, they were informed of the opposite role's group affiliation. For example, sellers were informed of the group affiliation for every buyer, and also reminded of their own value profile. Similarly, buyers were informed of the type of each seller, told about which seller proposed to which buyer at what price, and reminded of their own buyer profile. Screen shots on seller and buyer decisions are included in Appendix C.

At the end of each round, subjects were given feedback on the results on the round just ended. The feedback screen was similar for sellers and buyers. It included information on which partner each subject was matched with, if at all, and at what price, individual earnings in the most recent round, and cumulative earnings. Subjects were also informed about all other transactions, including to which buyer each seller proposed and at what price, and whether the offer was accepted. It was public information that this feedback was given to every participant.

There were 50 rounds, with profile 1 being used in rounds 1-25 and profile 2 in rounds 26-50. When round 25 ended, subjects were warned that a new set of value profile would be used for the remainder of the experiment, but their roles as seller or buyer would stay unchanged. At the end of the experiment, while we made the payment we

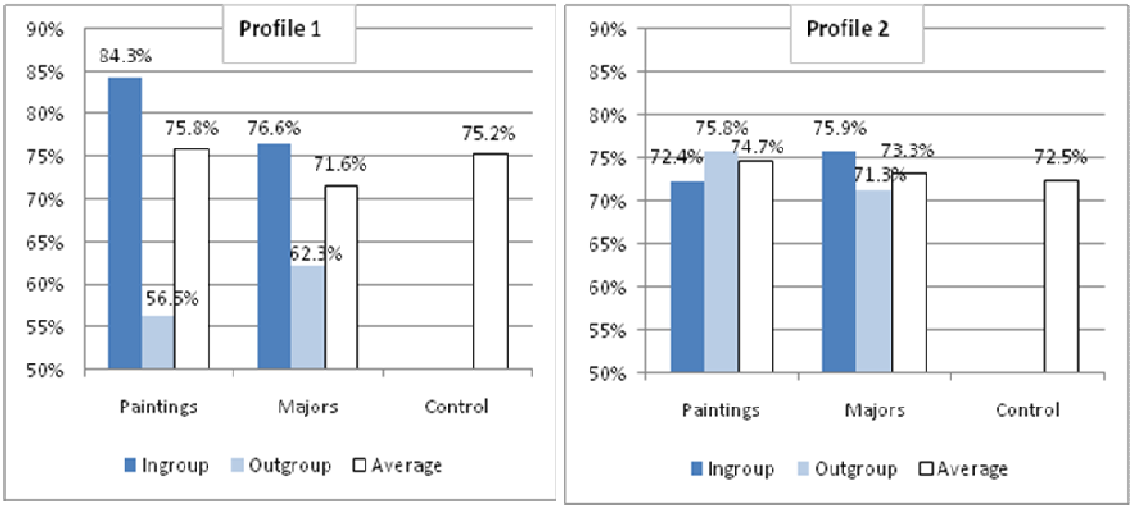
wrote each group's average earnings on the board, as announced in the instructions, although most subjects left without seeing them.

The experiments were conducted at the University of Texas at Dallas. Subjects were recruited through announcements in classes and posters throughout the university. The experiment lasted about one hour. Subjects' true identities remained anonymous and were represented by computer assigned subject numbers. The experiments were programmed using z-Tree (Fischbacher 2007). Subjects were paid their cumulated earnings through all rounds based on the exchange rate of 200 lab tokens per dollar. In total, six Paintings sessions, six Majors sessions, and five control sessions were conducted, with six subjects per session.

4. Results

For a visual inspection of the results pertaining to hypothesis 1, we summarize in Figure 1 the average rate that a proposal gets accepted by a buyer (i.e., the rate of successful transactions). Statistics for ingroup match, outgroup match, and overall average are represented by black, grey and white bars, respectively. We find that although the overall average acceptance rates are similar across experiment conditions, proposers' group affiliation clearly affects the likelihood of whether an offer is accepted. In profile 1 of the Paintings treatment, 84.3% of price offers proposed to ingroup buyers are accepted, in contrast to 56.5% of acceptance rate for offers proposed to outgroup buyers. In profile 1 of the Majors treatment, the acceptance rate is 76.6% for offers proposed to ingroup, and 62.3% for offers proposed to outgroup. In profile 2, the ingroup and outgroup difference in acceptance rate declines. For the Majors treatment, the acceptance rate is still higher for ingroup (75.9%) than for outgroup (71.3%). For the Paintings treatment, the relationship reverses with the acceptance rate for outgroup (75.8%) slightly higher than for ingroup (72.4%). The summary statistics suggest that on average, proposals to ingroup buyers are more likely to be accepted.

Figure 1. Rate of offer acceptance



We use random effect logit regressions to formally investigate the determinants of acceptance of seller offers. Recall that in each round a seller can choose only one buyer and make a price offer, and the offer may be accepted or rejected. In our sample, the rate of rejection is 24.8% in the Paintings treatment, 27.6% in the Majors treatment, and 26.1% in control. We investigate the factors that determine whether a seller's offer is accepted or rejected. The dependent variable is the probability that a seller's offer is accepted. We consider two explanatory variables including group affiliation (the *Ingroup* dummy) and a price factor (*Relative Price*) in the identity treatments.[8] The *Ingroup* dummy variable is coded as one if the proposing seller and the buyer come from the same group, and zero otherwise. The variable *Relative Price* is the seller's proposing price normalized by buyer value. In other words, the variable *Relative Price* represents the fraction of buyer gross value that can be extracted by the seller if the offer is accepted. Our prediction is that the probability of offer acceptance increases with the ingroup matching but decreases with the relative price.

[8] The group affiliation variable is inapplicable in the control.

Table 3: Determinants of seller offer acceptance – random effect logit regressions

		Paintings	Majors	Control
Profile 1	Ingroup	0.345***	0.164***	
		(0.077)	(0.054)	
	Relative Price	-0.636***	-0.828***	-0.442***
		(0.141)	(0.122)	(0.134)
	Observations	450	450	375
	Log likelihood function	-197.7	-211.1	-190.4
Profile 2	Ingroup	-0.031	0.091*	
		(0.055)	(0.054)	
	Relative price	-0.462***	-0.586***	-0.308**
		(0.090)	(0.136)	(0.139)
	Observations	450	450	375
	Log likelihood function	-232.2	-237.4	-211.1

Note: Dependent variable is the probability that a seller's offer is accepted; the constant term is included in the regressions; the table reports the marginal effects; standard errors in the parentheses are clustered at the individual level; *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 3 presents the results. We report the marginal effects of the explanatory variables rather than the coefficient estimates. Standard errors in the parentheses are clustered on the individual level.[9] Firstly, we find that buyers respond negatively to price. A higher price (normalized by the buyer value) significantly decreases the chance of acceptance ($p < 0.01$). The results on price are consistent across all the experimental conditions and the two value profiles. In addition, the effect of group affiliation on offer acceptance exhibits interesting patterns. In profile 1 of both the Paintings and Majors treatments, the *Ingroup* matching increases significantly the likelihood of offer acceptance, conditional on the relative price. Particularly, ingroup affiliation in the Paintings treatment increases the likelihood of offer acceptance by 34.5% ($p < 0.01$), all else being equal. Ingroup affiliation in the Majors treatment increases the likelihood of acceptance by 16.4% ($p < 0.01$). It supports hypothesis 1 that buyers are more likely to accept an offer from an ingroup seller. In profile 2, however, buyer's preferential treatment towards ingroup sellers diminishes substantially. In the Majors treatment, the marginal effect of the ingroup dummy variable reduces from 0.164 in profile 1 to 0.091 ($p < 0.10$) in profile 2, with the standard errors unchanged. In the Paintings treatment, its marginal effect of ingroup becomes -0.031, but is not statistically different from zero. One conjecture is that buyers' favorable treatment toward ingroup sellers may generate

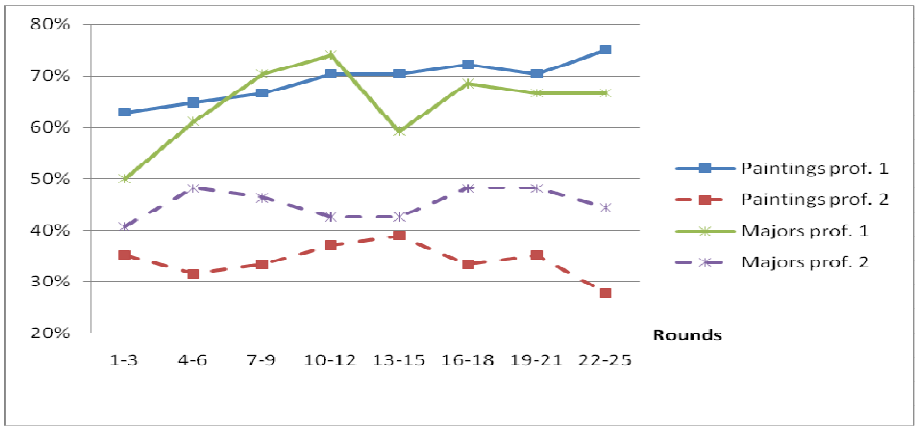
[9] A constant term is included in the random effect logit regressions for each treatment. It is omitted in the table since the marginal effects are reported here.

opportunistic responses from the latter, and buyers learn this over time and consequently withdraw their ingroup favorable choices. This conjecture is discussed when we investigate sellers' decisions over buyers and price, to which we will turn after stating Result 1.

Result 1: All else equal, price offers from ingroup sellers are more likely to be accepted in profile 1, but this tendency diminishes over time.

We next investigate whether sellers' selection of buyers is influenced by group differentiation. We find that on average, sellers choose an ingroup buyer 69.3% of the time in profile 1 and 33.8% in profile 2 for the Paintings treatment, and 64.7% in profile 1 and 45.1% in profile 2 for the Majors treatment. Figure 2 presents the dynamics of the probability that sellers choose ingroup buyers. Each dot represents a three-round average. The solid lines refer to profiles 1 and dashed lines profiles 2; lines with squares refer to the Paintings treatment and lines with asterisks the Majors treatment. Comparing these lines with the 50% reference line (in which case ingroup and outgroup are selected with 50-50% of chance) reveals that for both of the identity treatments, sellers are more likely to choose ingroup buyers in profile 1. In profile 2, sellers are more likely to choose outgroup buyers in the Paintings treatment, and also show marginal favoritism towards outgroup buyers in the Majors treatment.

Figure 2. Probability that sellers make a price proposal to ingroup buyers



We use a conditional logit model to formally study the determinants of sellers' choice of buyers. The dependent variable is the likelihood that buyer *i* (*i* = 1 for buyer 1, *i*

= 2 for buyer 2, and $i = 0$ for buyer 3) is selected by the seller. Explanatory variables include seller and buyers' group affiliations (represented by the *Ingroup* dummy), and the seller and buyer joint payoffs (*Total surplus*). The *Ingroup* dummy takes a value of one if the seller and the buyer come from the same group, and zero otherwise. Results are reported in Table 4.

Table 4. Determinants of sellers' choice over buyers– conditional logit regressions

		Paintings	Majors	Control
Profile 1	Ingroup	0.328***	0.226***	
		(0.038)	(0.029)	
	Total surplus	0.021***	0.006***	0.004*
		(0.002)	(0.002)	(0.002)
	Buyer 1	-0.268***	-0.066*	-0.085***
		(0.042)	(0.036)	(0.035)
	Buyer 2	-0.115***	0.055	0.002
		(0.044)	(0.038)	(0.040)
	Observations	450	450	375
	Log likelihood function	-361.7	-441.1	-402.6
Profile 2	Ingroup	-0.159***	0.020	
		(0.027)	(0.028)	
	Total surplus	0.012***	0.009***	0.015***
		(0.002)	(0.002)	(0.002)
	Buyer 1	-0.033	-0.085	-0.056
		(0.034)	(0.035)**	(0.037)
	Buyer 2	-0.113	-0.030	-0.171
		(0.032)***	(0.028)	(0.031)***
	Observations	450	450	375
	Log likelihood function	-443.2	-465.0	-372.0

Note: Dependent variable is the probability that a seller proposes a price to a buyer; the table reports the marginal effects; * significant at 10%, ** significant at 5%, *** significant at 1%.

For both of the identity treatments, sellers are more likely to choose ingroup buyers than outgroup buyers in profile 1. Specifically, the probability of choosing an ingroup buyer is 32.8% ($p < 0.01$) higher than choosing an outgroup buyer in the Paintings treatment, and 22.6% ($p < 0.01$) higher in the Majors treatment. Similar to result 1, this ingroup favoritism evaporates and potentially reverses in profile 2. For the Paintings treatment, sellers are 15.9% ($p < 0.01$) less likely to choose ingroup buyers in profile 2; for the Majors treatment, the ingroup and outgroup difference is 2% and not significantly different from zero ($p > 0.10$) in profile 2. In almost all cases except profile 1 for the control, the *Total surplus* variable enters with a positive and significant effect (p

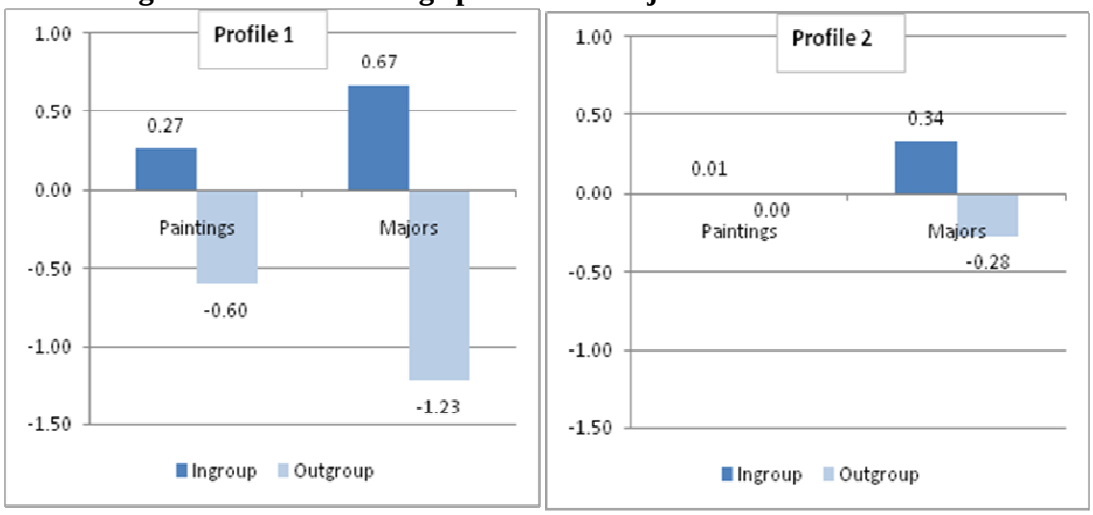
< 0.01). It suggests that the higher the seller-buyer joint payoffs, the more likely that the seller will make an offer to the buyer. This gives us Result 2.

Result 2: All else being equal, ingroup membership significantly increases the probability of an offer in profile 1. The ingroup favoritism diminishes or reverses in profile 2.

We next investigate hypothesis 3 on seller price offers. For a visual inspection, we summarize sellers' average price offers, adjusted for individual effect, in Figure 3. Specifically, for each seller, individual means are subtracted from the observations of each price, before the average price is computed. Figure 3 presents this adjusted average price for ingroup (black bars) and outgroup (grey bars) matching, respectively, in the Paintings and Majors treatments. Note that, by definition, the adjusted average price is zero for the control condition since the average of individuals' deviations from the mean must be zero. We find that in all cases, seller average price is higher for ingroup than for outgroup. In profile 1 the ingroup-outgroup price difference is 0.87 (0.27 plus 0.60) tokens for the Painting treatment and 1.9 tokens for the Majors treatment. In profile 2 the difference is 0.01 tokens for the Paintings treatment and 0.62 tokens for the Majors treatment. We also find sellers' price offers are highly state dependent, and are highly correlated with prices offered in previous rounds. For example, the correlation between individual prices with the average price of successful transactions in the previous round ranges from 0.20 to 0.68 (all with *p* value less than 0.01).[10] This is not surprising since, in each round after transaction, subjects were given feedbacks on all the prices in that round. Therefore, it is expected that the feedbacks on prices may influence sellers' ask prices in subsequent rounds.

[10] The correlations are 0.56 (profile 1 in Paintings), 0.35(profile 2 in Paintings), 0.20 (profile 1 in Majors), 0.40 (profile 2 in Majors), 0.68 (profile 1 in control) and 0.28 (profile 2 in control), all with *p* values less than 0.01.

Figure 3. Sellers' average price offers adjusted for individual effect



We use random effect linear regressions to formally investigate the determinants of price proposed by sellers. The dependent variable is the price that a seller proposed. Explanatory variables include group affiliation (the *Ingroup* dummy), seller and buyer joint payoffs (*Total surplus*), one period lag of average price (*Lag price*).[11] The dummy variable *Ingroup* is coded as one if the seller and the buyer to whom the seller proposed come from the same painting or college-major group, and zero otherwise. The *Total surplus* variable is constructed as the sum of buyer value and seller value. *Lag price* is included to control for state dependence of price, and is constructed as the average of prices in the successful transactions in the previous round.[12]

Table 5 reports the estimated coefficients in the random effect linear regressions. The coefficient of the *Ingroup* variable is positive and significant in most cases (except profile 2 of the Paintings treatment), indicating that outgroup sellers charge a lower price than ingroup sellers. Specifically, all else being equal, the ingroup and outgroup price gap is 1.765 tokens ($p < 0.01$) in profile 1 of the Paintings treatment, and 2.519 tokens ($p < 0.01$) and 1.568 tokens ($p < 0.01$) in profiles 1 and 2 of the Majors treatment,

[11] In a separate regression for the Majors treatment, we incorporated the survey measures on identity as proxies for group affiliation. The effects of the *Ingroup* dummy, *Total surplus*, and *Lag price* variables are robust. The identity variables did not enter with significance at any conventional level.
[12] The price offers which were rejected were not included in the computation for the *Lag price* variable.

respectively.[13] These differences are economically sizable – they are 18.4%, 25.2%, and 18.7% of the corresponding average proposed price, respectively.[14]

Table 5. Determinants of seller's proposing price – random effect linear regressions

		Paintings	Majors	Control
Profile 1	Ingroup	1.765***	2.519***	
		(0.616)	(0.632)	
	Total surplus	0.100**	0.034	-0.037
		(0.043)	(0.039)	(0.050)
	Lag price	0.566***	0.236***	0.619***
		(0.054)	(0.075)	(0.065)
	Constant	-2.516	4.419*	6.658**
		(2.608)	(2.370)	(2.939)
	R^2	0.37	0.10	0.49
	Observations	432	432	360
Profile 2	Ingroup	-0.332	1.568***	
		(0.813)	(0.548)	
	Total surplus	-0.022	0.037*	0.037
		(0.033)	(0.022)	(0.031)
	Lag price	0.438***	0.405***	0.155**
		(0.075)	(0.072)	(0.073)
	Constant	7.211***	2.318	5.713**
		(2.206)	(1.493)	(2.239)
	R^2	0.11	0.13	0.11
	Observations	432	432	360

Note: The dependent variable is the price proposed by seller. Standard errors in the parentheses are clustered at the individual level; * significant at 10%, ** significant at 5%, *** significant at 1%.

We have two conjectures regarding this ingroup-outgroup price differentials. One conjecture is that anticipating their offers are more likely to be accepted by ingroup buyers, opportunistic sellers take advantage of it by charging ingroup buyers a higher price. The other conjecture is that, anticipating buyers would favor their ingroup, sellers try to offer competitive (i.e., lower) prices to win the business whenever proposing to their outgroup buyers. Over all, sellers' price offer increases with the buyer and seller joint payoff (variable *Total surplus*), but the effect varies across treatments and profiles. The effect is 0.1 ($p < 0.05$) in profile 1 of the Paintings treatment, 0.037 ($p < 0.10$) in profile 2 of the Majors treatment, and close to zero in other cases ($p > 0.10$). The variable

[13] In profile 2 of the Paintings treatment, the ingroup-outgroup price difference is -0.332, not significantly different from zero ($p > 0.10$).

[14] The average proposed price is 9.6 tokens in profiles 1 and 2, respectively, for the Paintings treatment, 10.0 and 8.4 in profiles 1 and 2 for the Majors treatment, 11.0 and 9.2 in profiles 1 and 2 for the control condition.

Lag price enters with a significant positive effect ($p < 0.05$ for profile 2 in control, and $p < 0.01$ for all others), indicating substantial state dependence of sellers' price offers over prices of the previous round. This gives us result 3.

Result 3: Sellers differentiate ingroup and outgroup when making price offers. On average, outgroup sellers charge a lower price than ingroup sellers.

The results above suggest that the presence of groups affects both partner selection and price in markets. Result 1 shows that in profile 1, all else being equal, both sellers and buyers show preferences for ingroup trade partners relative to outgroup counterparts. Result 3 shows ingroup and outgroup price differentials, with the outgroup sellers charging a significantly lower price. This may be because that the disutility from rejecting disadvantageous ingroup offers (result 1) allows ingroup sellers to increase prices (result 3) and therefore works in the ingroup sellers' advantage. Or the outgroup sellers, in anticipation for the buyers' intergroup preferences, try to compete with ingroup sellers by undercutting the latter's price. These findings are consistent across the Paintings and Majors treatments.

In profile 2, the group differentiation diminishes, and even reverses in some cases, and the effects vary across treatments. For example, in profile 2 of the Majors treatment, sellers are equally likely to propose to ingroup and outgroup buyers, rather than showing ingroup favoritism as they did in profile 1. In profile 2 of the Paintings treatment, sellers are more likely to make offers to *outgroup* buyers. This change in sellers' preferences may be due to variety seeking (Choi *et al* 2006, Hsee *et al* 2003, Kim and Drolet 2003, Kapuscinski and Chintagunta 1999, Kahn *et al* 1986). More interestingly, in profile 2 of the Majors treatment, when sellers do not discriminate but buyers prefer ingroup sellers, there are still considerable intergroup price differentials. In contrast, in profile 2 of the Paintings treatment, when buyers' intergroup bias disappears the ingroup-outgroup price differentials vanish as well. This is consistent with our hypothesis that the price differentials we observe (in profile 1 for the Paintings treatment and both profiles in the Majors treatment) may be triggered by buyers' intergroup preferences in selecting sellers and sellers' rational expectations regarding buyers.

5. Conclusion

We reported a lab experiment to analyze the impact of group identity in an oligopolistic market with a few buyers and sellers who interact with each other repeatedly. We found that sellers are more likely to make offers to ingroup buyers, but the effect varies with the seller-buyer intrinsic preferences. Buyers are more likely to accept offers from ingroup sellers than from outgroup sellers, and anticipating buyers' ingroup favoritism, outgroup sellers react by offering *lower* prices than ingroup sellers.

We acknowledge that our design misses some potentially critical market features. One feature is that price offers made by sellers in this study are static as opposed to dynamic. That is, offers are made once in each round and cannot be revised before the next round. This captures certain types of markets but not others. The second limitation pertains to the fact that the social ties in this study arise from pre-determined groups rather than emerging from dynamic interaction. In contrast, in the real world markets social ties may develop from learning, commitment of resources to joint operations, joint investments, etc. (Jap and Haruvy, 2007). Since these aspects are relatively more difficult to be replicated in a lab setting and our primary goal in this study is to identify the *existence* of the impact of group identity on market transactions, this paper is limited in its capacity to address these issues. Further research is needed for the current results to be generalized to broader market settings.

Appendix A. Survey in the college Majors treatment

(The following survey was used for business majors.)

Please answer the following survey questions. Your answers will not affect your earnings during this experiment and will be used for this study only. Individual data will not be exposed.

1. What is your major? _____ Business _____ Engineering
2. What is the major of most of your friends on campus?
3. Please list three characteristics that your major is different from the engineering major.
4. Please list three characteristics that your major is similar to the engineering major.
5. Please rate on a 5-point scale from "strongly disagree" to "strongly agree" with the following statements.

   a). Being a business major is an important part of who I am

   (*Summary statistics: Mean 3.5, median 4, standard deviation 1.3, min 1, max 5*)

   b). Being a business major is an important part of the image that I project.

   (*Summary statistics: Mean 3.5, median 4, standard deviation 1.3, min 1, max 5*)

   c). Being a business major is a source of pride for me.

   (*Summary statistics: Mean 4.0, median 4, standard deviation 1.1, min 1, max 5*)

Appendix B: Experimental Instructions (Sample for the Paintings treatment)

WELCOME!

Below you will find a short description of two key artists in the expressionist movement.

Prior to this experiment, you were asked to choose between pairs of paintings. Each pair contained a painting by Kandinsky and a painting by Klee. We classified you into one of two groups, according to your choices. If the majority of your choices were Kandinsky, you are classified as Kandinsky. If the majority of your choices were Klee, you are classified as Klee.

At the end of the experiment, we will compare the average earnings of the Klee and Kandinsky groups and write the average earnings of each group on the board.

Now, we will explain how your choices in this experiment affect your earnings.

In this experiment you are assigned the role of either SELLER or BUYER. SELLERS can make a price offer to one of three buyers. BUYERS can accept a price offer from one of three sellers. The price is added to the earnings of the seller and subtracted from the earnings of the buyer. You are predetermined to be a seller or a buyer.

Sellers are assigned values over buyers. These values are displayed on the screen in front of them. These values remain fixed over time until you are told otherwise. If a seller sells to a particular buyer, the seller gets the value of that buyer to the seller plus the price stated in the offer. For example, if the screen in front of a participant in the role of seller 1 says:

You are Seller 1:	
Value of buyer 1 to you	35
Value of buyer 2 to you	15
Value of buyer 3 to you	25

Then by selling to buyer 2 for a price of 5 the participant in the role of seller 1 would get 15 + 5 = 20 tokens.

Buyers are assigned values over sellers. These values are displayed on the screen in front of them. These values remain fixed over time until you are told otherwise. If a buyer accepts an offer from a particular buyer, the buyer gets the value of that seller to the buyer minus the price stated in the offer. For example, suppose the screen in front of buyer 3 says:

You are buyer 3:	
Value of seller 1 to you	15
Value of seller 2 to you	35
Value of seller 3 to you	25

If seller 2 made buyer 3 an offer of price=7 and the buyer accepted, then buyer 3 would get 35 – 7 = 28 tokens by accepting seller 2's offer.

If you are a seller, it is important to keep in mind that there are two other participants also in the role of seller. They are also going to try and sell to a buyer. If you and another seller make offers to the same buyer, that buyer can only accept an offer from one of you.

If a participant in the role of a buyer receives no offer, he should type '0' in the decision text area and then press CONTINUE.

Each period proceeds as follows: First, each seller decides which buyer he will make an offer to and at what price. Next, each buyer decides which seller's offer to accept, if any seller made an offer to him in the first stage.

In the case more than one seller made an offer to the same buyer, all but one of the sellers who made an offer to the same buyer will be unmatched in that market.

You will be shown the values of buyers to sellers and the values of sellers to buyers in each period.

After each period, you will also find out which buyer each seller made an offer to, at what price, and to whom each seller and each buyer is matched. These will be given on your screen after the end of each period.

At the beginning of the experiment you will have 10 tokens as a starting fee. If you make your choices wisely, you will earn additional tokens, which will be translated into dollars at the end of the experiment (200 tokens = $1). Your cumulative earnings will be displayed on the screen at all times.

You may also lose money: If you end up being unmatched to a buyer or to a seller in any market, you will lose 1 token in that market.

You will repeatedly make decisions in 50 periods. Your earnings will be the sum of all tokens you earned.

The Values of Sellers and Buyers: There are two value profiles that will be used in the experiment. In the first 25 periods, Profile 1 will be used. In the next 25 periods, Profile 2 will be used. The values of buyers to sellers are given in the top panel and the values of sellers to buyers are given in the bottom panel. For example in profile 1 top panel, value of buyer 2 to seller 3 is 35. This, plus the price, is what seller 3 will earn when he gets matched to buyer 2. In the bottom panel value of seller 3 to buyer 2 is 25. This, minus price, is what buyer 2 will earn when he gets matched to seller 3.

Periods 1-25: Profile 1

Payoffs of Sellers – This is the number of tokens a participant in the role of a SELLER would earn by matching with a buyer, in addition to the price

	Buyer 1	Buyer 2	Buyer 3
Seller 1	35	25	15
Seller 2	25	35	15
Seller 3	15	35	25

Payoffs of Buyers – The number of tokens a participant in the role of a BUYER would earn by matching with a seller, before subtracting price

	Seller 1	Seller 2	Seller 3
Buyer 1	15	25	35
Buyer 2	15	35	25
Buyer 3	35	15	25

Periods 26-50: Profile 2

Payoffs of Sellers – This is the number of tokens a participant in the role of a SELLER would earn by matching with a buyer, in addition to the price

	Buyer 1	Buyer 2	Buyer 3
Seller 1	15	35	25
Seller 2	15	25	35
Seller 3	25	35	15

Payoffs of Buyers – The number of tokens a participant in the role of a BUYER would earn by matching with a seller, before subtracting price

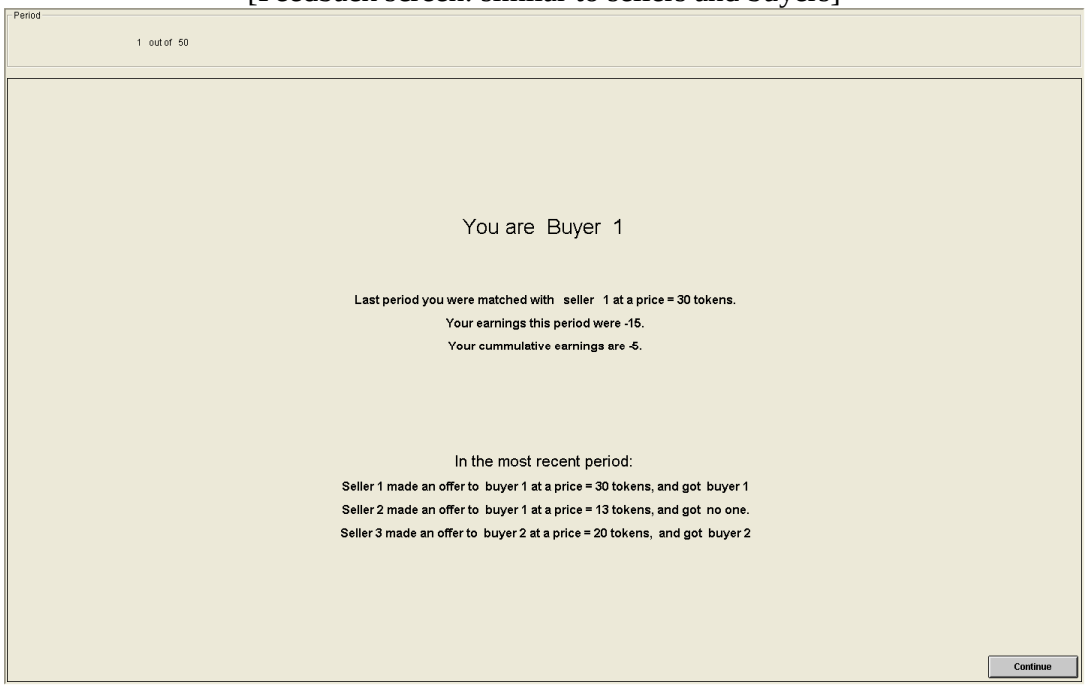
	Seller 1	Seller 2	Seller 3
Buyer 1	35	15	25
Buyer 2	15	25	35
Buyer 3	35	25	15

Appendix C. Screenshots of the Paintings treatment

[Decision screen for seller]

[Decision screen for buyer]

[Feedback screen: similar to sellers and buyers]



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