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Communication, home bias and social capital

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COMMUNICATION, HOME BIAS AND SOCIAL CAPITAL

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To Shirley Skorbiansky, Marinos Tsigas and Kevin Camp.

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PREFACE

What is true is already so.
Owning up to it doesn't make it worse.
Not being open about it doesn't make it go away.
And because it's true, it is what is there to be interacted with.
Anything untrue isn't there to be lived.
People can stand what is true,
for they are already enduring it.

Eugene Gendlin

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ABSTRACT

Raszap Skorbiansky, Sharon PhD, Purdue University, May 2015. Communication, Home Bias and Social Capital . Major Professor: Steven Y. Wu.

This dissertation consists of three essays on the effects of communication, home bias and social capital. The first study analyzes three different laboratory treatments that determine if policies that introduce and improve communication are beneficial to a market. The control treatment has no communication. Then, two different types of communication mechanisms are introduced: cheap communication, where subjects are able to lie, and truthful communication, where only honest messages may be sent. The results demonstrate that truthful communication dramatically improves subjects' ability to trade efficiently, ultimately leading to higher social surplus and lower income inequalities. Cheap communication does not produce the same results: it does not lead to changes in overall efficiency, although it lowers income inequality by decreasing seller incomes. The results have implications for the development and improvement of communication forums designed to ease and improve trading outcomes.

The second study reports the results from a laboratory experiment on local trade in the presence of foreign comparative advantage. The treatments simulate the effects of policies designed to improve local trade by introducing two types of policies: a reduction of the attractiveness of the foreign market, and the introduction of communication (cheap or truthful) to the local market. I find that only an implementation of both policies has a significant effect on local trade and efficiency. The results have implications for the development and drive toward a stronger local economy, demonstrating that successful policies require a large amount of resources to be viable.

In the third study, I determine whether social capital has a beneficial effect on income in the United States, and whether the magnitude of this effect varies by

type of occupation using data from the General Social Survey. I find that social capital, measured by voluntary associations, is correlated with higher incomes, but that not all social capital is created equal. Specifically, fraternal, service, sport and professional memberships are correlated with higher incomes. On the other hand, school, literature and church memberships are correlated to lower incomes, while the rest do not have a statistically significant relation to individual income. Because of the endogenous nature of social capital, I use an instrumental variable to explore the causal effect of higher social capital on income. Using trust in strangers as an instrument, I find that higher levels of social capital cause a rise in individual income.

CHAPTER 1. INTRODUCTION

Each of this dissertation's three essays revolves around the importance of communication and the effects that the interconnectedness of individuals have on economic outcomes. Communication allows parties to share ideas and thoughts, leading to new innovations, and the creation of trust and social norms.

In the first essay, I look at how markets can benefit from introducing a communication mechanism. This question is especially relevant today as the internet has facilitated the creation of new markets that allow anonymous agents to trade. Weak or nonexistent formal enforcement can lead to the unraveling of a market, but communication can act as a substitute by not only allowing traders to keep tabs on each other, but also enabling them to refuse trade with a known past defector. The threat of future unemployment can be enough to keep a trader honest in the present, regardless of formal punishment mechanisms. I explore two different types of communication mechanisms in a laboratory experiment: cheap communication in which subjects can either lie or tell the truth, and truthful communication in which subjects can only share truthful information. I analyze how each policy affects the magnitude of trade, qualities traded, social surplus and income inequalities. The results of this study can inform market-makers and investors on the optimal type of communication in which to invest. It seems clear that a truthful mechanism would be harder and more costly to implement. It follows that the benefits derived from a simpler mechanism, namely cheap communication, are interesting to explore.

In the second essay, I look at how trade occurs in a two-country open trading market in a laboratory experiment. To mimic a local market I separate subjects into

two groups; for each group, ingroup members can be considered "local" traders, and outgroup members can be considered "foreign" traders. Furthermore, the market design is such that there is a comparative advantage for buyers to create offers for foreign sellers. I have set up this environment to study the current trend to source and buy locally even when foreign producers may have better economies of scale, and not necessarily poorer qualities. I implement three different treatment policies that can be employed to increase and improve local trade. First, I look at introducing cheap communication and truthful communication into the market. Several initiatives in the United States have begun to connect consumers and producers, such as USDA'a Know Your Farmer. Reducing the perceived distance between consumers and producers is believed to positively influence the quality of matches between traders. Furthermore, it can afford buyers and sellers a better and more transparent understanding of the value chain, thereby promoting honesty. In addition to the two communication policies, I implement a reduction in the foreign multiplier which makes the local market relatively more attractive. Subsidy-style policies have appeared in several states encouraging consumers to purchase at local farmers' markets. I analyze how each policy affects magnitude of trade, quality traded, social surplus and income inequality for both the local and the foreign markets. The results from this paper could have important implications for local policy makers, especially as the trend of "eating local" grows in popularity. My conclusions can inform of which types of policies achieve the targeted goals most efficiently.

In the third essay, I look at how connections created by individuals via social interactions (such as those explored in the first two papers) can have an impact on their income using survey data from the General Social Survey. Specifically, I analyze whether social capital, measured by membership to voluntary associations, has an economic impact, and whether this impact differs across types of occupations. Social capital has been used as a policy tool in several developing economies, but it has been largely ignored in the United States. In this study, I discuss the different meanings of social capital, and how it can be beneficial to US residents. It is important to

remember that a "a rose by any other any other name would smell as sweet". Much of the backlash against social capital has been directed at the name "social capital" itself, and its enigmatic nature. Calls abound for a re-branding of old ideas under a new marketable name. I believe that these calls are wide of the mark, and obfuscate social capital's usefulness in bolstering economies. As such, it can be a very useful and relatively cheap policy to implement.

The first two essays in this dissertation use laboratory experiments for data collection. A question that goes hand-in-hand with the use of experimental economics is whether results can be generalizable. Common critiques of experimental studies are that subject pools are unrepresentative (usually undergraduate students) or that they produce unrealistic data. For example, because subjects know that they are being observed, they may act in a manner to please the experimenters, perhaps acting more altruistic than they would in the field. However, experimental economics is useful for many reasons. In various situations, field experiments, those that rely on naturally occurring environments, can be infeasible for reasons such as being too expensive, unethical, illegal or impractical. Experimental economics can fill a gap of knowledge in these instances. Criticism aside, laboratory experiments bring much to the table - using them researchers are able to *ceteris paribus* analyze the effect of modifying a single aspect of an environment. In essence, laboratory experiments can be thought as test tubes for economic policy tests. Testing policy in the real world can lead to confounding problems resulting from the numerous moving pieces involved. On the other hand, in the laboratory researchers can find very clean results for causality because only a single element is changing.

All of the sufficient conditions for a microeconomic experiment as compiled by Smith [1982] have been satisfied in my two experiments. The sufficient conditions are: nonsatiation - given a costless choice between two different alternatives, an autonomous subject will choose the one that yields the highest payoff; saliency - guaranteed right to rewards associated with performance in the experiment; dominance - the rewards are greater than the cost for the subject of participating in the experi-

mental activities; and privacy - subjects only receive information on their own reward schedules. A fifth condition, parallelism, should be added if the goal of a study is to provide insight into "real" markets. In that case, the experiment should also be such that the observed behavior being tested in the experiment should also be observable in other microeconomic markets (be they field or experimental). This means that if an experiment and a real world market have *ceteris paribus* similar conditions, then the outcomes from the experiment and the other environment should be comparable. It is nearly impossible to recreate a market in a laboratory experiment. However, I do believe that the experiments presented in this paper are effective in isolating important and interesting behaviors that can be interpreted with policy implications.

CHAPTER 2. INVESTING IN COMMUNICATION: AN EXPERIMENTAL STUDY OF COMMUNICATION IN A RELATIONAL CONTRACT SETTING

2.1 Introduction

This paper analyzes the effects that adding a communication system, or improving an existing communication system has on a market. In modern economies, markets for goods and services often include communication forums to facilitate trading between buyers and sellers. Some examples from the Internet include Angie's List, a website that may be used to review local service businesses; Yelp, a website for general businesses in an area; and Amazon forums, for goods purchased on the Amazon website. These information-sharing networks have revolutionized how customers and firms interact. They allow word of mouth to spread easily and at a low cost to other Internet users, while they can also be used by organizations to reach mass audiences [Dellarocas, 2003]. The popularity of online-based reputation platforms has powerful implications in the market, impacting brand building, acquisition and retention of customers, and quality assurance [Dellarocas, 2003].

Some market-makers go beyond creating forums by making investments to improve the quality of communication platforms in order to introduce more truthful reviews. This is akin to Yelp or Amazon investing on specialized personnel (Elite or Vine members, respectively), who have incentives to be truthful[1]. Communication has been considered a tool to facilitate the creation of reputation and trust, as it reduces the "social distance", i.e. the perceived closeness between individuals or groups [Dufwenberg and Muren, 2006].

[1]Yelp's Elite Squad is managed by a city community manager who keeps in contact with them, meet at monthly events and are in general more exposed to the public eye, thereby subjecting their reviews to more criticism. As a rule, Elites must have their real given names on the site as well as an identifying picture of themselves on their profiles.

The rapid emergence of online reputation systems led researchers to wonder if these systems work, how they work, and finally, how much they contribute. However, research in this area is new and has not yet come to a consensus Bajari and Hortacsu [2003].[2]

When a third-party is not available to enforce the quality of the good traded, communication can be especially important as it may act as a substitute for contract enforceability [Greif, 1993]. The lack of an arbitrator, in the absence of communication, can lead to opportunistic behavior without means for punishment both online and in physical markets. Online transactions are often engaged by partners across the world, with no "local" authority to turn to. In turn, consider a market for broilers: if a grower has been contracted and become effectively locked in to a non-liquid investment, assuming that it is costly to transfer the supply to a different buyer then in the short-run the grower is committed to the relationship. This situtation has been referred to as "appropriable quasi rents" [Williamson, 1979]. Under these circumstances, the buyer may declare that the original specified (discretionary) price will not be paid as the quality did not meet standards (regardless of the truth), but agree to buy at a lower price.

Yet, many markets do not use third-party arbitrators. Scott [2003] shows that many businesses do not account for quality (performance) measures in their contracts. There are a few reasons why enforcement may not be available. In some cases, quality is unobservable. For example, long shelf life fresh-market tomatoes cannot be readily distinguished from standard shelf life tomatoes on the spot [Hueth et al., 1999]. In other cases, exogenous systems for grading quality do not exist, and the contracting parties rely on self-inspection. A case in point is the broiler industry, in which quality sorting occurs only through buyer inspections, allowing for discretionary latitude in final payments because deviations in quality cannot be legally proven to a third-party

[2]For some studies on reputation systems see Bolton et al. [2004], an experimental study in which sellers' histories are made public to all buyers', Fan et al. [2013] for an empirical study of the online auction website Taobao.com (an eBay-like Chinese auction platform), and Luca [2011] for an empirical study on Yelp reviews' effects on restaurants.

[Wu and Roe, 2007a]. Finally, a third-party enforcer may be available but the cost of relying on such an institution may be too high. This can be especially true when trading overseas, as laws regarding contract enforcement vary greatly across countries [Djankov et al., 2003].

Experimentally, the effects of communication have been analyzed on simple trust contracts.[3] In those experiments, communication was used to punish negative performances and cooperate on a more fair pot distributions [Ben-Ner and Putterman, 2009, Rice, 2012].

This paper adds to the current research with experiments that determine if a policy of introducing communication is beneficial overall, who exactly benefits, and through which channels it affects markets, using a relational contracting framework, that more closely resembles contracts found in the real world Halac [2012], Cordero Salas [2011], Wu and Roe [2007b], Levin [2003], Brown et al. [2004], Dixit [2003], MacLeod and Malcomson [1989]. Also, existing research has yet to address the effect of improving a common message space. I examine what there is to gain (and for whom) from making investments in better communication platforms by looking at two types of communication that use the same message space: cheap communication -where lying is permissible, and truthful communication -where only truthful messages may be sent. Note that under cheap communication, buyers and sellers may choose whichever message they would like to send, meaning that a message sent could be either honest or dishonest.

In my framework, the principal makes an offer for an abstract good that can vary in quality. The agent chooses a quality which is not third-party enforceable, and receives a fixed payment plus a discretionary bonus. This framework closely mimics actual transactions in certain real-world markets. For one, contracts in a wide variety of settings structure payments to agents as a combination of fixed and contingent

[3]A trust game is an extension of a dictator game and is composed of two active players. A first player is given a certain endowment and must choose whether to trust a second player by sending an amount. Whatever is sent will be increased (perhaps doubled or tripled) in the hands of the second player. In the third stage, the second player must decide how much to send back.

payments (e.g. boilerplate contracts in the agricultural industry, contractors, wait staff). Secondly, the model allows for qualities differences (i.e. differentiated goods). That can be especially relevant for coordination in some markets, such as agricultural markets. For example, both industry buyers and end-consumers are often willing to pay different premiums depending on the quality of fruits and vegetables. In my model, higher quality levels are less likely to be produced or traded when the market lacks a third-party assigned to grade quality levels and/or arbitrate disputes between buyers and sellers.

In the control treatment of this experiment, I model a market with no communication. Then, I introduce two treatments with structured communication where subjects can endogenously choose to send pre-selected messages about their transactions (e.g. "The seller did not deliver desired quality."). I allow for two different types of communication: (a) sending any pre-selected message regardless of trading outcomes (cheap communication), or (b) only sending truthful pre-selected messages (truthful communication).

The results show that without communication buyers and sellers are able to coordinate on quality, but do not achieve an efficient level. Compared to the control treatment, the addition of truthful communication leads to better outcomes for buyers and sellers as expected. Traders use messages to punish defection and reward good outcomes. Truthful information results in higher qualities traded in the market and and higher bonuses as rewards. Despite leading to a slight decrease in contract acceptance, these better outcomes, coupled with lower levels of shirking, ultimately lead to social surplus increases and lower income inequalities between buyers and sellers. Adding truthful communication seems to be a tool for development that benefits all parties.

On the other hand, cheap communication does not have a significant impact on efficiency or social surplus. This result is not surprising as cheap communication is simply "cheap talk".[4] Moreover, traders under cheap communication shared fewer

[4]Cheap talk is a mechanism in which players may provide cheap and costless information to others which has no basis on their future actions. The literature disagree on exactly what cheap talk can

messages than those under truthful communication. Of those messages that were shared, there were high levels of dishonesty observed under cheap communication, especially those shared by sellers. However, one unexpected consequence resulted with the addition of cheap communication: income distribution becomes more equitable in comparison to no communication and truthful communication. This result suggests that cheap communication can still be a beneficial tool for development, depending on the outcome desired.

2.2 Real-World Communication Platforms

Table 2.1 lists a few notable online platforms available to share information. The table includes a summary of feedback (i.e. which party provides the feedback), the format of the solicited feedback, and whether the company has invested in further mechanisms to ensure honesty in reporting. Yelp, Angie's List and Trip Advisor reviews are largely for brick-and-mortar stores and personal services. These communication platforms serve as a place for individuals to share their thoughts and opinions on businesses or services that they have received. Amazon is both a retailer of their own as well as a host for third-party retailers. eBay hosts consumer-to-consumer auctions and facilitates with finding items, assuring payment, providing buyer insurance. Finally, eLance connects businesses with freelancers for a variety of jobs that can be delivered online such as web programming, graphic design and general writing jobs. Evidently, the information platform can be provided by a third-party separated from the transaction (Yelp, Angie's List, Trip Advisor), by a company that hosts the transaction itself (eBay, eLance and Amazon) or even by one of the traders (Amazon).

Because they are not involved in selling or hosting transactions and thus accruing revenues from sales themselves, Angie's List, Trip Advisor and Yelp charge businesses to advertise on their pages. Only Angie's List charges a nominal fee for using their services, thus collecting a portion of the profit from both the seller and the

accomplish, some believing that it can function as a signal, while others finding that its lack of enforceability renders it meaningless [Farrell and Rabin, 1996].

Table 2.1.
Notable Online Reputation Systems

Website Name	Summary	Format	Anonymous?	Investments in honesty
Amazon	Buyers rate third-party sellers after a transaction; sellers may respond. Buyers write product reviews for items that may have been sold by Amazon or a third-party company	1 to 5 stars, plus a short comment for a third-party vendor. 1 to 5 stars for products plus a headline and a review	Yes	Amazon Vine: trusted reviewers are invited to review new and pre-released items. Amazon provides free products by participating vendors
Angie's List	Paying users review businesses; companies and providers may respond	A to F ratings based, on price, quality, responsiveness, punctuality and professionalism	Name and address available to company rated but not to other members	
eBay	Buyers and sellers rate each other after a transaction; rated party may respond	Positive, negative or neutral rating, plus a short comment. Sellers may only leave positive feedback	Yes	
eLance	Clients rate freelancers mid-job and after a job is completed, freelancers may respond	1 to 5 rating on quality, expertise, cost, schedule, response and professionalism, and a short feedback	No; first name and first last name initial for seller; company name for buyer	
Trip Advisor	Users rate businesses	1 to 5 points on overall, service, food, value, atmosphere plus a review	Yes	
Yelp	Users rate businesses; owners or managers may respond	1 to 5 stars, plus a review	No; first name and first last name initial	Yelp Elite Squad: active users who provide worthy content are invited to the "squad". Members receive access to free monthly events and act as city ambassadors for their city

buyer. [5] Companies profit from investing in feedback mechanisms as they are used to generate enough trust between trading partners to override the risk of trading with complete strangers [Dellarocas, 2003]. g Also of note, is the different platforms' efforts to improve reliability of reviews. Angie's List and eLance requires reviewers

[5]For more information on fees see:
Angie's List membership: http://support.angieslist.com/
Angie's List advertising: http://support.business.angieslist.com/
Trip Advisor advertising: http://www.tripadvisor.com/MediaKit
Yelp advertising: http://www.yelp.com/advertise

to be non-anonymous, achievable due to their non-free service. Amazon and Yelp's efforts in achieving honesty involves elevating active users through their Vine and Elite programs, respectively. Leading to these investments is the assumption that higher trust in reviewers should translate into higher trust in the hosting company (and its products, if relevant). Luca [2011] shows that Elite reviews on Yelp have twice the impact on businesses' revenue than non-Elite reviews.

2.3 Theory

2.3.1 Introduction to the Contracting Model

In this section I provide a theoretical model which will be used to derive theoretical predictions for the experiments. This model is similar to MacLeod and Malcomson [1989] and is extended in the next section to analyze the effect that communication mechanisms have on the coordination problem between buyers (principals) and sellers (agents) in a relational contract setting.

In each period, the buyer makes a take-it-or-leave-it offer to the seller. The contract may include a base fixed price p, a discretionary bonus b, and a discretionary quality q. The bonus and the quality are discretionary, and thus unenforceable by a third-party. The price p is enforceable but the bonus b is not. This allows the buyer to pay an ex-post final wage that is greater than the fixed price specified in the contract. Henceforth, I will denote all *contract* terms in lower case and all *actual* terms in upper case.

The seller has the choice to accept or reject the specified contract. If the contract is accepted, the seller can choose the actual quality (Q) to provide, which may differ from the quality specified, q, due to the lack of enforceability and incurs cost $c(Q)$. The cost function is always positive, a minimum at $(c(\underline{Q}))$ and is convex, $c'(Q) > 0$ and $c''(Q) \geq 0$.

If the contract is rejected, both parties receive their reservation payoffs, $\overline{v}$ and $\overline{u}$. In the case where the contract has been accepted and quality has been observed, the buyer must choose the actual bonus (B) to pay to the seller, which may differ from the specified bonus b. The buyer has a concave revenue function $R(Q)$, $R'(Q) > 0$ and $R''(Q) \leq 0$.

In each period, a buyer and a seller can trade one unit of a good with a quality index $Q \in [\underline{Q}, \overline{Q}]$, where Q is observable but not third-party enforceable. If trade occurs at a non-negative price P, with an unenforceable non-negative bonus B, then the stage-game payoff to the buyer is $V = R(Q) - P - B$ and the stage-game utility obtained by the seller is $U = P + B - c(Q)$. Both the seller's and buyer's profits from exchange are functions of quantity, Q.

Social surplus is composed of the principal's and agent's payoff functions minus the reservation payoffs expected by the buyer and seller, $S(Q) = R(Q) - c(Q) - \overline{v} - \overline{u}$. Trade is socially efficient where R'(Q*) = c'(Q*).

I model the principal-agent interactions as an infinitely repeated game. Without communication, repeat trading (i.e. the repetition of the stationary, one-shot trading game) is crucial to sustain cooperation because the promise of future trades incentivizes buyers and sellers to sustain cooperation in the present period. This means that in each period, the buyer and seller will keep future transactions and potential profits in mind when deciding which quality or bonus to deliver in the current period. As hypothesized in the reputation literature, if communication is present, repeat trading can be replaced by communication as an enforcement mechanism. While the need to establish long-term relations may not be as strong, traders are concerned with negative and positive feedback left in previous periods, thus a one-shot game model would still not apply. For example, an Amazon-hosted seller may only sell to a buyer once, but the feedback provided on the site by the buyer will help the buyer conduct more trade in the future.

2.3.2 Model

Principals can make offers that include both a discretionary bonus and a fixed price. This contract could thus leave room for both the agent and principal to deviate from their promises.

The principal's stationary problem is to maximize profit over the desired contract, where q and p are choice variables.

$$\max_{q,p} \ (R(q) - p - b) \quad \text{s.t} \tag{2.1}$$

$$\text{agent's participation constraint (APC):} \quad p + b - c(q) \geq \overline{u} \tag{2.2}$$

$$\text{agent's incentive constraint (AIC):} \quad \frac{p + b - c(q)}{1 - \delta} \geq P - c(\underline{q}) + \frac{\delta \overline{u}}{1 - \delta} \tag{2.3}$$

$$\text{principal's incentive constraint (PIC):} \quad \frac{R(q) - p - b}{1 - \delta} \geq R(q) - p + \frac{\delta \overline{v}}{1 - \delta} \tag{2.4}$$

Buyers and sellers discount future incomes with the common discount factor $\delta \in [0, 1]$.

I am looking for solutions on an equilibrium path where both parties coordinate on the socially-efficient level of quality in every period.

Solving the AIC provides the necessary price that must be paid to the agent:

$$P \geq c(\underline{q}) + \overline{u} + \frac{c(q) - c(\underline{q}) - b}{\delta} \tag{2.5}$$

The principal will choose values such that Equation 2.5 holds with equality due to profit maximizing behavior.

Solving the APC for p and substituting into Equation 2.5 and then solving for the bonus yields the bonus equation:

$$B \geq c(q) - c(\underline{q}) \tag{2.6}$$

A principal that is profit maximizing will choose a bonus b such that the bonus that covers the cost difference of providing higher quality $q > \underline{q}$. Substituting the bonus back into the APC yields the optimal price:

$$P = \overline{u} + c(\underline{q}) \tag{2.7}$$

Therefore, seller participation is covered by price, while the incentive to produce higher levels of quality is covered by the bonus payment.

Substituting the price and bonus back into the principal's profit function, the profit function is:

$$V = R(q) - p - b = R(q) - \overline{u} - c(q) \tag{2.8}$$

The principal's optimal quantity is derived by solving the initial maximization problem:

$$\max_{q} \; R(q) - \overline{u} - c(q) \tag{2.9}$$

which has a first order condition of $R'(q) = c'(q)$. Therefore, the principal will choose q such that $R'(q*) = c'(q*)$.

Finally, combining the principal's and agent's self-enforcement constraints reveals the necessary discount factor to sustain cooperation:

$$R(q) - \frac{[c(q) - c(\underline{q})]}{\delta} - c(\underline{q}) \geq \overline{v} + \overline{u} \tag{2.10}$$

$$\delta \geq \frac{c(q) - c(\underline{q})}{R(q) - c(\underline{q}) - \overline{v} - \overline{u}} \tag{2.11}$$

Allowing Equation (2.11) to bind a be equal to δ_C, then the seller will honor the contract for all $\delta \geq \delta_C$. Any δ below δ_C does not support cooperation as an equilibrium.

2.4 Communication Effect and Hypotheses

I introduce two communication devices that modify history of play, via traders sharing information about their previous matches. These devices are cheap communication (traders are able to share both false and truthful information), and truthful communication (traders may only share truthful information). The market design and communication mechanism will be discussed in detail in Section 2.5. The communication device has no effect on the optimal structure of the contract, it only changes the pattern of convergence to the optimal contract between both parties.

In the last section, I introduced the outside option $\overline{u}$, which is constant and guaranteed. Through the market design, there is a second type of outside option that is only present if the agent receives more than a single offer. An agent cannot

ensure acquisition of offers, and thus for each period an agent evaluates their choices. If an offer is not received, then the agent collects the reservation wage $\overline{u}$. If the agent receives an offer, then the participation constraint is:

$$\text{APC, one offer:} \quad p + b - c(q) \quad \geq \quad \overline{u} \tag{2.12}$$

If the agent receives multiple offers, then these offers also become outside options. In the case of two offers, indexed as offers 1 and 2, an agent accepts offer one as long as:

$$\text{APC, two offers:} \quad p_1 + b_1 - c(q_1) \quad \geq \quad p_2 + b_2 - c(q_2) \quad \geq \quad \overline{u} \tag{2.13}$$

As shown in the theoretical section, in order to sustain cooperation (i.e. uphold contractual promises), it must be that $\delta \geq \frac{c(q)-c(\underline{q})}{R(q)-c(\underline{q})-\overline{v}-\overline{u}}$. Communication will impact the discount factor by threatening to lower the outside option. It does so by exposing traders that have not been reliable in the past, and thus making those traders' likelihood of trade lower in the future. A lower outside option results in a lower discount factor necessary in order to sustain cooperation. Under cheap communication, communication is not a suitable threat because buyers and sellers may use it to falsely report transactions.

Hypothesis 2.1 *Communication will lead to higher quality levels and higher levels of acceptance than no communication.*

Recall that social surplus is calculated by $S(Q) = R(Q) - c(Q) - \overline{v} - \overline{u}$. The total social surplus or total net value of trade in the market can be calculated by multiplying the level of achieved social surplus times the amount of trade in the market. Higher quality and acceptance rates achieved through communication will result in higher total net value of trade in the market.

Hypothesis 2.2 *(Social Surplus) Communication will lead to higher levels of total social surplus in the market.*

2.5 Experimental Procedures

Experiments were conducted in the Vernon Smith Experimental Economics Laboratory (VSEEL) at Purdue University between November of 2013 and February 2014. Subjects were undergraduate Purdue University students who were randomly selected and recruited using the ORSEE (Online Recruitment System for Economic Experiments) database. Experimental procedures were implemented in z-tree [Fischbacher, 2007]. Prior to the experiment, subjects were told they would be making decisions regarding an economic choice and that money earned would be dependent upon their own investment decisions plus a $5 show up fee.

To begin, the experimenter read the instructions aloud, while subjects followed along on their own. Next, all subjects took a short test based on the instructions and were encouraged to ask questions about the test, instructions and/or the experiment itself. After the short test, subjects played two trial periods to become accustomed to the computer program, and learn their role (buyer or seller) which was fixed for the duration of the experiment. Once all subjects finished the trial period, the actual experiment began. Subject's identification numbers were re-shuffled at this time, such that no subject was able to build up reputation during the trial periods. The sessions lasted an average of 2 hours, with students earning about $10 an hour. In total, 102 subjects participated in the experiment.

2.5.1 Experimental Design

My main interest is to find the effect that introducing and improving communication have on market efficiency. Therefore, the experimental design allows subjects to endogenously choose the contractual form, while subjecting them to exogenous limitations on communication. The design is able to separate the effect that communication has on contractual agreements and trade.

The experiment involves contracting of an abstract good between human subjects who are randomly assigned to be either buyers or sellers. The ratio of buyers to sellers is one-to-one, with a total of three buyers and three sellers per session.

Every period in the experiment follows the same sequence of events: each period begins with a proposal phase, followed by a quality determination phase, a payment determination phase, and in treatments with communication, a message phase. Buyers and sellers see a "waiting screen" when it is not their turn to act. The waiting screen summarizes information from the current period. Please see the Appendix for screen shots of each phase of the experiment, including waiting screens.

1. Proposal Phase: During the proposal phase, the buyer can propose a contract to any one seller. The proposal allows the parties to agree to the terms of trade, including a list of promises and obligations of both parties. The buyer must choose a desired quality (q) that can range between 1 and 15 (in whole numbers), a binding price (p) between 0 to 200 (in whole numbers), and a discretionary bonus payment (b) between 0 to 200 (in whole numbers). Once all proposals have been submitted, sellers review their offers. Sellers may accept a maximum of one proposal per period. No buyer is obliged to submit offers, and no seller is obliged to accept an offer.

2. Quality Determination Phase: If the seller accepts a proposal, she can choose the actual quality to provide. A seller can choose any quality (Q) she wants to from 1 to 15, regardless of the quality specified in the proposal (q).

3. Payment Determination Phase: Following the quality determination phase, all buyers whose offers were accepted and offered a bonus determine the level of actual bonus (B) to pay the seller. The actual bonus can range from 0 to 200, regardless of the bonus amount specified in the proposal (b).

4. Payoff Screen: After trade has concluded, all buyers and sellers can review information regarding the current period. All subjects are asked to keep track of this information in a sheet provided to them.

5. Message Phase: In treatments that include communication, all buyers and sellers enter the message phase after reviewing their payoffs. All subjects are asked to write down the messages in a sheet provided to them. A detailed description of the message space will be provided in Section 2.5.2.

Following the experimental literature on repeated games, we implement an infinitely repeated game using random termination [Camera et al., 2013, Dal Bó and Fréchette, 2007, Cabral et al., 2011] by allowing the game to terminate with a probability of $1 - \delta$.[6] In this experiment, the probability of continuation after each period was 80%.[7]

Table 2.5.1 summarizes the design differences between the three treatments. As explained above, each supergame lasted a random number of periods. On average, two supergames were played in each session. This was true for all three treatments. The average and maximum number of periods in Table 2.5.1 is the average period for the overall session.

Table 2.2.
Treatment Comparisons

treatment	communication	total subjects	average # of periods	maximum period
N	off	30	18.4	20
C	cheap	30	12.8	18
T	truthful	42	12.4	16

[6]If an agent is risk neutral then a constant continuation probability is theoretically equal to a constant time discount rate and an infinite horizon. Dal Bó [2005] finds that cooperation is more abundant in games of indefinite duration in comparison to finitely repeated games of the same expected termination.

[7]A computer generated roulette was coded to pop up at the beginning of each period and fall on a number between 1 and 10. Subjects were told that if the roulette landed on a number between 1 and 8, then the game would continue. If the wheel landed on 9 or 10, then one of two conditions had to be met to end the game. If they game had already played out for 10 periods, the game would end; or, if a 9 or a 10 had already come up twice before, the game would end; otherwise, the game would continue. A maximum of three supergames (or stages) could be played in each session.

All sessions are parametrized equally, where $R = 11q$, $\overline{v} = \overline{u} = 10$, $\underline{q} = 1$ and $\overline{q} = 15$. The cost function for sellers follows the function $C(Q) = \frac{Q^2}{2}$, rounded to nearest whole number (as shown in Table 2.3).

Table 2.3.
Production Costs

Quality	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Cost	1	2	5	8	13	18	25	32	41	50	61	72	85	98	113

Buyers and sellers receive the following payoffs per period:

$$V = \begin{cases} 11Q - P - B & \text{if trade occurs} \\ 10 & \text{if trade does not occur} \end{cases}$$

and,

$$U = \begin{cases} P + B - c(Q) & \text{if trade occurs} \\ 10 & \text{if trade does not occur} \end{cases}$$

Given the parameters set in the experiment, a probability of continuation of 80% is enough to sustain cooperation at the efficient quality level of 11.

Subjects were paid according to a cumulative payment scheme and received their total earnings at the end of the experiment.

2.5.2 Communication Mechanism

Buyers and sellers are able to send structured messages regarding their trading experience. Pre-selected messages provide subjects with a common language and restrict the possibility of identification. For those reasons we choose pre-selected messages over free-chat. Each trader is able to send a total of 4 messages per period, one to each of 4 available communication channels. The total number of messages per channel are limited to a maximum of 1. This is done to keep period duration short since, as in, each period can last upwards of 10 minutes. Furthermore, all information

to one channel can be included in just one message. The first channel, *public*, can be viewed by all traders. The *buyers* and *sellers* channels make messages viewable only to buyers or sellers, respectively. The last channel, *specific*, is completely private; a trader must specify the ID of the trader to receive the message, and only that trader will have access to it. Once all traders are finished choosing the messages, the messages are delivered to a message log.

A list of all messages can be seen in the Appendix (Section A.3). The messages can be divided into five encompassing categories: market information (e.g. sharing price or effort desired), partner search (e.g. a seller informing buyers that she did not receive any offers), punishments (e.g. a buyer reporting that her seller did not deliver the desired quality), rewards (e.g. a buyer reporting that her seller did deliver the desired quality), and self-reporting (a seller reporting that she delivered the desired quality).

In treatments with truthful information, only truthful information can be included in messages. For example, if a seller has delivered the promised quality, then a buyer can either abstain from sharing a message regarding quality or can share that the seller delivered the promised quality. She may not share a message stating that the seller has not delivered the promised quality. In practice, under truthful communication, a message is simply not included in the message list when it was not truthful so that a trader did not have the option of sending an untruthful message.

In treatments with cheap information, buyers and sellers do not have to share truthful information. In the example above, the buyer can share that the seller did not deliver the desired quality.

2.6 Empirical Results

2.6.1 Pre-Contractual Efficiency: Contract Acceptance

A summary of contracts offered are presented in table 2.4, and contracts accepted in 2.5. It is beneficial to examine these side by side as contracts that buyers create and the type that sellers accept have great influence over one another. Overwhelmingly, buyers choose to create contracts (i.e. stay in the market) as revealed by the high percentage of contracts offered on all treatments.

Table 2.4.
Contract Terms for all Contracts Created

	N	C	T
# of possible contracts	240	185	255
# of contracts offered	235	184	253
% of contracts offered	97.9	99.5	99.2
price	45.8	44.1	50.7
	(25.313)	(22.919)	(27.676)
desired quality	9.9	9.2	9.9
	(2.813)	(2.226)	(2.311)
bonus amount	41.5	22.9	29.5
	(44.507)	(26.500)	(23.512)

Ex-ante, buyers offer better contract terms to sellers (i.e. higher fixed price) under truthful communication (Wilcoxon rank-sum test, p=0.0101 and p=0.0399, in comparison to no and cheap communication, respectively). Interestingly, buyers with cheap communication offer the same price (Wilcoxon rank-sum test, p=0.6778) as no communication but a lower discretionary bonus (p<0.0000). Total ex-ante promised

Table 2.5.
Contract Terms for all Contracts Accepted

	N	C	T
# of contracts offered	235	184	253
# of contracts accepted	158	121	176
% of contracts accepted	67.2	65.8	69.6
price	50.4	49.2	53.1
	(24.969)	(21.576)	(27.413)
desired quality	9.8	9.4	10.1
	(2.576)	(1.928)	(2.049)
bonus amount	35.3	18.5	30.6
	(35.256)	(19.556)	(23.732)

payments (i.e. price plus promised bonus) are highest in treatment N, followed by T and finally C, and remain fairly stable over time.

Figure 2.1 provide a comparison of the average percentage of contracts accepted by sellers in each round. Nearly a third of offers are not accepted in every treatment[8]. Observationally, we see that trends for accepted contracts change in different stages of the experiment. Figure 2.1 could suggest that sellers in T are willing to initially experiment with buyers by accepting offers. Recall that sellers in T utilized the message space to punish buyers that deviated. Later, sellers in C seem to accept more offers than those in treatments N and T.

To formally test the hypothesis that under environments with different communication mechanisms buyers provide different pre-contractual incentives, a probit model with marginal effects is used. Results are shown in Table 2.6. The dependent variable

[8]Figures will be presented with a 5-period moving average smoother, as is common in the experimental economics literature. The raw figures are presented in the Appendix, and can be found in section A.6

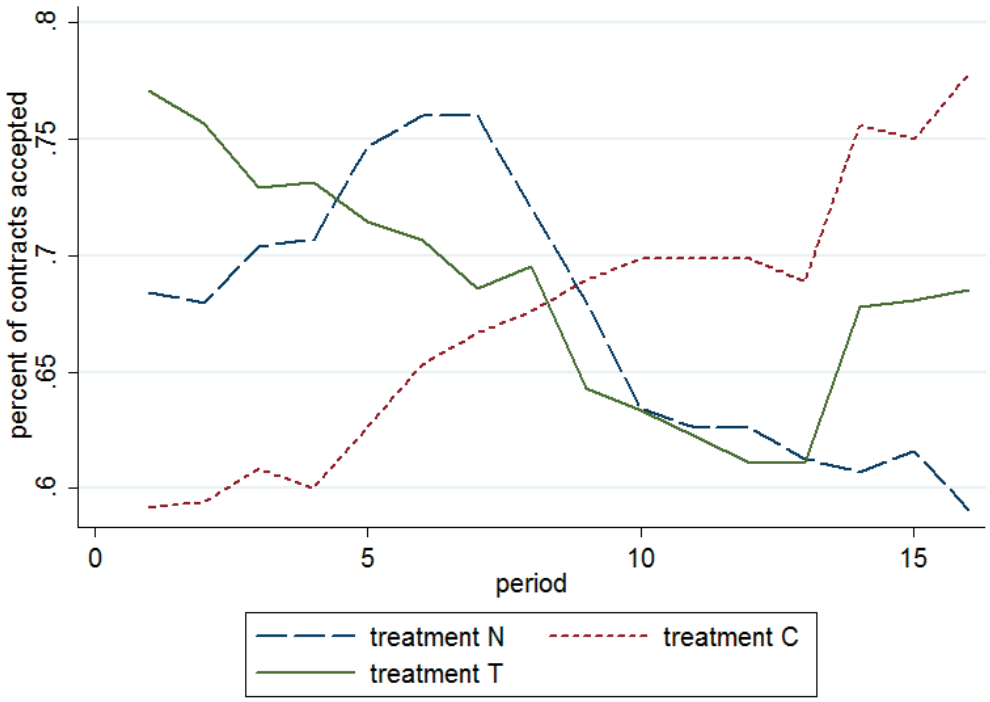

Figure 2.1. Average Acceptance per Period, 5-Period Moving Average

accept, takes the value of 1 if an offer was accepted, and a value of 0 if the offer was rejected. Regression (1) shows that on average there is no significant difference in offer acceptance between the three treatments. Additionally, the Wald test for equality between treatments C and T could not be rejected.

Regression (2) takes into account all the relevant exogenous choice regressors[9] It explains how subjects in different treatments react to the same type of offer. As expected, there is a negative relationship between offer acceptance and the receipt of another offer. Regression (2) shows a significant difference between treatment T and

[9]Subjects make choices each period based on knowledge from previous periods. Still, for each period, the choice variables can be said to be "exogenous" to acceptance. This is because variables such as desired price, bonus and quality have been firmly set prior to a seller's acceptance choice. Therefore, henceforth I will refer to these choice variables as exogenous variables.

treatment N at the 10% level.[10]. This means that for the same type of offer, sellers in treatment C are likelier to accept it.

Result 2.1 *The addition of cheap and truthful communication do not have an effect on contract acceptance. However, keeping all contract terms fixed, sellers under unverified communication are likelier to accept it.*

2.6.2 Post-Contractual Efficiency: Quality in the Market

Table 2.7 summarizes the means of the realized outcomes for offers that were accepted by sellers. It reveals that on average, no treatment fully achieved the optimal trading quality level ($Q = 11$), though verified communication seems to lead to the highest level of quality, and as a result the highest level of ex-post payments (bonuses).

Bonus differences between all treatments are statistically significant (Mann-Whitney between pairs, N and C p-value = 0.0049, N and T p-value < 0.0000 and C and T p-value = 0.0009). Buyers under verified communication pay the highest ex-post bonuses, followed by no communication and finally verified communication.

Figure 2.2 displays the 5-period moving average of average per period quality comparisons across treatments. While treatments N and C cross each other multiple times, treatment T yields higher efficiency than treatments N and C over most periods. Observationally, it appears that verified communication leads to higher efficiency in the market. Furthermore, a Mann-Witney test reveals that quality differences between treatments N and C are not significant ($p = 0.2624$), but significant between N and T ($p = 0.0012$) and between C and T ($p < 0.0000$). To further analyze how quality is determined, I use a tobit model with standard errors adjusted for clustering on sessions, shown in (1) and (3) of Table 2.8.[11] The first regression simply presents

[10]Please see section A.4 of the Appendix for a description of all variables used in this paper.

[11]Tobit models can be employed when a variable is only observed for a selected sample. In this case, the quality variable is restricted between 1 and 15. This approach to analyze quality and shirking has previously been used in papers such as Cordero Salas [2011] and Sheremeta and Wu [2012].

Table 2.6.
Probability of Contract Acceptance, Marginal Effects

	(1)	(2)
treatment C	-0.0147	-0.0169
	(0.0414)	(0.0317)
treatment T	0.0233	-0.0721*
	(0.0372)	(0.0423)
stage		0.0269
		(0.0316)
period		-0.0469*
		(0.0242)
period sq		0.00109
		(0.00113)
price		0.00474***
		(0.00120)
bonus amount		0.000651
		(0.00142)
desired quality		-0.00638
		(0.0103)
other offers		-0.328***
		(0.0276)
relationship		0.0825***
		(0.0178)
observations	672	672
Wald tests for equality of treatments C and T	0.2313	0.1940

Note: Probit with robust standard errors adjusted for clustering on sessions.
*,**,***: significantly different from zero at 10%, 5% and 1%, respectively
Base category for treatment: N

the effect of treatment on quality, whereas regression (3) includes all the appropriate exogenous regressors. The inclusion of verified communication leads to an increase of quality of 0.862 points.

Censoring is appropriate because our dependent variables, quality and shirking, is bounded between 1 and 15 in the experiment.

Table 2.7.
Statistics for all Contracts Accepted

	N	C	T
quality	7.949	7.612	9.165
	(3.288)	(3.275)	(2.988)
bonus	17.581	14.610	24.302
	(21.244)	(21.001)	(23.340)
observations	158	121	176

Note: standard deviations in parentheses

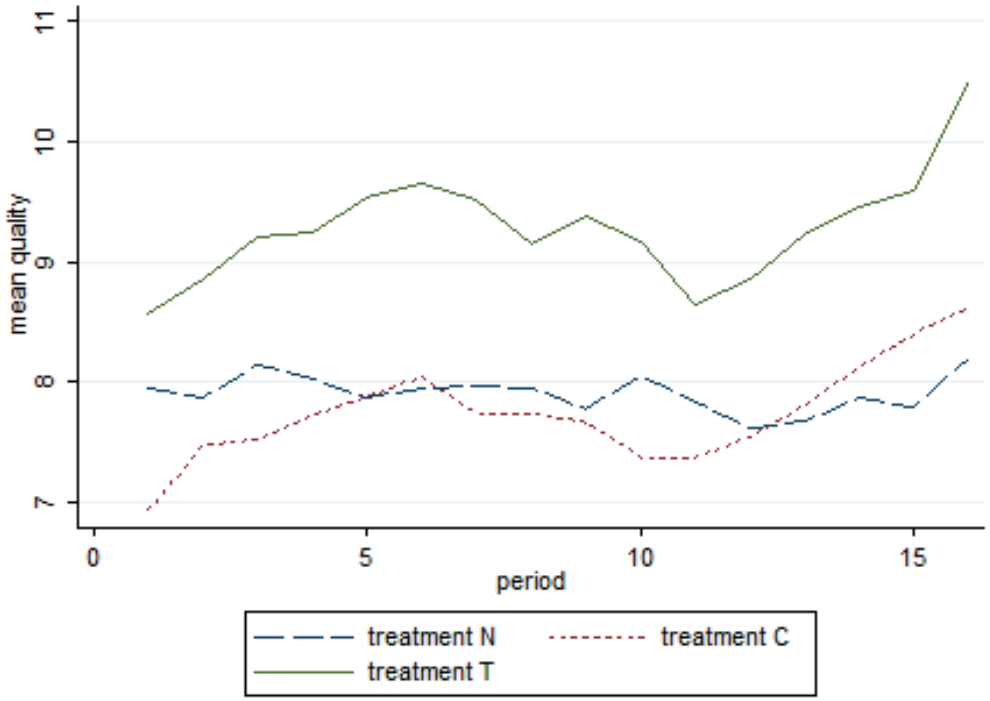

Figure 2.2. Average Quality per Period, 5-Period Moving Average

Result 2.2 *Hypothesis 3 is supported by the results. Verified communication leads to higher levels of quality in the market.*

Table 2.8.
Censored Regressions for Quality

	(1) quality	(2) shirking	(3) quality	(4) shirking
C	-0.372	-0.141	-0.0841	0.439
	(0.810)	(0.549)	(0.690)	(0.619)
T	1.248*	-0.947*	0.862**	-0.673*
	(0.715)	(0.506)	(0.376)	(0.386)
stage			0.0690	-0.00371
			(0.256)	(0.267)
period			0.123	-0.158
			(0.146)	(0.167)
period sq			-0.00337	0.00490
			(0.00631)	(0.00769)
price			0.0488***	-0.000839
			(0.0142)	(0.00637)
bonus amount			0.0295	0.0142
			(0.0189)	(0.0101)
desired quality			0.390**	
			(0.185)	
relationship			0.502***	-0.409***
			(0.0690)	(0.0625)
other offers			0.514**	-0.444**
			(0.260)	(0.215)
constant	7.858***	1.893***	2.023*	0.525
	(0.389)	(0.382)	(1.158)	(0.862)
observations	455	455	455	455
Wald tests for equality of treatments C and T	0.0827	0.1190	0.0797	0.0192

Tobit with robust standard errors adjusted for clustering on sessions.
*,**,***: significantly different from zero at 10%, 5% and 1%
Base category for treatment: N

Meanwhile, unverified communication does not have a significantly different effect when compared to no communication. The Wald test shows that results from verified communication are significantly different from those achieved from unverified communication.

Other significant exogenous regressors have the expected signs. A higher fixed price and desired quality both lead to higher quality levels; a longer trading relationship has a positive impact on quality, possibly because sellers would prefer to enjoy the trust built up in a relationship as opposed to receiving a one time deviation payment.

Regressions (2) and (4) in Table 2.8 repeat the process discussed but uses shirking as the dependent variable. Shirking is the difference between promised quality (q) and delivered quality (Q) . A positive $q - Q$ indicates that the seller has shirked and delivered a lower quality than promised, while a negative $q - Q$ indicates that the seller has delivered a quality higher than requested.

Because buyers in treatment T requested higher levels of quality on average, it is possible that even though quality was higher with verified communication, the amount of shirking is not significantly impacted. The regressions demonstrate that verified communication significantly decreases the amount of shirking while unverified communication once again fails to create a change from no communication. A Wald test for equality shows that quality and shirking levels for treatment C and T are significantly different from each other in all regressions.

Result 2.3 *Verified communication decreases seller shirking.*

2.6.3 Social Surplus and Income Inequality

In addition to pre- and post-contract efficiency, there are two important measures worth examining: social surplus and income inequality between buyers and sellers. The differences in these measures are akin to differences in a country's total social surplus and Gini coefficients, respectively. While a policy may increase overall surplus, it could also erode income conditions for a subsample of the population. Results are presented in Table 2.9.

Recall that social surplus generated in a single transaction is $S(Q) = R(Q) - c(Q) - \overline{v} - \overline{u}$. Total surplus achieved can be calculated by multiplying policy average social surplus times the percentage of trade achieved. I then calculate efficiency by calculating the ratio of actual total surplus to the maximum possible total surplus.

Table 2.9.
Social Surplus Measures

	N	C	T
% of contracts accepted	67.2	65.8	69.6
average social surplus	30.23	29.22	34.15
	(15.215)	(15.762)	(12.692)
total surplus	2031.46	1922.68	2376.84
	(1022.432)	(1037.107)	(883.394)
efficiency	0.600	0.571	0.674

Truthful communication leads to the highest levels of total surplus, achieving 60% of the maximum possible amount of surplus efficiency. A Wilcoxon rank-sum test on social surplus reveals that there are differences in the underlying distributions between the pairs (N, T) and (C,T), but not between (N,C). The results demonstrate that verified communication not only increases the amount of social surplus achieved through a single transaction (a result that follows directly from higher qualities), but also increases the overall amount of welfare in the market economy.

Result 2.4 *Truthful communication leads to higher levels of total surplus.*

Policies that increase an economy's social welfare might not necessarily decrease income inequalities. For that reason, I examine the effect that the communication mechanisms have on income distribution. I look at two types of income inequality measures: matched income inequality (MII), calculated by looking at average per trade income disparities between buyers and sellers in each treatment, and the Gini

coefficient, the dispersion of income across a population. The Gini coefficient varies between 0 (complete equality) and 1 (complete inequality). Results are shown in Table 2.10.

Table 2.10.
Income Inequality Measures

	N	C	T
average buyer income	20.589	22.430	24.011
	(29.317)	(22.051)	(19.175)
average seller income	29.639	26.793	30.136
	(22.519)	(12.660)	(13.305)
income inequality	9.05	4.363	6.125
	(50.017)	(32.320)	(30.468)
Gini coefficient	0.21382	0.20218	0.18198
	(4.289)	(4.642)	(0.270)

Firstly, Wilcoxon rank-sum tests reveal that truthful communication increases buyer profit both from no (p=0.0246) and cheap (p=0.0848) communication. Meanwhile, cheap communication leads to lower seller profits.

While no treatment has a significant effect on MII, both truthful communication and cheap communication lead to a lower Gini coefficient (p=0.0001).

2.6.4 Messages

The messages can be described by five encompassing categories: (1) market information (2) partner search, (3) punishments, (4) rewards, (5) self-reporting. Some key observations and results can be derived from the types of messages sent. Recall that all of the message variables are listed and described in Table B.1. Subjects sent the bulk of the messages at the beginning of the experiment, tailing off around period

10, as seen in Figure 2.3. The messages allowed traders to search for partners, and to

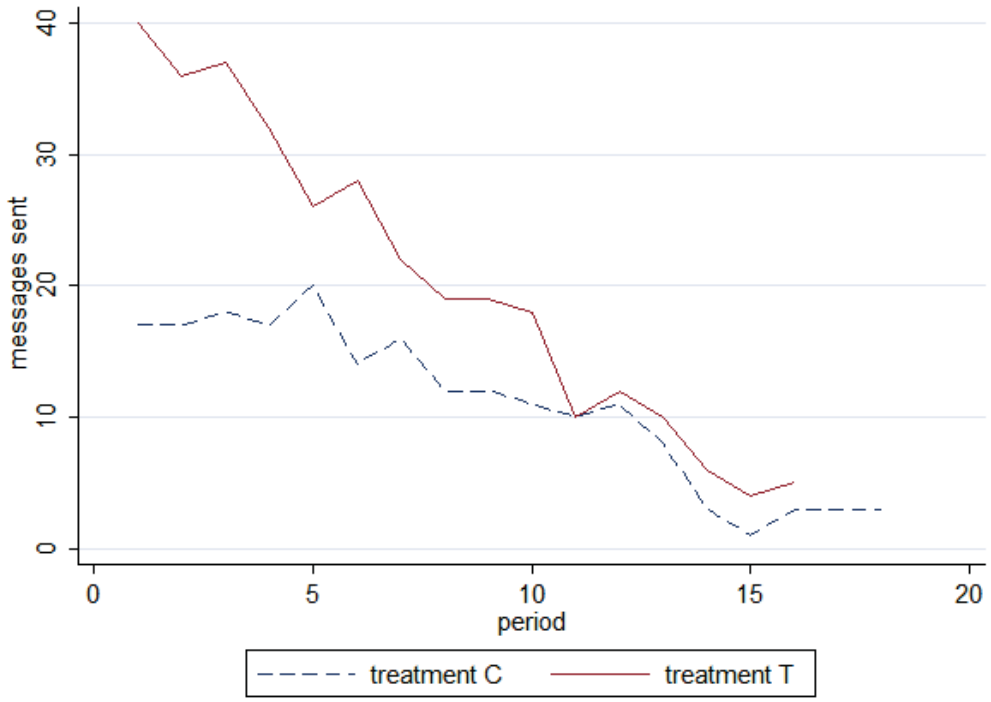

Figure 2.3. Messages Sent by Period

punish and reward. However, only the effects that the mechanisms themselves have on outcomes are tested, not the individual messages. I summarize how messages were used to provide an insight into how the mechanisms themselves function. Statistics for all messages can be found in the Appendix.

Market information: In the unverified communication treatment, sellers report quality and bonuses falsely. For example, 62% of quality levels reported through unverified communication are higher than actual quality delivered. Buyers also use messages to distort transactions; 100% of efforts and bonuses shared to *public* are higher than those actually delivered. In the verified communication treatment, both sellers and buyers tended toward sharing all contract terms, mostly through the *public* and $specific$ channels.

Search and matching: Sellers and buyers largely used the *public* channel to communicate a lack of trade. 38.46% of sellers who did not receive an offer in the verified communication treatment sent a message via the *public* channel indicating so. Buyers on the other hand were less likely to use messages to search for sellers, likely because as first-movers they are able to choose which seller to offer a contract.

Sanctions: Under unverified communication, sellers report buyers through all channels; although the *sellers* channel is the most used. However, many of these reports were unreliable. For example, 40% of buyers reported by a seller to not have paid the bonus via the *sellers* channel had in actuality paid the appropriate bonus. Buyers on the other hand, used the *public* channel most often, with no incidence of lying (publicly), and only 7.69% incidence of misreporting in the *buyers* channel. Under verified communication, both buyers and sellers prolifically used the *public* channel. For example, 16.79% of cheated sellers choose to report to all that their partner had not paid the appropriate bonus.

Rewarding messages: Without verification, sellers reward buyers though the *buyers* channel, such that other sellers may not use this information to differentiate the good from bad buyers. Buyers do not provide many positive ratings, although the most used channel is $specific$. In the presence of verification, buyers and sellers use the *public* and $specific$ channels to reward their partners. For example, 18.70% of sellers reported publicly that their buyer had paid the promised bonus, and 15.15% of buyers report publicly that their partner delivered the appropriate quality.

Self-reporting: Under unverified communication, sellers mostly positively self-report (i.e. report that they have delivered quality) via the *public*, *buyers* and *sellers* channels. With verified communication, once again, the bulk of seller messages are positive. Buyers, on the other hand, used self-reporting to show that they do not pay bonuses when cheated - 7.57% of buyers report that the promised bonus was not paid. Of note is that all buyers (in C and T) that report themselves to not have paid the bonus also report that the seller did not deliver the promised quality. In addition,

buyers that reported publicly that the promised bonus had been paid also report that the seller delivered the promised quality. This implies that buyers use messages to show that they are willing to play fair: if the seller does not deliver on quality, they will withhold the payment (and announce it publicly), but if the seller is willing to deliver they will reward them accordingly. The results on the inequality measures provide an insight into how market policies can have unexpected externalities in a market. In this case, truthful communication leads to the highest level of social surplus and the lowest level of income inequality. And while cheap communication does not increase total surplus, it does work toward equalizing subjects' incomes.

Result 2.5 *Both truthful communication and cheap communication lower the amount of income inequality, as evidenced by resulting in lower Gini coefficients.*

The overall results are in line with my findings when evaluating the discount factors. While there is an imposed discount factor of 0.8 for all treatments, Dal Bó and Fréchette [2007] find that satisfying the imposed threshold is a necessary but not sufficient condition to sustain cooperation. I compare the three treatment's necessary threshold for cooperation by solving for δ (see Equation 2.11). Under truthful communication, the reservation wage is truly the outside option because a defection will lead untrustworthy buyers and sellers to exit the market. However, this may not be quite so in treatments C and N. For treatment N, which does not have a communication mechanism, I instead use the average seller and buyer payoffs as the outside option. This is because after a transgression, buyers and sellers will not be immediately pushed out of the market and instead be able to conduct other trades. For treatment C, I take the average of the reservation wages and the average buyer and seller payoffs. Truthful communication has the lowest discount factor, followed by C and then N. The ranking results on the discount thresholds are not surprising and support that truthful communication leads to the highest levels of cooperation. While N and C lead to equal levels of quality and contract acceptance, I do find slight welfare improvements with the addition of cheap communication, also supported by the ranking.

2.7 Discussion

This study examines the economic impact introducing communication in a market. I analyze different two different policies, cheap communication, in which buyers and seller can choose to send either truthful or deceitful information and truthful communication. Several online markets have in place communication platforms, such as Yelp, a website for general businesses in an area, or even Amazon forums, used for goods purchased on the Amazon website. The information-sharing networks have revolutionized how customers and firm interact. Word of mouth can now easily be spread at a low cost and with mass audiences. Several markets have made further investments in communication platforms to make them more honest – for example, Yelp has started the Yelp Elite program, in which superusers are given an "Elite badge" on their Yelp profile and are invited to monthly parties at local businesses. The investment that Yelp has made on these Elite members creates incentives for their honest opinions to be shared online, and causes others in the community to be more respectful of their opinions.

Results from this study show that truthful communication proves to be an effective development tool for increasing efficiency in a market. Traders utilize the message system to punish and reward each other. As a result, it appears that buyers and sellers reach a higher degree of trust, facilitating trade without legal contract enforcement. With truthful communication, agents deliver higher levels of quality and reduce the amount of shirking. As a reward for contract upholding, and for fear of retribution via negative messages, buyers respond in turn with higher bonuses and lower amounts of payment withholding.

Cheap communication does not lead to higher efficiency nor higher levels of social surplus. Traders, particularly sellers, exploit the communication platform by choosing dishonest messages. In addition, while traders using an cheap communication mechanism do send messages, fewer messages are sent when compared to truthful communication, possibly because traders predict that due to dishonesty in the sys-

tem their messages will not sway others' opinions. A surprising result is that cheap communication, while not affecting efficiency nor social surplus, leads to a better dispersion of income, as shown by a decrease in the Gini coefficient. The result mostly likely comes at the expense of sellers – average seller income decreases while average buyer income increases. While cheap talk does not aid buyers and sellers in cooperating on an efficient quality, it could be the case that communication closes the social distance felt between them, thus leading to fairer payoffs. Because of this result, cheap communication cannot be completely overruled as a development tool as it can be used in the short-run to alleviate persistent income inequalities between groups.

It is clear that truthful communication is the better tool for market development. Truthful communication achieves the highest quality levels in the market while also leading to the highest total social surplus (which takes into account both quality and number of accepted contracts) and the lowest Gini coefficient. Markets already containing a communication mechanism (such as online review sites) can greatly benefit by investing in improvements toward truthful communication.

CHAPTER 3. THE EFFECT OF HOME BIAS AND PROTECTIONIST POLICIES

3.1 Introduction

In this study I look at different policies aimed at influencing the attractiveness of local markets. Buying locally has gained popularity due to perceived benefits to the local economy. However, these benefits may be nonexistent [Lilico, 2008]. The drive to source locally, even when it may be more profitable to trade with foreign markets, is increasingly common around the world, in part because of the fear of large business dominance [Feagan et al., 2004, Kimura and Nishiyama, 2008, Patterson et al., 1999, Weatherell et al., 2003].

The trend has especially affected the demand for local foods. The growth in consumer interest has led large retailers to invest in markets for local food [Chambers et al., 2007, Guptill and Wilkins, 2002, Selfa and Qazi, 2005], but studies have shown that local food supply chains are still underdeveloped [Jones et al., 2004, Selfa and Qazi, 2005]. Born and Purcell [2006] warn of the "local trap", a tendency to assume that there is something inherently positive or desirable about the local scale. The authors claim that the assumption that local is desirable does not always hold and may induce planners to confuse ends (improving the local economy) with means (increasing local trade).

To mimic differences between local and foreign markets, this study involves separating subjects into two groups. In the experiment's control treatment, I observe trade for a good between buyers and sellers in group A and B. Each buyer may create a take-it-or-leave-it offer for a seller in either their group or the other group. The

offer includes a fixed price enforced by the computer, a discretionary bonus, and a discretionary quality. Each seller may only accept a single offer. If the seller accepts the offer, then she may choose to deliver any quality. Upon observing the quality delivered, the buyer may then choose to pay any bonus.

In addition, it is more profitable to trade outside of one's own group. The buyer's revenue function has a higher revenue multiplier for subjects who trade with a foreign seller. This scenario corresponds to a market in which buying foreign goods is more profitable monetarily. For a constant quality, a mass-produced good from a distant region is likelier to have better scales of production than a locally produced good. This can be compared to the hype of eating locally, or going on the "100 mile diet" which has grown substantially, and yet this practice has also received considerable criticism on the grounds that it lacks sustainability. Critics believe that in order to make local food systems sustainable they will also have to scale up when necessary by engaging more or larger consumers and producers [Born and Purcell, 2006, Mount, 2012].

I implement treatment policies which may be utilized to increase local trade: (a) introducing cheap communication; (b) bettering the quality of local information (by ensuring that it is truthful); and (c) reducing the attractiveness of the foreign market (subsidies on local goods or taxation on foreign goods). I will also look at the effect of combining policies (a) or (b) with (c).

I implement these policies and ask how they affect the economy. Particularly, I examine if these policies achieve their goal (increase local trade), and if they do so efficiently (what happens to the quality of goods traded locally), while also observing the effect that these policies have on the overall economy. In addition, I analyze how the policies affect social welfare and income distributions in the economy.

The results show that despite the lucrativeness of foreign trade, local trade occurs in the control treatment. This indicates that some amount of home bias is present. At the same time, no communication policy increases the percentage of local offers

accepted, however decreasing the attractiveness of the foreign market causes the percentage of local offers created and accepted to increase. Furthermore, adding cheap or truthful communication to a policy that has decreased the foreign multiplier does not have any additional benefits in terms of local offer creation or acceptance. The addition of either type of communication, and reducing the foreign multiplier, all improve quality in the overall market, though they do not have an effect on local quality. Only a combined policy of truthful communication and a reduction of the foreign multiplier is able to significantly increase quality in the local market. This result has implications for the development of local food systems; it is possible to increase local trade effectively, however doing so will take large investments.

Another noteworthy aspect of these policies is the effect that they could have on social surplus and income inequalities. I find that treatments that introduce truthful communication achieve the highest levels of total surplus (which combines measures for social surplus and amount of trade reached). The highest level of local total surplus is reached when combining a policy of truthful communication and a reduction of the foreign multiplier. However, this leads to a lower global total surplus than what is possible. I calculate two different types of income inequalities: differences earned between buyers and sellers on average per period(matched income inequality, or MII), and a Gini coefficient which measures the dispersion of income. No policy has an effect on the global MII and Gini coefficient, meaning that no policy has an effect on global inequalities. However, when looking at the local market, a combination policy of truthful communication and a reduction in the foreign multiplier causes buyer-seller income differences to drop to zero.

3.1.1 Policy Review

3.1.1.1 Group Distinctions

There are many reasons why individuals choose to buy locally, including higher utility derived from support of the local economy and quality expectations [Feagan et al., 2004]. Group distinctions are hypothesized to affect social distance, a concept first developed in psychology by Tajfel and Turner [1979]. Social distance regards the actual distance perceived between individuals. This distance is of importance when studying economic situations that are influenced by social norms or economic decisions that bear social consequences [Akerlof, 1997]. Distance has been found to affect hiring decisions and business success [Faust and Wasserman, 1994], as well as job performance, trust and reciprocity [Charness et al., 2007, Cox and Deck, 2005, Eckel and Wilson, 2000]. Several empirical studies have shown that social distance can have a large impact on economic outcomes[1]. I use group distinctions as a proxy for social distance.

Shorter social distances increase willingness to cooperate for several reasons, including the feeling of belonging, as well as fear of retribution. Orbell et al. [1988] finds that lower social distance translates to higher levels of cooperation, and Buchan et al. [2006] finds evidence of the importance of social distance on cooperation in the United States. On the other hand, as social distance increases, or the level of anonymity becomes greater, selfish behavior becomes more pronounced [Charness and Gneezy, 2008].

Social psychology identifies reciprocity and stereotype-based trust, the attribution of more positive characteristics to others in same group, as leading reasons why subjects are more likely to put their trust in ingroup members [Cook et al., 2009]. If subjects expect that fellow group members will favor ingroup over outgroup in

[1]See for example Rao and Schmidt [1998], Eckel and Wilson [2003].

the allocation of resources, they are more likely to also favor ingroup over outgroup [Jetten et al., 1996, Moy and Ng, 1996].

Also at play is the imperfect enforcement of contracts, which is a potential deterrent of foreign trade. Especially when trading outside of one's own country or group, enforcement authorities may treat foreigners less fairly. Uncertainty regarding contract enforcement will increase the risk of out of group contracting. No contract can ever be truly complete for all contingencies, leading parties to understand certain aspects of the agreement implicitly. In turn, it is easier to understand implicit agreements when dealing domestically [Anderson, 2002].

3.1.1.2 Subsidies

A subsidy is an external financial support granted to a specific party. Generally, subsidies are given to sectors of an economy that are not able (at least in the short-term) to sustain themselves. The subsidy is given toward the end of garnering investors' interest and promoting economic development. At the country-level, there already exist several subsidies in the US aimed at making locally-produced products relatively more attractive. For example, the 2014 US Farm Bill provides support to several agricultural parties, such as sugar producers and catfish farmers [Tanner, 2014].

Policies to increase the attractiveness of local trade also exist at smaller scales. The number of federal government policies supporting local food initiatives continues to grow, with examples such as the Community Food Project Grants Program, the Woman, Infants and Children Farmers' Market Nutrition Program, Senior Farmers' Market Nutrition Program and the Federal State Marketing Improvement Program [Martinez, 2010].

Most regulations aimed at increasing the attractiveness of local products take place at the State or local level (for example, sales taxes) [Martinez, 2010]. The Missouri Department of Agriculture created a label that promotes locally-grown products and

provides matching funds for growers who use the label to encourage consumers to "Buy Missouri" [Brown, 2003]. Additionally, the "Shop N Save" intervention which provided a $5 a week incentive to customers spending $5 or more in food assistance at a particular farmers' market in rural South Carolina.[2]

Several empirical studies exist that analyze the effect that subsidies have on the economy. For example, the Global Trade Analysis Project (GTAP) at Purdue University compiles a global database of trade and agricultural subsidy interventions by governments and uses a multi-region general equilibrium model to decompose the effect of a policy in a specific region (e.g. the change in total surplus due to a percentage change in a subsidy). In general, a GTAP simulation that reduces the level of a subsidy for an endowment leads to economic benefits because it reallocates resources away from a relatively low social marginal value product use to one of high social marginal value Huff and Hertel [2000]. Various GTAP studies exist that look at the effect of subsidies on specific products and regions.

Despite the attention on smaller-scale local markets, there are still few studies that assess the impact of local food markets on economic development [Martinez, 2010]. Subsidies generally affect a market by reducing the price paid by buyers while also effectively increasing the quality sold by sellers. Subsidies tend to create deadweight loss; this loss comes from the tendency for subsidies to be pareto inefficient by not recouping the cost (to whomever funds the subsidy) via the market benefits.

3.1.1.3 Communication

Theoretically, communication has been found to further reduce social distance, and affect choice of partner: Fiedler et al. [2011] studies a one-shot trust game where the subject must choose between trading with a familiar responder (communication through chat) or a stranger with whom trading can yield higher payouts, posing a

[2]Farmers' markets are a form of direct marketing – producers sell directly to final consumers, thus skipping the middleman.

tradeoff between the comfort of social closeness and economic opportunities with an outsider. Proposers consistently prefer the familiar partner across treatments even in the face of lower private earnings and social efficiency. The outcome is likely due to chat communication's role in updating the sender's beliefs regarding reciprocicity.[3]

Reciprocity is sparked by a belief on the actions of the other players, and thus lower social distances are likely to lead to intrinsic reciprocity, where a kind act by one player changes the preferences or utility of those with whom she interacts in such a way that it elicits a behavior of kindness in response[4].

Chen and Li [2009] find that allowing participants to chat intensifies the sense of group identity: in a five period laboratory experiment where subjects are divided depending on their art preferences, subjects are asked to split tokens if they are paired with two members of their own group, two members of the other group or a mix. When splitting tokens between ingroup and outgroup members, more tokens are given to the ingroup; more envy is observed when an outgroup member has a higher payoff; players are more likely to reward good behavior from an ingroup subject, and are significantly more likely to forgive the ingroup for misbehavior; and players are more likely to pick a social welfare maximization outcome when matched with an ingroup subject. Isaac et al. [1984] show that when sellers are able to communicate in a repeated public goods game, they will forgo the opportunity to increase individual gain at the expense of other sellers, instead choosing prices in unison.

Empirically, the introduction or improvement of communication in groups or markets can increase social embededness and thus reduce distance between buyers and sellers in the market increasing transparency and trust. Many hypothesize that direct exchange between farmers and consumers is critical to the success of local systems [Feagan, 2008, Ostrom and Jussaume Jr, 2007], because through direct contact buyers

[3]Reciprocity, as explained by Sobel [2005], regards the tendency to respond to perceived kindness with kindness, and perceived meanness with meanness.

[4]This is different than "instrumental" reciprocity where in a repeated game setting players will be driven to cooperate not because of kindness but because of selfish motives. In order to achieve payoffs in the future they are willing to give up the high short-term gains of deviating.

and sellers are able to exchange "ideas, stories, questions and reassurances" thereby leading to higher level of transparency in the buyer-seller relationship [Mount, 2012]. Due to communication that occurs at local levels, fraud is less likely to go unnoticed and reputations are more easily impugned. Therefore, improving communication can have substantial payoffs. Communication investments for local markets have occurred in both the private and the public sector. For example, as a response to in-transparent value chains where quality standards between farmers and buyers are out of sync and intermediaries capture most of the margins, a Swiss investment company has piloted an online database where farmers and consumers of fresh produce in Tanzania can track volumes, grades and prices [Tanja Havemann and Cordes, 2014].

USDA has collaborated with University Of Illinois Extension, the Initiative for the Development of Entrepreneurs in Agriculture, the Illinois Department of Agriculture and Illinois Council on Food and Agricultural Research to develop "MarketMaker". MarketMaker is an electronic infrastructure that more easily connects farmers with economically viable new markets (i.e. matches retailers/wholesalers/processors with farmers). Food producers and marketers take part in a "Buy and Sell Forum", which is now available in several states (see Colorado MarketMaker [2014]). Via the forums, both buyers and sellers are able to post information on what they would like to purchase or sell. For example, a post on the Michigan MarketMaker for Potatoes states that no fertilizers, pesticides or herbicides were used, states the farm at which the potatoes were grown and states how many page views the site has received from potential buyers.

Another example is the Know Your Farmer, Know Your Food Initiative (USDA), focused on connecting consumers with local producers includes the launch a website to promote dialogue. USDA has stated that "there is too much distance between the average American and their farmer and we are marshalling resources from across USDA to help create the link between local production and local consumption" [USDA-GIPSA, 2010].

3.1.2 Policy Effects

One of the main economic impacts purported to benefit economic development is that of import substitution. The idea is that if consumers purchase goods in the local market, then money will stay in the local economy. The new income generated in the economy then spills over to other areas, such as the number of jobs or the budget for production inputs [Swenson, 2013, 2011, 2010]. These studies rely on regional input-ouput models, and find shifting activities to the local market will have a positive outcome in economic development, even after accounting for revenues lost from the opportunity cost of land. However, these type of studies assume that local products can be produced competitively, and ignore production efficiencies from larger farms and losses to the economy from import-related industries (i.e. displaced economy activity from non-local products, of the type often sold in supermarkets).

Unlike other studies, Hughes et al. [2008], considers the net, as opposed to gross, impact of West Virginia farmers' markets on the local economy. They incorporate the "opportunity cost" of consumers spending money at the farmers' market as opposed to a conventional grocery store. In comparison to previous studies, they find lower but still positive economic benefits to the local economy.

None of the studies bring to light how the estimates of economic benefits from increased local activity would change if the cost of public investment in local food markets were accounted for Martinez [2010], nor exactly how much these programs, some of which have existed for several years, truly affect the local market.

3.2 Theory

3.2.1 Introduction to the Contracting Model

In my model, the buyer takes the role of the principal and the seller assumes the role of the agent. In each period, the buyer makes a take-it-or-leave-it offer to

the seller. The seller has the choice to accept or reject the specified contract. The contract may include a base fixed price p, a discretionary bonus b, and a discretionary quality q. The bonus and the quality are discretionary, and thus unenforceable by a third-party. Because the price p is enforceable but the bonus b is not, the buyer can ex-post offer a final wage that is greater than the fixed price specified in the contract. Henceforth, I will denote all *contract* terms in lower case and all *actual* terms in upper case.

If the contract is accepted, the seller can choose the actual quality (Q) to provide, which may differ from the quality specified, q, due to the lack of enforceability. If the contract is rejected, both parties receive their reservation payoffs, $\overline{v}$ and $\overline{u}$. In the case where the contract has been accepted and quality has been observed, the buyer must choose the actual bonus (B) to pay to the seller, which may differ from the specified bonus b.

Supposed that a buyer and a seller can trade one unit of a good with a quality index $Q \in [\underline{Q}, \overline{Q}]$, where Q is observable but not third-party enforceable. If trade occurs at a non-negative price P, with an unenforceable non-negative bonus B, then the stage-game payoff to the buyer is $V = R(Q) - P - B$ and the stage-game utility obtained by the seller is $U = P + B - c(Q)$. Both the seller's and buyer's profits from exchange are functions of quantity, Q.

Social surplus is composed of the principal's and agent's payoff functions minus the reservation payoffs expected by the buyer and seller, $S(Q) = R(Q) - c(Q) - \overline{v} - \overline{u}$. Trade is socially efficient where R'(Q*) = c'(Q*).

I model the principal-agent interactions as an infinitely repeated game as opposed to a one-shot game. Without communication, repeat trading (the repetition of the one-shot trading game) is crucial in order to sustain cooperation due to the ongoing relationship between the buyer and seller makes strategic planning necessary. This means that in each period, the buyer and seller will keep future transactions and potential profits in mind when deciding which quality or bonus to deliver in the

current period. If communication is present, traders can share their previous trading experiences and repeat trading can be replaced by communication as an enforcement mechanism. While the need to establish long-term relations may not be as strong, traders are concerned with negative and positive feedback left in previous periods, thus a one-shot game model would still not apply.[5]

3.2.2 Model

Principals can draft offers that include both a discretionary bonus and a fixed price. This contract could thus leave room for both the agent and principal to deviate from their promises.

The principal's stationary problem is to maximize profit over the desired contract choices.

$$\max_{q,p,b} \ (R(q) - p - b) \quad \text{s.t} \tag{3.1}$$

$$\text{agent's participation constraint (APC):} \quad p + b - c(q) \geq \overline{u} \tag{3.2}$$

$$\text{agent's incentive constraint (AIC):} \quad \frac{p + b - c(q)}{1 - \delta} \geq P - c(\underline{q}) + \frac{\delta \overline{u}}{1 - \delta} \tag{3.3}$$

$$\text{principal's incentive constraint (PIC):} \quad \frac{R(q) - p - b}{1 - \delta} \geq R(q) - p + \frac{\delta \overline{v}}{1 - \delta} \tag{3.4}$$

Buyers and sellers discount future incomes with the common discount factor $\delta \in [0, 1]$.

I am looking for solutions on an equilibrium path where both parties coordinate on the socially-efficient level of quality in every period.

Solving the AIC provides the necessary price that must be paid to the agent:

$$P \geq c(\underline{q}) + \overline{u} + \frac{c(q) - c(\underline{q}) - b}{\delta} \tag{3.5}$$

The principal will choose values such that Equation 3.5 holds with equality due to profit maximizing behavior.

[5]For example, an Amazon-hosted seller may only sell to a buyer once, but the feedback provided on the site by the buyer will help the buyer conduct more trade in the future.

Solving the APC for p and substituting into Equation 3.5 and then solving for the bonus yields the bonus equation:

$$b \geq c(q) - c(\underline{q}) \tag{3.6}$$

A principal that is profit maximizing will choose a bonus b such that the bonus that covers the cost difference of providing higher quality $q > \underline{q}$. Substituting the bonus back into the APC yields the optimal price:

$$P = \overline{u} + c(\underline{q}) \tag{3.7}$$

Therefore, seller participation is covered by price, while the incentive to produce higher levels of quality is covered by the bonus payment.

Substituting the price and bonus back into the principal's profit function, the profit function is:

$$V = R(q) - p - b = R(q) - \overline{u} - c(q) \tag{3.8}$$

The principal's optimal quantity is derived by solving the initial maximization problem:

$$\max_{q} \; R(q) - \overline{u} - c(q) \tag{3.9}$$

which has a first order condition of $R'(q) = c'(q)$. Therefore, the principal will choose q such that $R'(q*) = c'(q*)$.

Finally, combining the principal's and agent's self-enforcement constraints reveals the necessary discount factor to sustain cooperation:

$$R(q) - \frac{[c(q) - c(\underline{q})]}{\delta} - c(\underline{q}) \geq \overline{v} + \overline{u} \tag{3.10}$$

$$\delta \geq \frac{c(q) - c(\underline{q})}{R(q) - c(\underline{q}) - \overline{v} - \overline{u}} \tag{3.11}$$

Allowing Equation (3.11) to be equal to δ_C, then the seller will honor the contract for all $\delta \geq \delta_C$. Any δ below δ_C does not support cooperation as an equilibrium.

3.2.3 Treatment Effects and Hypotheses

Half of the buyers and sellers belong in group A, while the other in group B. Buyers and sellers can trade within their own group, the "local" group, or with the other group, the "foreign" group. In the control treatment there is no communication between traders. Buyers face an outside profit multiplier of 14 and an inside multiplier of 11.[6] This difference is not insignificant for buyers. For any particular quality, the revenue function increases by 27% when trading outside of the group. All terms being equal, a profit maximizing buyer will value trade with a foreign seller over a local seller because:

$$V_{out} \quad = \quad 14 * q - p - b \quad > \quad V_{in} = \quad 11 * q - p - b \tag{3.12}$$

Also consider the effect that the higher profit function has on the discount factor δ when all other terms are equal:

$$\delta_{out} \quad = \quad \frac{c(q) - c(\underline{q})}{14 * q - c(\underline{q}) - \overline{v} - \overline{u}} \quad < \quad \delta_{in} \quad = \quad \frac{c(q) - c(\underline{q})}{11 * q - c(\underline{q}) - \overline{v} - \overline{u}} \tag{3.13}$$

Lower discount factors are necessary in order to sustain cooperation between a buyer and a seller of differing groups.

Hypothesis 3.1 *Group distinction does not create an incentive to trade locally. Traders prefer to trade with the foreign market.*

If buyers and sellers feel a shorter social distance to each other through group membership then they will receive non-monetary utility from trading locally. The market will be characterized by home bias, in which buyers create offers for local sellers despite the contradicting monetary incentives.

I am interested in observing the effect of policies aimed at increasing the attractiveness of local trade. There are two types of mechanisms that I will explore: the

[6] A local multiplier of 11 was chosen because in a prior pilot it was shown to be high enough to induce trade. A baseline of 14 was chosen as the foreign multiplier to create a substantial gap between the attractiveness of the two markets.

introduction of communication (verified and unverified) and a re-scaling of the outside multiplier. Treatments will be discussed in detail in Section 3.3.

Both verified and unverified communication occur locally - it allows traders to share their trading experiences with others within their own group. When discussing local trade, traders may provide all transaction information, including their partner's unique identifier. However, if trade occurred with a foreign trader, only contract terms (quality, fixed price, bonus) and whether their partner fulfilled their promise (paid bonus or delivered quality) may be shared. The unique trader identifier of a foreign partner cannot be shared. The communication mechanism will be explained in more detail in Section 3.3.

Consider a buyer that has a prior belief about the types of sellers in the market. She believes that there is a percentage of sellers who will be "fair" (i.e. they will deliver the promised quality, given that the buyer has not deviated in the past). Because buyers are able to share all past transaction information on local trade, a deviation by a seller is likely to lead that seller to either receive worse offers or to face unemployment in future periods. Referring back to Equation 3.13, communication reduces the reservation payoffs $\overline{v}$ and $\overline{u}$ by destroying the outside option. The threat of unemployment and lower future payoffs lower the threshold for discount factors δ_{in} necessary to sustain cooperation.

When trade occurs with a foreign seller, buyers cannot observe the seller's previous trade history. If the seller defects, the buyer may share the information that a foreign seller has defected and it will become public knowledge that a foreign seller has defected. However, the identity of the defector is veiled. Healy [2007] proposes that when buyers have limited information on seller types, they perceive a correlation between seller types. In other words, buyers stereotype sellers and a single defection by a seller will lead buyers to believe that other sellers are also likely to defect. The experiments by McEvily et al. [2006] show that even if group membership is known to be assigned arbitrarily, a subject belonging to a group whose members have been

known to be untrustworthy will also be viewed as untrustworthy. In the foreign market, communication also reduces the reservation payoffs $\overline{v}$ and $\overline{u}$, however, the exact effect on group members' payoffs, and thus the effect on the threshold for δ_{out} due to a single deviation will depend on the degree of perceived correlation.

Hypothesis 3.2 *The addition of communication will increase quality and acceptance rates in both the local and foreign markets.*

Communication lowers both δ_{in} and δ_{out}, but at differing rates because reporting is specific in the local market but general in the foreign market, leading δ_{in} to have a larger drop.

Hypothesis 3.3 *The addition of communication will result in a greater percentage increase in quality in the local market relative to the foreign market, and a greater reduction in rejection rates in the local market relative to the foreign market.*

The other major mechanism I consider is rescaling of the foreign revenue multiplier. Referencing back to Equation 3.13, a decrease in the foreign revenue multiplier from 14 to 12 causes δ_{out} to rise. An increase in the threshold necessary to sustain cooperation will cause a larger amount of foreign trade to unravel causing a decrease in quality and contract acceptance in the foreign market.

Hypothesis 3.4 *Ceteris paribus, a drop in the foreign revenue multiplier will cause foreign quality to fall and foreign contract acceptance to fall.*

3.3 Experimental Procedures

Experiments were conducted in the Vernon Smith Experimental Economics Laboratory (VSEEL) at Purdue University between November of 2013 and February 2014. Students sign up through the ORSEE (Online Recruitment System for Economic Experiments) database. The experiments were implemented using z-tree [Fischbacher,

2007]. At the beginning of the experiment, the experiment read the instructions aloud while the subjects followed on their own copy, then subjects were tested on the instructions and were encouraged to ask questions both regarding the test and the instructions or experiment itself. After the short test, subjects played two trial periods so that they could get accustomed to the computer program, and learn their role (buyer or seller) in the experiment. Identification numbers and group identification was shuffled once the actual experiment begun. Once all subjects finished the trial period, the actual experiment begun. The experiment lasted an average of 2.5 hours, and students made about $10 an hour.

3.3.1 Experimental Design

The experimental design allows subjects to endogenously choose the contractual form, while subjecting them to exogenous policies. The design allows us to analyze the effect of different policies that target an increase in the amount of local trade and an improvement in local qualities traded. The experiment involves contracting of an abstract good between human subjects that are randomly assigned to be either buyers and sellers and given membership to be in different groups (A or B). The ratio of buyers to sellers and group A to group B was set to a one-to-one ratio. The groups are each compromised of three sellers and three buyers. Group distinctions are introduced to create a sense of social closeness between buyers and sellers belonging to the same group.

Every treatment and session follows the same sequence of events. Every period begins with a proposal phase, followed by a quality determination phase, a payment determination phase, and a message phase. Buyers and sellers see a "waiting screen" while it is not their turn to act. The waiting screen summarizes all the information and actions from their previous action.

1. Proposal Phase: During the proposal phase, the buyer can make a proposal on the terms of trade to the seller. A proposal allows both parties to commit to terms of trade by including a list of promises and obligations for both parties. The buyer submits a single proposal to a specific seller. The buyer must choose a desired quality (q) between 1 and 15, a binding price (P) between 0 to 200 to be automatically delivered by the and a discretionary bonus payment (B) between 0 to 200. All prices and qualities are specified in discrete numbers. Once all proposals have been submitted, sellers review their offers and can accept up to one offer. No buyer is obliged to submit offers, and no seller is obliged to accept an offer.

2. Quality Determination Phase: If the seller accepts a proposal, she must now choose the actual quality to provide. A seller can choose any quality (Q) she wants to from 1 to 15, regardless of the quality specified in the proposal (q).

3. Payment Determination Phase: Following the quality determination phase, all buyers whose offers were accepted and offered a bonus will determine the level of actual bonus (B) to pay the seller. The actual bonus (B) can differ from the bonus specified in the proposal (b).

4. Payoff Screen: After trade has concluded, all buyers and sellers view all information regarding their transaction. All subjects are asked to write down all the information in a sheet provided to them.

5. Message Phase (if applicable): All buyers and sellers enter the message phase after reviewing their payoffs. All subjects are asked to write down the messages in a sheet provided to them.

Treatments differ along two dimensions: communication (none, cheap or truthful) and outside multiplier (12 or 14). Table 3.1 summarizes the design differences between the 5 treatments. Treatments with truthful communication did not allow traders to share false information, while under cheap communication dishonest messages could

be sent. Table 3.1 lists the treatments and aids in understanding how the treatments will be used to draw conclusions, because only treatments differing along a single dimension can be compared, or the results may have confounding effects. Table 3.2 shows the total number of subjects, average periods and maximum period for each treatment in the experiment. On average, two supergames were played in each session for all treatments, with the exception of treatment C.12, for which had an average of 1 supergame per session. The average and maximum number of periods in Table 3.2 is the average period for the overall session.

Table 3.1.
Treatments

Foreign multiplier	no communication (N)	cheap communication (C)	truthful communication (T)
14	N.14	C.14	T.14
12	N.12	C.12	T.12

Table 3.2.
Treatments: Subjects and Periods

treatment	total subjects	average periods	max period
N.14	72	12	18
N.12	36	14	25
C.14	48	12	15
C.12	36	14	16
T.14	60	15	17
T.12	48	11	15

The cost function for sellers follows the function $C(Q) = \frac{Q^2}{2}$, and rounded to nearest whole number:

In accordance to the theoretical model and the parametrization, buyers receive the following payoff per period:

Table 3.3.
Production Costs

Quality	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Cost	1	2	5	8	13	18	25	32	41	50	61	72	85	98	113

$$V = \begin{cases} 11Q - P - B & \text{if trade occurs within own group} \\ 14Q - P - B & \text{if trade occurs outside group, treatments } N.14,\ C.14 \text{ and } T.14 \\ 12Q - P - B & \text{if trade occurs outside group, treatments } N.12,\ C.12 \text{ and } T.12 \\ 10 & \text{if trade does not occur} \end{cases}$$

and sellers receive:

$$U = \begin{cases} P + B - c(Q) & \text{if trade occurs} \\ 10 & \text{if trade does not occur} \end{cases}$$

To implement an infinitely repeated game, we follow the convention of using probabilistic continuation after each round by allowing the game to terminate with a probability of $1 - \delta$ [Camera et al., 2013, Dal Bó and Fréchette, 2007, Cabral et al., 2011]. Dal Bó [2005] finds that cooperation is more abundant in games of indefinite duration in comparison to finitely repeated games of the same expected termination.[7] All of our treatments, include a probability of continuation after each period of 80%.[8]

3.3.2 Communication Mechanism

Traders can send structured messages about their trading experience to others within their group. Each trader is able to send a total of 4 messages per period,

[7] If an agent is risk neutral then a constant continuation probability is theoretically equal to a constant time discount rate and an infinite horizon.

[8] A computer generated roulette was coded to pop up at the beginning of each period and display a number between 1 and 10. If the roulette landed on a number between 1 and 8, then the game would continue, otherwise: if they game had already played out for 10 periods, the game would end; or, if a 9 or a 10 had already come up twice before, the game would end; otherwise, the game would continue. Therefore, a maximum of three supergames (or stages) could be played in each session.

one to each of the 4 available communication channels. We restrict one message per channel per period because all information can be included in one message and to conserve time. The first channel, *public*, can be viewed by all traders within the sender's group. The *buyers* and *sellers* channels make messages viewable only to buyers or sellers in the sender's group, respectively. The last channel, *specific*, is completely private; a trader must specify the ID of a trader within their group to receive the message, and only that trader will have access to it. Once all traders are finished choosing the messages, the messages are delivered to a message log. A list of all messages can be seen in the Appendix (Section B.1).[9]

The messages can be divided into five encompassing categories: market information (e.g. sharing price or effort desired), partner search (e.g. a seller informing buyers that she did not receive any offers), punishments (e.g. a buyer reporting that her seller did not deliver the desired quality), rewards (e.g. a buyer reporting that her seller did deliver the desired quality), and self-reporting (a seller reporting that she delivered the desired quality).

In treatments with truthful communication, buyers and sellers can only share information that is true. For example, if a local seller has delivered the promised quality, then a buyer can either abstain from sharing a message regarding quality or can share that the local seller ID number has delivered the promised quality. She may not share a message stating that the seller has not delivered the promised quality. In practice, under truthful communication, a message is simply not included in the message list when it was not truthful.

In treatments with cheap information, buyers and sellers do not have to share truthful information. In the example above, the buyer can share that the local seller did not deliver the desired quality.

[9]Pre-selected messages provide subjects with a common language and restrict the possibility of identification. For those reasons we choose pre-selected messages over free-chat.

One further note concerns distinctions between reporting on local and foreign traders. For example, when reporting a foreign seller, a buyer may only say "A seller from the other group did not deliver the appropriate quality" but the specific ID number cannot be shared, while if a buyer reports a local seller the negative message can be tied to their personal identification.

3.4 Results

3.4.1 Contract Choice

Tables 3.4 and 3.5 present the summary statistics for all contracts created and all contracts accepted, respectively. A large percentage of buyers choose to create contracts. That is to say, there is a small amount of buyer exit from the market.

Buyers create the majority of offers to foreign sellers, while also requesting slightly higher qualities and offering better ex-ante contract terms. Yet, the number of offers made to local sellers is non-zero, suggesting some consideration to group identity unlike Hypothesis 3.1 suggests.

Result 3.1 *Across all treatments, the majority of offers are created for the more lucrative foreign market, however, there is a non-zero amount of local offers in the control treatment.*

Hypothesis 3.2 and 3.3 predict that communication will have a positive effect on the number of offers accepted in both markets, but at a larger rate in the local market. Yet, cheap communication (C.14) does not have a statistical impact on the number of local offers (Wilcoxon rank-sum test, p=0.5331), nor on the number of local offers accepted (p=0.7864). Change to the local market comes from the introduction of truthful communication, which causes an increase in the amount of local offers created when compared to N.14 (p=0.0002), as well as increasing local

offers in C.14 (p=0.0029). However, truthful communication does not have an effect on the number of locally accepted offers (p=0.3010 when compared to N.14 and p=0.2471 when compared to C.14). Neither type of communication has an effect on the number of foreign offers accepted in the foreign market (although it must be noted that the number of offers accepted in the foreign market was already high in the control treatment).

Result 3.2 *Communication (cheap and truthful) does not lead to an increase in the number of local and foreign offers accepted. Truthful communication increases the number of local offers created.*

The other major mechanism involves rescaling the foreign multiplier. A reduction in the attractiveness of the foreign market has a large impact on local offering behav-

Table 3.4.
Contract Terms for all Offers

	$N.14$	$N.12$	$C.14$	$C.12$	$T.14$	$T.12$
max offers (#)	402	342	276	246	42	294
actual offers (#)	396	312	262	225	41	286
foreign	310	197	202	141	284	185
local	86	115	60	84	134	101
actual offers (%)	98.41	91.23	94.93	91.46	98.12	97.28
local offers (%)	21.72	36.86	22.90	37.33	32.06	35.31
price	41.07	32.81	61.08	55.28	63.03	40.26
	(29.983)	(29.072)	(33.292)	(33.065)	(45.839)	(22.255)
foreign	43.97	31.919	63.8	61.23	71.72	41.72
	(30.889)	(30.783)	(34.058)	(31.533)	(46.967)	(21.686)
local	30.60	34.339	51.83	45.29	44.61	37.57
	(23.821)	(25.939)	(23.821)	(33.349)	(37.301)	(23.130)
desired quality	9.42	9.09	10.24	9.91	11.07	9.65
	(3.557)	(3.253)	(2.944)	(3.105)	(3.215)	(2.519)
foreign	9.61	9.04	10.26	9.89	11.62	9.54
	(3.460)	(3.291)	(3.062)	(2.830)	(3.095)	(2.319)
local	8.73	9.18	10.2	9.94	9.896	9.861
	(3.827)	(3.197)	(2.529)	(3.538)	(3.158)	(2.849)
bonus amount	48.91	39.34	37.35	33.50	48.72	39.20
	(58.713)	(39.449)	(41.730)	(43.488)	(42.306)	(31.271)
foreign	47.58	38.02	31.495	24.574	47.29	36.319
	(56.895)	(38.439)	(38.929)	(37.291)	(44.222)	(29.939)
local	51.43	41.6	38.383	40.107	39.73	39.049
	(65.114)	(41.195)	(50.034)	(51.043)	(33.656)	(37.567)

Note: standard deviations in parentheses

Table 3.5.
Contract Terms for Accepted Offers

	N.14	*N*.12	*C*.14	*C*.12	*T*.14	*T*.12
offers accepted (#)	255	181	183	144	273	204
foreign	212	118	149	94	208	137
local	43	63	34	50	65	67
offers accepted (%)	64.39	58.01	69.85	64.00	65.31	71.33
foreign	68.39	59.9	73.76	66.67	73.24	74.05
local	50	54.78	56.67	59.52	48.51	66.34
local offers (%)	16.86	34.81	18.58	34.72	23.81	32.84
price	49.27	41.25	67.72	61.95	73.70	42.07
	(30.983)	(41.254)	(33.940)	(61.951)	(44.727)	(21.460)
foreign	50.77	39.017	70.13	68.03	80.01	43.77
	(31.511)	(34.271)	(34.527)	(28.361)	(44.366)	(20.713)
local	41.86	45.44	57.18	50.52	53.48	38.61
	(27.372)	(45.444)	(29.429)	(34.823)	(39.887)	(38.612)
desired quality	9.47	9.35	10.27	9.83	11.54	9.55
	(3.277)	(3.051)	(2.905)	(2.938)	(3.002)	(2.150)
foreign	9.5	9.46	10.28	9.79	12.07	9.59
	(3.212)	(3.112)	(3.013)	(2.757)	(2.718)	(2.205)
local	9.28	9.16	10.27	9.8	9.83	9.48
	(3.614)	(2.947)	(2.416)	(3.280)	(3.248)	(2.048)
bonus amount	45.15	37.50	32.98	25.99	46.53	37.19
	(52.954)	(36.085)	(37.094)	(23.639)	(40.538)	(26.125)
foreign	42.72	39.29	31.97	19.99	51.23	37.79
	(49.364)	(38.035)	(34.618)	(22.285)	(45.072)	(35.591)
local	57.16	34.14	32.88	34.90	32.58	34.89
	(67.366)	(32.136)	(46.772)	(44.323)	(28.271)	(26.233)
relationship length	3.56	3.39	4.89	4.7	6.91	6.87
	(2.485)	(3.807)	(3.915)	(3.328)	(4.627)	(5.423)
foreign	4.02	4.05	5.49	4.61	7.64	6.82
	(2.482)	(4.401)	(4.039)	(3.559)	(4.693)	(5.458)
local	1.33	2.16	2.24	3	4.57	6.97
	(0.474)	(1.779)	(1.558)	(1.927)	(3.527)	(5.391)

Note: standard deviations in parentheses

ior: local offers increase from 22% to 37% (p=0.0001), though it does not affect local acceptance (p=0.9631).

A policy maker can choose to utilize both types of mechanisms (communication and subsidies). What happens when the two types of policies (communication and rescaling of the foreign multiplier) are combined? Adding either type of communication has no added value. In other words, once the multiplier has been reduced from 12 to 14, introducing cheap (C.12) or truthful (T.12) communication does not increase local offering behavior (p=0.7726 and p=0.9821, respectively) nor does it increase local acceptance rates (p=0.3077 and p=0.1188, respectively). Furthermore,

introducing the subsidy (i.e. reducing the multiplier from 14 to 12) to $C.14$ causes local offers to increase, and when introduced to $T.14$, it causes local trade to increase (p=0.0009 and p=0.0011, respectively). In this analysis, I find that policies that aim at reducing the gap in attractiveness between the foreign and local market accomplish the highest levels of local trade.

Result 3.3 *The introduction of communication (cheap or truthful) to an economy which subsidizes local trade does not achieve additional local benefits. However, introducing a subsidy policy to an economy with a communication mechanism in place has positive local trade results.*

I further explore the evidence on offering and acceptance behavior by group with a probit model that takes into account the possibility of time trends (period, period squared and stage). Results are shown in Tables 3.6 and 3.7. First, I look at preferences in the creation of offers for foreign versus local sellers. I use the dependent variable *same* that takes the value of 1 if the seller is local and a value of 0 if the seller is foreign. These results can be found in Table 3.6. Then, I look at the probability that a local offer will be accepted. I use the variable *accept* that takes the value of 1 if the offer was accepted and 0 if the offer was rejected. These results can be found in Table 3.7 on columns (1) - (4). Similarly, I look at the probability that a foreign offer will be accepted, on columns (5) - (8). Recall that treatment comparisons cannot be made for all combinations, therefore the regression is estimated with different bases.

Regressions (1) and (5) estimate the effect of introducing or improving communication; (2) and (6) the effect of making the local market relatively more attractive and via the Wald tests, the additional effect of communication; (3), (4), (7) and (8) show the effect of lowering the multiplier on top of a communication policy. As presented in Table 3.7, results remain fairly similar once time controls are taken into account; in several instances, the introduction of a subsidy increases the probability that a local offer will be created and the probability that a local offer will be accepted.

Table 3.6.
Effect of Group Membership on Probability of Contract Creation

	(1)	(2)	(3)	(4)
Base:	N.14	N.12	C.14	T.14
C.14	0.012			
	(0.068)			
T.14	0.102*			
	(0.057)			
N.12	0.152*			
	(0.078)			
C.12		0.04	0.107**	
		(0.059)	(0.043)	
T.12		-0.007		0.045
period	0.012	-0.003	0.0075	0.019
	(0.018)	(0.019)	(0.027)	(0.025)
period sq	-0.001	0.001	0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
stage	0.001	0.032	-0.05*	0.012
	(0.032)	(0.034)	(0.027)	(0.049)
Obs.	1,388	823	487	704
Wald tests for equality of treatments				
C.14,T.14	0.1114	-	-	-
C.12,T.12	-	0.3989	-	-

Notes: Probit marginal effects with robust standard errors adjusted for clustering on sessions.
*,**,***: significantly different from zero at 10%, 5% and 1%, respectively.

3.4.2 Post-contractual efficiency: quality in the market

Table 3.8 summarizes the means of the realized outcomes for offers that were accepted by sellers for the market as a whole, and also includes the breakdown for foreign and local trades.

Figures 3.1 and 3.2 depict the averages of local and foreign quality, respectively[10]. Via observational inference, it appears that the addition of most types of policies have a significant effect on overall quality in the market, especially pronounced with a policy that simply introduces truthful communication. This is especially true for the foreign market, which reaches an average quality of 10 in treatment T.14. It

[10]Figures will be presented with a 5-period moving average smoother, as is common in the experimental economics literature. The raw figures are presented in the Appendix, and can be found in section B.2

Table 3.7.
Effect of Group Membership on Probability of Contract Acceptance

	prob. that local offer is accepted				prob. that foreign offer is accepted			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Base:	N.14	N.12	C.14	T.14	N.14	N.12	C.14	T.14
C.14	0.066				0.055**			
	(0.085)				(0.025)			
T.14	-0.011				0.045			
	(0.085)				(0.034)			
N.12	0.052				-0.084**			
	(0.076)				(0.039)			
C.12		0.139**	0.12			0.046	-0.15	
		(0.059)	(0.086)			(0.102)	(0.094)	
T.12		0.125**		0.206***		0.145**		0.028
period	0.019	-0.019	-0.017	0.044	-0.011	0.015	0.045***	0.005
	(0.033)	(0.015)	(0.031)	(0.053)	(0.014)	(0.019)	(0.016)	(0.025)
periodsq	-0.001	0.001	0.001	-0.002	0.001	0	-0.002**	0.000
	(0.002)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)
stage	0	0.078**	0.138	-0.096	-0.006	-0.013	-0.085***	-0.001
	(0.054)	(0.039)	(0.088)	(0.062)	(0.019)	(0.028)	(0.019)	(0.048)
Obs.	395	300	144	235	993	523	343	469
Wald tests for equality of treatments								
C.14,T.14	0.1252	-	-	-	0.7847	-	-	-
C.12,T.12	-	0.8404	-	-	-	0.3773	-	-

Notes: Probit marginal effects with robust standard errors adjusted for clustering on sessions.
*,**,***: significantly different from zero at 10%, 5% and 1%, respectively.

Table 3.8.
Statistics of Realized Outcomes

	$N.14$	$N.12$	$C.14$	$C.12$	$T.14$	$T.12$
quality	5.98	4.99	7.809	7.847	9.571	7.824
foreign	6.18	4.91	7.987	8.298	10.337	7.701
local	5	5.17	7.029	7	7.123	8.075
price	49.27	41.25	61.084	55.276	63.029	40.259
foreign	50.77	39.02	63.832	61.227	71.718	41.724
local	51.833	45.44	41.86	45.286	44.612	37.574
bonus	8.76	6.37	12.29	9.681	22.557	23.583
foreign	10.07	7.39	12.946	8.415	26.288	23.285
local	9.412	4.44	2.3	12.06	10.615	24.194

Note: standard deviations in parentheses

seems that local quality has its most significant increase under a combined policy of truthful communication and a lower foreign multiplier. Average per period qualities traded for foreign and local markets are plotted in Figure 3.2.

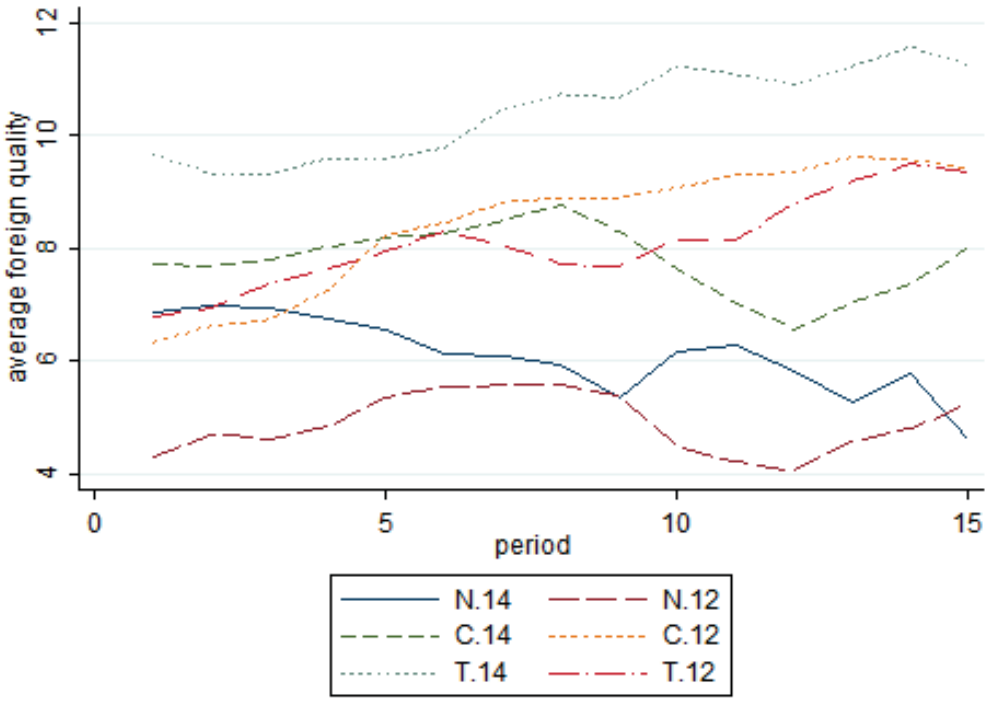

Figure 3.1. Average per Period Quality in the Foreign Market, 5-Period Moving Average

There is an increasing trend in quality over time in both markets in treatments that contain truthful communication. Treatments characterized by no communication or cheap communication have downward trend on local quality, and either a downward or no trend in the foreign market.

To analyze the effect of the differing policies on efficiency in the market, I use a tobit model with standard errors adjusted for clustering on sessions to analyze quality and shirking. Shirking is the difference between promised quality (q) and delivered quality (Q). A positive $q-Q$ indicates that the seller has shirked and delivered a lower quality than promised, while a negative $q-Q$ indicates that the seller has delivered a quality higher than requested. Results are shown in Tables 3.9, 3.10, 3.11 and 3.12. Columns (1) and (2) show the average treatment effect on quality and shirking; (3) and (4) include treatment and group interactions as well as time variables, allowing

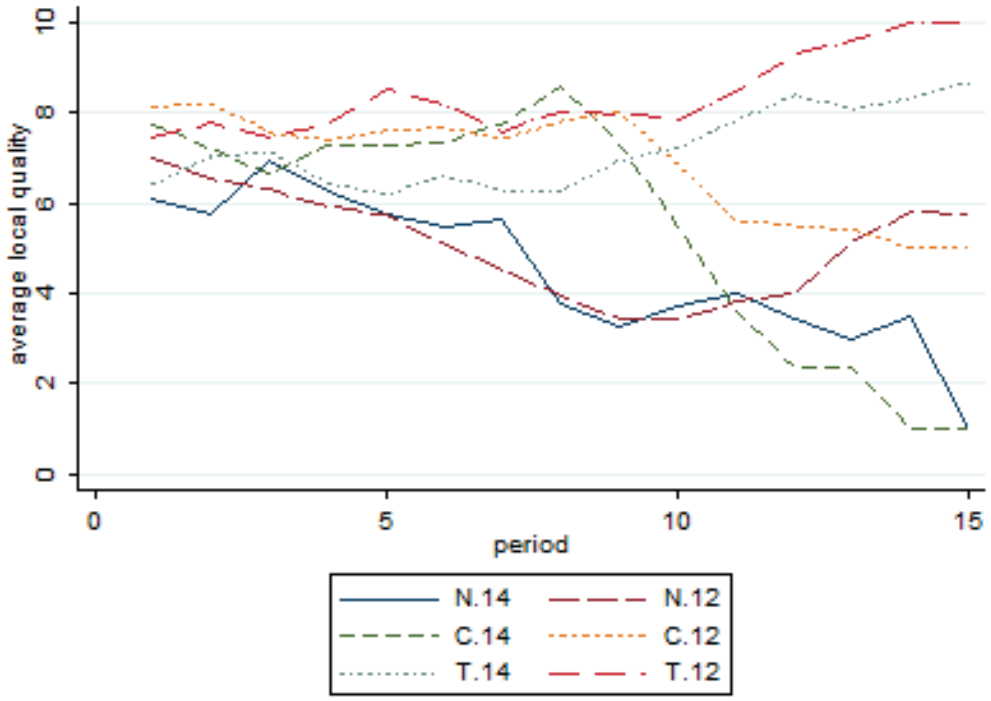

Figure 3.2. Average per Period Quality in the Local Market, 5-Period Moving Average

for membership to affect quality differently; and (5) and (6) includes contract terms and other relevant regressors.

From Table 3.9 columns (1) and (2), I find that cheap and truthful communication increase quality and decrease shirking. From the Wald test, I cannot reject the equality of these two effects. Columns (3) and (4) are perhaps more interesting due to the differences between local and foreign markets (e.g. trading in the foreign market is more lucrative, group identity, etc.). Recall that Hypotheses 3.2 and 3.3 predicted that the addition of communication would lead to an increase in quality in both the local and foreign market, though at a higher rate in the local market. These results contradict the hypotheses and show that most of the benefit services the foreign market: cheap communication increases quality by almost 2 points in the foreign market, while truthful communication increases it by almost 5 points. Both decrease

the amount of shirking from foreign sellers. The negative coefficient of *same* signifies that quality in the control treatment ($N.14$) is lower by about a point and a half. From the interaction terms it can be concluded that while cheap communication does not have an added effect on local quality, truthful communication increases quality at a lower rate in the local market than in the foreign market. Column (5), which includes all exogenous regressors, shows that holding all exogenous variables constant, truthful communication leads to an increase in quality. In this sense, it is "cheaper" to obtain higher qualities under truthful communication.

Result 3.4 *Cheap communication results in higher qualities and lower shirking in the foreign market, but has no additional impact on local quality and shirking. Truthful communication is most successful in increasing foreign quality, while also decreasing the level of shirking, but causes lower levels of quality increases in the local market.*

The other major mechanism is the rescaling of the foreign market was predicted in Hypothesis 3.4 to have a negative impact on foreign quality. The average effect of decreasing the foreign multiplier from 14 to 12 is a quality decrease of a point, and an increase in shirking by a point. However, once the effect is separated into the foreign and local market, I find that lowering the multiplier decreases foreign quality and increases foreign shirking while slightly increasing local quality and decreasing local shirking.

Result 3.5 *A decrease in the foreign multiplier causes foreign quality to decrease and foreign shirking to increase. Meanwhile, the lower multiplier also causes a slight increase in local quality and a decrease in local shirking.*

Next, I will examine the effect of combining communication policies with a reduction in the foreign multiplier. Table 3.10 documents the additional effect of communication on a policy that has rescaled the foreign multiplier. The introduction of either type of communication increases quality and decreases shirking in the foreign market. Recall that a policy which reduces the foreign multiplier led to an increase

Table 3.9.
Quality and Shirking, Base $N.14$

	(1) quality	(2) shirking	(3) quality	(4) shirking	(5) quality	(6) shirking
C.14	2.052**	-1.059***	1.899**	-1.019**	0.565	-0.408
	(0.844)	(0.398)	(0.849)	(0.484)	(0.538)	(0.408)
T.14	4.073***	-1.546***	4.627***	-1.583***	1.809**	-1.238**
	(1.286)	(0.484)	(1.305)	(0.521)	(0.761)	(0.547)
N.12	-1.111*	0.844*	-1.752**	1.364**	-0.737	1.341**
	(0.674)	(0.510)	(0.701)	(0.551)	(0.552)	(0.633)
same			-1.406***	0.996	-0.232	0.0207
			(0.492)	(0.733)	(0.623)	(0.541)
C.14#same			0.395	-0.124	0.854	0.0366
			(0.593)	(0.842)	(0.737)	(0.739)
T.14#same			-2.224*	-0.077	-0.317	0.507
			(1.346)	(0.911)	(0.785)	(0.766)
N.12#1.same			1.654**	-1.602*	0.797	-0.851
			(0.740)	(0.859)	(0.697)	(0.763)
stage			0.558	-0.196	0.494**	-0.345**
			(0.496)	(0.168)	(0.235)	(0.151)
period			-0.339*	0.364**	-0.537***	0.448***
			(0.192)	(0.157)	(0.122)	(0.123)
period sq			0.0153	-0.0194**	0.0116	-0.0109
			(0.010)	(0.008)	(0.008)	(0.008)
price					0.0439***	0.00866*
					(0.011)	(0.005)
desired bonus					0.013	0.0271***
					(0.009)	(0.003)
desired quality					0.228*	
					(0.126)	
relationship					0.674***	-0.505***
					(0.128)	(0.104)
otherconts					0.334*	-0.377**
					(0.190)	(0.184)
constant	5.445***	3.529***	6.140***	2.401***	1.311	1.383*
	(0.626)	(0.290)	(0.831)	(0.642)	(0.828)	(0.758)
observations	892	892	892	892	892	892
Wald tests for equality of treatments						
$C.14$ and $T.14$	0.1096	0.3053	0.0369	0.3271	0.0529	0.0502

Notes: Tobit with robust standard errors adjusted for clustering on sessions. *,**,***: significantly different from zero at 10%, 5% and 1%, respectively.

in local quality. The addition of truthful communication does not have an additional impact on quality, however, cheap communication causes local quality to decrease.

Result 3.6 *Adding communication to a policy that reduces the foreign multiplier causes foreign quality to increase. The addition of cheap communication also leads to a decrease in local quality.*

Table 3.10.
Quality and Shirking, Base $N.12$

	(1) quality	(2) shirking	(3) quality	(4) shirking	(5) quality	(6) shirking
C.12	3.246***	-2.366***	4.709***	-4.230***	2.965***	-3.325***
	-0.732	-0.517	-0.898	-0.556	-0.746	-0.759
T.12	3.137***	-2.632***	3.180***	-2.804***	2.086***	-2.049***
	(0.874)	-0.816	-0.573	-0.778	-0.647	-0.747
same			0.181	(0.536)	0.402	(0.761)
			-0.583	-0.404	-0.345	-0.589
C.12#same			-1.656*	2.111	(0.892)	1.660
			(0.903)	-1.294	(0.800)	-1.042
T.12#same			0.211	0.054	0.364	0.334
			-0.76	-0.521	-0.389	-0.585
stage			0.766*	-0.876**	0.368	(0.507)
			-0.453	-0.383	-0.323	-0.343
period			(0.126)	0.498***	(0.238)	0.326*
			-0.193	-0.18	-0.157	-0.179
period sq			0.007	-0.0257***	0.003	(0.009)
			-0.0105	-0.00781	-0.00941	-0.00955
price					0.0395***	0.0211***
					-0.0132	-0.00659
desired bonus					0.017	0.0292***
					-0.013	-0.00731
desired quality					0.146	
					(0.153)	
relationship					0.439***	-0.363***
					(0.0938)	-0.0675
other offers					0.261	(0.322)
					(0.218)	-0.198
constant	4.507***	4.372***	3.225***	4.687***	0.643	2.951**
	-0.262	-0.426	(0.716)	-0.752	(1.099)	-1.193
observations	529	529	529	529	529	529
Wald tests for equality of treatments						
$C.12$ and $T.12$	0.9218	0.7248	0.2048	0.1273	0.2648	0.0657

Notes: Tobit with robust standard errors adjusted for clustering on sessions. *,**,***: significantly different from zero at 10%, 5% and 1%, respectively.

Tables 3.11 and 3.12 present the effect of adding the rescaling policy to a market that has a communication mechanism in place. From Table 3.11, I find that a reduction in foreign multiplier in a market with cheap communication does not have any additional effects on foreign or local trade.

Table 3.12 tells a different story, mainly that a lower outside multiplier may lead traders under truthful communication to trade more efficiently locally. Despite the fact that it is more profitable to trade with a foreign partner, introducing a lower

Table 3.11.
Quality and Shirking, Base $C.14$

	(1) quality	(2) shirking	(3) quality	(4) shirking	(5) quality	(6) shirking
C.12	0.198	-0.463	0.108	-0.649	0.913*	-0.473
	(0.937)	(0.420)	(0.998)	(0.486)	(0.489)	(0.405)
same			-1.159***	0.967***	0.0576	0.425
			(0.201)	(0.352)	(0.247)	(0.336)
C.12#same			-0.162	0.440	-0.598	0.298
			(0.810)	(1.247)	(0.894)	(0.929)
stage			-0.441*	0.208	-0.219	0.0982
			(0.244)	(0.309)	(0.207)	(0.239)
period			0.540**	-0.0909	0.0912	-0.0387
			(0.229)	(0.165)	(0.218)	(0.199)
period sq			-0.0354**	0.00845	-0.0211*	0.0147
			(0.016)	(0.007)	(0.012)	(0.010)
price					0.0340**	0.0220***
					(0.015)	(0.007)
desired bonus					0.0194	0.0299***
					(0.015)	(0.006)
desired quality					0.324*	
					(0.176)	
relationship					0.479***	-0.426***
					(0.099)	(0.079)
other offers					0.0653	-0.282
					(0.332)	(0.284)
constant	7.532***	2.470***	6.988***	2.051**	1.279	0.573
	(0.591)	(0.286)	(1.109)	(0.901)	(1.517)	(1.179)
observations	327	327	327	327	327	327

Notes: Tobit with robust standard errors adjusted for clustering on sessions. *,**,***: significantly different from zero at 10%, 5% and 1%, respectively.

foreign multiplier to the market under truthful communication causes foreign quality to decrease, while also causing local quality to increase and local shirking to decrease.

Result 3.7 *Reducing the foreign multiplier in addition to a policy with truthful communication causes the foreign quality to decrease, but local quality to increase and local shirking to decrease.*

3.4.3 Social Surplus and Income Inequality

In addition to pre- and post-contract efficiency, there are two important measures worth examining: social surplus and income inequality between buyers and sellers.

Table 3.12.
Quality and Shirking, Base $T.14$

	(1) quality	(2) shirking	(3) quality	(4) shirking	(5) quality	(6) shirking
T.12	-1.936	-0.241	-3.157**	0.287	-0.198	0.656
	(1.474)	(0.810)	(1.394)	(0.874)	(0.697)	(0.603)
same			-3.599***	0.914*	-0.0645	0.369
			(1.112)	(0.553)	(0.678)	(0.637)
T.12#same			3.951***	-1.380**	1.036*	-0.993*
			(1.221)	(0.625)	(0.614)	(0.587)
stage			1.686	-0.858*	0.358	-0.35
			(1.051)	(0.471)	(0.434)	(0.342)
period			-0.502	0.501*	-0.394**	0.330**
			(0.404)	(0.258)	(0.177)	(0.155)
period sq			0.0273	-0.0276**	0.00317	-0.00259
			(0.017)	(0.012)	(0.012)	(0.012)
price					0.0516***	0.00128
					(0.017)	(0.006)
desired bonus					0.0136	0.0246***
					(0.011)	(0.006)
desired quality					0.410**	
					(0.176)	
relationship					0.599***	-0.488***
					-0.153	-0.126
other offers					0.0947	-0.193
					-0.258	-0.203
constant	9.523***	1.979***	8.982***	1.640***	0.714	0.789
	-1.154	-0.401	-1.084	-0.548	(1.071)	-0.775
Observations	477	477	477	477	477	477

Notes: Tobit with robust standard errors adjusted for clustering on sessions. *,**,***: significantly different from zero at 10%, 5% and 1%, respectively.

The differences in these measures are akin to differences in a country's total social surplus and Gini coefficients. A policy may increase overall surplus, but further degenerate income conditions for a subsample of the population.

Recall that social surplus generated in a single transaction is $S(Q) = R(Q) - c(Q) - \overline{v} - \overline{u}$. Total surplus achieved can be calculated by multiplying a policy's average social surplus times the percentage of trade achieved.

Then, actual total surplus can be compared to the maximum surplus achievable (efficient social surplus per trade times the maximum percentage of trade possible) to observe how efficient each treatment is at subtracting the largest amount of surplus. The maximum possible social surplus can be generated by inputting the efficient

values for quality: marginal revenue is equal to marginal cost when quality is equal to 14 when trading outside outside of the group in treatments $N.14$, $C.14$ and $T.14$ or 12 in treatments $N.12$, $C.12$ and $T.12$, and when quality is equal to 11 in all treatments when trading in the local market. I will look at average total social surplus (global) as well as foreign specific, and local specific total social surplus. Table 3.13 presents relevant information on the welfare scores.

Table 3.13.
Social Surplus Measures

	N.14	N.12	C.14	C.12	T.14	T.12
offers accepted (%)	64.39	58.01	69.85	64.00	65.31	71.33
foreign	68.39	59.9	73.76	66.67	73.24	74.05
local	50	54.78	56.67	59.52	48.51	66.34
actual (average) social surplus	35.2	19.49	46.16	33.65	52.14	35.15
out group	39.21	20.69	51.41	38.38	60.83	36.65
in group	15.44	17.24	23.176	24.76	24.338	32.09
global total social surplus	2266.53	1130.61	3224.28	2153.60	3405.26	2507.25
efficiency	0.29	0.22	0.41	0.41	0.44	0.48
total foreign total social surplus	2681.57	1239.33	3792.00	2558.79	4455.19	2713.93
efficiency	0.34	0.24	0.49	0.49	0.57	0.52
total local total social surplus	772.00	944.41	1313.38	1473.72	1180.73	2128.85
efficiency	0.19	0.24	0.33	0.37	0.30	0.53

Treatments with higher foreign multipliers and communication ($C.14$ and $T.14$) lead to the highest level of global total social surplus. Wilcoxon rank-sum tests show that treatment $T.14$ does indeed lead to the highest level of social surplus, followed by treatment $C.14$, $T.12$, $N.14$, $C.12$ and finally $N.12$. Treatments that have a higher foreign multiplier tend to reach higher levels of social surplus simply by design – it is more efficient to trade higher qualities. Looking at efficiency of total social surplus shows that treatments with truthful communication reach a higher level of the total possible total social surplus, followed by cheap communication. Treatments with no communication reach less than 30% of the possible total social surplus.

With regards to local total social surplus, treatments with communication that rescale the foreign multiplier downward reach the highest levels of total social surplus,

as well as the highest levels of efficiency in reaching the maximum amount of local total social surplus.

Result 3.8 *Treatments with truthful communication are the most efficient in achieving the highest level of global total social surplus. However, treatments that combine a lower multiplier for the foreign market and communication are the most efficient increasing local total social surplus, which in turn decrease global total social surplus.*

I also calculate two different measures of income inequality. The first, henceforth called matched income inequality (MII) compares the average income disparities between sellers and buyers in each treatment. However, it is also relevant to look at overall dispersion of incomes, regardless of experimental role. I calculate a Gini index using subjects' final experimental income. The Gini coefficient varies between 0 (complete equality) and 1 (complete inequality). Table 3.14 presents relevant information on the income inequality scores.

Table 3.14.
Income Inequality Measures

	N.14	N.12	C.14	C.12	T.14	T.12
average buyer profit	23.16	10.51	25.39	20.1	32.66	25.57
	(44.553)	(33.613)	(25.439)	(36.525)	(36.525)	(25.439)
foreign	25.67	12.47	28.74	23.13	38.41	25.36
	(43.091)	(33.778)	(26.872)	(36.790)	(36.790)	(26.872)
local	10.84	6.86	10.74	14.42	14.26	26.02
	(48.454)	(32.883)	(22.407)	(28.994)	(28.994)	(22.407)
average seller profit	32.04	28.97	40.86	33.55	39.27	29.58
	(24.471)	(23.612)	(15.212)	(22.454)	(22.454)	(15.212)
foreign	33.54	28.22	43.35	35.26	42.14	31.29
	(22.647)	(23.354)	(14.814)	(22.395)	(22.395)	(14.814)
local	24.6	30.38	29.97	30.34	30.08	26.08
	(29.193)	(23.997)	(15.525)	(20.197)	(20.197)	(15.525)
matched income inequality	8.871	18.459	15.47	13.44	6.61	4.00
	(62.076)	(54.976)	(37.664)	(52.604)	(52.604)	(37.664)
foreign	7.88	15.75	14.61	12.13	3.74	5.93
	(59.217)	(55.173)	(38.474)	(54.219)	(54.219)	(38.474)
local	13.767	23.52	19.24	15.92	15.82	0.06
	(77.338)	(57.148)	(74.212)	(55.074)	(46.254)	(35.909)
Gini coefficient	0.248	0.248	0.238	0.225	0.212	0.223

Most policies increase the level of global matched income inequality. However, no significance was found through Wilcoxon rank-sum tests (p-values > 0.2757). In the

local market, treatment $T.12$ has a matched income inequality of almost zero, which is statistically significant from all relevant pairs ($p<0.0735$).

MII cannot tell the complete inequality story because it only considers contracts that have been accepted. If the buyer and seller do not trade, then both receive a reservation wage of 10, an an income inequality of 0. This would imply that no trade is a beneficial outcome. Also, even though small income inequalities are preferred, it is possible for a portion of partners to be cooperating on very inefficient qualities and receiving very low payoffs, which would be ignored under the MII.

Result 3.9 *No policy has a statistical impact on the level of global matched income inequality. The introduction of both truthful communication and lowering the outside multiplier leads to a local matched income inequality of almost zero.*

Finally, I look at the Gini coefficient. The Gini coefficients were calculated using the STATA command *ineqdeco* and standard errors were obtained via bootstrapping. Treatment $T.14$ has the lowest Gini coefficient, or lowest income inequality. However, the equality of Gini coefficients across treatments cannot be rejected.

Result 3.10 *No treatment has a significant effect on income dispersion.*

Recall that via the experimental design, all treatments have an imposed discount factor. Then why is it that some treatments display higher levels of cooperation on quality despite the fact that they all "clear" the discount factor threshold necessary to sustain cooperation? While it is a necessary condition for a cooperative action to be supported in equilibrium with experience, this condition is not sufficient for subjects to sustain cooperation. Bó and Fréchette [2011] shows that end session behavior is not fully explained by the equilibrium conditions being satisfied. For example, beliefs about other player's future actions, or the length of the previous supergame can affect the degree of cooperation in an experiment, even if the discount threshold has been cleared. The larger the belief that defecting is the optimal choice, the less likely the subject will cooperate, and vise versa. The longer the previous supergame, the

likelier the subject will be willing to cooperate. With regards to the first example, as previously stated, truthful communication has an effect on outside options because buyers and sellers are able to update their beliefs via updated information more quickly. As shown in Table 3.8, treatment $T.14$ does lead to the highest levels of average quality.

Some of my results are supported by analysing the necessary discount factor δ. I solve Equation 3.11 for each treatment using different outside options depending on whether communication was present or not. Under truthful communication, the reservation wage is truly the outside option because a defection will lead untrustworthy buyers and sellers to exit the market. However, this may not be quite so in treatments C and N. For treatment N, which does not have a communication mechanism, I use the average seller and buyer payoffs as the outside option. This is because after a transgression, buyers and sellers will not be immediately pushed out of the market and instead be able to conduct other trades. For treatment C, I take the average of the reservation wages and the average buyer and seller payoffs. The derived discount factors reveal that treatment T.14 has the lowest discount factor in the foreign market, followed by treatment T.12. This finding supports my results that truthful communication lead to better market outcomes. The ranking is then followed by N.12, C.12, C.14 and N.14. The analysis is not perfect because I use the buyer's and seller's profit as an outside option. Consider for example, treatment N.12. Without communication and with a lower foreign multiplier, cooperation decreased in the foreign market, as well as profits. The lower profits come into the discount factor formula as lower outside options, giving the impression that it is easier to cooperate. However, in truth, it represented a breakdown of cooperation in the foreign market. In the local market, the ranking of discount factors was (from most cooperative to least cooperative): T.12, T.14, C.14, N.14, C.12, N.12.

3.4.4 Messages

All of the message variables are listed and described in Table B.1. Statistics on messages can be seen in the Appendix (B.3). The messages are an important aspect of the communication mechanism as they allowed traders to search for partners, punish and reward. However, only the effects that the mechanisms themselves have on outcomes are tested, not the individual messages. I summarize how messages are used to provide an insight into how the mechanisms themselves function.

Subjects begin the experiment by sending large amounts of messages. The number of messages sent in each period slowly decreases as seen in Figure 3.3.

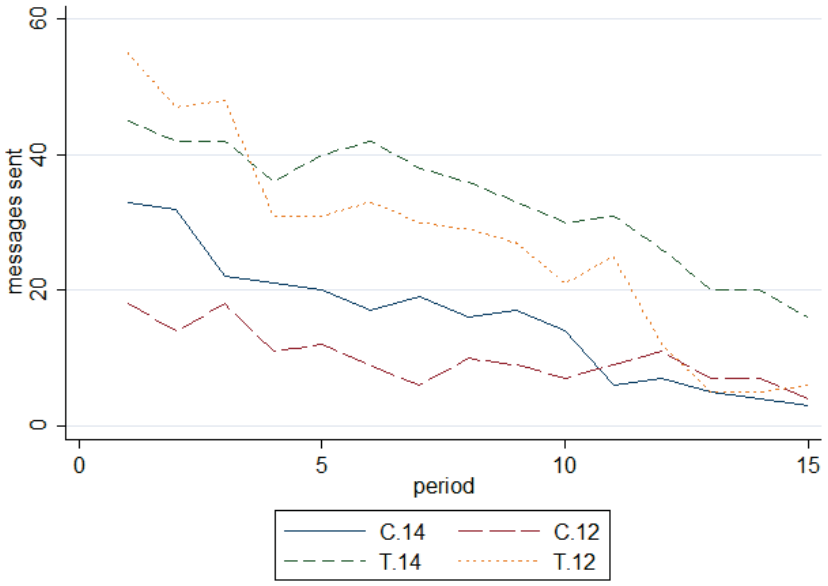

Figure 3.3. Messages Sent by Period

The messages can be described by five encompassing categories: (1) market information (2) partner search, (3) punishments, (4) rewards, (5) self-reporting. Some key observations and results can be derived from the types of messages sent.

Market information: Under cheap communication, buyers and sellers modestly shared market information. While there is evident dishonesty in the reporting of

information, it is not as pervasive as in Raszap Skorbiansky [2014], a similar market setting with only one group is present, where buyers and sellers misreported as high as 100%. When truthful communication is available, buyers and sellers choose to share more information, mostly through the *public* channel.

Search and Matching: Sellers largely use the *public* channel to communicate a lack of trade.

Sanctions: Sanctions in treatments $C.14$ and $C.12$ are surprisingly honest. For example, 80% of local sellers in treatment $C.14$ reported to not have delivered, had truthfully not delivered. Similarly, in 3.12, 100% of buyers reported in *pubic* had not paid the bonus. Dishonesty increases when discussing the foreign market; only 54.55% of foreign sellers (ID withheld) in treatment $C.14$ that were reported by their partners to not have delivered, truly had not delivered the desired quality.

Rewarding Messages: Results on rewards are similar to those of sanctions. Even under cheap communication, messages were fairly honest. For example, 90% of local sellers reported in the *public* channel in treatment $C.14$ to not have delivered the appropriate quality, had not delivered the quality.

Self-Reporting: Similarly to messages analyzed in Chapter 2, sellers mostly positively self-report, while buyers, utilized self-reporting to demonstrate that if quality is not delivered the bonus will be withheld.

3.5 Discussion

This study examines the economic impact of local sourcing. I analyze different policies that can be employed to increase local trade: the introduction of cheap talk, the introduction of truthful communication and a reduction in the attractiveness of the foreign market (i.e. a subsidy to the local market). I also observe the effect of combination policies that use both a communication mechanism and the subsidy to the local market.

Contrary to this paper's hypotheses, the introduction of communication does not have a significant effect on the number of offers accepted locally. In order to increase the number of offers accepted locally, it is necessary to employ a policy that integrates a reduction of the foreign multiplier and truthful communication. This policy also performs the best in increasing local quality. It is also this policy that reduces differences in average per period payoff between buyers and sellers to zero in the local market. It appears then, that buyers and sellers under this policy learn to trade while fairly splitting the profits.

These results imply that in order to achieve higher levels of trade in the local market, and furthermore to make this trade more efficient, it will be necessary to invest in making local communication available and truthful while also lowering the incentives for buyers to purchase from lower cost foreign sellers. Something to consider is that I did not take into considering the cost of implementing each policy. While the combination policy of truthful communication and a subsidy leads to the best local outcomes, I believe that the implementation of a policy with truthful communication and a subsidy would most likely be the most monetarily costly. In general, subsidy policies are quite costly, and cause deadweight loss; added to that is the implementation of a communication platform with investment towards honesty. As shown in Chapter 2, several online markets have successfully made steps to creating reputable superusers who are given incentives to tell the truth. Most definitely, stronger and more transparent connections between producers and consumers can lead to such an outcome.

In addition to the costs already discussed, are the opportunity cost lost from not putting into effect more globally efficient policies. When compared to a policy that simply introduces truthful communication, the combination policy of truthful communication and a subsidy reduces global total social surplus. In fact, even the single policy of cheap communication achieves a higher level of global total social

surplus. It is clear that reducing the foreign multiplier then has a negative impact on the overall economy.

The results from this study shed light on the types of policies that policy makers should use in order to stimulate local development, while also cautioning that the effects do not come without negative spillover effects to the rest of the economy.

CHAPTER 4. SOCIAL CAPITAL AS A BUILDING BLOCK FOR A DEVELOPED ECONOMY: EVIDENCE FROM THE UNITED STATES

4.1 Introduction

Social capital in its various forms has been employed to explain many facets of life, such as health [Tampubolon et al., 2011, Kawachi et al., 2008, Ronconi et al., 2012], crime rates [Lederman et al., 2002], happiness [Beaman, 2012]. It follows that social capital is of interest due to its potential effect on income, which is in turn interrelated with many outcomes such as health and crime.

The first objective of this paper is to determine if social capital has a direct effect on income in the United States. I use individual data from the Generalized Social Survey (GSS) in the United States. Respondents' memberships to voluntary associations are used as a proxy for social capital. Connections between individuals are important because they facilitate communication between parties, enabling the formation and dispersion of trust and reciprocity. There are no similarly detailed studies for the United States, an economy that differs drastically from those in the developing countries upon which this type of study is typically based. Studies that analyze the effect of social capital on income have been conducted in other countries, such as rural Tanzania [Narayan and Pritchett, 1999], Indonesia [Grootaert, 1999] and South Africa [Maluccio et al., 2000]. The second objective is to analyze whether the effect of social capital differs across occupation groups within the population. Previous studies have relied on relatively rural populations, with a substantial proportion of the population dedicated to subsistence farming. The sample used in this study will have greater heterogeneity in labor choice.

I hypothesize that social capital has a varying effect on income across occupations. Some individuals are likely to only be influenced by social capital sporadically, for example when looking for a new job (i.e. obtaining a referral from an acquaintance). I designate this type of occupation a periodical social capital (PSC) occupation. On the other hand, some jobs are very likely to be affected daily by social capital. Occupations that rely on word-of-mouth for customer acquisition, such as carpentry, rely on social capital by extension. Acquaintances will likely request the individual's business because their connections provide an element of trust. This second type of job is affected on a day-to-day basis by the amount of social capital present, and is designated a social capital intensive (SCI) occupation. While I do not claim that the first type of job does not benefit from high levels of social capital, I simply argue that the channels through which social capital affects these types of jobs' incomes differ.

As a policy tool, social capital has been employed by many organizations, including the World Bank (for example, see Woolcock and Narayan [2000]) under the institution's Social Development group. While social capital has mostly been looked upon as a tool for community development in developing countries, it could also be of use for the poorest in the United States, and developed countries generally.

To elicit the impacts of social capital on income, I use a modified Mincer equation [Mincer, 1974] by regressing income on respondents total membership and a set of control variables. The results show that higher levels of total membership are correlated with higher incomes. Periodical social capital occupations are correlated with higher incomes; but I do not find that investments in social capital have differing effects on the two types of occupational groups.

I investigate the possibility that the results are driven by union membership. Once I separate union membership from the social capital measure, I do not find significant results when estimating total membership on income. The result is likely driven by the fact that different types of membership have varying effects on income: fraternal,

service, sport and professional memberships are correlated with higher incomes, while school, literature and church memberships to lower incomes.

Then, I explore the possibility that there is a selection issue by using a simple matching technique. In the human capital literature this unobservable characteristic is a person's innate ability. In this study, this could be "friendliness," which is part of a person's personality or ability to be pleasant. I use a simple matching mechanism to compare individuals with similar characteristics and the same occupations, but who differ in the number of memberships they have. The matching algorithm shows that even for similar individuals in the same occupation, joining a club does have a positive effect on income. However, this is only true for up to two occupations.

Finally, I account for the possibility that there may be endogeneity in the model by re-estimating the model with a control function that uses trust in strangers as an instrument variable. The residual is significant, indicating a strong possibility that social capital is endogenous. I find that the average effect of an additional membership after correcting for endogeneity is significant and positive.

This paper's contribution to the literature is as follows: it provides empirical evidence about the contribution of social capital to income in the United States; it explores whether social capital may be a more worthy investment for a subgroup of occupations. This study should appeal to researchers and policy makers interested in community development in the United States.

4.2 Literature Review

4.2.1 What is Social Capital?

"Social capital, while not all things to all people, is many things to many people" [Narayan and Pritchett, 1999]. While social capital can easily be defined as a concept (i.e. benefits derived from social activity), its practical definition varies greatly. The

elusive nature of social capital creates confusion when working with the term. While there are several definitions, the primary ones can be described as the "communitarian view", the "networks view" and "institutional view".

The communitarian view defines social capital as the local level of organizations such as clubs and civic groups. Studies examining this view generally use data on membership to voluntary associations to measure social capital. This view sees social capital as a good, such that individuals have nonsatiation for its accumulation (for example, Putnam [1993]). The networks view of social capital stresses the importance of horizontal and vertical ties between people and organizations. This view acknowledges the potentially pervasive consequence of social capital and differentiates between two different types of ties. "Horizontal" ties or intra-community links are important to give communities a sense of identity and common purpose, while "vertical" or inter-community ties (those that cross various types of divides such as religion, ethnicity, etc.) links individuals to outsiders, exposing them to new resources and information. Without vertical ties, social capital can become a basis for the pursuit of narrow sectarian interests (for examples of this view see Granovetter [1995] or Fox [1996]). Finally, the institutional view concentrates on the macroeconomic aspect of social capital, looking at the political, legal and institutional environment. This final view concentrates on generalized trust as a proxy for social capital, and is usually used in cross-country or cross-region studies (e.g. Knack and Keefer [1997]). Without any doubt, these definitions are interconnected [Woolcock and Narayan, 2000]. Studies have found high correlations between trust and group membership.

4.2.2 Why is Social Capital Important?

Social capital has gained popularity in the social sciences as it has been recognized for its important role in facilitating transactions between individuals [Bernstein, 1992, Fukuyama, 1996, Putnam, 1993]. Network theory has become essential for modeling important social and economic relationships in the past few decades. Social networks

play an important role in determining how and to whom information is conveyed. Observing a particular node in a network could provide insight on personal motivations for joining networks, and the effect of that particular network on individual income. Individuals join networks without the expectation of equivalent exchanges over time, but instead operating under a so-called "generalized reciprocity" [Sahlins, 1965] where belonging to the network is the insurance itself. Repeated interactions will ensure that if need be, the network may be used for future help as long as help is given to others in the network.

Particularly in rural areas, several studies have attempted to identify how social capital affects economic development. For a household maximizing utility, social capital can enter the production function and act as a "lubricant" for agricultural production in communities, facilitating management of shared resources and improving the household's access to commodities such as water or sanitation [Jonathan Isham, 2002, Deaton and Muellbauer, 1980, Betancourt, 1996]. Other studies find social capital to be an important asset in a number of domains: as a risk management tool and a means of protection for the poor [Fafchamps and Lund, 2003, Fafchamps and Gubert, 2007, Fafchamps, 1992, Kozel and Parker, 1998, Rosenzweig, 1988, Townsend, 1994, Ligon et al., 2002, Ambrus et al., 2010]; for access to agricultural inputs [Isham, 2002, Narayan and Pritchett, 1999]; and for access to credit [Biggs et al., 2002]. The potential use of social capital as a tool to alleviate poverty induced several researchers to study its connection to income. For example, Narayan and Pritchett [1999] in Tanzania, Maluccio et al. [2000] in South Africa and Grootaert [1999] in Indonesia all find a positive effect of group membership on income. Fafchamps and Minten [2002] look at networks of traders in Madagascar and find that better connected traders have significantly larger sales and value added (difference between total sales and total purchases in value).

The benefits of social capital and networking are bound to be quite different in developed countries. Informal contacts can aid job searches by providing informa-

tion on availability and/or influence, thus affecting the matching of employees and employers [Granovetter, 1995, Lin, 1999, Marsden and Hurlbert, 1988]. For example, Granovetter [1995] researches benefits of social networks on job seekers, Mouw [2003] who compares jobs found with or without a referral and Montgomery [1991] who addresses how hiring through referrals can benefit both firms and individuals by avoiding problems of adverse selection. Employment through informal social network contacts is striking, with reports estimating between 30% and 60% of jobs are found through such sources [Bewley, 1999, Ioannides and Loury, 2004].

Finding employment through contacts leads to better understanding of the availability of jobs and their characteristics, finding a better job match and higher job satisfaction [Granovetter, 1995], a higher probability of securing a job [Fernandez and Weinberg, 1997], higher acceptance rates of job offers [Holzer, 1987], longer job tenure [Simon and Warner, 1992, Loury, 2006], lower quit rates [Datcher, 1983] and higher wages [Granovetter, 1995, Flap and Boxman, 2001, Lai et al., 1998].

The wage benefit has been a controversial topic, and many studies have failed to provide evidence that there exist wage bonuses and monetary benefits of social networks. There are several reviews on this, such as Granovetter [1995], Marsden and Gorman [2001], Lin [1999], Lin et al. [1981], and Bartus [2001].

There is not consistent evidence that the use of networking in a developed economy is associated with higher wages. For example, Franzen and Hangartner [2006] find that social capital does not have a monetary effect, but they do find non-monetary effects from social networks, which they claim result in greater benefits than those seen in jobs not obtained through a social network. Korenman and Turner [1996], Green et al. [1995]and Rosenbaum et al. [1999] find higher wages associated with referred employment. However, Mouw [2003] points out that these results are questionable; Korenman and Turner [1996] find no such effect on a larger sample; Green et al. [1995] can not attribute statistical significance to their results; and according to Rosenbaum et al. [1999] other information channels, such as college placement or professional

meetings, have a larger effect on wages. Lin [1999], Granovetter [1995], Marsden and Gorman [2001], and Bartus [2001] conclude that the use of informal channels does not lead to wage bonuses.

More recently, Pellizzari [2010] finds that using informal search channels on wages leads to higher bonuses in Austria, Belgium and the Netherlands, lower wages in Greece, Italy, Portugal and the United Kingdom, and no significant wage effect in other EU countries. He finds positive, though not significant, results in the US. However, the survey used is not representative of the whole US population (instead sampling only 18 to 23 year olds), and thus the estimates are biased.

4.3 Methodology

4.3.1 Research Question

Networking has been shown to influence several facets of individual's economic activities. As previously mentioned, referrals can help individuals to obtain a better matched job, keep said job, and have higher job satisfaction. I look at individuals who are already employed, and analyze how participation in memberships affects their income. Several studies use voluntary associations to account for social capital, such as Narayan and Pritchett [1999], Grootaert [1999], Hassan and Birungi [2011]. Findings include that social capital leads to higher incomes in developing countries, as well as that higher levels of social capital at the country level lead to higher output (measured in GDP). I hypothesize that this result applies also to the US.

Hypothesis 4.1 *Social capital will have a positive effect on individual income.*

However, it is likely that social capital will affect individuals differently depending on their occupation. Some occupations rely more heavily on word of mouth and repeat customers for future income. For this type of occupation, reputation, network size

and quality become very important commodities. I call this type of occupation social capital intensive (SCI). On the other hand, some occupations may only be influenced by social capital periodically. For example, a worker pursuing a desk job could take advantage of social capital when obtaining the job. Then, once the job is obtained, this individual would no longer receive any day-to-day monetary benefits from social capital. Social capital could come into play once again for a promotion in the future. A specific occupation fitting this example would be that of a secretary; once the job is obtained social capital is still important for other aspects of life but not for yearly income. I call this type of occupation periodical social capital (PSC).

Hypothesis 4.2 *Social capital will have a larger effect on income for social capital intensive occupations than for periodical social capital occupations.*

4.3.2 Empirical Model

4.3.2.1 Does social capital have an effect on income?

To elicit the impacts of social capital on income, a model similar to a Mincer equation is used [Mincer, 1974], wherein I regress income on the social capital measures and a set of control variables. The underlying income variable that the GSS collected is continuous but recorded in intervals (which will be discussed in Section 4.4) Imputed income estimators usually suffer estimation problems. Drawbacks from ad hoc Least Square Estimators are summarized in Berg and Lien [2002] and [Hsiao, 1983]. The main problem is that the standard errors will overstate the precision of estimation because within-bracket variation is suppressed and the error is not taken into account. The result is that potentially causing the effects of the regression have the potential to appear significant even when they are not. Still, the "best" type of measurement error to have is random measurement error in the dependent variable. In such a case, there is no correlation between the regressors and the error, nor is there any bias in

the estimators. The variance is affected by this measurement error, which is desired to be as small as possible.

For this reason, I use an interval regression estimation which takes into account the lower and upper bounds of income, and thus is much more appropriate for the data. Interval regressions are similar to the ordered probit model, however instead of estimating a discrete response variable, they estimate a continuous variable. With interval regressions, there is also no necessity in estimating the cut points, or the bounds in the interval, and the coefficients contain the partial effects of interest [Wooldridge, 2002].

The interval regression equation is,

$$ln(lower) \;\; ln(upper) = \beta_0 + \beta_1 membership_i + \mathbf{X}\beta_2 + \varepsilon \tag{4.1}$$

where $ln(lower)$ is the natural logarithm of the lower bound of constant individual income in 2010 dollars for individual i, $ln(upper)$ is its upper bound, $membership$ is the level of membership of social capital possessed by the individual, β_1 is the rate of return to social capital, X is a matrix of other individual characteristics included and ε is the residual.

I would like to assess the effect that membership has on income. Figure 4.1 aids in understanding the potential directionality of the effects at hand. I posit that individuals find jobs (potentially through networks, as previously studied in the literature), and through memberships are able to obtain higher incomes. As I am looking only at individuals who already have jobs, I will not assess the effect that social capital has on the probability of finding a job.

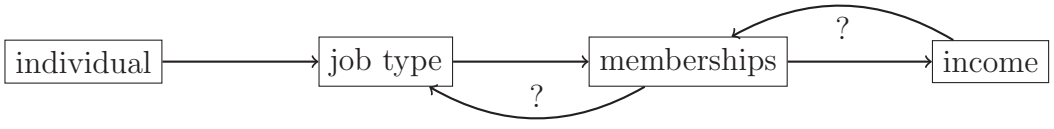

Figure 4.1. Effect of Membership on Income

There are three main problems to overcome when dealing with the magnitude and directionality of the effect.

4.3.2.2 Omitted Variable Bias

The omission of relevant causal factors can lead to what is called "omitted variable bias". If a variable is omitted, is a determinant of income, and also is correlated with social capital, then a model estimating the effect of social capital on income will compensate for this by either under-estimating or over-estimating the coefficient for social capital.

I include the following variables: a) age - as age increases so does experience, leading to higher earnings and higher connections. As it is typically done in this literature, age squared is also included to account for the nonlinearity in the effect of age on earnings. It is common to observe positive effect of age and negative effect of age squared, which suggests that there exist diminishing marginal returns to an individual's experience; b) education - higher levels of education are associated with higher incomes. As individuals specialize they are able to qualify for a greater range of job opportunities. A categorical variable for education was chosen because using a variable such as years of education imposes linearity in education, when in actuality the effects of education on income look more akin to a step function; c) gender - being a female is associated with lower earnings; d) religion - religion may affect both income and social capital. Religious organizations are social networks which may contribute to a larger set of income opportunities; e) ethnicity and US born - ethnic groups may rely on networks for information and job opportunities, several studies have shown that members of immigrant communities in developing countries use networks to find nonagricultural jobs [Munshi, 2003, Edin et al., 2004, Xue, 2008]; f) geography - geographic variables are included for two main reasons. Firstly, incomes differ depending on location. Some areas are may simply be more expensive to live in,

and their cost of living will inflate overall levels of income. Secondly, different regions can have differing levels of social capital. For example, the Midwest is considered to be more "friendly"; g) year - due to inflation, year causes income to increase. It will also affect social capital if as Putnam [2000] believed social capital has been "on the decline" in America.

4.3.2.3 Selection Bias

The first question mark in Figure 4.1 that I will discuss deals with the problem of selection bias. Selection bias refers to the possibility that some groups in the sample are not sufficiently random to allow for drawing general conclusions. The existence of selection bias can lead to the "spotlight fallacy" where a result is incorrectly extrapolated to apply to the wrong group of people. In the context of social capital, it is possible that individuals with a tendency for socialization (thus having more memberships) select themselves into occupations that require a higher level of sociability and social capital. This scenario could result in finding that higher levels of social capital lead to higher or lower incomes. However, the result could be showing that occupations that require higher levels of social capital simply have higher or lower earnings.

I use a simple nearest-neighbor matching estimator to find the average treatment effect of adding an additional membership. The technique works by estimating the average effect of a binary treatment variable (e.g. increasing from zero memberships to one membership, or from one membership to two memberships) on a continuous outcome (individual's income). It is impossible to observe one single individual that has has joined both zero and one memberships (if it were, we could just look at her income differences), but this framework allows for the comparison of two individuals who are identical or very similar in all other respects, but vary in the treatment variable. The difference of the outcome variables is the sample average treatment effect (SATE), or the causal effect for an individual of joining one extra membership. If

for similar individuals with different levels of membership there exists wage disparities, then I can say that it is not simply a selection issue, but that higher levels of membership are related to higher incomes.

4.3.2.4 Endogeneity

According to Figure 4.1, the next arrow that I must eliminate is the possibility of endogeneity or simultaneity in the creation of social capital and income. I assume that income is a function of social capital; however, it is possible that social capital is also a function of income, suggesting a two-way causality between social capital and income (simultaneity bias). It is also possible that there is an association between social capital and the error term. For example, the error term could contain friendliness, which could lead to higher levels of social capital and income. The consequence of such a correlation would lead an increase in social capital to have two effects on income - the direct effect via $\beta \ \ membership$ and the indirect effect via the error ε.

In either case, an instrument variable can be used to obtain consistent parameter estimates that isolate the effect that social capital has on income. An instrument must be correlated with social capital but not lead to changes in income (aside from the indirect route via social capital). Once the model is estimated, using the instrument will allow us to use the portion of social capital that is not correlated with the error.

Because of the underlying normality assumption, it is possible to use the control function method, which relies on the same kinds of identification conditions as those used in two-stage least squares (2SLS) approaches. The underlying model is the standard linear model

$$y*_1 = \mathbf{z_1}\delta_\mathbf{1} + \alpha_1 y_2 + u_1 \tag{4.2}$$

, where $y*_1$ is the response variable income, y_2 is the endogenous explanatory variable (social capital) and $\mathbf{z}$ is the $1xL$ vector of exogenous variables, and $\mathbf{z_1}$ is a $1xL_1$ is a

subvector of $\mathbf{z}$. However, $y*_1$ is imperfectly observed and instead y_1 is the observable censored variable.

The linear reduced form for social capital is

$$y_2 = \mathbf{x}\delta_\mathbf{2} + v_2 \tag{4.3}$$

which includes all the exogenous explanatory variables, plus the instrument variable and the first-stage residuals, v_2. The residuals are collected and included in Equation 4.2. A good indicator of endogeneity is finding that the residuals are significantly different from zero.

Finding a good instrument variable that eliminates the possible simultaneity relationship between social capital and income is no easy task. Previous economic studies have identified possible instrument variables for estimating the effect of membership on income.

4.3.2.5 Trust as an Instrument

Several studies have used trust in various groups as an instrument for membership, such as Narayan and Pritchett [1999], Grootaert [1999], Grootaert et al. [2002], Yusuf [2008]. Trust is highly correlated with social capital; for example, Putnam [2001] stated that while social trust does not define social capital it is a close consequence, and therefore could be thought of as a good proxy. Furthermore, greater levels of trust are shown to lead to higher social capital. La Porta et al. [1996] show that trust is an important component for the survival of large organizations and civic groups or associations where participation is mostly voluntary. They find a strong bivariate correlation between expressed degrees of trust and membership in associations.

Studies using trust as an instrument assume that the trust held by the individuals in strangers and institutions does not directly affect household income and is not affected by household income itself. As a result, trust is a potential instrument

variable. Grootaert et al. [2002] states that generalized trust that is not tied to a specific known individual, such as a friend or relative, is built over time and can be thought of as a function of the community's cohesion and norms. Thus, this type of trust can be assumed to be independent of the income level of a specific household or individual.

Of course the use of trust has its limitations as an instrument. For example, Putnam [2000] makes the case that rich individuals can have higher propensity to trust. Still, withstanding the limitations of the instrument, it can provide a direction of causality between social capital and income.

4.3.2.6 Other Possible Instruments

While trust is the most common instrument for social capital, a few studies have invoked other variables to isolate the effect of social capital on income.

Ethnicity: ethnicity can be an effective tool for eliciting and maintaining social relationships, and some argue that it is uncorrelated with income thus making it a potential instrument [Fafchamps and Minten, 2002, Xue, 2008]

Religion: membership to religious groups can offer the opportunity to build social capital, and some argue that it is not associated with access to resources therefore making it a good instrument [Fafchamps and Minten, 2002, Aker, 2007]

Length of residency: Glaeser et al. [2000] finds that length of residency is highly correlated with social capital, but uncorrelated or weakly correlated with household income. This occurs because it takes a long amount of time to build a social network once a move to a new locale has taken place [Adepoju and Oni, 2012].

Charity: Charity indicates the household's sense of kinship with the community, but is not associated with the level of wealth because even poor households will donate to maintain a good relationship with their church or community. [Adepoju and Oni, 2012, Aker, 2007]

I choose to not pursue these instruments for several reasons. Ethnicity and religion are included in my exogenous variables. While it would be practical to test length of residency and charity as instrumental variables, neither variable is present in my data for respondents that have answered membership questions. Instead I pursue the use of trust as an instrument.

4.4 Data

I use data from the General Social Survey (GSS) to determine the effect of social capital on personal income in the United States. The GSS is a repeated annual cross-section and contains data on demographic, behavioral and attitudinal questions collected by the National Opinion Research Center (NORC) at the University of Chicago. It includes household-level and personal characteristics provided by the individual answering the questionnaire.

Starting in 1975, the GSS begun using full-probability sampling of households designed to give every household the equal probability of being included in the survey. Prior to 1975, the GSS used a modified probability sample with a quota element at the block level (quota levels based on sex, age, and employment status). In 1975, as a transitional period, studies were conducted half using full-probability and half using block quota. I only use the 1975 surveys which had full-probability sampling.

The GSS has several weights that can be used to draw correct estimates from the population sample. I use three probability weights as described below. A probability (or sampling) weight is the inverse of the probability of being included in the sample.

I use the GSS weight which takes into account the sub-sampling of non-respondents, the number of adults in the household sampled, and maintains the original sample size for year 2004. It is important to take into account the number of adults in a household because only one adult per household is interviewed [Davis and Smith, 1992] and I study data at the individual-level (household-level variables are self-weighting).

In large households each individual has a lower probability of being chosen to respond. The downside of adding weights to the analysis is that efficiency is decreased (standard errors increase).

4.4.1 Membership Data

The GSS collected membership in the survey years 1974, 1975, 1977-1980, 1983, 1984, 1986-1991, 1993, 1994, 2004 and 2010. I use data from 1977 and on since prior the GSS did not use full-sample probability weighting.

The specific question asked was, "Here is a list of various organizations. Could you tell me whether or not you are a member of each type?" The categories of membership included are: fraternal group, service group, veteran group, political club, labor union, sports club, youth group, school service, hobby club, school fraternity, national group, farm organization, literary or art group, professional society, church group and other.

Responses for membership are shown in Table 4.1. On average, people belong to one or two groups. Church or religious organizations have the highest amount of members (35% membership).

4.4.2 Income Variables

Although the GSS strives to apply the same methods consistently over time by keeping questions constant, income has been an exception (both for family income, and respondents' income from principal occupation before taxes). The variable *rincome* measures the respondent's earnings from only a single occupation.

The meaning of income values changes over time for respondents as inflation devalues the categories [Hout, 2004], and the upper bound becomes weaker. For example, in 1977 the highest income category recorded was $50,000 with only 1.36% of the surveyed population corresponding to that income group. While that upper bracket

Table 4.1.
Group Membership Statistics

club	memberships	# of members
average membership	1.75	-
church or religious	34.19%	6208
sport	18.90%	3432
farm	3.68%	666
professional	15.21%	2757
school service	13.13%	2381
labor unions	12.47%	2262
other	10.25%	1804
service	9.88%	1791
youth	9.50%	1722
fraternal	9.12%	1654
hobby	9.79%	1777
literary or art	9.27%	1681
veteran	6.72%	1219
school fraternity	4.83%	875
political	4.03	730
nationality	3.21	582

Source: GSS Data on membership per respondent

was an adequate amount in 1977, by 2004, 25% of the population surveyed claimed a personal income higher than $50,000, thus the need for higher income brackets. I create a constant income variable *xconrinc* which uses the Consumer Price Index Research Series Using Current Methods (CPI-U-RS) and has 2010 as the base year. I also create income variables *lower* and *upper* to be used in the interval regression model which takes into account the bounds between which a respondent's variable

may fall. For the methodology and more information on the income variable refer to C.1.1.

4.4.3 Occupation Variables

The GSS codes occupation variables by asking the following three questions: (a) What kind of work do you (did you normally) do? That is, what (is/was) your job called?; (b) What (do/did) you actually do in that job? Tell me, what (are/were) some of your main duties?; (c) What kind of place (do/did) you work for?; and d) What (do/did) they (make/do)?

These answers are not reported, but are used to match the occupation to one of several hundred categories (classification codes extend to 999) in accordance to a categorization method developed by the Census.

I divide the occupations into two different camps: social capital intensive occupations (SCI) and periodical social capital (PSC).[1] Occupations that require a lot of entrepreneurship, repeat costumers and social interactions were categorized as social capital intensive occupations. A large majority of the sample is employed in periodical social capital occupations, at 76.23% of the respondents in the data set belonging to PSC.

The Occupational Information Network (O*NET) OnLine is a source of occupational information which contains information on hundreds of occupations and is developed under sponsorship of the US Department of Labor/Employment and Training Administration (USDOL/ETA). For each occupation, the database records the necessary abilities, interest, knowledge, skills, work activities, work context and work values. For example, file clerks have the abilities listed as clerical, English language, and customer and personal service, and their skills as reading comprehension, active listening, speaking, critical thinking, time management and writing.

[1]Initially, farming occupations were separated into a third group. However, no analysis could be performed due to the small number of observations, thus the group was dropped.

No category listed in O*NET matches exactly to what encompasses a social capital intensive occupation. Especially, not all categories listed are relevant to social capital, such as near vision (under abilities), or telephone (under work context). I selected a few categories that may be used to compare the occupational groups:

- Customer and Personal Service - Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction;
- Performing for or Working Directly with the Public - Performing for people or dealing directly with the public. This includes serving customers in restaurants and stores, and receiving clients or guests.
- Establishing and Maintaining Interpersonal Relationships - Developing constructive and cooperative working relationships with others, and maintaining them over time.
- Social - Social occupations frequently involve working with, communicating with, and teaching people. These occupations often involve helping or providing service to others.

Each occupation listed in O*NET has a page detailing all of its characteristics, thus it was necessary to first match the Census occupation to the O*NET occupations, and second, record the occupational characteristics listed above (if the ability appears under the occupation it is listed as a 1, otherwise it is listed as a zero). For information on the procedure of matching each Census occupation to an O*NET occupation, and for the Ruby code used see C.1.

The data is used to discern if the occupation groups created had inherent differences. Since these are mutually independent categorical data[2], chi-square tests can be used to see if there exists a relationship between them. The chi-square test is a method of testing how likely it is that a distribution observed is simply due to chance. While the test do not tell us whether the division of categories are correct or not, it will test the null hypothesis that the variables are independent given the data.

There is a statistically significant relationship between the characteristic and the type of occupation. While the tests does not prove that the categorization of occupations is correct or incorrect, it shows that for many of the skills, there is a relationship with it and the type (social capital intensive versus periodical) of occupation. The first page of the Census occupations, with their corresponding O*NET match, social capital level given and skills given by O*NET can be found in Table C.1.

4.4.4 Other Variables

These additional variables in the matrix X are included to isolate the effect of social capital on income by controlling for other factors that are known to affect it. For the literal question asked to obtain the variables and possible answers please refer to Table 4.2. Note that for all variables, it is always the respondent's prerogative to not answer.

4.5 Econometric Results

The regressions cover the years 1977-78, 1980, 1983-84, 1986-91, 1993-94, 2004, and 2010 since these are the years for which membership data is available.

[2]The occupation groups are mutually independent since the groups never overlap, for example, an occupation which is categorized as social capital intensive is never categorized as a farm occupation and they are categorical since they have been divided into the three categories of occupations.

Table 4.2.
GSS Variables

Variable	Question	Possible Answers
age	What is your date of birth?	Month/Date/Year.
born	Were you born in this country?	Yes; No; Don't Know.
degree	Do you have any college degrees?	Yes: What degree or degrees? (< than high school, high school, associate/junior college, bachelor's and graduate); No.
ethnic	From what countries or part of the world did your ancestors come?	Africa, European, Canadian, Asian, Hispanic, Caribbean American Indian, Arabic, American Only, Other
memnum	Could you tell me whether or not you are a member of each type?	Yes/No: Fraternal groups; Service clubs; Veterans' groups ; Political clubs ; Labor unions; Sports group; Youth groups ; Hobby or garden clubs; Farm organizations; School fraternities or sororities; School Service groups; Literary, art, discussion, or study groups; Nationality groups; Professional or academic societies; Church-affiliated groups; Any other groups?
occ80	What kind of work do you do? That is, what (is/was) your job called?	Census Occupation Code, 1980
religion	What is your religious preference?	Protestant; Catholic; Jewish; Other
region	Region of interview	New England; Middle Atlantic; East North Central; West North Central; South Atlantic; East South Central; West South Central; Mountain; Pacific
rincom77/ 82/86/ 91/98 /06	Did you earn any income from (occupation) in (previous year)?	In which of these groups did your earnings from (occupation), fall? Before taxes or other deductions
sex	Male/Female?	Male; Female
size	Size of place in thousands(population to the nearest 1,000 of the smallest civil division listed by the U.S. Census)	0-8008.
trust	Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?	Can trust; Cannot trust; Depends
wtsall wtcomb	Weight variable	Not applicable
year	GSS year for this respondent	Year

4.5.1 Interval Regression

Table 4.3 displays the results from the interval regression. The dependent variable is the log of constant income, coded as $ln(lower)$ and $ln(upper)$, and all exogenous variables were included. Column (1) shows results on the effect of total membership

Table 4.3.
Effect of Membership on Income, Interval Regression

	(1)	(2)
membership	0.0297**	0.0441***
	(0.013)	(0.017)
membership sq	-0.00194	-0.00192
	(0.002)	(0.002)
PSC	0.0322	0.0686*
	(0.025)	(0.036)
PSC#membership		-0.019
		(0.012)
constant	0.0398	0.0275
	(2.623)	(2.623)
observations	8,461	8,461

covariates: age, age squared, sex, race, degree, religion, US born, ethnic, region, size, year
gull table in Appendix
robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

on income, as well as the effect of belonging to the two different types of occupational groups.[3] Social capital has a small but positive effect on income; an additional membership is connected to about a 3% rise in income.

Column (2) allows membership to affect income differently depending on which type of occupational group the individual belongs to. The average effect of an additional membership on social capital intensive occupations is a 4% increase in income. This effect does not differ for periodical social capital occupations; the interaction term is negative, though it barely misses the mark for significance. Periodical social capital occupations earn a higher income than social capital intensive occupations (7% more income).

[3]This model was also estimated as a Ordinary Least Squares model, with similar results.

Result 4.1 *Higher levels of membership are correlated with higher income levels. I cannot reject the alternative hypothesis that the effect of an additional membership is equal for social capital intesnive occupations and periodical social capital occupations.*

Of concern is whether the results are driven by membership to a labor union. Many labor unions in the US got their start as mutual-aid societies, protecting workers while also providing social services such as helping the sick and setting up literacy programs. Union members were required to not only pay membership dues, but also to deliver social services to less-fortunate union members as needed [Jarley, 2005]. As unions grew larger, the mutual-aid function eroded. Today, labor unions' primary goal as organizations is to improve the pecuniary and non-pecuniary conditions for their member's employment. Union membership is different from the other types of memberships in this study in that its purpose is completely tied to the work environment and wages. Even professional clubs, which are tied to members' occupations, can be largely used for networking and socialization. The effect of unions on wages has been hotly debated in the past. Mischel and Walters [2003] report that union raise unionized workers' wages by roughly 20%. However, the impact of unions on non-unionized workers is almost as large. They find that that the most important advantages that unionized workers have are non-monetary, such as paid leave and better health insurance and pension plans.

It is unclear whether union membership is driving the membership results, but it is worth examining. Also worthy of note is that studies that have used this paper's variable for social capital (membership) include union membership as a form of social capital. Table 4.4 reports the interval regression with differentiated memberships. Column (1) includes the whole data set, while column (2) restricts the estimation to non-union members.

Column (1) reveals that union membership results in a large and positive effect on income. Union membership also has the largest effect on income among all the voluntary associations, at 30%.

Table 4.4.
Differentiated Memberships Effect on Income, Interval Regression

	(1)	(2)
fraternal	0.103***	0.122***
	(0.035)	(0.042)
service	0.0636*	0.0759**
	(0.034)	(0.038)
veteran	0.0203	0.0258
	(0.039)	(0.046)
political	-0.0438	-0.0494
	(0.054)	(0.061)
labor union	0.304***	
	(0.026)	
sport	0.0851***	0.0908***
	(0.027)	(0.030)
youth	-0.0367	-0.0147
	(0.037)	(0.043)
school	-0.171***	-0.197***
	(0.032)	(0.037)
hobby	-0.0865**	-0.0876**
	(0.036)	(0.041)
greek	0.0579	0.06
	(0.043)	(0.048)
national	0.0422	0.0444
	(0.052)	(0.062)
farm	-0.118*	-0.182**
	(0.067)	(0.079)
literature	-0.112***	-0.111***
	(0.037)	(0.040)
professional	0.279***	0.318***
	(0.030)	(0.033)
religious	-0.0534**	-0.0702**
	(0.025)	(0.028)
other membership	-0.0596*	-0.0589
	(0.036)	(0.040)
Constant	-2.923	-3.225
	(2.596)	(2.885)
Observations	8,076	6,764

covariates: age, age squared, sex, race, degree, religion, US born, ethnic, region, size, year
full table in Appendix
robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Result 4.2 *Membership to a labor union is connected to the largest increases in income from all voluntary associations.*

Recall that the network view of social capital states that not all social capital is made equal. Specifically, homogeneous groups fostering social capital can become harmful, while vertical links or "weak" links, can present a person with new opportunities and information. Both columns (1) and (2) from Table 4.4 tell a similar story: not all memberships are equal. Memberships to fraternal societies, service groups, sport clubs and professional organizations have a positive effect on income, while school, literature and church memberships have a negative effect.

Result 4.3 *Not all memberships are connected with higher income levels. Specifically, fraternal, service, sport and professional memberships are related with higher incomes, while school, literature and church memberships with lower incomes.*

The effects of membership on respondents are alike when comparing the whole sample and when only looking at non-union members. Thus, I keep union members in the data set, but separate union membership from social capital, instead including it in the analysis as a dummy.[4]

The original interval regression is re-estimated with union membership as a separate dummy variable. Results are presented in Table 4.5. Once union membership is separated from the social capital measure, I find that on average an additional membership has no effect on income for social capital intensive occupations, nor for periodical social capital occupations.

This result indicates that total membership is not entirely helpful in understanding the ways in which social capital affects income – as previously seen in Table 4.4, specific memberships lead to positive or negative effects on income, while others have no effect. It is likely that the different effects of varying types of social capital

[4]All results in this analysis hold even when re-estimating each model without the inclusion of union members.

cancel each other out, ultimately leading to a lack of an overall effect. While total membership may still be appropriate as a means for understanding the overall effect of social capital on income, it does not provide a full story. Other results remain accurate; PSC occupations are related to higher incomes, and membership to unions leads to higher incomes by 30%.

Table 4.5.
Effect of Membership on Income, Union Separated

	(1)	(2)
membership	-0.00153	0.012
	(0.013)	(0.016)
membership sq	0.000677	0.000675
	(0.002)	(0.002)
PSC	0.0277	0.0588*
	(0.025)	(0.034)
PSC#membership		-0.0177
		(0.013)
labor union	0.290***	0.291***
	(0.025)	(0.025)
constant	-0.935	-0.94
	(2.609)	(2.609)
observations	8,411.000	8,411.000

covariates: age, age squared, sex, race, degree, religion, US born, ethnic, region, size, year
full table in Appendix
robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.5.2 Simple Matching

It is possible that individuals who are more/less sociable select themselves into a particular type of occupation. In that case, an effect associated with social capital could be due to the fact that jobs that attract more sociable people offer higher incomes. To rule out this possibility, I compare individuals with similar characteristics and occupations but different levels of social capital, and note whether differing levels of membership reveal wage disparities using a simple matching estimator.

The dependent variable is the respondent's constant income in 2010 dollars. There are fifteen different treatment variables: to compare the effect of adding one more

membership, I generate binary variables for each switch. For example, the dummy *None to One* compares similar respondents in all other characteristics except one does not belong to any groups, while the other has one membership. The dummy *One to Two* compares two similar individuals, though one belongs to one group while the other to two groups, and so on. [5] This technique will also shed light on the potential concavity of social capital.

I use two different exact options for occupation in the matching algorithm. The option forces the algorithm to pair the respondent to another in the same occupation, or as close as possible. First, I use this paper's occupation type division (SCI vs PSC). Then, I use the Census occupational variable. The Census orders occupations in groups. Examples from the 1980 Census occupational code include aerospace engineers (44), metallurgical and material engineers (45), mining engineers (46), and so on.

Table 4.6 displays the SATE results for the matching algorithms. I do not include the results for membership switches from ten to eleven and forward because there are less than 50 observations. The results provide some insights. First, the benefits to switching memberships cease after two memberships. The result is intuitive as joining a membership requires at the very least a time investment; there is a point at which the marginal cost of joining an additional membership will outweigh the marginal benefits. Second, results are similar regardless of which type of occupational variable is included. For example, a switch from no membership to one membership leads to a $1,405 income increase when using the SCI/PSC variable, and $1,410 increase when using the Census occupation variable. Lastly, the results imply that there is not a severe selection problem. For individuals with similar characteristics (regions, ages, years, type of jobs, etc.) and in the same type of jobs, an additional membership up to a total of two memberships does lead to higher incomes.

[5] In the matching algorithm, the age variable was modified, and places age groups into intervals of 5 years to allow individuals close in age to become paired.

Table 4.6.
Sample Average Treatment Effect from Joining one more Membership

Membership switch	exact SC	exact occ80	Observations
Zero to One	1404.81*	1409.76*	4686
	(824.707)	(835.92)	
One to Two	2839.00***	2167.31*	3437
	(1090.25)	(1118.526)	
Two to Three	1894.73	2376.18	2338
	(1431.21)	(1450.45)	
Three to Four	1438.66	-1290.09	1553
	(1923.51)	(1938.90)	
Four to Five	-2534.35	-757.32	978
	(2416.77)	(2442.33)	
Five to Six	4986.85	3284.81	563
	(3100.79)	(3186.56)	
Six to Seven	4451.74	2165.96	317
	(4663.31)	(4606.34)	
Seven to Eight	1803.18	-1905.59	175
	(5264.97)	(5691.48)	
Eight to Nine	-10525.88	-10488.46	94
	(8721.79)	(8939.43)	

Covariates included: ageint sex race degree ethnic born religs region size year memunion
standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Result 4.4 *There is no strong evidence that selection is driving the results. Increasing membership up to two groups is connected with higher incomes.*

Finally, I look at the possibility that there is endogeneity in the model, and use trust as the instrument variable. Table 4.7 presents the results for the first and second stage of the control function approach. Note that the residual is negative and significant, providing evidence that social capital was an endogenous regressor.

Once that endogeneity is accounted for, I find that the average effect of an additional membership leads to a 18% increase in income. The instrument is not without faults, and as such, this effect should be evaluated with some caution – however, it does appear that higher levels of social capital lead to higher incomes.

Table 4.7.
Control Function

	(1)	(2)
first stage	second stage	
membership		0.180**
		(0.088)
residual		-0.178**
		(0.088)
PSC	-0.0193	0.0135
	(0.040)	(0.025)
labor union	0.306***	0.243***
	(0.059)	(0.036)
cannot trust	-0.253***	
	(0.038)	
depend trust	-0.272***	
	(0.091)	
constant	34.08***	-6.233
	(4.028)	(4.029)
observations	11,814	8,020

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Result 4.5 *After accounting for the endogeneity of social capital, I find that an additional membership leads to increases in income.*

4.6 Discussion

This investigation of the effect of social capital on a developed economy's income-generating process uses instrument variable methods to estimate the effect of membership on income in the United States. First, I hypothesize that investing in social capital has positive impacts on income. I find evidence to support this hypothesis: controlling on observables I find that an additional membership is correlated with higher incomes.

I also find evidence for the network view of social capital which claims that not all associations are equal. The network view of social capital asserts that heterogeneous groups are more beneficial because they allow individuals from different socioeconomic, religious, ethnic backgrounds, among other distinctions, to share information. As support, sport associations (which can unite many different types of people) are associated with higher incomes, while religious groups are associated with lower incomes. Additionally, memberships to hobby groups are correlated with lower incomes. I find that using total membership as a proxy for social capital can only weakly inform about the effect that social capital has on income because not all memberships are equal. Still, using total membership can provide us with a general understanding of whether increasing social capital can have positive impacts on income.

Second, I hypothesized that social capital would have a larger effect on social capital intensive occupations. However, I do not find any evidence for this. The interaction term for periodical social capital and membership is constantly negative (although it barely misses the mark for significance with a p-value of about 0.10)

Accounting for the endogeneity of social capital is important because its existence could bias the results. I choose trust as an instrument variable. As an instrument it performs very well, it is highly correlated with trust while not correlated with income. The results show that, to a point, additional memberships lead to higher incomes. The causal relationship between social capital and income makes social capital a good public policy tool for development. Networking should be encouraged; connecting with others to form new relationships and share information does seem to lead to higher incomes. While I do not explore the ways in which membership leads to higher incomes, there are several ways in which it could occur. For social capital intensive occupations, networking can lead to a larger network of potential customers, while for periodical social capital occupations, networking can lead to new opportunities within a company.

Social capital has been correlated with several positive community outcomes: happier and healthier people [Kawachi et al., 2008], higher educational achievements, better performing governmental institutions [Putnam et al., 1993], faster economic growth [Knack and Keefer, 1997], less crime and violence [Akçomak and ter Weel, 2011]. Because of this, it has been employed as a policy tool for poverty reduction by several organizations including the World Bank, legitimizing the work of non-governmental organizations in community investment. Furthermore, fostering social capital could encourage individuals to create informal networks with a diverse number of individuals. This means social capital can be a relatively cheap investment with a high payoff [UNESCO, 2002]. While this tool has been used in developing countries, a roadblock in the United States is that there is not a single federal agency that primarily is concerned with community life and social cohesion [Hudson and Chapman, 2002]. Still, the Saguaro Seminar for Civic Engagement in America, an initiative and lead by Dr. Robert D. Putnam at the John F. Kennedy School of Government at Harvard University, continues to study social capital as a way to improve workplace relations, diversity, and poverty in the United States.[6] It is important to remember that social capital has played a key role in US society, and has not only worked as a tool for rural and developing economies. For example, the historically fragmented American cotton industry thrives today because of a group of investors in the late 1700s who were able to use their networks, reputation to avoid defaulting on investments and fostered trust to create an industry with a production process from raw cotton to cloth [Dalzell, 1987].

[6]http://www.hks.harvard.edu/programs/saguaro

CHAPTER 5. CONCLUSIONS

This dissertation has presented my three essays, in Chapters 2-4. These chapters explore the policy implications of communication, the benefits and costs of strengthening local markets and the income effects of social networks in the United States.

The first essay in this dissertation examines the effect of introducing two different types of communication mechanisms in a market: cheap communication and truthful communication. Previously, no study had looked at the effect of improving the communication space in the same experimental market. This research is especially relevant as real-world online markets have begun to make investments toward more honest communication (e.g. forums from Yelp, Amazon) I examine what there is to gain (and for whom) from making these investments. The results show that truthful communication slightly decreases contract acceptance, but has a large and positive effect on quality traded in the market. Despite the decrease in contract acceptance, truthful communication ultimately leads to higher levels of total social surplus and a lower Gini coefficient (i.e. lower income disparity between subjects). In contrast, cheap communication does not increase the level of quality traded in the market nor does it increase total social surplus. Perhaps the result should not be surprising - under cheap communication traders are able to share untruthful information. Buyers and sellers must decide whether to update their beliefs using information which they cannot verify as authentic. In this particular study, sellers exploit the communication platform by choosing to send dishonest messages. An unexpected consequence is that cheap communication also leads to lower income disparities, due to a decrease in seller incomes. While cheap communication cannot be completely ruled out as a development tool due to its impact on income inequality, it is clear that truthful

communication is preferable. Thus, it is not surprising that real-world markets have begun investing in steps toward achieving more honest agents.

The second essay studies different policies aimed at influencing the attractiveness of local markets. The paper is motivated by the current drive to source and purchase locally, which has especially affected the demand for local food. I examine the effects that two different types of policies have on the local and global market. The policies are facilitating communication (both cheap and truthful), and reducing the attractiveness of the foreign market (i.e. a subsidy to the local market). I also observe the effect of "combination" policies that implement one type of communication as well as a subsidy. The results show that the most effective policy at improving local trade is a combination policy of truthful communication and a subsidy. This combination policy increases the number of local offers created and accepted, increases local quality traded, increases local total social surplus and eliminates local buyer-seller income inequalities. These results imply that in order to achieve better local trade, a single policy is not sufficient. The key to this result, however, is that it only holds at the local level. By contrast, at the global level, a one-sided policy of truthful communication leads to the highest global quality traded, highest total social surplus and lowest Gini coefficient. In other words, employing the combination policy to bolster the local economy comes at the cost of foregoing higher potential global benefits. These results shed light on the types of policies necessary to induce not just more, but better local trade. Several policies, such as "Shop N Save" (subsidy) and "Know your Farmer" (communication) have already been put in place in several states to provide incentives for consumers to shop locally. While the first type of policy could lead to higher levels of offers in the local market, the combination of the two is necessary to ensure enough transparency between consumers and producers to reach a more efficient market level.

The third essay aims to determine whether social capital has a direct effect on US income using data from the General Social Survey. Despite the popularity of so-

cial capital as a research topic, this type of study has not been previously conducted in the United States. I hypothesize that social capital, measured by respondents' memberships to voluntary associations, has a positive effect on income. I also hypothesize that the effect of membership on income is larger for occupations that are more "social capital intensive". The results from this study show that higher levels of social capital are correlated with higher incomes. Furthermore, I find that not all social capital is equal - fraternal, service, sport and professional memberships are correlated with higher incomes, while school, literature and church memberships are associated with lower incomes. To control for the possibility of selection, I employ a matching algorithm which compares individuals in the same occupation and with similar demographic characteristics but who belong to different numbers of voluntary associations. I find that for the same occupation, an additional association leads to higher incomes. However, this is only true up to two memberships. This result is logical as social capital is truly a form of "capital" - it requires investments in order to prevent its depreciation. Finally, I use trust as an instrument variable to correct for the endogenous relationship between social capital and income. After correcting for endogeneity, I find that social capital has a positive causal effect on individuals' income. However, throughout the paper, I do not find any evidence that the effect of social capital varies based on the type of occupation an individual has. The result implies that social capital can be a useful development tool in the United States.

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APPENDICES

APPENDIX A. APPENDIX FOR CHAPTER 2

A.1 Proofs of Infinitely Repeated Series

The value of cooperating with a specific principal can be derived by computing the present value of the sum of an infinite sequence of payoffs discounted at the discount factor $\delta \in (0, 1)$. The cooperation and deviation payoffs for the principal are derived similarly to those of the agent, thus I only derive the agent's payoffs. By cooperating with the principal, the agent will receive $P + B - C(Q)$ in each period. The sum of the payoffs, r, that the agent will receive for cooperating forever:

For a discretionary bonus contract with communication, the agent's value of cooperation is:

$$r = P + B - c(Q) + \delta(P + B - c(Q)) \tag{A.1}$$
$$+ \delta^2(P + B - C(Q)) + ...$$
$$r = P - c(Q) + B + \tag{A.2}$$
$$\delta\left[(P + B - c(Q)) + \delta(P - c(Q)) + \delta^2(P + B - C(Q)) + ...\right]$$
$$r = P + B - c(Q) + \delta r \tag{A.3}$$
$$r - \delta r = P + B - c(Q) \tag{A.4}$$
$$r = \frac{P + B - c(Q)}{1 - \delta} \tag{A.5}$$

The principal's payoff for deviation will include r_1, her gain in the immediate period from receiving a good quality but not paying a bonus, plus r_2, forever receiving her reservation wage:

$$r_1 = R(Q) - P \tag{A.6}$$

$$r_2 = \delta\overline{v} + \delta^2\overline{v} + \delta^3\overline{v} + ... \tag{A.7}$$

$$r_2 = \delta\overline{v} + \delta(\delta\overline{v} + \delta^2\overline{v} + ...) \tag{A.8}$$

$$r_2 - \delta r_2 = \delta\overline{v} \tag{A.9}$$

$$r_2(1-\delta) = \delta\overline{v} \tag{A.10}$$

$$r_2 = \frac{\delta\overline{v}}{1-\delta} \tag{A.11}$$

$$r_1 + r_2 = R(Q) - P + \frac{\delta\overline{v}}{1-\delta} \tag{A.12}$$

A.2 Discount Factor Necessary to Sustain Cooperation

Here we present the derivation for the discount factor needed in order to sustain cooperation when the agent and principal are trading. In order to find the necessary discount factor for both the principal and agent to sustain cooperation, the agent's and principal's self-enforcement's (AIC and PIC, respectively) constraints are combined:

$$\text{AIC:} \quad \frac{P + B - c(Q)}{1-\delta} \geq \frac{(1-\delta^{\alpha})\left[P - c(\underline{q})\right]}{1-\delta} + \frac{\delta^{\alpha}\overline{u}}{1-\delta} \tag{A.13}$$

$$\text{PIC:} \quad \frac{R(Q) - P - B}{1-\delta} \geq \frac{(1-\delta^{\beta})\left[R(Q) - P\right]}{1-\delta} + \frac{\delta^{\beta}\overline{\pi}}{1-\delta} \tag{A.14}$$

We can manipulate the constraints and then sum them to solve for the δ that will satisfy both constraints:

$$P \geq C(Q) - B + P - c(\underline{Q}) - \delta^{\alpha}(P - c(\underline{Q})) + \delta^{\alpha}\overline{u} \quad + \tag{A.15}$$

$$P \geq P + B - R(Q) + R(Q) - \delta^{\alpha}(R(Q) - P) + \delta^{\alpha}\overline{v} \quad =$$

$$2P \geq C(Q) - B + P - c(\underline{Q}) - \delta^{\alpha}(P - c(\underline{Q}) + \delta^{\alpha}\overline{u} + P + B - R(Q) \tag{A.16}$$

$$+ R(Q) - \delta^{\alpha}(R(Q) - P) + \delta^{\alpha}\overline{v} \quad = \tag{A.17}$$

$$0 \geq C(Q) - c(\underline{Q}) - \delta^{\alpha}(P - c(\underline{Q})) + \delta^{\alpha}\overline{u} - \delta^{\alpha}(R(Q) - P) + \delta^{\alpha}\overline{v} \quad =$$

$$\delta^{\alpha}(P - c(\underline{Q}) - \overline{u} - \overline{v}) \geq C(Q) - c(\underline{Q}) \quad =$$

$$\delta^{\alpha} \geq \frac{C(Q) - c(\underline{Q})}{P - c(\underline{Q}) - \overline{u} - \overline{v}} \quad =$$

$$\delta \geq \left[\frac{C(Q) - c(\underline{Q})}{P - c(\underline{Q}) - \overline{u} - \overline{v}}\right]^{\frac{1}{\alpha}} \tag{A.18}$$

A.3 Pre-selected Messages

Following is a list of all messages that could be sent to other traders. It is divided into three categories: messages that were trader-neutral, seller-specific messages and buyer-specific messages.

- General messages
  - Group the message is to be shared with: all, buyers, sellers, specific trader
  - ID of the trader that received the offer
  - Price offered
  - Promised Effort
  - Promised Bonus
  - Would like to contract with trader ID # again
  - Do not contract with trader ID #
- Buyer-specific Messages

  - Did the seller deliver promised quality? yes, no
  - Did you pay the promised bonus? yes, no, no; I made a mistake
  - I did not create an offer
  - I did not find a seller to trade with this period
- Seller-specific Messages
  - Did the buyer pay promised bonus? yes, no
  - Did you deliver quality? yes, no, no; I made a mistake
  - I did not accept an offer
  - I did not receive an offer

A.4 Variable Name and Description

Table A.1.
Variable names and descriptions

Variable	Description
accept	the variable takes the value of 1 if the seller accepted the offer, or 0 if the seller rejected the offer
bonus	the actual bonus paid by the buyer
bonus amount	the desired bonus offered by the buyer
buyer total profit	the buyer's total profit before the current period
desired quality	the desired quality offered by the buyer
expnum	the experimental session's unique identifier, used to cluster on session
other offers	the total number of offers the seller received in this period (0 through 3)
period	the current period
period sq	the current period squared
price	the fixed price offered by the buyer
quality	the actual quality delivered by the seller
relationship	the number of times the buyer and seller have currently traded
seller total profit	the seller's total profit before the current period
shirking	the difference between desired quality and actual quality
stage	the current supergame the subject is in
withholding	the difference between desired bonus and actual bonus

A.5 Experiment screen shots

The treatments differed on whether communication was allowed, and the type of communication. All screens prior to the communication phase were identical for all treatments. Screen shots are in order of play.

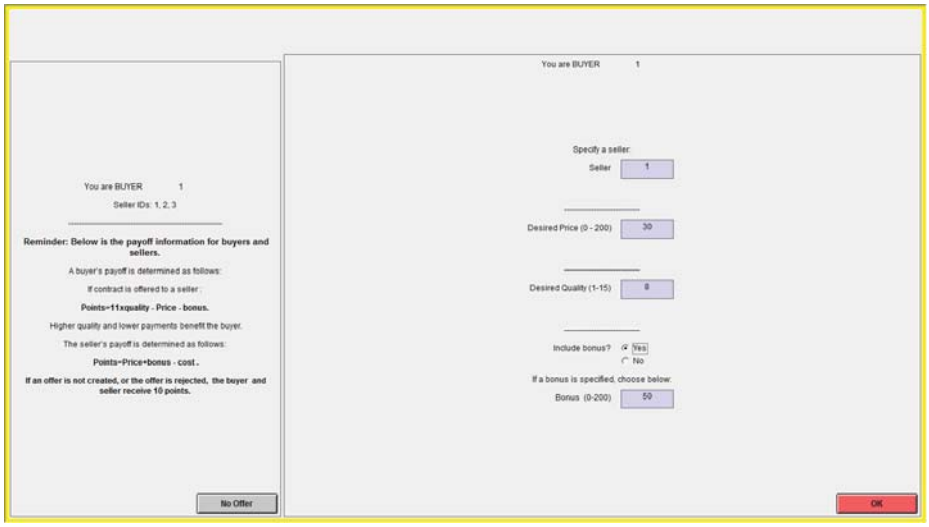

Figure A.1. Buyer's Choice: Contract Offer

Figure A.2. Buyer's Waiting Screen

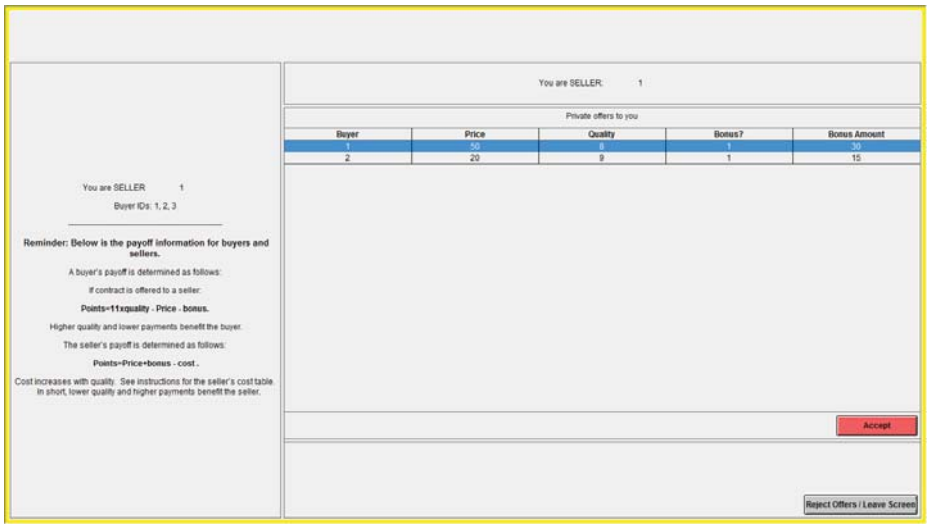

Figure A.3. Seller's Choice: Offer Acceptance or Rejection

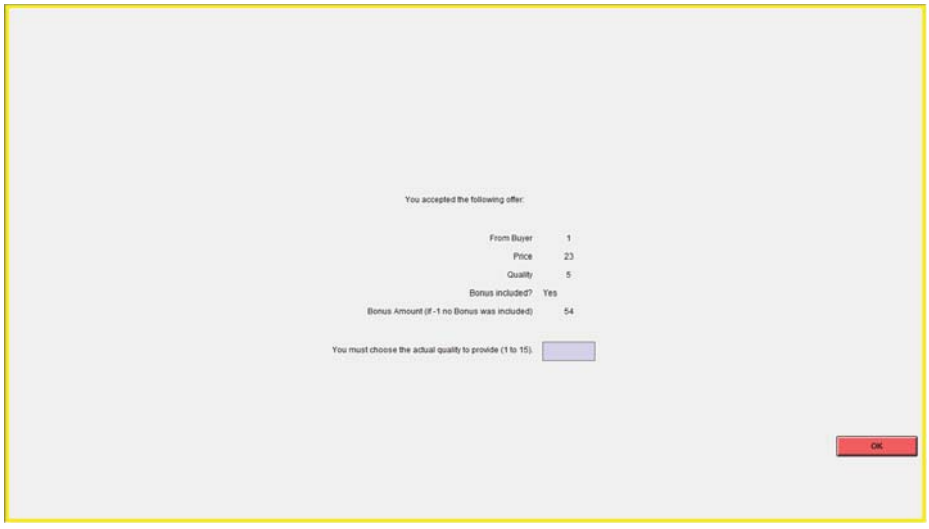

Figure A.4. Seller's Quality Determination Screen

Figure A.5. Seller's Waiting Screen

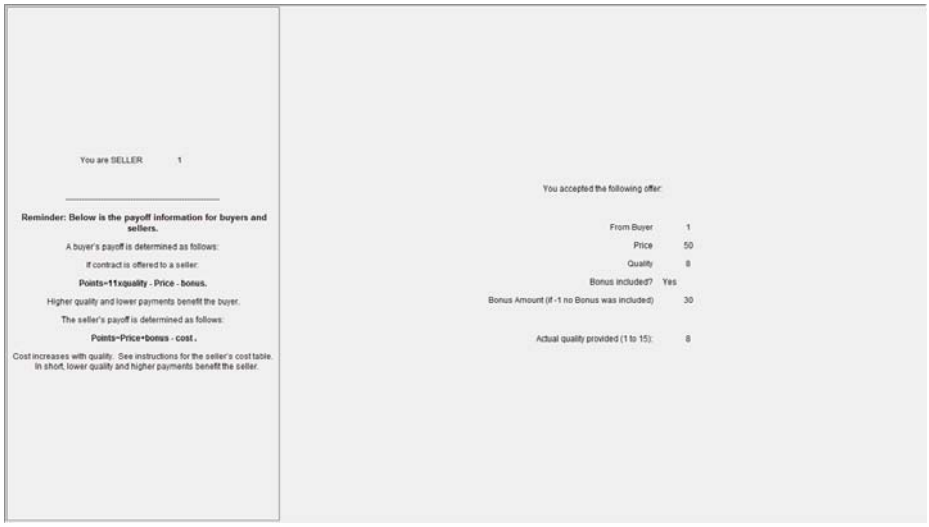

Figure A.6. Buyer's Bonus Determination Screen

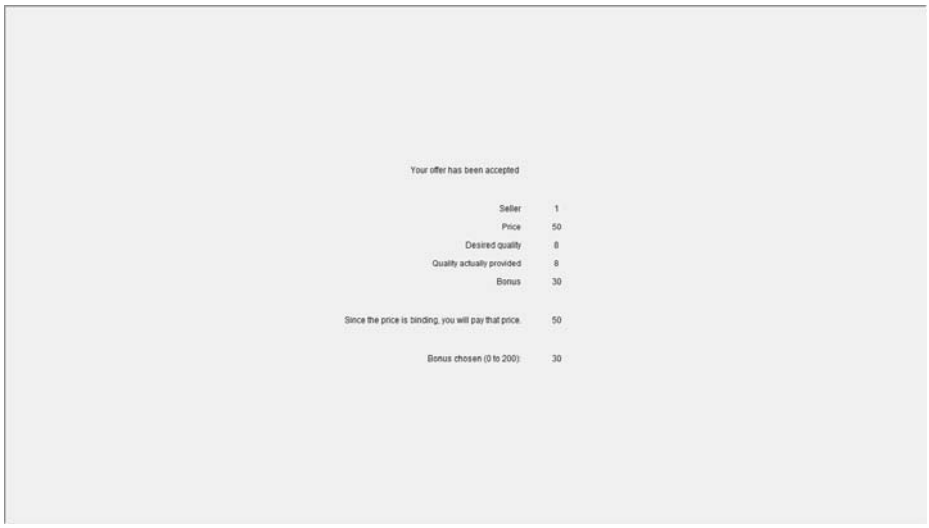

Figure A.7. Buyer's Waiting Bonus Screen

Figure A.8. Buyer's Payoff Screen

Figure A.9. Seller's Payoff Screen

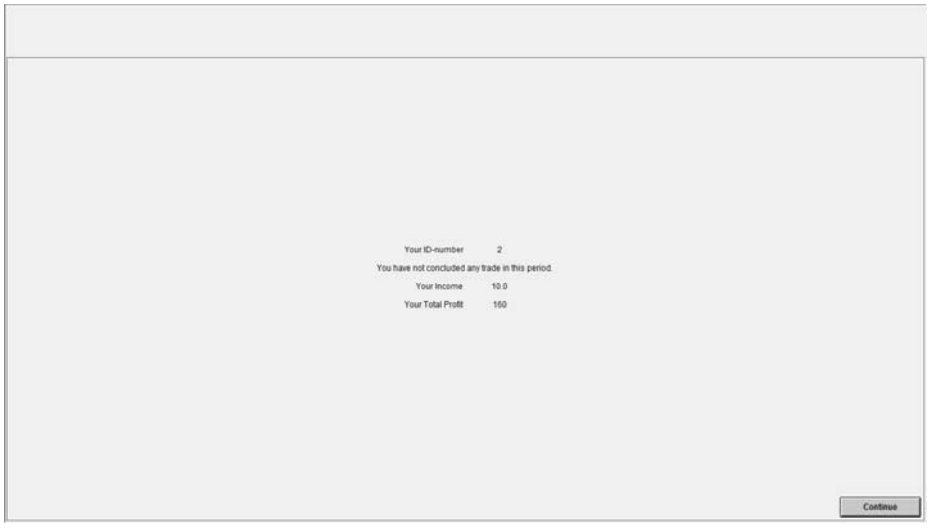

Figure A.10. No Trade Payoff Screen

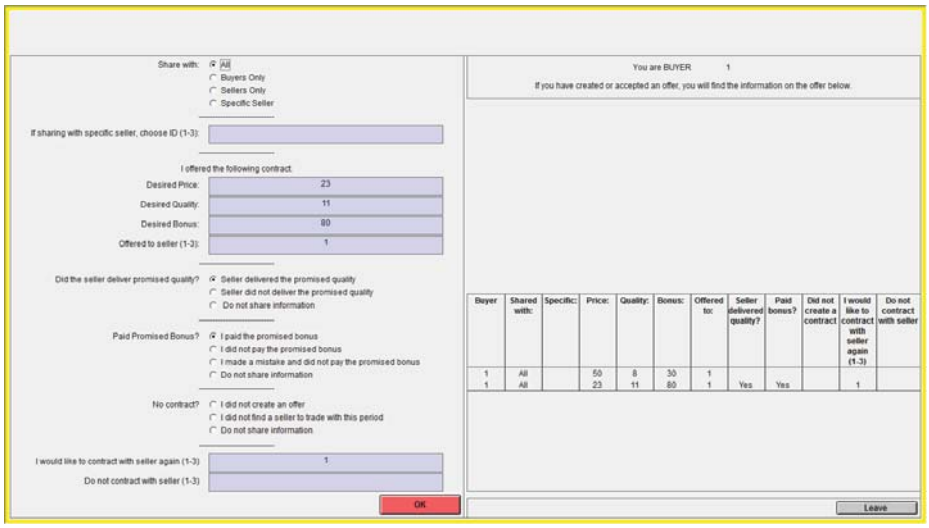

Figure A.11. Buyer's Message Screen, C

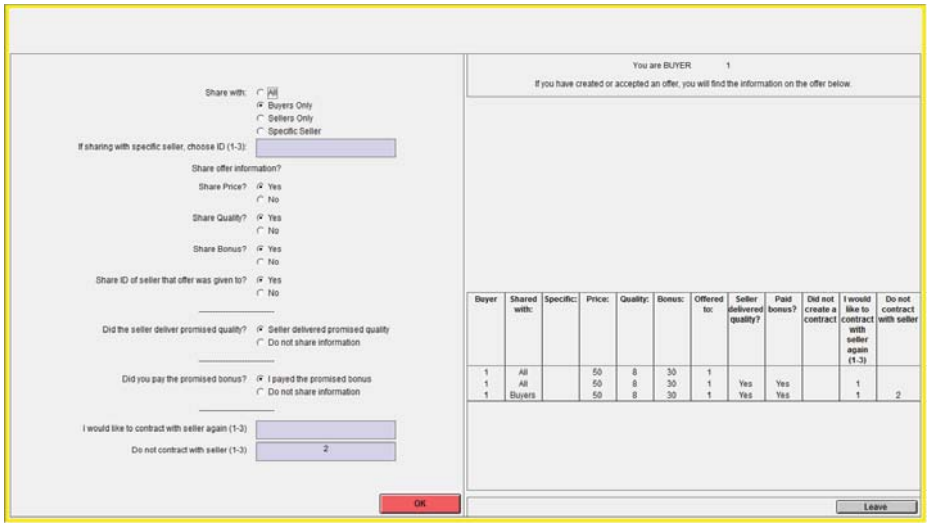

Figure A.12. Buyer's Message Screen, T

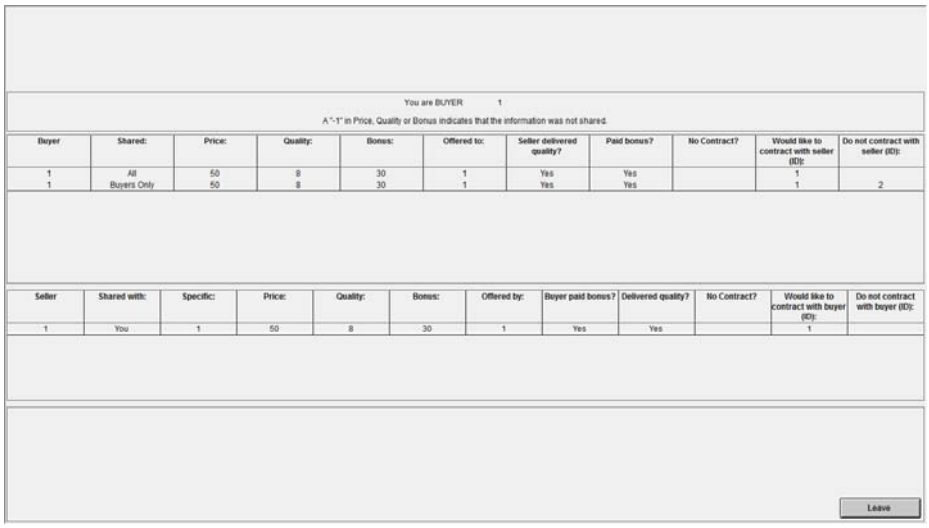

Figure A.13. Buyer's Message Log

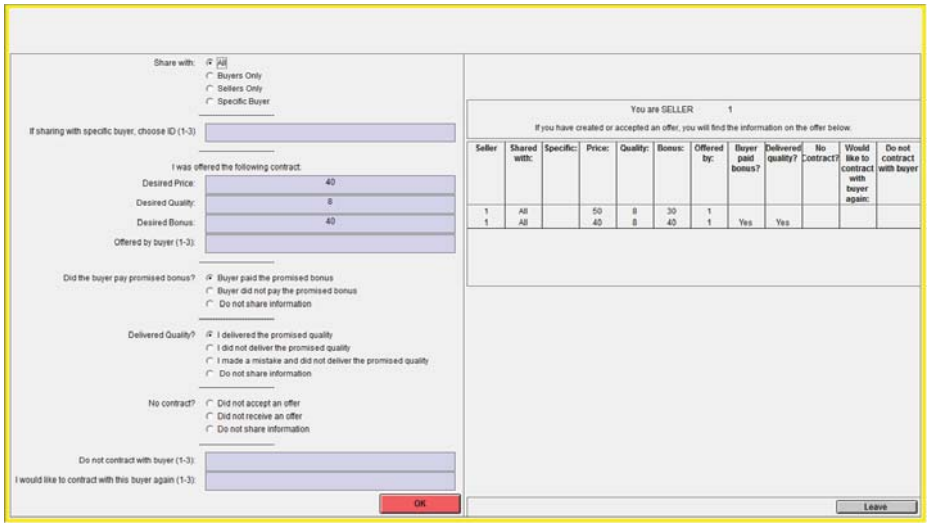

Figure A.14. Seller's Message Screen, *C*

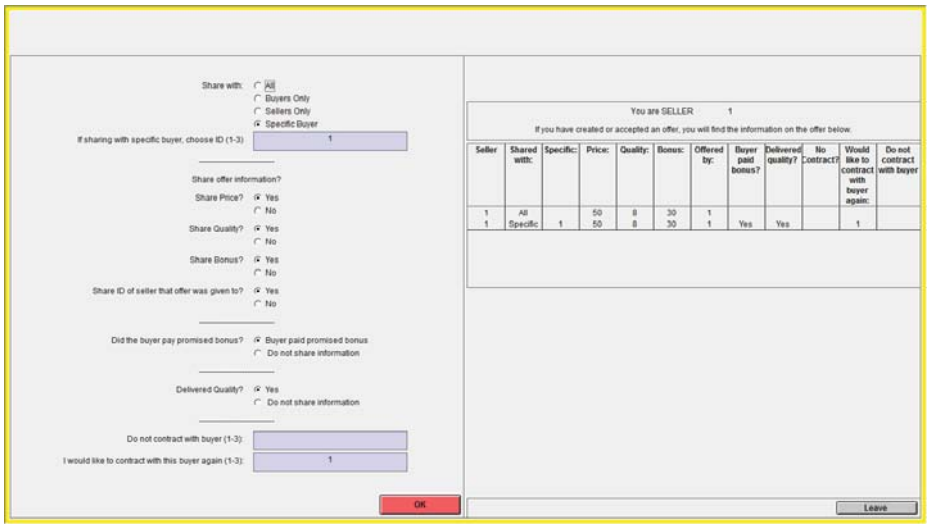

Figure A.15. Seller's Message Screen, T

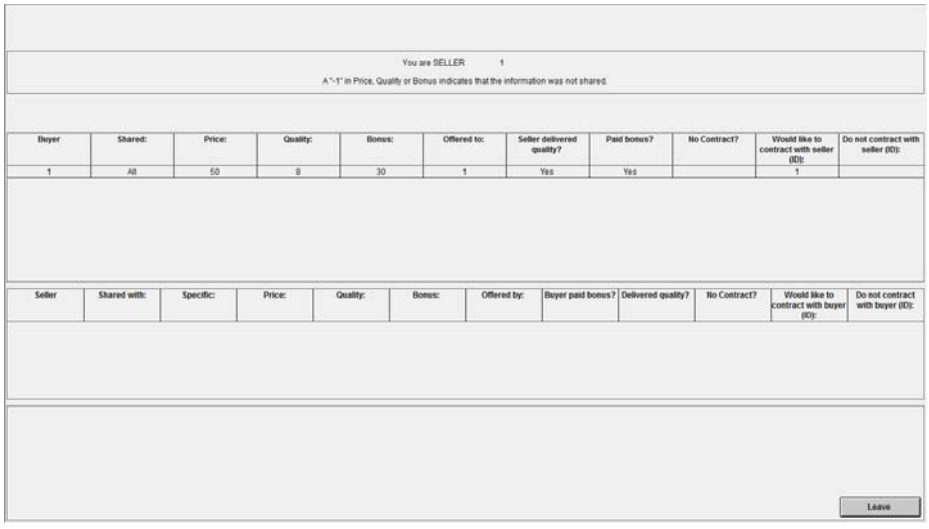

Figure A.16. Seller's Message Log

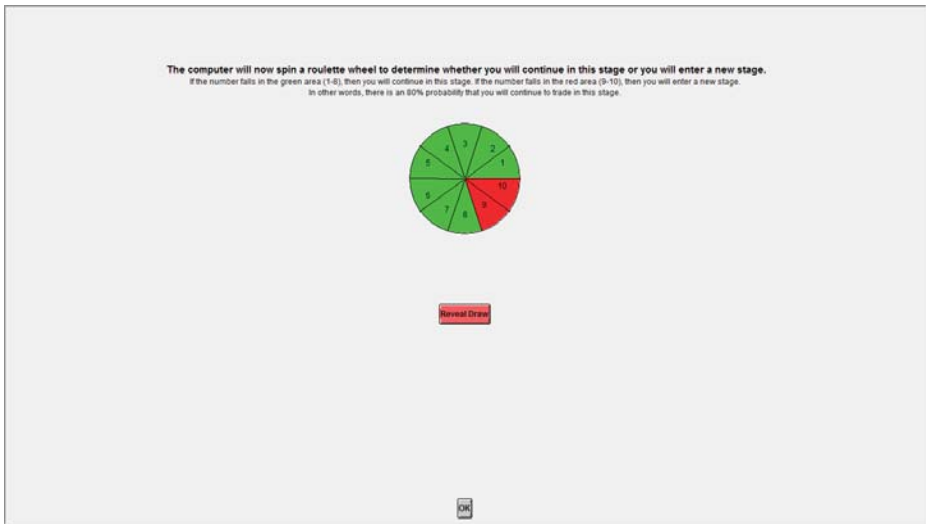

Figure A.17. Roulette

Figure A.18. Roulette Before Reveal

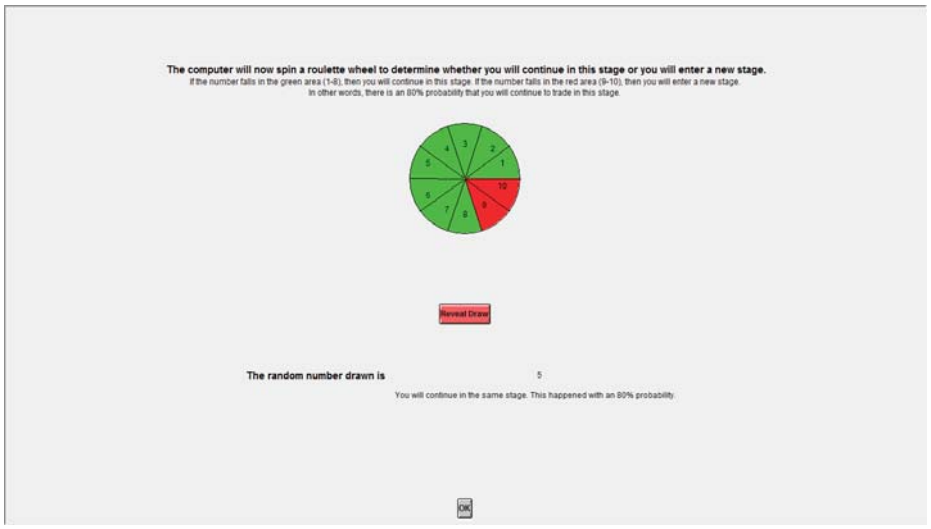

Figure A.19. Roulette After Reveal

A.6 Result Figures

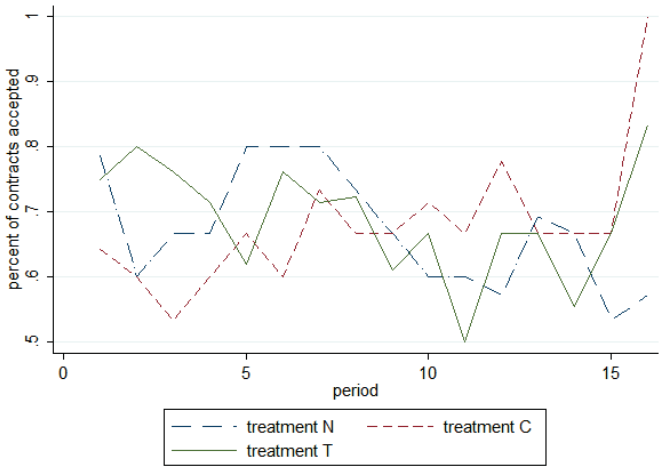

Figure A.20. Average Acceptance per Period

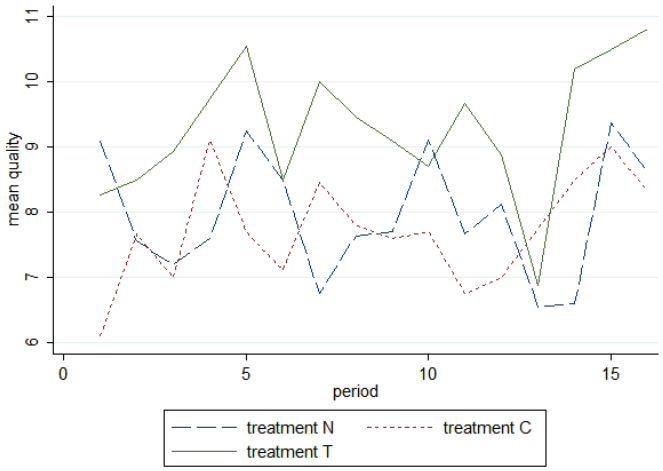

Figure A.21. Average Quality per Period

A.7 Message tables

Tables A.2 through A.6 report percentages and total numbers for messages sent in treatments C and T. Percentages included refer to the percentage of traders (sellers or buyers) that made the decision to include said message out of the maximum number of times the message could have been chosen (for example, if a seller chooses to not send any message in a period, then it is as if she is choosing to abstain from including each individual message).

Table A.2.
Market Information

	treatment C				treatment T			
	public	buyers	sellers	specific	public	buyers	sellers	specific
Seller messages:								
Price								
−included	8.26%(20)	10.33%(25)	8.26%(20)	5.37%(13)	8.12%(26)	3.44%(11)	6.87%(22)	8.12%(26)
−higher than actual	5.00%(1)	4.00%(1)	0.00%	30.77%(4)	-	-	-	-
−lower than actual	0.00%(0)	4.00%(1)	10.00%(2)	7.69%(1)	-	-	-	-
Effort								
−included	8.68%(21)	10.33%(25)	8.26%(20)	5.37%(13)	9.69%(31)	3.12%(10)	6.25%(20)	7.81%(25)
−higher than actual	61.90%(13)	12.00%(3)	35.00%(7)	53.85%(7)	-	-	-	-
−lower than actual	0.00%(0)	12.00%(3)	0.00%(0)	0.00%(0)	-	-	-	-
Bonus								
−included	8.68%(21)	10.33%(25)	7.85%(19)	5.37%(13)	8.44%(27)	3.12%(10)	6.87%(22)	8.12%(26)
−higher than actual	66.67%(14)	20.00%(5)	47.37%(9)	30.76%(4)	-	-	-	-
−lower than actual	0.00%(0)	12.00%(3)	0.00%(0)	15.38%(2)	-	-	-	-
Buyer messages:								
Price								
−included	7.02%(17)	8.26%(20)	2.89%(7)	2.48%(6)	13.12%(42)	3.44%(11)	2.50%(8)	7.5%(24)
−higher than actual	11.76%(2)	15.00%(3)	0.00%(0)	0.00%(0)	-	-	-	-
−lower than actual	0.00%(0)	5.00%(1)	0.00%(0)	0.00%(0)	-	-	-	-
Effort								
−included	7.02%(17)	8.68%(21)	2.89%(7)	2.48%(6)	13.12%(42)	3.44%(11)	2.50%(8)	7.50%(24)
−higher than actual	100%(17)	85.72%(18)	57.14%(4)	16.67%(1)	-	-	-	-
−lower than actual	0.00%(0)	4.76%(1)	14.29%(1)	16.67%(1)	-	-	-	-
Bonus								
− included	7.02%(17)	7.85%(19)	2.48%(6)	2.48%(6)	4.37%(14)	1.25%(4)	1.36%(5)	4.69%(15)
−higher than actual	100%(17)	73.69%(14)	33.33%(2)	16.67%(1)	-	-	-	-
−lower than actual	0.00%(0)	5.26%(1)	0.00%(0)	16.67%(1)	-	-	-	-

Table A.3.
Search and Matching Messages

	treatment C				treatment T			
	public	buyers	sellers	specific	public	buyers	sellers	specific
Seller messages:								
Did not receive an offer								
−included	7.53%(14)	4.30%(8)	-	1.61%(3)	9.84%(25)	1.57%(4)	-	1.97%(5)
−honest	22.81%(13)	14.04%(8)	-	5.26%(3)	38.46%(25)	6.15%(4)	-	7.69%(5)
Buyer messages:								
Did not find partner								
−included	1.62%(3)	3.24%(6)	0.54%(1)	-	4.71%(12)	0.39%(1)	0.78%(2)	0.39%(1)
−honest	4.76%(3)	9.52%(6)	1.59%(1)	-	15.58%(12)	1.30%(1)	2.60%(2)	1.30%(1)

Table A.4.
Punishment

	treatment C				treatment T			
	public	buyers	sellers	specific	public	buyers	sellers	specific
Seller messages:								
Buyer did not pay								
−Included	4.30%(8)	3.23%(6)	8.60%(16)	2.15%(4)	8.63%(22)	1.97%(5)	8.66%(21)	2.36%(6)
−honest	5.88%(7)	5.04%(6)	8.40%(10)	3.36%(4)	16.79%(22)	3.82%(5)	16.03%(21)	4.58%(6)
Do not contract with								
−included	4.3%(8)	3.76%(7)	8.6%(16)	1.61%(3)	2.76%(7)	0.79%(2)	2.36%(6)	1.97%(5)
Buyer messages:								
Seller did not deliver								
−included	8.11%(15)	7.03%(13)	1.08%(2)	1.57%(4)	7.84%(19)	3.92%(10)	0.39%(1)	1.57%(4)
−honest	12.71%(15)	10.17%(12)	1.69%(2)	0.85%(1)	15.45%(19)	8.13%(10)	0.81%(1)	3.25%(4)
Do not contract with								
−included	7.03%(13)	6.49%(12)	-	-	2.75%(7)	4.31%(11)	0.39%(1)	0.39%(1)

Table A.5.
Rewarding Messages

	treatment C				treatment T			
	public	buyers	sellers	specific	public	buyers	sellers	specific
Seller messages:								
Buyer paid bonus								
−included	4.84%(9)	11.29%(21)	0.54%(1)	2.15%(4)	9.02%(23)	2.36%(6)	2.36%(6)	9.06%(23)
−honest	7.46%(5)	28.36%(19)	1.49%(1)	5.97%(4)	18.70% (23)	4.88%(6)	4.88%(6)	18.70%(23)
Want to trade with buyer again								
−included	7.53%(14)	10.75%(20)	4.3%(8)	12.90%(24)	6.69%(17)	3.54%(9)	3.54%(9)	12.60%(22)
Buyer messages:								
Seller delivered quality								
−included	0.54%(1)	0.54%(1)	2.16%(4)	3.24%(6)	7.84%(20)	0.78%(2)	2.35%(6)	8.63%(22)
−honest	1.49%(1)	1.49%(1)	4.48%(3)	8.96%(6)	15.15%(20)	1.52%(2)	4.55%(6)	16.67%(22)
Want to trade with seller again								
included	1.08%(2)	-	2.70%(5)	4.86%(9)	8.24%(21)	1.18%(3)	1.57%(4)	20.78%(53)

Table A.6.
Self-reporting

	treatment C				treatment T			
	public	buyers	sellers	specific	public	buyers	sellers	specific
Seller messages:								
−I delivered the quality	8.06%(15)	12.90%(24)	8.06%(15)	3.23%(6)	11.02%(28)	2.36%(6)	3.54%(9)	12.60%(32)
−I made a mistake	0.54%(1)	-	0.54%(1)-	0.39%(1)	0.39%(1)	1.18%(3)	0.39%(1)	
−I did not deliver	1.08%(2)	1.61%(3)	0.54%(1)	1.61%(3)	4.72%(12)	1.18%(3)	3.54%(9)	1.97%(5)
Buyer messages								
−I paid bonus	0.54%(1)	1.62%(3)	3.24%(6)	3.24%(6)	7.45%(19)	0.39%(1)	-	7.84%(20)
−I made a mistake	-	-	-	0.54%(1)	0.39%(1)	-	-	0.39%(1)
−I did not pay bonus	7.57%(14)	2.16%(4)	0.54%(1)	-	6.27%(16)	2.35%(6)	1.96%(5)	1.18%(3)

A.8 Instructions

Included are the instructions for treatment T. Instructions for all treatments in Chapter 2 and 3 are very similar, and can be looked at upon request.

Instructions (T)

You can earn money during this experiment, with the exact amount depending on the decisions you make. Your experimental income is calculated in points, which will be converted into cash at the rate of: \$1 = 30 points. We will start you off with a balance of 150 points (\$5).

All written information you received from us is for your private use only. You are not allowed to share any information to other participants in the experiment. Talking during the experiment is not permitted. Any violation of these rules may force us to stop the experiment.

General Information

This experiment is about how people buy and sell goods for which quality matters. Participants are divided into two groups: half will be buyers and the other half sellers. And then a trading period will start in which a buyer and seller will trade one unit of a good that can vary in quality. The price agreed upon between the buyer and seller and the quality of the good traded will determine how much money each party makes in that period. There will be many trading periods throughout the course of this experiment. *All sellers and buyers are assigned a numeric ID which is not associated with their real identity. You will also retain your ID and role (i.e. buyer or seller) through the entire experiment.*

When does the experiment end? There will be a maximum of three sections in the experiment. Each section will be exactly the same. What constitutes a "section"? At the end of each period, a computer generated roulette will spin and fall randomly

on a number between 1 and 10. If the roulette stops on the numbers 1,2,3,4,5,6,7 or 8 then this section of the experiment will continue. However, if the numbers 9 or 10 are spun then this section will end and a new and identical section will begin. In other words, there is an 80% chance of this section continuing at the end of each period. This will continue at the end of each period for a maximum of 3 sections. However, if 10 periods have already been played, then the current section is the last section. This does not mean that the experiment will end at 10 periods exactly, but rather that once the section randomly terminates, the experiment ends. In summary, the experiment will end if (1) The numbers 9 or 10 have come up 3 times or (2) if the experiment has lasted at least10 rounds and a 9 or 10 is spun.

CONDUCTING TRADES

Each trade occurs within a trading period. Each trading period is then divided into a proposal phase, a quality determination phase, a payment determination phase and a message phase.

1. During the proposal phase, the buyer can make a proposal on the terms of trade to the seller. The seller can either accept or reject the proposal.
2. If the seller accepts the proposal, then during the quality determination phase, the seller chooses the actual quality level to supply.
3. After quality is observed, comes the payment determination phase. During this phase, the buyer can make final adjustments in payment depending on the initial terms of the proposal.
4. Finally, after all outcomes have been observed, buyers and sellers can choose from a list of messages to send in the message phase.

1. The Proposal Phase

Each period starts with a proposal phase. A proposal allows the parties to agree to the terms of trade by including a list of promises and obligations of both parties.

The buyer can submit a single proposal during the proposal phase. Once a proposal is submitted, the seller will decide to accept or reject the proposal. An offer is submitted to one seller only. Only the seller will be informed of the offer and only the seller can accept the offer. The buyer must specify the seller by entering the sellers ID number. Remember, every buyer and seller maintains the same ID number throughout the duration of the experiment.

How does a buyer make a proposal? A proposal screen will appear that will require the buyer to enter values for the following terms: quality, price, and a bonus.

Quality - A buyer can ask the seller to deliver a specific level of quality. Quality can range from 1 to 15 (whole numbers only), where higher numbers indicate higher quality. To specify quality, the buyer enters a number in the "desired quality" field.
Important: During the quality determination phase which comes later, the seller can choose any quality level s/he wishes. In other words, the desired quality allows the buyer to request a specific quality level but it is not binding on the seller to deliver this quality level.

Price This allows the buyer to state the price she will pay for the good. The buyer enters a price in the "price" field. The price ranges from 0 to 200 (whole numbers only).
The price the buyer specifies will be binding. That is, this is similar to an upfront payment or a legally binding obligation, once the proposal is agreed upon, the computer will ensure that the price is paid to the seller.

Bonus The buyer can state that s/he will pay a bonus. To enter a bonus, click on the "yes" box next to "would you like to offer a bonus?" Then enter a number in in the "bonus" field to specify the size of the bonus (enter a whole number from 0 to 200). If the buyer does not wish to offer a bonus, simply click "no" next to "would you like to offer a bonus?" The total payment is price plus bonus.
Important: The stated bonus is not binding. During the payment determination phase to come later, the buyer can choose any bonus level s/he wishes. Thus, this is

a discretionary bonus. However, if the buyer clicked "no" to offering a bonus, then there will be no payment determination phase for the buyer in this period. The price then becomes the final payment.

No buyer is obliged to submit offers, and no seller is obliged to accept an offer. After the buyer has specified desired quality, price and performance bonus, s/he needs to click "OK" to submit it. Once sellers receive their offers, they may choose to accept only one offer per period.

2. **Quality Determination Phase**

All sellers who accepted an agreement will determine the level of quality that they will supply to their buyers. A seller can choose any quality s/he wants to from 1 to 15. The Quality Determination screen will appear and a seller can enter his/her quality choice in the "actual quality" field. Nothing restricts the seller from choosing a quality level that is different from the "desired quality" level specified in the proposal.

3. **Payment Determination Phase**

Following the quality determination phase, all buyers who offered a bonus will determine the level of actual bonus that s/he will pay to the seller. The Payment Determination screen will appear and the buyer will enter his/her bonus choice in the "actual bonus" field. Nothing restricts the buyer from choosing a bonus level that is different from the bonus that was specified in the proposal. The actual bonus can range from 0 to 200 at the buyer's discretion.

4. **Message Phase**

All buyers and sellers have the choice of sharing messages. You have the following options for sharing messages: (1) You can send messages publicly so that all traders will receive your messages; (2) You can send messages only to buyers; (3) You can send messages only to sellers; (4) You can choose a specific individual to receive a message. The symbol □ indicates a blank box that can be filled with information. Buyers and sellers may only send one message to each of the groups listed above in each period. So, in total, buyers and sellers can each send 4 messages in each period.

Buyers may choose from the following:
- I offered the following contract: price □, quality □ and bonus □
- Offered to seller □
- Seller did not deliver promised quality
- Seller delivered promised quality
- I would like to contract with seller □ again
- Do not contract with seller □
- I paid the promised bonus
- I did not pay the promised bonus
- I made a mistake and did not pay the promised bonus
- I did not create an offer
- I did not find a seller to trade with this period

Sellers may choose from the following:
- I was offered the following contract: price □, quality □ and bonus □
- Offered by buyer □
- Buyer did not pay the promised bonus
- Buyer paid the promised bonus
- I would like to contract with buyer □ again
- Do not contract with buyer □
- I delivered the promised quality
- I did not deliver promised quality
- I made a mistake and did not deliver promised quality
- I did not accept an offer
- I did not receive an offer

Note: Buyers and sellers can select which messages to send from the list. However, they will not be able to send untruthful messages. For example, if the seller has delivered at least the promised quality, the buyer could choose to send the message "Seller delivered the promised quality" or could simply not share information on quality deliverance. However, she would not be able to choose the message "Seller did not deliver promised quality". Also note that "I would like to trade with seller/buyer □ again" and "Do not contract with seller/buyer □" are opinions and can be shared regardless of trading outcomes.

How Are Points (Income) Calculated?

How do Buyers Make Money?

If the seller rejects the offer, the buyer will receive 10 points for that period.

If the buyer's proposal is accepted, the buyer's points for the period depend on the actual quality, the price and the actual bonus paid. That is,

Buyer Points = 11 * Actual Quality - Price - Actual Bonus

The higher the Actual Quality and the lower the total payments (i.e., Price and Actual Bonus), the more points the buyer earns.

How do Sellers Make Money?

If the seller rejects the proposal, the seller will receive 10 points for that period.
If the seller has accepted an offer, then the seller's points depends on the price, actual bonus, and production costs s/he incurs. The seller's points are determined as follows:

Seller PointsPrice + Actual Bonus - Production Costs

The higher the actual payments and the lower the quality the more points the seller earns.

How are production costs calculated? The following table gives you the exact cost of producing each quality level.

Quality	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Cost	1	2	5	8	13	18	25	32	41	50	61	72	85	98	113

Points for all buyers and sellers are determined in the same way. **Each buyer can calculate the income of her seller and vice versa**. Note that buyers and sellers can incur losses in each period. These losses are subtracted from your points balance.

At the end of each period, the buyer and seller will be shown an "income screen". The following information is displayed on this screen:

- the ID number of your trading partner.
- the price the buyer offered.
- the promised/desired bonus and the actual bonus granted
- the buyer's promised/desired quality and the actual quality delivered by the seller.
- the points earned (or lost) by both parties in this period.

Please record all the information in the documentation sheet supplied to you. This will help you keep track of your performance across periods so that you can learn from your past results. In addition, we provide a worksheet to record all messages sent by buyers and sellers. Before we begin the experiment, we ask all participants to complete a questionnaire which will test familiarity with the procedures. The experiment will not begin until all participants are completely familiar with all procedures. In addition, we will conduct 2 trial periods of the proposal phase so that you can get accustomed to the computer. During the trial periods you will receive different IDs and no money can be earned.

APPENDIX B. APPENDIX FOR CHAPTER 3

B.1 Pre-Selected Messages

Following is a list of all messages that could be sent to other traders. It is divided into three categories: messages that were trader-neutral, seller-specific messages and buyer-specific messages.

- General messages
  - Group the message is to be shared with: all, buyers, sellers, specific trader
  - ID of the trader that received the offer
  - Price offered
  - Promised Effort
  - Promised Bonus
  - Would like to contract with trader ID # again
  - Do not contract with trader ID #
- Buyer-specific Messages
  - Did the seller deliver promised quality? yes, no
  - Did you pay the promised bonus? yes, no, no; I made a mistake
  - I did not create an offer
  - I did not find a seller to trade with this period
  - Did the seller from the other group deliver promised quality? yes, no
- Seller-specific Messages
  - Did the buyer pay promised bonus? yes, no

- Did you deliver quality? yes, no, no; I made a mistake
- I did not accept an offer
- I did not receive an offer
- Did the buyer from the other group pay promised bonus? yes, no

B.2 Result Figures

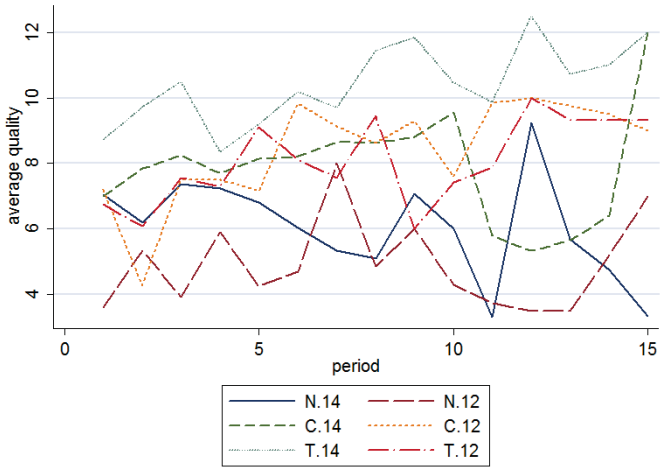

Figure B.1. Average per Period Quality in the Foreign Market

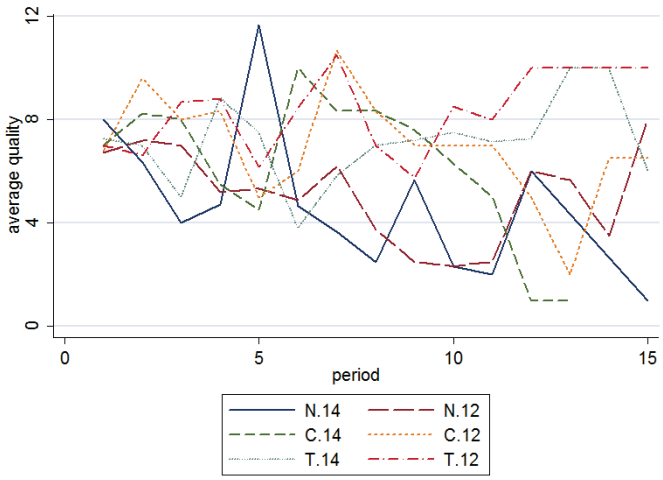

Figure B.2. Average per Period Quality in the Local Market

B.3 Message Statistics

Table B.1.
Market information, Treatments C.14 and C.12

	treatment C.14				treatment C.12			
	public	buyers	sellers	specific	public	buyers	sellers	specific
seller messages								
price								
−included	7.97%(22)	7.97%(22)	11.23%(31)	2.17%(6)	6.50%(16)	0.81%(2)	4.07%(10)	0.81%(2)
−higher	13.64%(3)	4.55%(1)	0%(0)	0%(0)	6.25%(1)	50%(1)	10%(1)	0%(0)
−lower	27.27%(6)	31.82%(7)	3.23%(1)	50%(3)	6.25%(1)	0%(0)	0%(0)	50%(1)
effort								
−included	7.25%(20)	7.25%(20)	7.25%(20)	2.17%(6)	6.50%(16)	1.23%(3)	4.07%(10)	0.81%(2)
−higher	52.38%(11)	22.73%(5)	41.94%(13)	66.67%(4)	25%(4)	66.67%(2)	20%(2)	50%(1)
−lower	23.81%(5)	36.36%(8)	3.23%(1)	0%(0)	6.25%(1)	0%(0)	10%(1)	50%(1)
bonus								
−included	7.25%(20)	7.25%(20)	11.23%(21)	2.17%(6)	6.50%(16)	0.81%(2)	4.07%(10)	0.81%(2)
−higher	5%(1)	0%(0)	6.45%(2)	0%(0)	6.25%(1)	50%(1)	0%(0)	0%(0)
−lower	30%(6)	40%(8)	0%(0)	0%(0)	6.25%(1)	0%(0)	0%(0)	50%(1)
buyer messages								
price								
−included	7.72%(22)	7.72%(22)	10.47%(30)	2.11%(6)	6.15%(16)	0.77%(2)	3.85%(10)	0.38%(1)
−higher	13.64%(3)	4.55%(1)	0%(0)	0%(0)	6.25%(1)	50%(1)	10%(1)	0%(0)
−lower	27.27%(6)	31.82%(7)	3.33%(1)	50%(3)	6.25%(1)	0%(0)	0%(0)	100%(1)
effort								
−included	7.37%(21)	7.72%(22)	10.47%(30)	2.11%(6)	6.15%(16)	1.15%(3)	3.85%(10)	0.38%(1)
−higher	23.81%(5)	4.55%(1)	0%(0)	16.67%(1)	6.25%(1)	0%(0)	0%(0)	0%(0)
−lower	4.76%(1)	31.82%(7)	0%(0)	16.67%(1)	6.25%(1)	33.33%(1)	0%(0)	100%(1)
bonus								
included	7.02%(20)	7.02%(20)	10.47%(30)	2.11%(6)	6.15%(16)	0.77%(2)	3.85%(10)	0.38%(1)
higher	5%(1)	0%(0)	6.67%(2)	0%(0)	6.25%(1)	50%(1)	0%(0)	0%(0)
lower	30%(6)	40%(8)	0%(0)	0%(0)	6.25%(1)	0%(0)	0%(0)	100%(1)

Table B.2.
Market Information, Treatments T.14 and T.12

	T.14				T.12			
	public	buyers	sellers	specific	public	buyers	sellers	specific
buyer messages								
price	10.85%(60)	5.06%(28)	4.52%(25)	1.27%(7)	14.36%(54)	6.12%(23)	2.39%(9)	6.65%(25)
effort	10.67%(59)	6.15%(34)	4.7%(26)	1.27%(7)	14.36%(54)	7.18%(27)	2.13%(8)	6.65%(25)
bonus	9.22%(49)	4.7%(26)	5.06%(28)	1.45%(8)	9.57%(36)	4.52%(17)	2.13%(8)	6.65%(25)
seller messages								
price	9.62%(41)	2.58%(11)	6.1%(26)	0.23%(1)	18.03%(53)	2.72%(8)	10.54%(31)	3.4%(10)
effort	9.15%(39)	2.58%(11)	6.1%(26)	0.23%(1)	18.71%(55)	2.72%(8)	10.54%(31)	3.06%(9)
bonus	8.22%(35)	1.64%(7)	5.87%(25)	0.47%(2)	13.27%(39)	2.72%(8)	8.84%(26)	3.4%(10)

Table B.3.
Foreign Market, Treatments C.14 and C.12

	treatment C.14				treatment C.12			
	public	buyers	sellers	specific	public	buyers	sellers	specific
buyer messages								
did not deliver	7.97%(22)	3.26%(9)	2.54%(7)	0.72%(2)	7.32%(18)	4.88%(12)	1.22%(3)	1.22%(3)
−honest	54.55%(12)	33.33%(3)	14.29%(1)	0%(0)	55.56%(10)	41.67%(5)	0%(0)	66.67%(2)
did deliver	4.35%(12)	1.09%(3)	0.36%(1)	0.36%(1)	1.22%(3)	0%(0)	0%(0)	0%(0)
−honest	91.67%(11)	66.67%(2)	100%(1)	100%(1)	100%(3)	0%(0)	0%(0)	0%(0)
seller messages								
did not pay	7.25%(20)	5.07%(14)	6.16%(17)	0.72%(2)	11.38%(28)	5.28%(13)	5.69%(14)	4.47%(11)
−honest	30%(6)	21.43%(3)	58.82%(10)	50.00%(1)	32.14%(9)	15.38%(2)	71.43%(10)	45.45%(5)
paid	1.45%(4)	2.54%(7)	4.71%(13)	0%(0)	0%(0)	0%(0)	2.44%(6)	0%(0)
−honest	75%(3)	85.71%(6)	92.31%(12)	0%(0)	0%(0)	0%(0)	83.33%(5)	0%(0)

Table B.4.
Foreign Market, Treatments T.14 and T.12

	treatment T.14			treatment T.12		
	public	buyers	sellers	public	buyers	sellers
buyer messages						
did not deliver	27.69%(18)	24.62%(16)	4.62%(3)	25.49%(13)	15.69%(8)	3.92%(2)
did deliver	25.17%(36)	6.29%(9)	3.50%(5)	15.12%(13)	12.79%(11)	1.16%(1)
seller messages						
did not pay	3.58%(8)	0% (0)	4.04%(9)	2.82%(4)	0.70%(1)	3.52%(5)
paid	13.45%(30)	0.45%(1)	0.90%(2)	9.15%(13)	0% (0)	9.15%(13)

Table B.5.
Local Market Punishment and Rewards, Treatments C.14 and C.12

	treatment C.14				treatment C.12			
	public	buyers	sellers	specific	public	buyers	sellers	specific
buyer messages								
seller did not deliver	7.25%(20)	5.80%(16)	1.09%(3)	1.09%(3)	5.28%(13)	1.63%(4)	0%(0)	0.41%(1)
−honest	80%(16)	37.50%(6)	0%(0)	66.67%(2)	76.92%(10)	75%(3)	0%(0)	100%(1)
seller delivered	3.99%(11)	1.63%(4)	1.81%(5)	1.09%(3)	3.66%(9)	0.81%(2)	0.41%(1)	0.81%(2)
−honest	90.91%(10)	50%(2)	80%(4)	66.67%(2)	77.78%(7)	100%(2)	100%(1)	100%(2)
do not contract with	3.61%(10)	1.81%(5)	0.36%(1)	0.36%(1)	2.44%(6)	2.44%(6)	0.41%(1)	0.41%(1)
want to contract with	3.26%(9)	0.36%(1)	1.80%(5)	1.08%(3)	2.44%(6)	0.81%(2)	0.82%(2)	1.22%(3)
seller messages								
buyer did not pay	3.26%(9)	1.81%(5)	3.99%(11)	1.09%(3)	2.85%(7)	0%(0)	4.47%(11)	0.41%(1)
−honest	77.78%(7)	60%(3)	72.73%(8)	33.33%(1)	100%(7)	0%(0)	90.91%(10)	100%(1)
buyer paid	3.62%(10)	5.80%(16)	5.43%(15)	0.72%(2)	4.47%(11)	0.81%(2)	2.03%(5)	0.81%(2)
−honest	40%(4)	62.50%(10)	100%(15)	0%(0)	90.91%(10)	50%(1)	100%(5)	100%(2)
do not contract with	1.09%(3)	0.81%(2)	2.89%(8)	0.36%(1)	1.22%(3)	50%(1)	3.25%(8)	0.81%(2)
want to contract with	3.26%(9)	4.71%(13)	3.99%(11)	1.45%(4)	4.47%(11)	0.41%(1)	0%(0)	3.25%(8)

Table B.6.
Local Market Punishment and Rewards, Treatments T.14 and T.12

	treatment T.14				treatment T.12			
	public	buyers	sellers	specific	public	buyers	sellers	specific
buyer messages								
seller did not deliver	19.05%(8)	16.67%(7)	2.38%(1)	9.52%(4)	31.82%(7)	27.27%(6)	4.55%(1)	4.55%(1)
seller delivered	13.04%(3)	8.70%(2)	8.70%(2)	0%(0)	24.44%(11)	11.11%(5)	2.22%(1)	48.89%(22)
seller messages								
buyer did not pay	6.45%(4)	1.61%(1)	9.68%(6)	1.61%(1)	31.25%(10)	0%(0)	12.50%(4)	3.13%(3)
buyer paid	14.29%(2)	14.29%(2)	21.43%(3)	0%(0)	42.11%(16)	0%(0)	10.53%(4)	5.26%(2)

APPENDIX C. APPENDIX C: APPENDIX FOR CHAPTER 4

C.1 Occupations, Social Capital Level, and O*net Matching

A Ruby code written by Brian Raszap Skorbiansky searches the O*NET website for each one of the occupations listen in the Census. Once an occupation is searched, O*NET lists a number of occupations and their relevancy score. The code is written to output all occupations listed with a relevancy score of 90% and above. For each occupation listed it searches its page to find the keywords previously listed, writing a 0 if it cannot find the word and 1 if it can. Precaution was taken that it searched for the actual category, since for example, the word social could appear in other sections of the page). Please contact the author if interested in the Perl code.

Table C.1 is a sample output of the Perl code. Sales engineers was able to be matched up correctly with the O*NET category. However, Engineers, not elsewhere classified is not paired up with the correct occupation. For occupations that are not correctly paired up, we manually searched for the closest occupation, searched and coded the characteristics of the occupation. For occupations that encompass several occupations, all occupations relevant where listed and characteristics where pooled from all.

Table C.1.
Sample Output of Ruby Code

Census Occupation	O*NET Occupation
Sales Engineers	Sales Engineers
Engineers, not elsewhere classified	Helpers–Production Workers

Table C.1 shows a sample of the database created Census data and O*NET data. It shows the occupation name given by the Census and used by the General Social Surveys; the social capital level and O*NET categories. For the complete list, please ask author.

Table C.2.
Census Occupations, Social Capital Level, O*NET Matching and Work Characteristics

Occupation	O*net Match	Social Capital	Customer Service	Manag-ment	Establishing Relationships	Enterprising	Social	Realistic	Cooperation
Accountants	Accountants	1	1	1	1	1	0	0	1
Architects	Architect Except	1	0	0	1	1	0	0	1
Computer Programmers	Computer Programmers	2	1	1	0	0	0	0	1
Comp Systems Analysts	Comp Systems Analysts	2	1	0	1	0	0	1	1
Comp Specialists , n.e.c.	Comp System Analysts	2	1	0	1	0	0	1	1

Notes: Social capital: 1=Social Capital Intensive Occupations, 2=One-time Social Capital Occupations.
n.e.c = not elsewhere classified

C.1.1 Income Variables

The GSS collected respondent incomes in several categories: $RINCOME$ for the survey years 1973-1977, 1979-1980, 1982-1990, 1992-1993, 1995, 1997, 1999, 2001, 2003 and 2005, $RINCOM77$ for survey years 1977-78 and 1980, $RINCOM82$ for survey years 1982-85, $RINCOM86$ for survey years 1986-90, $RINCOM91$ for survey years 1991-96 and $RINCOM98$ for survey years 1998-2004, and $RINCOM06$ from 2005 and on.

Each of these categories have different lower and upper bounds for the corresponding income levels due to previous bounds becoming obsolete. Table C.3 displays all of the individual income categories. As the years progress inflation changes relevant upper bound of respondents' incomes. Because the upper and lower bounds is left open (notice that the last category for each year is marked as "$X or over"), I will

use the information available to create the lower and upper bounds for the interval regression.

Table C.3.
Respondent Income Variables Collected by GSS

Values	RINCOM77	RINCOM82	RINCOM86	RINCOM91	RINCOM98	RINCOM06
1	Under $1000	Under $1000	Under $1000	LT $1000	Under $1 000	Under $1 000
2	$1000 to 2999	$1000 to 2999	$1000 to 2999	$1000 to 2999	$1 000 to 2999	$1000 to 2999
3	$3000 to 3999	$3000 to 3999	$3000 to 3999	$3000 to 3999	$3000 to 3999	$3000 to 3999
4	$4000 to 4999	$4000 to 4999	$4000 to 4999	$4000 to 4999	$4000 to 4999	$4000 to 4999
5	$5000 to 5999	$5000 to 5999	$5000 to 5999	$5000 to 5999	$5000 to 5999	$5000 to 5999
6	$6000 to 6999	$6000 to 6999	$6000 to 6999	$6000 to 6999	$6000 to 6999	$6000 to 6999
7	$7000 to 7999	$7000 to 7999	$7000 to 7999	$7000 to 7999	$7000 to 7999	$7000 to 7999
8	$8000 to 9999	$8000 to 9999	$8000 to 9999	$8000 to 9999	$8000 to 9999	$8000 to 9999
9	$10000 to 12499	$10000 to 12499	$10000 to 12499	$10000 to 12499	$10000 to 12499	$10000 to 12499
10	$12500 to 14999	$12500 to 14999	$12500 to 14999	$12500 to 14999	$12500 to 14999	$12500 to 14999
11	$15000 to 17499	$15000 to 17499	$15000 to 17499	$15000 to 17499	$15000 to 17499	$15000 to 17499
12	$17500 to 19999	$17500 to 19999	$17500 to 19999	$17500 to 19999	$17500 to 19999	$17500 to 19999
13	$20000 to 22499	$20000 to 22499	$20000 to 22499	$20000 to 22499	$20000 to 22499	$20000 to 22499
14	$22500 to 24999	$22500 to 24999	$22500 to 24999	$22500 to 24999	$22500 to 24999	$22500 to 24999
15	$25000 to 49999	$25000 to 34999	$25000 to 29999	$25000 to 29999	$25000 to 29999	$25000 to 29999
16	$50000 or over	$35000 to 49999	$30000 to 34999	$30000 to 34999	$30000 to 34999	$30000 to 34999
17		$50000 or over	$35000 to 39999	$35000 to 39999	$35000 to 39999	$35000 to 39999
18			$40000 to 49999	$40000 to 49999	$40000 to 49999	$40000 to 49999
19			$50000 to 59999	$50000 to 59999	$50000 to 59999	$50000 to 59999
20			$60000 or over	$60000 to 74999	$60000 to 74999	$60000 to 74999
21				$75,000	$75000 to $89999	$75000 to $89999
22					$90000 to $109999	$90000 to $109999
23					$110000 or over	$110000 to $129999
24						$130000 to $149999
25						$150000 or over
Year	77-78,80	82-85	86-90	91-96	98-04	05-2010

In order to correct for inflation, the GSS created the variable *conrinc* which converts all incomes to 2000 dollars. However, it uses an outdated index table from the Consumer Price Index Research Series Using Current Methods (CPI-U-RS), thus I update the variable by creating the variable *xconrinc* which will both update the consumer price index used and have 2010 as the base year. CPI-U-RS data was collected from the Bureau of Labor Statistics website [U.S. Department of Labor, Bureau of Labor Statistics, 2010].

The variables *lower* and *upper* which contain the lower bound and upper bound of income for each individual, respectively, were not previously created by the GSS.

These income variables are used in the interval regression model. The CPI-U-RS is also used to correct the upper and lower bounds (seen in Table C.3) for inflation. The GSS collects income data from the previous calendar year, i.e. in 1974 respondents provided information for the 1973 income they received before subtracting taxes. For this reason each year's income is adjusted for inflation using the the CPI-U-RS from the previous year. The CPI-U-RS data can be seen in Table C.4 with both the 1977 (the base used by the Bureau of Labor Statistics) and the 2010 base.

Table C.4.
Consumer Price Index Research Series Using Current Methods, 2010 Base

Year	December 1977 base	2010 Base
1973	0.73	0.2279825109
1974	0.803	0.250780762
1975	0.869	0.2713928795
1976	0.919	0.2870081199
1977	0.977	0.3051217989
1978	1.044	0.3260462211
1979	1.144	0.3572767021
1980	1.271	0.3969394129
1981	1.392	0.4347282948
1982	1.476	0.4609618988
1983	1.539	0.4806371018
1984	1.602	0.5003123048
1985	1.657	0.5174890693
1986	1.687	0.5268582136
1987	1.744	0.5446595878
1988	1.808	0.5646470956
1989	1.886	0.5890068707
1990	1.98	0.6183635228
1991	2.051	0.6405371643
1992	2.103	0.6567770144
1993	2.155	0.6730168645
1994	2.201	0.6873828857
1995	2.254	0.7039350406
1996	2.314	0.7226733292
1997	2.364	0.7382885696
1998	2.397	0.7485946284
1999	2.447	0.7642098688
2000	2.529	0.7898188632
2001	2.6	0.8119925047
2002	2.642	0.8251093067
2003	2.701	0.8435352904
2004	2.774	0.8663335415
2005	2.867	0.8953778888
2006	2.961	0.9247345409
2007	3.045	0.9509681449
2008	3.162	0.9875078076
2009	3.15	0.9837601499
2010	3.202	1

To construct the variable *xconrinc* a value of income must be assigned for each interval provided. There are several ways to solve the problem of open bounds, such as adding a constant or a percentage to the top category. However, I follow the method outlined in Hout [2004] and Ligon [1994] which creates the top income by extrapolating information from its own lower limit (income and frequency) and those of next-to-last category using an income distribution (Pareto) curve. Midpoints are used for all categories except the open top category since this simple approach is is most likely close to what a more complex approach would provide, especially since the incomes are broken into so many brackets.

Ligon [1994] also justifies the midpoint as a good measure for income since it is close to the mean income in each category as compared to the Current Population Survey for all except the extreme categories. The upper bound is the best place to use the Pareto distribution curve since we have the most information (regarding previous categories) and thus the curve is a good fit [Ligon, 1994].

The formula to calculate the highest income is:

$$M_{top} = 0.5 * L_{top}\left(1 + \frac{V}{V-1}\right) \tag{C.1}$$

$$V = \frac{ln(f_{top-1} + f_{top}) - ln(f_{top})}{ln(L_{top}) - ln(L_{top-1})} \tag{C.2}$$

where M_{top} is the upper bound of the highest income category that we would like to know, L_{top} is the lower limit of the top category, L_{top-1} is the lower limit of the previous category, f_{top} is the frequency in the top category, and f_{top-1} is the frequency in the previous category.

Equation C.1 is based on empirical observations of Vilfred Pareto, who discovered that the upper ranges of the income distribution can be described by fitting a curve of the general type

$$Y = AX^{-v} \tag{C.3}$$

where x is income size, Y is the population with income x or higher, and A and v are parameters to be estimated.

We can mathematically derive an estimation for the mean of the upper bound of such a curve. Let q be some arbitrary lower limit of the open ended category. We are interested in the area under the curve from q to infinity:

$$Y = \int_q^\infty f(x)\,\mathrm{d}x \tag{C.4}$$

where $y = f(x)$ is the number of people with income x, and the anti-derivative of Y. Figure C.1 presents a graphical example of this calculation. For each point in Figure C.2, we can observe how many individuals have some income x. The area between the x-axis and the graph is the area of interest. For example, if q is indicated by the vertical red line, then the area to the right and below the curve is the total number of individuals that have income greater than or equal to q.

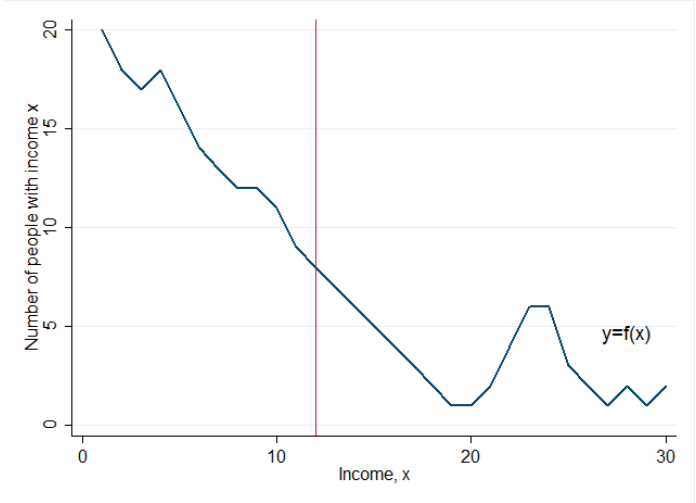

Figure C.1. Plot Total Number of Individuals with Income x, y=f(x)

Next, I would like to know the total amount of income for individuals with income greater than or equal to q. The aggregation of all incomes greater than q is:

$$\int_q^\infty x f(x)\,\mathrm{d}x \tag{C.5}$$

For each point in Figure C.2, I observe the total amount of money by individuals earning x. The orange line plots income, which is equivalent to only one individual

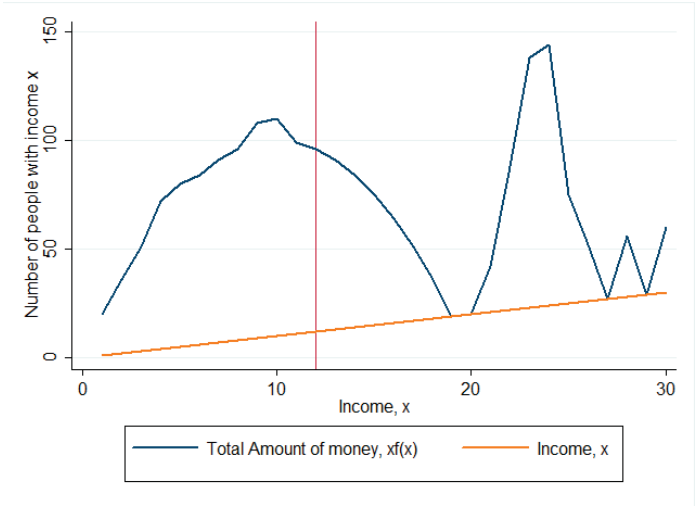

Figure C.2. Plot of Income (x) and Total Amount of Income (xf(x))

having each income level. Whenever $xf(x)$ is tangent to the income curve, only one individual earns said income. If the vertical line is q, then the area to the right of the line and below the curve is the amount of pooled income between all individuals who have income greater than or equal to q.

The mean income of the population with an income greater than or equal to q can be found by dividing the total amount of income of individuals with income greater than q by the total amount of individuals with income greater than q, or Equation C.5 by Equation C.4:

$$\bar{x} = \frac{\int_q^\infty xf(x)\,\mathrm{d}x}{Y} = \frac{\int_q^\infty xf(x)\,\mathrm{d}x}{\int_q^\infty f(x)\,\mathrm{d}x} \tag{C.6}$$

By definition, $Y = Ax^{-v}$, and so $f(x)$, the number of people with income x is equal to:

$$y = \frac{dY}{dx} = \frac{-Av}{x^{-v-1}} \tag{C.7}$$

Substituting Equation C.7 for $f(x)$ into Equation C.6 yields:

$$\bar{x} = \frac{\int_q^\infty x(\frac{-Av}{x^{v+1}})\,\mathrm{d}x}{\int_q^\infty \frac{-Av}{x^{v+1}}\,\mathrm{d}x} = \frac{-Av}{-Av}\frac{x^{1-v}}{1-v}\frac{v}{x^v} = \frac{xv}{1-v} \tag{C.8}$$

To estimate Equation C.8 I set x equal to the lower bound of the open category, and estimate v using a quartile method, where a is the log of the lower bound of the penultimate category, b is the log of the lower bound of the top category, c is the sum of the frequencies in the top two categories and d is the frequency of the top category, and the quartile estimator of v is:

$$v = \frac{c - d}{b - a} \tag{C.9}$$

C.2 Tables

Table C.5.: Effect of Membership on Income, interval regression

	(1)	(2)
membership	0.0297**	0.0441***
	(0.013)	(0.017)
membership sq	-0.00194	-0.00192
	(0.002)	(0.002)
PSC	0.0322	0.0686*
	(0.025)	(0.036)
PSC#membership		-0.019
		(0.012)
age	0.137***	0.137***
	(0.006)	(0.006)
age sq	-0.00142***	-0.00142***
	(0.000)	(0.000)
sex	-0.657***	-0.657***
	(0.021)	(0.021)
black	-0.180**	-0.180**
	(0.070)	(0.070)
other race	-0.0815	-0.0839
	(0.066)	(0.066)
high school	0.394***	0.392***
	(0.036)	(0.036)
junior college	0.601***	0.599***
	(0.054)	(0.054)
bachelor	0.800***	0.800***

	(0.043)	(0.043)
graduate	0.988***	0.986***
	(0.049)	(0.049)
european	-0.0782	-0.0769
	(0.076)	(0.076)
canadian	-0.159	-0.158
	(0.102)	(0.102)
asian	-0.111	-0.109
	(0.114)	(0.114)
hispanic	-0.127	-0.126
	(0.089)	(0.089)
caribbean	-0.0552	-0.0556
	(0.147)	(0.147)
other ethnicity	0.0348	0.0344
	(0.110)	(0.110)
american indian	-0.112	-0.111
	(0.082)	(0.082)
arabic	-0.131	-0.125
	(0.219)	(0.220)
only american	0.0906	0.0913
	(0.090)	(0.090)
non US born	-0.00745	-0.0065
	(0.044)	(0.044)
catholic	0.0183	0.0181
	(0.026)	(0.026)
jewish	0.222***	0.221***
	(0.069)	(0.069)
other religion	-0.0215	-0.0211
	(0.035)	(0.035)

middle atlantic	-0.0953*	-0.0949*
	(0.050)	(0.050)
e. nor. central	-0.128***	-0.128***
	(0.047)	(0.047)
w. nor. central	-0.147***	-0.148***
	(0.053)	(0.053)
south atlantic	-0.173***	-0.172***
	(0.048)	(0.048)
e. sou. central	-0.183***	-0.182***
	(0.061)	(0.061)
w. sou. central	-0.138**	-0.137**
	(0.054)	(0.054)
mountain	-0.195***	-0.195***
	(0.059)	(0.059)
pacific	-0.081	-0.0814
	(0.050)	(0.050)
size	2.48e-05***	2.49e-05***
	(0.000)	(0.000)
year	0.00393***	0.00393***
	(0.001)	(0.001)
constant	0.0398	0.0275
	(2.623)	(2.623)
lnsigma constant	-0.153***	-0.153***
	(0.013)	(0.013)
observations	8,461	8,461

robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table C.6.: Differentiated Memberships Effect on Income, Interval Regression

		(1)	(2)
fraternal	0.103***	0.122***	
	(0.035)	(0.042)	
service	0.0636*	0.0759**	
	(0.034)	(0.038)	
veteran	0.0203	0.0258	
	(0.039)	(0.046)	
political	-0.0438	-0.0494	
	(0.054)	(0.061)	
labor union	0.304***		
	(0.026)		
sport	0.0851***	0.0908***	
	(0.027)	(0.030)	
youth	-0.0367	-0.0147	
	(0.037)	(0.043)	
school	-0.171***	-0.197***	
	(0.032)	(0.037)	
hobby	-0.0865**	-0.0876**	
	(0.036)	(0.041)	
greek	0.0579	0.06	
	(0.043)	(0.048)	
national	0.0422	0.0444	
	(0.052)	(0.062)	
farm	-0.118*	-0.182**	
	(0.067)	(0.079)	
literature	-0.112***	-0.111***	

	(0.037)	(0.040)
professional	0.279***	0.318***
	(0.030)	(0.033)
religious	-0.0534**	-0.0702**
	(0.025)	(0.028)
other membership	-0.0596*	-0.0589
	(0.036)	(0.040)
age	0.137***	0.137***
	(0.006)	(0.006)
age sq	-0.00142***	-0.00142***
	(0.000)	(0.000)
sex	-0.595***	-0.596***
	(0.022)	(0.025)
black	-0.179**	-0.223***
	(0.070)	(0.084)
other race	-0.0756	-0.0889
	(0.067)	(0.073)
high school	0.389***	0.424***
	(0.036)	(0.042)
junior college	0.588***	0.626***
	(0.054)	(0.062)
bachelor	0.743***	0.781***
	(0.044)	(0.050)
graduate	0.863***	0.917***
	(0.053)	(0.061)
european	-0.0663	-0.104
	(0.076)	(0.092)
canadian	-0.147	-0.210*
	(0.102)	(0.122)

asian	-0.0691	-0.112
	(0.116)	(0.132)
hispanic	-0.107	-0.155
	(0.088)	(0.105)
caribbean	-0.0767	-0.141
	(0.157)	(0.190)
other ethnicity	-0.012	-0.0486
	(0.111)	(0.128)
american indian	-0.102	-0.124
	(0.082)	(0.096)
arabic	-0.0798	-0.179
	(0.240)	(0.254)
only american	0.103	0.106
	(0.088)	(0.106)
non US born	-0.0156	-0.000282
	(0.046)	(0.052)
catholic	0.00174	-0.00123
	(0.026)	(0.030)
jewish	0.249***	0.258***
	(0.070)	(0.075)
other religion	-0.0316	-0.0287
	(0.036)	(0.041)
middle atlantic	-0.0895*	-0.104*
	(0.050)	(0.058)
e. nor. central	-0.117**	-0.154***
	(0.047)	(0.055)
w. nor. central	-0.118**	-0.138**
	(0.053)	(0.061)
south atlantic	-0.125***	-0.159***

	(0.048)	(0.054)
e. sou. central	-0.131**	-0.143**
	(0.062)	(0.068)
w. sou. central	-0.0649	-0.0737
	(0.054)	(0.060)
mountain	-0.147**	-0.169***
	(0.059)	(0.065)
pacific	-0.0574	-0.0692
	(0.050)	(0.057)
size	2.20e-05**	2.05e-05*
	(0.000)	(0.000)
year	0.00537***	0.00553***
	(0.001)	(0.001)
constant	-2.923	-3.225
	(2.596)	(2.885)
lnsigma constant	-0.170***	-0.135***
	(0.013)	(0.014)
observations	8,076	6,764

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

age age sq i.degree sex i.race i.religs i.born i.ethnic

Table C.7.: Effect of Membership on Income, Union Separated

membership	-0.00153	0.012
	(0.013)	(0.016)

membership sq	0.000677	0.000675
	(0.002)	(0.002)
PSC	0.0277	0.0588*
	(0.025)	(0.034)
PSC#membership		-0.0177
		(0.013)
labor union	0.290***	0.291***
	(0.025)	(0.025)
age	0.134***	0.134***
	(0.006)	(0.006)
age sq	-0.00139***	-0.00139***
	(0.000)	(0.000)
sex	-0.638***	-0.638***
	(0.021)	(0.021)
black	-0.192***	-0.192***
	(0.069)	(0.069)
other race	-0.0975	-0.1
	(0.064)	(0.064)
high school	0.404***	0.403***
	(0.036)	(0.036)
junior college	0.626***	0.624***
	(0.053)	(0.053)
bachelor	0.842***	0.841***
	(0.043)	(0.043)
graduate	1.019***	1.017***
	(0.049)	(0.049)
european	-0.0633	-0.0622
	(0.075)	(0.075)
canadian	-0.141	-0.141

	(0.101)	(0.101)
asian	-0.0681	-0.0657
	(0.112)	(0.112)
hispanic	-0.119	-0.118
	(0.087)	(0.088)
caribbean	-0.0401	-0.0406
	(0.144)	(0.144)
other ethnicity	0.0389	0.038
	(0.107)	(0.107)
american indian	-0.102	-0.101
	(0.081)	(0.081)
arabic	-0.108	-0.103
	(0.217)	(0.218)
only american	0.0736	0.0743
	(0.090)	(0.090)
non US born	-0.0135	-0.0123
	(0.044)	(0.044)
catholic	0.00986	0.00958
	(0.026)	(0.026)
jewish	0.243***	0.242***
	(0.069)	(0.069)
other religion	-0.0235	-0.0231
	(0.035)	(0.035)
middle atlantic	-0.0910*	-0.0903*
	(0.050)	(0.050)
e. nor. central	-0.121***	-0.121***
	(0.047)	(0.047)
w. nor. central	-0.123**	-0.123**
	(0.053)	(0.053)

south atlantic	-0.133***	-0.132***
	(0.048)	(0.048)
e. sou. central	-0.134**	-0.133**
	(0.061)	(0.061)
w. sou. central	-0.0885	-0.0878
	(0.054)	(0.054)
mountain	-0.166***	-0.165***
	(0.059)	(0.059)
pacific	-0.0671	-0.0672
	(0.050)	(0.050)
size	2.24e-05**	2.24e-05**
	(0.000)	(0.000)
year	0.00442***	0.00441***
	(0.001)	(0.001)
constant	-0.935	-0.94
	(2.609)	(2.609)
lnsigma constant	-0.160***	-0.160***
	(0.013)	(0.013)
observations	8,411	8,411

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table C.8.: Control Function

	(1)	(2)
first stage	second stage	
membership		0.180**

		(0.088)
residual		-0.178**
		(0.088)
PSC	-0.0193	0.0135
	(0.040)	(0.025)
labor union	0.306***	0.243***
	(0.059)	(0.036)
cannot trust	-0.253***	
	(0.038)	
depends trust	-0.272***	
	(0.091)	
age	0.0139**	0.131***
	(0.006)	(0.006)
age sq	-8.95E-05	-0.00137***
	(0.000)	(0.000)
sex	-0.0032	-0.631***
	(0.036)	(0.022)
black	0.15	-0.224***
	(0.117)	(0.072)
other race	-0.043	-0.0874
	(0.113)	(0.065)
high school	0.615***	0.280***
	(0.044)	(0.067)
junior college	1.098***	0.427***
	(0.090)	(0.112)
bachelor	1.656***	0.528***
	(0.067)	(0.158)
graduate	2.283***	0.592***
	(0.097)	(0.214)

european	0.213*	-0.118
	(0.129)	(0.080)
canadian	0.0771	-0.176*
	(0.171)	(0.102)
asian	0.0126	-0.0549
	(0.201)	(0.112)
hispanic	0.0825	-0.153*
	(0.150)	(0.089)
caribbean	0.0305	-0.0291
	(0.216)	(0.145)
other ethnicity	0.347*	-0.0494
	(0.205)	(0.119)
american indian	-0.0271	-0.124
	(0.134)	(0.082)
arabic	-0.206	-0.0981
	(0.346)	(0.218)
only american	-0.0626	0.078
	(0.134)	(0.091)
non US born	-0.198***	0.0296
	(0.073)	(0.049)
catholic	-0.138***	0.045
	(0.044)	(0.029)
jewish	0.124	0.221***
	(0.163)	(0.072)
other religion	-0.485***	0.0615
	(0.055)	(0.056)
middle atlantic	0.0885	-0.128**
	(0.089)	(0.051)
e. nor. central	0.158*	-0.163***

	(0.085)	(0.049)
w. nor. central	0.388***	-0.206***
	(0.102)	(0.065)
south atlantic	0.206**	-0.177***
	(0.089)	(0.052)
e. sou. central	0.272***	-0.192***
	(0.104)	(0.066)
w. sou. central	0.308***	-0.165***
	(0.104)	(0.060)
mountain	0.352***	-0.269***
	(0.106)	(0.069)
pacific	0.0568	-0.0862*
	(0.090)	(0.051)
size	-4.48e-05***	3.20e-05***
	(0.000)	(0.000)
year	-0.0170***	0.00709***
	(0.002)	(0.002)
constant	34.08***	-6.233
	(4.028)	(4.029)
R-squared	0.154	
lnsigma constant	-0.167***	
observations	11,814	8,020

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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Sharon Raszap Skorbiansky is originally from Montevideo, Uruguay. She received her B.S. from the University of Maryland, College Park in Economics with a concentration in International Development and Conflict Management. As an undergrad she interned at The Tax Foundation, the Board of Governors of the Federal Reserve System, Federal University of Viçosa and International Food Policy Research Institute. She was also a research assistant for professors both at the University of Maryland and the Hebrew University of Jerusalem. Sharon began her graduate studies as a Master's student in Agricultural Economics at Purdue University in August, 2008, and became a doctoral student in 2010. Her field of study is industrial organization, and her Ph.D. research was conducted under the supervision of Steven Y. Wu. Sharon has had several teaching experiences: she was a teacher assistant for a game theory course at the University of Maryland, the instructor for the Master's level economics for mathematics course at Purdue University, and was an adviser for the Economic Modeling and Trade Policy Workshops II and III in Kyiv, Ukraine. Beginning in January 2015, she will work as a rice market economist at National Rice Company.