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Social Preferences and Relational Contracting:
An Experimental Investigation

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Abstract. The form and regulation of contracts is of increasing importance to agricultural economists as farmers and agribusinesses increasing rely on contracts rather than markets to acquire inputs and sell outputs. We focus on the differences between the joint and individual surplus achievable under complete versus incomplete or relational contracts, where the latter are contracts that are not verifiable by a third party and must rely upon threat of termination in order to entice mutually satisfactory performance. Using an experimental market similar to Brown, Falk, and Fehr [Brown, M., A. Falk, and E. Fehr. "Relational Contracts and the Nature of Market Interactions, *Econometrica,* 72 (2004):747-780] we replicate the general results found by these authors, including the qualitative findings that complete contracts dominate incomplete contracts in terms of social surplus generated and that incomplete contracts significantly deviate from the minimal levels of social surplus predicted by equilibrium models featuring purely self-interested agents. We extend the Brown, Falk, and Fehr results in a fundamental way: we explicitly link individual outcomes in relational contracts (e.g, surplus, prices, quality) to the nature of subjects' social preferences, which were measured by a separate experimental protocol that was implemented prior to the experimental trading session. We find subjects with other-regarding preferences enter into relational contracts that generate levels of social surplus similar to the surplus generated under complete contracts. Furthermore, subjects with other-regarding preferences tend to locate others with similar preferences and enter into long-term trading relationships that generate these higher surplus levels. We discuss the ramifications of the results for current regulatory efforts aimed at agricultural contracts.

Key Words: Relational contracts, experimental economics, social preferences, regulation
JEL Codes: C91, D31, D86, K12

Social Preferences and Relational Contracting: An Experimental Investigation

The form and regulation of contracts is of increasing importance to agricultural economists as farmers and agribusinesses increasing rely on contracts rather than markets to acquire inputs and sell outputs. Contracts can range from agreements that address nearly all contingencies (complete contracts) to simple, open-ended, informal agreements (incomplete or relational contracts – we shall use these terms interchangeable throughout). *Relational contracts* (Levin) are increasingly recognized as important trade mechanisms as many real-world incentive schemes reward aspects of performance that are difficult for third parties (e.g., courts) to verify. In the absence of third-party verification and enforcement, such contracts must be self-enforcing, i.e., rely upon both parties' threat of contract termination to entice mutually satisfactory performance.

In some cases, contracting partners strategically choose to omit contingencies (i.e., choose relational to complete contracts) to maintain flexibility (Bernheim and Whinston), and in other cases relational contracts are the only alternative because third-party verification is noisy or non-existent. For example, processors in some livestock sectors weigh the animals themselves and determine mortality rates without a third party present, which has led to allegations that processors engage in opportunistic behavior (Hamilton 1995).

Even when performance is verifiable, real world contracts often contain implicit components that are inherently unverifiable. For example, some agricultural contracts may precisely define performance (e.g. feed conversion ratio) and provide for third-party verification, but may omit the agreement's length, contract renewal provisions, or determinants of future contract payments. Future contract terms might be based on unverifiable factors such as a grower's degree of cooperation with a processor or the willingness of a grower to upgrade her facilities at the

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processors request. Indeed, recent legislation (e.g., the Producer Protection Act of 2000 initiated by the Iowa Attorney General) addresses the issue of contract renewal or termination, implying that policy makers understand that contracts are often less "complete" than they appear.

Standard theory predicts contracts that lack third-party enforceability provide weaker incentives than complete contracts and may skew the distribution of benefits towards one party. Therefore, the use of complete contracts should lower the necessity of costly ex post bargaining or legal remedies. Thus, the study of relational contracts, which contain both explicit (legally enforceable) and implicit (not verifiable) components, becomes an increasingly important research agenda for agricultural economists.

Furthermore, because standard theory predicts that incomplete contracts dominate complete contracts, it may provide a rationale for government intervention in relational contracts in the same way that market failures often justify market regulation. However, economists have recently begun to explore the impact of *social preferences* (e.g. reciprocity, fairness, altruism; see Fehr and Fischbacher for an overview) on trading outcomes. When economic agents display social preferences that deviate from standard assumptions of self-interest, it is possible that the efficiency gap between complete and relational contracts will be narrower than theory predicts and, furthermore, the imposition of increased regulation may 'crowd out' implicit forces such as reciprocity that can make relational contracts achieve high degrees of efficiency. Indeed, a better understanding of the impact of social preferences on economic outcomes can provide insights into positive questions about how social preferences influence trade, and normative questions such as how the government ought to intervene in contracting relationships

In this paper we investigate several questions surrounding relational contracts, including:

(1) Do relational contracts result in lower productivity and generate less surplus than complete contracts?

(2) How does the distribution of surplus differ by contracting regime?

(3) How do the answers to the previous two questions depend upon the social preferences of participants?

(4) How do subjects with heterogeneous social preferences interact; that is, to what extent are they able to form long-term relationships, which require trust and cooperation.

To address these questions and to forward the growing discussion concerning the structure, efficiency and regulation of contracts in agricultural markets, we fit a bilateral contracting model to data generated from a series of economic experiments in which subjects endogenously form contractual partnerships over a finite time horizon via a computerized network with no face-to-face interaction. The experimental marketplace features: more sellers (agents) than buyers (principals); sellers with a positive reservation wage; the ability for parties to track the reputation of other parties with whom they interact; and costly quality provision by sellers. Subjects participate in two 15-period sessions per experiment. The experiment features a two-tier design where the type of contract (complete vs. incomplete) is randomly assigned across groups.

Our experimental setup is very similar to that of Brown, Falk, and Fehr (BFF). In addition, individual-specific social preferences are measured prior to the experiment using a series of Charness-Rabin tests. To date 36 university student subjects have participated in the protocol and have generated data on more than 400 individual trades (48 more subjects are scheduled to participate prior to the presentation of this paper and will be added to all results). Standard economic experimental practices were followed for all aspects of the experiment (Friedman and Sunder).

Our evidence is consistent with previous findings by BFF, namely that relational contracts are less efficient than complete contracts in terms of productivity (quality) and social surplus. In addition, like BFF, we find that, under complete contracts, surplus is less evenly distributed between principals and agents with the short side of the market (principals) capturing most of the surplus. However, when different groups of subjects as delineated by their social preference indices are examined, we find the nature of individual subjects' social preferences have a statistically and economically significant impact on the terms of trade that emerge under the relational contracting regime.

The remainder of the paper is as follows. First, we review several strands of literature that relate to the current paper. We then develop the underlying bilateral model used to derive theoretical predictions and to structure the experimental market. Next, details of the experimental design, methods and procedure are provided. Results are then discussed and conclusions drawn.

Extant Literature

This proposal builds upon the literature of incomplete and relational contracts, informal enforcement mechanisms (e.g. cooperation, reciprocal behavior, trust, etc.) and social norms. A standard prediction made by economists is that incomplete contracts are less effective at providing performance incentives relative to complete contracts (Klein, Crawford, and Alchian; Holmstrom and Tirole; Hart and Moore). A contract can be unenforceable for a number of reasons, e.g., weak legal institutions, informal or sloppily written contracts, contracts based on performance measures that cannot be verified, etc.

Recent experimental evidence has led economists to moderate their assessments of the inefficiency of incomplete contracts. Experimental research has shown that incomplete contracts can be more efficient than first thought because informal enforcement mechanisms may exist to govern trade and exchange. Brown, Falk and Fehr conducted several experiments which showed that, even in the absence of formal enforcement, informal enforcement mechanisms, such as trust and concern for reputation, will emerge to protect the integrity of trade. A number of other experimental studies have also been conducted illustrating the impact of implicit incentives on the efficiency of trade even when contracts are incomplete (e.g. Fehr, Gachter and Kirchsteiger; Fehr and Gachter provide an extensive survey). Both Brown, Falk and Fehr and Lazzarini, Miller and Zenger find that reputation formation is necessary in order for social preferences to improve social surplus under relational contracts, however. In the absence of individual reputation tracking it is clearly socially advantageous (and privately advantageous for the short side of the market) to operate in a regime with complete contracting.

The presence and measurement of social preferences is also an emerging field of interest in economics. While some economists have eschewed the study of individual preferences that deviate from pure self-interest, the emerging wisdom concerning preferences for things such as fairness, revenge or altruism was nicely summarize by Matthew Rabin in his Alfred Marshall Memorial Lecture to the European Economics Association: ". . . the mere fact that the taste for revenge and fairness is finite, and diminishes when it is more costly to purchase, makes it like every single other taste economists study, not something to be dismissed," (2002, pg. 685). Several formal models of preferences that incorporate the well-being of others have been developed, including models of fairness (Bolton and Ockenfels; Fehr and Schmidt), models of

reciprocity (Rabin 1993, Levine), and models that encompass several potentially competing explanations of other-regarding behavior (Charness and Haruvy).

Numerous experimental approaches exist for testing the nature and strength of social preferences. Typically two subjects are anonymously matched and money split between them according to a set of rules that may allow one player to make a choice about the allocation of funds (i.e., dictator games, Kahneman, Knetsch and Thaler), one player to allocate funds with the second player merely able to accept or veto the allocation (i.e., ultimatum games, Guth, Schmittberger and Schwarze), or for transfers to occur back and forth between subjects at various rates of exchange (e.g., gift-exchange games, Fehr, Kirchsteiger and Reidl). We rely upon a set of dictator and exchange games used by Charness and Rabin to determine the social preference structure of the subjects involved in our study. The set of games employed by Charness and Rabin allow for discrimination across several competing types of other-regarding preferences, including fairness or inequality-aversion, reciprocity and altruism.

Research Methods

The empirical testing of contract and incentive theory has posed some unique challenges to economists. First, data is difficult to obtain because firms are often reluctant to share detailed information about contract terms. Second, even when data is available, it may not be detailed enough to supply the researcher with a sufficient set of control variables as performance and contract structure may be heavily influenced by unwritten rules, expectations, and other social norms that are not measurable.

The use of an experimental approach allows the researcher to control the trading environment and randomly assign subjects to different treatment groups. This vastly improves the

researcher's ability to isolate and estimate the effect of individual items and allows for causal inferences. While not without its critics, experimental economics has gained great popularity because of its flexibility to study theoretical constructs that elude analysis of real world data and to study empirical issues in real-world markets that lack sufficient visibility or variation (see Roe and Randall for a summary experimental methods used in economics and agricultural economics and the profession's critiques of such approaches). The acceptance of experimental studies in all major economics and field journals is a testament to its usefulness to the profession.

Experimental Approach: Standard economic experimental protocol is followed for all stages of the experiments (see Friedman and Sunder) unless otherwise specified. All experiments are implemented using a networked computer lab where individual computers are separated by screens to prevent subjects from viewing other subjects' activity. We used *Z-Tree: The Zurich Toolbox for Readymade Economic Experiments, Version 2.1* (Fischbacher 1999) to create the experimental interface and program specific treatments (see Figure 1 for an example).

Period					
1 out of 15					

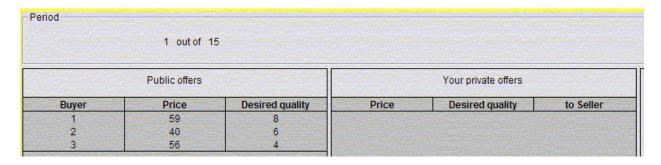| Public offers			Your private offers		
Buyer	Price	Desired quality	Price	Desired quality	to Seller
1	59	8			
2	40	6			
3	56	4			

Figure 1. Screen shot of trading environment from *Z-TREE* contract trading session.

Experimental Subjects. Thirty-six students were recruited by e-mail from the various departments throughout Ohio State University and through paid advertisements in campus newspapers. Recruitment materials described the general premise of the activity; promised a

minimum fee of $5 for merely attending; announced the distribution of additional payments that could be earned from participation; and informed recruits that actual returns will depend upon the rules of the game and the participant's and other participants' actions. Upon arrival participants registered, signed consent forms, and were seated in the computer lab.

Experimental Flow and Design. Experimental sessions proceeded as outlined in Table 1. After arrival, subjects participated in a set Charness-Rabin (CR) tests. The Charness and Rabin protocol pairs subjects together and then requires each subject in a pairing to make decisions that will affect the monetary payoffs of both subjects. Each game provides subjects with opportunities to forgo payment such that the payment of the other subject is altered – sometimes for the better and other times for the worse. By having each subject participate in a sequence of games with minor variations in roles and possible outcomes, various social preferences, including reciprocity, can be identified.

Table 1: Experimental Session Flow

1.	Arrival, consent forms, seating	10 minutes
2.	Social preference session 1	15 minutes
3.	Contracting session 1	40 minutes
4.	Social preference session 2	15 minutes
5.	Contracting session 2	35 minutes
6.	Demographics, payment, dismissal	10 minutes

After completing the CR tests, subjects participated in a session of an experimental economy where buyers and sellers interact in various forms of complete and incomplete contracts. The exact form and design of these sessions will be detailed below. Next, subjects participate in a variation of the CR tests. A second contracting session was then implemented followed by the administration of a demographic questionnaire. Finally, subjects are paid and dismissed.

As is commonly done in experimental settings (Friedman and Sunder, pg. 51), one experimental market session and one set of the social preference games are chosen to be the

'paying' session via a random process observed by the subjects (rolling dice). Subjects are fully

informed of this compensation tactic at the beginning of the experiment. This minimizes

potential wealth effects associated with paying all sessions and increases monetary incentives

during each session.

The contractual economy is based on the design of Brown, Falk, and Fehr. All trade is

conducted via bilateral contracts. Subjects are randomly partitioned into two groups: buyers and

sellers. Buyers offer "contracts" to sellers specifying a price-quality combination for a unit of an

abstract good. Sellers can accept or reject these offers. Round-specific payouts are determined

for buyers as follows:

$$(1) \ \pi_b = \begin{cases} 10Q - P & \text{if trade occurs} \\ 0 & \text{if no trade occurs} \end{cases}$$

where π_b is the buyer's payment, Q is the agreed upon quality level, and P is the agreed upon

payment. The seller's profit is:

$$(2) \ \pi_s = \begin{cases} P - c(Q) & \text{if trade occurs} \\ r & \text{if no trade occurs} \end{cases}$$

where $c(Q)$ is a cost function that is strictly increasing and convex in quality and r is a

reservation earnings in the absence of trade.

At the end of each round within a contracting session, each subject is informed of the payoff

for each subject (buyer and seller) involved in the transaction. Each contracting session is

comprised of 2 practice rounds and 15 rounds that may determine eventual cash payment. All

rounds feature the same type of contract (e.g., a complete contract) and the same contract type

will not be repeated across contracting sessions within the same experiment.

Two different contract types are explored. In the complete contract treatment (C), sellers

must supply the agreed upon quality; that is, quality is enforceable. In the incomplete

contracting session (IC), if sellers agree to these offers, they do not necessarily have to supply

the quality specified in the contract; in other words, quality is unenforceable.

In all treatments reputation formation is possible. Specifically, each subject will be told of

the other party's identification number and will be allowed to record this information on a

separate sheet of paper and each party maintains the same identification number for the entirety

of the 15-round session. Identification numbers are re-assigned between 15-round sessions to

eliminate any carry-over between sessions.

Each subject participates in two contracting session during one experiment, which means that

order effects might arise. Hence, the order of complete and incomplete contracting sessions in

switched between experiments.

In addition, Brown, Falk, and Fehr have graciously provided Wu with a module programmed

in Z-TREE (Fischbacher) that can be used as a base for implementing the specific requirements

of the proposed experimental design (see Figure 1 for a screen shot of the trading environment).

Models

In order to generate experimental predictions and testable hypotheses, we begin with the model

of Brown, Falk and Fehr. In addition, we draw from the insights of standard contract theory to

generate additional qualitative predictions in our experiments.

The Brown, Falk, and Fehr model involves a principal (buyer) who trades with a seller for a

single commodity with varying quality levels. The principal offers a contract to the seller where

the contract specifies a desired quality level, Q, and a payment P. If the seller accepts the

contract, it must subsequently choose the quality level it must supply. Once quality is chosen,

payoffs are determined in accordance with equations (1) and (2) specified earlier.

In order to generate specific numeric predictions, we must adopt a specific functional form

for the quality cost function $c(Q)$. We use the cost table of Brown, Falk, and Fehr, which is:

Table 2: Quality Production Costs

Quality	1	2	3	4	5	6	7	8	9	10
Cost	0	1	2	4	6	8	10	12	15	18

Thus, quality is an integer bounded between 1 and 10. Price is also restricted to belong to the set

of integers from 0 to 100. The reservation earnings, r, is set equal to 5.

Brown, Falk and Fehr used this model to generate numeric predictions for C and IC sessions.

Under C, quality specified in an agreement is enforceable and therefore the seller must supply

the quality specified in the contract. Thus, the principal's profit maximizing contract choice

determined by solving the problem:

(3) $\qquad \max_{Q,P} (10Q - P) \qquad\qquad$ s.t. $P - c(Q) \geq 5$

Assuming that the constraint holds with equality (which must be true for a profit maximizing

principal), solving for P, and substituting into the objective function yields:

(4) $\qquad \max_{Q} (10Q - 5 - c(Q))$

which yields the first order condition:

(5) $\qquad 10 - c'(Q) = 0$

However, one can see from the cost table that marginal cost never exceeds three so that the

principal chooses the implement the maximum quality level $Q^* = 10$. With Q^* in hand, it is easy

to solve for $P^* = 23$ using the participation constraint to ensure that the seller will accept the

contract. In our economy with five principals and seven sellers, in equilibrium, five trades take

place in any given round and joint surplus per trade is given by:

(6) $\qquad S^C = \pi_b + \pi_s - 5 = 77.$

Under IC, quality is no longer enforceable so that the seller has the discretion to deviate from the quality level specified in the contract. To evaluate the equilibrium outcome, first consider what the seller would do given a fixed payment, P. Note from her objective function (2) that profit is maximized when $Q = 1$ so that production cost is zero. Hence, equilibrium effort is: $Q^{IC} = 1$. The principal, anticipating that the buyer will deviate from any agreement that specifies $Q > 1$, will offer only a minimal payment to ensure participation; that is $P^{IC} = 5$. In equilibrium, five trades take place and joint surplus is given by $S^{IC} = 5$ because the seller earns no surplus above reservation earnings and the principal earns profits of 5. Thus, the unenforceability of efforts leads to substantially lower joint surplus and quality level.

Table 3 summarizes the numeric predictions under each of the treatments.

Table 3: Equilibrium Predictions by Treatment (5 buyers and 7 sellers)

	Q	P	π_b	π_s	Surplus	# of trades
Complete (C)	10	23	77	0	77	5
Incomplete (IC)	1	5	5	0	5	5

These predictions allow us to formulate several hypotheses:

Hypothesis 1: When quality is unenforceable so that contracts are incomplete (IC):

   a) Equilibrium quality will be lower than the case when quality is enforceable (C).

   b) Total surplus will be lower than the case when quality is enforceable (C).

Hypothesis 2: Whether quality is enforceable or not, all surplus goes to the principal.

The above hypotheses follow from the equilibrium predictions of Table 3. However, these predictions are based on the assumption that all subjects are rational and make decisions in their own self-interest and that there is no role for reputation formation. In addition, because there are

a finite number of rounds, the sub-game perfect Nash equilibrium of a finitely repeated game is for the subjects to repeat the stage game Nash equilibrium. Therefore, the predictions in Table 3 should hold across all rounds in the experiment.

Nonetheless, recent developments in contract theory have shown that it is possible for people to deviate from the rational outcomes so that incomplete contracts may be more efficient than canonical predictions. Fehr and Schmidt suggest that if enough subjects have social preferences that are not strictly selfish, then subjects may voluntarily enforce agreements even when it is costly for them to do so. In other words, if there are a sufficient number of subjects who have a social preference for fairness and are willing to retaliate against hostile actions or reward friendly actions even if it is costly to do so, then it's possible for $Q > 1$ to prevail in IC. Thus, if there are enough "reciprocal" types in the economy, quality and social surplus may be enhanced even when contracts are incomplete.

Indeed, economists have confirmed that some subjects do behave reciprocally or exhibit other-regarding preferences in experimental settings (e.g. Roth; Fehr and Gachter; Charness and Rabin; and Camerer). The intuition is that if an other-regarding principal receives a generous quality outcome from an agent, the principal will respond with a generous payment. Similarly, if an other-regarding agent receives a generous initial contract offer from the principal and it is known that many principals have a social preference for fairness, then the agent may respond with a generous quality. In essence, with enough other-regarding types in the economy and if it is common knowledge that these types exist, then high quality and surplus can be sustained in equilibrium even under IC. This leads to our next hypothesis:

Hypothesis 3: When there are enough other-regarding types in a trading cohort and reputation can be tracked (R), it is possible for $Q > 1$, $P > 5$ and surplus to exceed 5 under IC.

A key part of our experiment is to identify the proportion of other-regarding types in our subject population. By using the simple tests designed by Charness and Rabin, we can determine subjects' social preferences and test how the proportion of reciprocal types might be affected performance under IC. This will enable us to test another hypothesis.

Hypothesis 4: Equilibrium *Q, P*, surplus, and trades should be increasing in the proportion of reciprocal types in the subject pool.

Hypothesis 4 allows us to explore an important emerging question in the economics literature, which is how markets or alternative trading mechanisms affect behavior (List).

Results

Contracting Results

The top panel of Table 4 contains the summary statistics of the 443 trades completed to date (600 more trades are scheduled to be completed prior to March 1, 2005 and will be appended to subsequent drafts of this document). For complete and incomplete treatments, 225 trades were possible and expected under equilibrium predictions (Table 3), meaning that in only five and two cases, respectively, did trades not occur. Hence, equilibrium predictions concerning the level of trade activity are met.

Table 4. Trading Results

	N	*Price*	*Quality*	*Surplus*	*Buyer Rent-*π_b	*Seller Rent-*π_s
Complete (C)	220	[A]32.98 (14.97)	[A]9.36 [B](1.07)	[A]72.43 (7.79)	60.65 (17.20)	16.78 (14.94)
Incomplete (IC)	223	[A]34.01 (20.44)	5.09 (3.27)	38.79 (26.30)	16.88 (20.91)	26.91 (17.88)
Among Incomplete Contracts--						
Self-Regarding Buyers	193	[A]30.69 (21.92)	4.43 (2.95)	33.63 (24.02)	13.61 (20.47)	25.02 (18.29)
Other-Regarding Buyers	30	55.37 (11.1)	[A]9.33 (1.65)	[A]72.00 (12.52)	37.97 (6.47)	39.03 (7.48)
Self-Regarding Sellers	175	[A]32.02 (23.21)	4.77 (3.16)	36.24 (25.52)	13.60 (20.23)	[C]27.64 (18.63)
Other-Regarding Sellers	48	41.27 (12.22)	6.27 (3.43)	48.08 (27.27)	28.85 (19.1)	[C]24.23 (14.66)

A- For numbers within the same column featuring this superscript, we fail to reject the null hypothesis of no difference to the complete contract treatment (C) at all normal levels of significance.

B – Standard deviations in parentheses.

C – Seller rent observed for incomplete contracts was not statistically different at the 10 percent level for trades involving self-regarding versus other regarding sellers.

Comparing resulting levels of quality, surplus, buyer's rent and seller's rent (top panel, Table 4) to equilibrium predictions in Table 3 yields a formal rejection of the equivalence of observed levels to equilibrium level for each category of measurement and for both treatments. However, qualitative predictions surrounding the relative magnitudes of these five outcomes between complete and incomplete treatments are upheld in three cases. Specifically, quality, total surplus, buyer's rent are significantly higher under the complete than incomplete contracting treatment.

According to equilibrium predictions, the seller's rent would be no different between complete and incomplete treatments, with both scenarios providing zero seller rents. However, from the observed trades, seller rent was significantly larger than zero in both instances and

significantly larger under the incomplete than the complete treatment at all practical levels of statistical significance. Also, equilibrium predictions call for a higher price under complete than incomplete contracts, while the observed complete and incomplete contract prices were no different from one another and both significantly higher than the predicted price.

While Brown, Falk and Fehr (BFF) do not report raw averages and standard deviations for any of their data, they do plot round-by-round results concerning average quality and price. Our results for the complete contracting treatment appear similar in absolute values to those found by BFF, while our results for the incomplete contracts are somewhat lower in absolute terms. This implies that our results concerning the relative magnitudes of quality and price under complete vs. incomplete contracting follow those found by BFF and provide convergent validity of our experimental results collected to date.

Social Preferences

Brown, Falk and Fehr argue that agents with other-regarding preference can lead results observed under incomplete contracting to deviate from predictions derived from equilibrium models feature purely self-interested agents and claim that their observed deviations from equilibrium predictions support the notion that subjects with other-regarding preferences affect incomplete contracting results. If their conjecture is true, then one would expect that the results of individual trades by subjects with other-regarding preferences would differ from those with purely self-regarding preferences in terms of prices offered, quality observed and surplus achieved. To the best of our knowledge, our experimental protocol allows for the first direct test of this conjecture.

To measure the nature and intensity of subject's social preferences, we had each subject participate in the four Charness-Rabin games summarized in Table 5. Six choices were used to create an index of self-regarding preferences; players who made at least half of their choices in a manner consistent with someone who exhibits purely self-regarding preferences and believes all other subjects exhibit purely self-regarding preferences are categorized as self-regarding (SR) types while all others will be categorized as other-regarding (OR) types.

Table 5. Charness-Rabin Social Preference Games Used.

Game Structures[A]	Self-Regarding Index[B]
A – No Choice B – (400, 400) vs. (750, 375)	A – Not applicable B – Choose (400, 400)
A – (100, 1000) vs. let B choose B – (75, 125) vs. (150, 125)	A – Let B choose B – Not applicable
A – (700, 200) vs. let B choose B – (200, 700) vs. (600, 600)	A – Choose (700, 200) B – Choose (200, 700)
A – (375, 1000) vs. let B choose B – (400, 400) vs. (350, 350)	A – Let B choose B – Choose (400, 400)

A – Player A always moves first. Values in parentheses indicate (player A payment in cents, player B payment in cents). All subjects matched anonymously with no repeated pairings. Player B makes decision prior to learning player A's decision. All subjects play each game twice, once as player A and once as player B.
B – Indicates a choice that results in the addition of a single point to the subject's self-regarding index, which implicitly assumes that the subject believes his/her anonymous partner holds purely self-regarding preferences.

The characteristics of trades made by pairs involving SR and OR buyers in the incomplete contracting treatments are quantified in the top two rows of the bottom panel of Table 4. All five summary statistics are significantly different between the two groups at the one percent level of significance or lower. Specifically, when the buyer (principal) has OR preferences, price, quality, total surplus, buyer's rent and seller's rent are all significantly higher than trades initiated by buyers with SR preferences. Quality, price and buyer's rent are more than double when the buyer has OR rather than SR preferences while seller's rent in more than 50 percent

higher. This provides strong direct evidence that the presence of subjects with other-regarding preferences drives Brown, Falk and Fehr's results, as we connect the dots between individual buyers with other-regarding preferences and observed levels of price, quality and surplus than those buyers with self-regarding preferences.

The role of the seller's social preferences is also isolated in the bottom two rows of the bottom panel in Table 4. The qualitative results are similar to the differences observed between OR and SR buyers though the severity of differences is muted. Trades featuring sellers with OR preferences feature prices, quality, total surplus and buyer rent that is significantly larger than those obtained in trades featuring sellers with SR preferences.

However, seller's rent is no different between the two groups. This implies that sellers with other regarding preferences do no better themselves because of the nature of their preferences, but do provide a benefit to the buyer and society (via greater quality). Compare this to the comparison between buyer types: buyers with OR preferences tended to do better both for themselves and for the seller and society. This suggests that the social preferences held by those on the short side of the market (the buyer in this case) will have a larger impact on the benefits achieved during the trade than the preferences of those on the short side of the market.

Note, however, that in our set up the relative bargaining power of the two sides is also confounded with the order trading, i.e., buyers make offers before sellers react. Scenarios featuring the long side of the market acting first would be needed to determine if OR preferences drive better trading outcomes due to relative bargaining power or order of trading or some combination of the two factors.

Length of Contractual Relationships

The mechanism that allows for subjects with other regarding preferences to obtain outcomes beyond equilibrium predictions generated under the assumption of purely self-regarding preferences is that of reputation formation, which by its nature is a dynamic phenomenon. The market in which the subjects participate is realistic in that buyers may search for a seller via two avenues: public offers or private offers. Public offers are posted such that all sellers could view the proposed wage and quality combination with the first to respond to the offer allowed to participate in the trade. Private offers are posted such that only one seller of the buyer's choosing could view and respond to an offer. Buyers and seller could conclude a maximum of one transaction per period; given the imbalance of buyers and sellers, this implies that at least two sellers would engage in no trade and merely receive their reservation wage in each period.

We find that complete and incomplete contracts feature a similar, high level of reliance upon public offers during the initial periods of trading within a session. As trading progresses, subjects in the incomplete treatment migrate to a greater reliance upon private offers while subjects in the complete contracting treatments maintained a heavy reliance upon public offers for all rounds of trading. Specifically, the fraction of subsequent trades by a buyer that involves a different seller (called the *separation rate*) was 0.70 for incomplete contracts and 0.81 for complete contracts, which is significantly different at the one percent level. These results mirror those of Brown, Falk and Fehr.

Our contribution is to identify how the social preferences of the subjects impacts nature of the trading relationships that endogenously arise during the course of a 15-period trading session.

Table 6. Rate of Separation from Present Trading Partner for Incomplete Contracts[A]

	Self-regarding Buyer	Other-regarding Buyer
Self-regarding Seller	0.79 (0.41)	0.27 (0.39)
Other-regarding Seller	0.67 (0.48)	0.20 (0.41)

A – We reject the equality of both pairs of numbers within the same row at the one percent level using a t-test; we fail to reject the equality of both pairs of numbers within the same column using the same test.

Table 7. Subject Index of Self-regarding Preferences by Length of Trading Relationship[A]

Self-regarding Preferences	Same partner: ≤ 5 periods	Same Partner: > 5 periods
Buyer Index	0.74 (0.23)	0.43 (0.24)
Seller Index	0.77 (0.27)	0.48 (0.27)

A – We reject the equality of both pairs of numbers within the same row at the one percent level using a t-test; we fail to reject the equality of both pairs of numbers within the same column using the same test.

Tests of the equivalence of separation rates by the type of social preference held by the buyer (short side of the market) are rejected at all reasonable rates of significance (Table 6), however the separation rates of self-regarding and other-regarding second-movers (sellers) are not statistically different. The rate of separation after trades involving an other-regarding principal are only one-third that following trades involving a self-regarding principal, suggesting that employee turnover in this experimental market is tightly tied to the social preferences of the principal.

Another way to capture this qualitative finding is presented in Table 7, where the average index of self-regarding behavior is for buyers and sellers involved in trading relationships with a short (five periods or less) or longer (more than five periods) working relationship. The average

self-regarding preference index for buyers and sellers involved in the long-term agreements almost half that of those buyers and sellers involved in short-term agreements, suggesting that, through time, other-regarding buyers match themselves with other-regarding sellers and develop mutually beneficial, long-term working relationships.

Summary and Conclusions

We begin by summarizing several of our key results.

1. Both principals and agents with self-regarding preferences (the standard economic assumption) were involved in incomplete contracting transactions that yielded both low quality and low surplus (less than half of what is obtained under complete contracts). In addition, these principals earned only 22 percent of what they earned under the complete contract. However, agents earned more than they did under the complete contract.

2. Principals with other-regarding preferences were involved in transactions that yielded quality-surplus outcomes that were nearly identical to what was obtained under complete contracts. In addition, the surplus is distributed nearly equally between principals and agents.

3. Agents with other-regarding preferences produced higher quality than agents with self-regarding preferences, though they did not earn more rent.

4. Principals who contracted with agents with self-regarding preferences generated low quality and low surplus (about half of what is obtained under complete contracts). In addition, the principal obtained only one-third of the surplus.

5. Principals who contracted with agents with other-regarding preferences generated quality and surplus that exceeded levels obtained under incomplete contracts with agents with self-regarding preferences.

6. The average index of self-regarding preferences for principals and agents involved in long-term relationships (>5 periods) is much lower than the index of principals and agents that were involved in short-term relations (≤5 periods). Furthermore, principals with high degree of self-regarding preferences featured a higher separation rate than those with other-regarding preferences, though the same did not hold true for agents. Thus, it appears that selfish principals had more difficulty cooperating with agents and that other-regarding principals and other-regarding agents tended to 'find each other' through the matching process of trading through rounds.

The main implication of our findings is that social preferences appear to be extremely important in settings like incomplete contracts, where social norms such as trust and cooperation are important. We find that subjects with certain types of social preferences are better equipped to establish these norms in trading relationships, which can lead to highly efficient outcomes even under incomplete contracts. In addition, government intervention, such as the introduction of third-party enforceability of performance, which makes contracts more "complete", can be efficiency and surplus enhancing in the aggregate, but may cause different impacts by social preference class. Furthermore, if we believe that real-world markets retain the feature that other-regarding sellers and buyers find one another through trial and error in a relational contracting market and that these relationships generate similar social surplus as complete contracting scenarios, then it suggests that costly regulations aimed at making contracting markets more

'complete' may be ill advised but that regulations that facilitate reputation development and

matching of agents with suitable reputation could enhance market efficiency.

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