SI 710 Assignment 4: Experiment Design

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1 Experiment Design

1.1 Motivation

The purpose of this study is to see how the presence of social networks affects trading patterns and, by extension, the efficiency of decentralized markets.

1.1.1 Social Network Implementation

Real world, existing friendships.

1.2 Experiment Procedure

1. Randomly assign subjects into two groups, treatment and control. (Please refer to section "Subjects, Control and Treatment")

2. Elicit network of treatment group (Please refer to section "Network Elicitation Method")

3. Computer based trading: treatment with real ID; control with changing fake ID. Subject can post unbinding offers publicly but they can negotiate (private chatting) as well. (Please refer to section "Market mechanism")

4. At the end of each round, subject will observe the average price or distribution(we can discuss which one is better) (just like "truecar.com")

5. Subject will be reward the surplus they earned in the experiment.

1.2.1 Subjects, Control and Treatment

The experiment will be run in a computer-based trading setting among a class of undergraduate students, such as ECON 102. The main advantage of the selected group of subjects is the easy access and the fact that we would not need parental consent. This course is chosen since it is still a mass course and provides students with enough time to establish a network in college. Hence, the measured social network will be the existing friendship network among students.

In order to measure the importance of social networks on decentralized competitive markets and the choice of trading partners, subjects are randomly selected from the course and assigned into two groups of 25 individuals. The size of each group is selected to make the elicitation mechanism possible. (if not it is too long)

In the treatment group, students are identified with their real names which implies that the subjects are able to recognized trading partners with whom they have a closer social relationship. After the trading experiment is run, the social network of the treatment group is going to be elicited. In the control group, subjects are not identified and are randomly assign with a fake ID. Note that in both groups, the market design is identical except from the fact that in one group subjects are identifiable whereas in the other they are not.

The choice of this methodology allows us to identify how the social network influences the trading patterns among subjects. We expect that subjects are more likely to trade with individuals who belong to their social network.

1.3 Market Mechanism

We are focusing on a computer based double auction environment. The ask and bid offers are going to be posted in a publicly available fashion. In contrast to the transparency of the prices, agents will be able to privately chat and negotiate. The transactions will be realized once both parties agree on it. We will let sellers to have multiple units, whereas buyers are looking for one unit of good to purchase. The parties will be charged a small amount that will be determined with respect to the round of negotiations they make through private chatting.

1.4 Network Elicitation Method

Given the contextual setting of lab-experiment, we are restricted to a network of at most 25 subjects (max capacity of the lab in North Quad), which makes a thorough elicitation of the social network possible. The goal is to elicit the social network of subjects (both in control and treatment groups) as complete and detailed as possible, with an emphasis of measuring the strength of ties, i.e. acquaintances (weak ties), close friends (strong ties), *etc.*

Inspired by Alan's experiment design, we here have experimenter nominate each subject one at a time, and have the rest of subjects fill up a survey composed of the following list of questions:

1. How would you evaluate your relationship with him/her:
   (a) barely know each other;
   (b) acquaintances;
   (c) close friend;

   (Note here, Linfeng has omitted the category of "friends".)
2. What is his/her major?

   A drop-down manual shall follow this question;
3. Where does him/her come from?

   Open question box, and later we can check the matches at various levels (State, region, county and score the matches.)
4. Are you in the same study group with him/her?
5. Are you two in the same class other than Econ 102?
6. What is him/her favorite (pick any one, or more, from the following)
   (a) movie;
   (b) TV Show
   (c) book
7. TBD (may need to refer to Alan's questions for inspiration).

This list of questions shall compose a length of one-full-screen that suits the computers in the lab.

1.4.1 Incentive structure

Minimum incentive shall be provided, so as not to interfere with the market game. Details to be settled when the full "market game" is settled, from which we may calculate the expected payoff. As of now, I can only expect the total payment from answering the survey to be less than, say, two dollars.

1.4.2 Experimenter effect

It should be well stated that, although the true names were used in the survey and the market experiment (for treatment group), the experimenters will only access the data through numeric IDs. This needs to be stated in a trust-worthy way, so that the subjects do buy the argument and shall answer truthfully to the "friendship survey".

1.5 Hypothesis and Testing

1.5.1 Hypotheses

Hypothesis 1 Subjects will be more likely to trade with individuals who are in their social network.

Hypothesis 2 Bargaining costs will be lower when access to social networks is available.

Hypothesis 3 Efficiency will be higher in homogeneous good markets when networks are available. This is expected to be due to lower trading costs.

Hypothesis 4 Price dispersion will be greater in markets where social networks are available. In other words, the Law of One Price is less likely to hold.

Hypothesis 5 Surplus will be split more equally in markets with social networks.

Hypothesis 6 Friends with stronger "ties" will trade more items than friends with weak "ties", if anything at all.

1.5.2 Testing Hypothesis

Hypothesis 1 Utilizing the elicited network, compute the frequency to within network transaction of treatment group, compare it with no network effect probability.

Hypothesis 2 Compute means and standard deviations of bargaining time of control group, treatment group (a.total transactions; b.transactions within network; c. transactions outside of network), then calculate p-value to check statistic significance.

Hypothesis 3 Compute total surplus achieved in each round in both control and treatment, then calculate the statistic difference of these two.

Hypothesis 4 Compute means and standard deviations of price dispersion in each round of control group, treatment group (a.total transactions; b.transactions within network; c. transactions outside of network), then calculate p-value to check statistic significance.

Hypothesis 5 Compute means and standard deviations of surplus splitting ratio (sell surplus/buyer surplus) in each round of control group, treatment group (a.total transactions; b.transactions within network; c. transactions outside of network), then calculate p-value to check statistic significance.

2 Notes from Lecture 7 on Feb 15, feedbacks + thoughts

2.1 Feedback on the experiment design proposed as draft

Written in a tone of a group project, with a group meeting on Feb 21, 2016 in head.

2.1.1 Problems

1. How to let the subjects in the treatment group recognize their friends?
   - If through photos, then other traits shall penetrate: say, girls would like to trade with girls, and boys may offer discount for beautiful ladies & *vise versa*.
   - $\Longrightarrow$ maybe, we may use the real names to for agents to recognize each other?

     May consider introduce the confounding "human-recognition" step-by-step:

     (a) For Treatment Group I: use only the name;

     (b) For Treatment Group II: use name + photos (or photos only)

     To further elicit the effect of photos, may:

     (c) Introduce another control group, where agents with random IDs are identified through (randomly assigned?) photos.
2. What would the chatting channel brings:
   - Chatting feature may introduce various confounds[1]. Two ways out:

     (a) Implement the chat feature in full, and adopt NLP (natural language processing)?

     (b) Remove the chat feature, and let agents only interact through numeric bids Maybe we can have a hypothesis about chatting.
3. Alan's list of questions: missing

[1] Chatting is already costly via:

(a) they might miss a good price in the market while chatting

(b) they might be embarrassed to ask for a lower/higher price

- Emails sent to Alan echoed no reply. We may need to prolong the network-eliciting survey together.

4. Could other measure of the elicited network matter for trading patterns?
   - Had the agents been able to trade more than one good, will the distribution of deals be more evenly spread when the set of agents involved in the trade belong to a more **dense** network?
   - Given this, does the clustering, and diameter of network matter, when we are observing a vivid market with multiple friends trading?
5. How to make 24 participants appear?
   - The amount that will be paid to the participants for an hour, should in expectation be equal to the hourly wage of tutoring (depends on the participant pool, what the alternative occupation wage would be?)
   - Also, people usually put more effort into the experiment when they are negotiating over larger amount of money, so maybe let's have high numbers/valuations/prices and let's do the payments in laboratory units.
6. Maybe put a restriction of, say 10 rounds of negotiating through chatting, instead of the cost that is imposed for the private chatting rounds.
7. We expect a convergence-how many rounds should we have in each session?