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A guided tour to (real-life) social network elicitation

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Abstract

Limited attention has been devoted on how (real-life) social networks are elicited and mapped, even less from the viewpoint of mechanism design. This paper surveys the few mechanisms that have been proposed by the experimental literature to this purpose. These mechanisms differ in their incentive structure, as well as in the means of reward they employ. We compare these elicitation devices on the basis of the estimated differences in the characteristics of the induced networks, such as the number of (mutual) links, correspondence and accuracy. Our main conclusion is that the *elicited network architecture is itself dependent on the nature (and the structure) of the incentives*. This, in turn, should provide the social scientist with guidelines on the most appropriate device to use, depending on the research objectives.

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Introduction

There is a growing literature that highlights the importance of the *structure* of *social networks* in our social and economic life. These works explore how social networks influence people's behavior in a wide variety of economic settings, from job search to information transmission within firms.[1] Consequently, being able to properly map the structure of a network becomes crucial in understanding how network architecture influences individual behavior and, vice versa, what is the impact of individuals' decisions on the social network's structure and performance.

The aim of this paper is to survey the experimental literature that employs various mechanisms to elicit *real* (rather than *fictititous*, or artificially created in the lab) social networks. These mechanisms vary from simple surveys (in which subjects are just requested to name their friends in various manners, without incentives) to (slightly) more sophisticated devices in which network elicitation takes place under simple incentive schemes, designed to induce subjects to truthfully reveal the network of their social relationships. These mechanisms employ heterogeneous means of reward (from monetary incentives, to exam grades) and rely on different (strategic) coordination devices.

The basic messages of this paper are that

i) friendship is a rather subjective domain, in that individuals may perceive their social ties asymmetrically, as well as of a different intensity. This, in turn, makes the exercise of network elicitation subject to significant *measurement errors*;

ii) when economic incentives are employed -not surprisingly- *the elicited network architecture is itself dependent on the nature (and the structure) of the incentives.* This, in turn, provides the social scientist with guidelines on the most appropriate device to use, depending on the research objectives.

[1] See the excellent surveys of Vega-Redondo [19], Goyal [12] and Jackson [13].

The remainder of the paper is arranged as follows. Section 1 briefly describes the various devices employed for real-life social network elicitation, while in Section 2 we look at their differences from the viewpoint of mechanism design, by comparing the incentive structures of the induced game-forms. Section 3 reports our empirical findings on the features of the induced networks, confirming our main conjecture: *network architecture is indeed dependent on characteristics of the elicitation device*. Finally, Section 4 concludes, followed by an Appendix containing additional information on the experimental design and the graphs of some representative networks.

1 Network elicitation mechanisms

This section describes the most popular devices for network elicitation, ordered (increasingly) by their complexity. Starting from non incentivized surveys, we move toward simple strategic schemes in which network elicitation is rewarded by different means and relies on different coordination patterns.

Hypothetical surveys (HYPS)

Most of the concepts we know about social networks comes from Sociology and strongly relies on non-incentivized elicitation mechanisms, which simply consist in asking subjects to list their friends (see, among others, Barabasi and Albert [1]).

The combination of survey and behavioral data has been extremely useful to study, for instance, the interplay between social connections and behavioral traits among teenagers: consumption of marijuana, educational aspiration levels, political orientation, crime. etc... . These studies have been useful in understanding people's tendency to connect with those who display similar behavioral traits, namely, *homophyly* (see Jackson and Rogers [14]); and the strong preference for *cliques*: individuals prefer to link with those who are already linked to each other (see Goeree *et al.* [11]).

Benefit-Your-Friend (BYF, Brañas-Garza et al [3])

In essence, BYF is *a survey with social incentives*, in the sense that subjects do not receive any direct reward by naming a friend, but give some chance to the latter to get something out of the fact of being named. This protocol for network elicitation is extremely simple: subjects are asked to write down the name of their friends from the same undergraduate class on a piece of paper, since, as stated in the instructions, "*there is a chance that one of them will be later benefited in the experiment*". No further information is provided at this stage on the type of decisions subjects would make afterwards, or what these future benefits for the elicited friends would be.

In other words, BYF aims at revealing the identity of "close" friends. The instructions clearly state that subjects might be given the chance to benefit "*only one of their friends*", randomly selected from their elicited list. Therefore, the higher the number of friends they list, the lower the chance of benefiting any one of them.

Coordination Game I (COORD-I, Leider *et al.* [16])

The first attempt of an incentivized mechanism for network elicitation is that of Leider *et al.* [16]. Its challenging results motivated this literature, whose aim is to use economic incentives to induce subjects to reveal "truthfully" the complex network underlying their social relations.

In their paper, Leider *et al.* [16] develop an elicitation protocol based on a simple coordination game, we call it COORD-I, with the following rules:

1. Participation is voluntary, with recruitment conducted via the Internet.
2. COORD-I is a coordination game by which each subject has to pick up the name of her friends from a list of students of two university dorms, together with an estimate of the time spent together with each of them.
3. The outcome function is as follows: all links are checked, yielding a lottery by which subjects are rewarded with a prize of 50 USD cents with a 50% chance if the link is reciprocated, and nothing otherwise. If the difference in the reported time spent together (per week) is lower than one hour, the winning probability is raised to 75%.

Coordination Game II (COORD-II, Cobo-Reyes and Jiménez [7])

Cobo-Reyes and Jiménez [7] employ a mechanism, COORD-II, that can be thought as an intermediate device between BYF and COORD-I. Like in BYF, only one link is checked at random for payment; like in COORD-I, a link is rewarded only if it is reciprocated with sufficiently close "precision ".

The game-form of COORD-II is as follows. Students are asked to reveal the full names of their friends in their undergraduate class, jointly with a subjective evaluation ("strength") of each relationship. Let s_{ij} define the strength reported by i to the ij relationship, framed in the experimental instructions as follows: $s_{ij} = 1$: j is a person i "hardly knows"; $s_{ij} = 2$: j is "an acquaintance"; $s_{ij} = 3$: j is "a friend"; $s_{ij} = 4$: j is "a close friend". Finally, if subject i does not name subject j, let $s_{ij} = 0$. As for the outcome function, subjects receive a prize if one of the following two cases holds:

Case 1 they *do not name* anybody, or

Case 2 they *name at least one* subject. In this case, one of the elicited links is checked at random (each link being selected with equal probability). Let $\hat{\jmath}$ denote the subject associated with the randomly selected link. Subject i receives the prize if both rules are satisfied:

- **R1**: also $\hat{\jmath}$ has also named i as a friend (i.e. only if $s_{\hat{\jmath}i} \neq 0$);
- **R2**: friendship strength should also be sufficiently *accurate*, since, to ensure payment, the difference in the reported strengths should not be higher than 1: $D_{i\hat{\jmath}} = |s_{i\hat{\jmath}} - s_{\hat{\jmath}i}| \leq 1$.

Case 1 corresponds to an "exit-option" we shall discuss more in depth in Section 2, while Case 2 recalls the coordination device employed in COORD-I.

To sum up, COORD-II modifies COORD-I along the following dimensions.

a) First, subjects play the elicitation protocol *simultaneously*, that is, they have basically no possibility to coordinate their actions (something that can easily done in COORD-I, where elicitation takes place via Internet, with absolutely no control on the experimenter's behalf).

b) Recruitment in COORD-II is not voluntary, as network elicitation takes place during regular teaching sessions (or even during final exams (treatment TP, see details below). This allows (almost) full participation of the social group under scrutiny, as voluntary recruitment may imply self-selection issues affecting the network mapping through channels outside the experimenter's control.[2]

c) In addition to the standard written consent, to further preserve our subjects' rights of privacy that may be infringed by the non-voluntary recruitment protocol (*a fortiori*, when elicitation takes place during a regular exam), an "exit option" is introduced (CASE 1) *built in the same system of incentives.*

Through this exit option, subjects could ensure the maximum material payoff by simply abstaining from naming any friend. As will shall see in Section 3, introducing such a drastic rule seems to have a marginal impact in subjects' willingness to reveal the identity of their close friends, except in the treatments with no rewards. This is surely one of the most interesting findings of this paper. We shall interpret this evidence in Section 2 by appealing to subjects' *social preferences.*

d) COORD-II allows to assess the effect of changes in the means of reward, as it comes with three alternative treatments, depending on the nature of the prize. The baseline treatment, TP, involves the use of 1 extra-credit point (out of 10) in the final exam grading; in treatment TM the prize corresponds to 5 €; while in treatment TN there is no prize at all. In Section 3 we shall report on three networks collected under treatment TP -TP1 to TP3 - with 53 (289 links), 51 (165 links) and 31 (152 links) subjects, respectively; three networks TM -TM1 to TM3- with 39 (102 links), 65 (138 links) and 71 (160 links) subjects, respectively, and a unique TN network, with 40 subjects (103 links).

2 Theoretical conjectures

Coordination and symmetry

We have already noticed that both COORD-I and COORD-II -as opposed to HYPS and BYF- reward reciprocal elicitation. Even more, using two different devices (one more "objective", as time spent together, one more

[2]Voluntary participation was still ensured by the fact that all subjects were asked to give their written consent (and, therefore, they could still refuse to participate in the experiment).

"subjective", as an individual assessment of the "strength" of the relationship), both mechanisms provide incentives to elicit *symmetric* relationships (i.e., relationships that are perceived as similar by both parties involved). This is natural for any elicitation device based on coordination, where we expect subjects to disregard links that may be lived of a different intensity by either party. Whether asymmetric relationships play a role in the topics object of study by the cited papers is open to discussion. Nevertheless, *we expect asymmetric relationships to be underestimated* by any elicitation device that relies on coordination.

All links *vs.* 1

As we already discussed, one important difference between COORD-I and both BYF and COORD-II is that, in the former, all elicited links are payoff relevant, instead of just one, picked at random. This, in turn, implies that, in COORD-I, *expected monetary payoffs are increasing in the number of elicited links.* In other words, COORD-I is meant to map a social network "as dense as possible". Given this design feature, we expect subjects to name as many friends as possible, not just very close ones. By contrast, both BYF and COORD-II limit to one the number of checked links, forcing subjects to disregard their "marginal" social relationships (i.e., "acquaintances").

Social preferences I: unconditional altruism.

As we mentioned in Section 1, in BYF subjects do not receive a reward by naming a friend. Instead, they grant the latter with the possibility of a future reward. Therefore, the extent to which BYF may outperform HYPS lies in the degree of *unconditional altruism* (see, e.g., Cox *et al.* [8]) subjects hold with respect to their friends, that may be exploited by the eliciting device.

Social preferences II: guilt aversion

As we described in Section 1, by Case 1, COORD-II allows for the possibility of ensuring the full prize by simply not naming anybody. This rule of the game-form was, in some sense, dictated by ethical issues, since very personal information was collected during the standard activities of an undergraduate class (even more in the case of TP, which was administered during the final exam). This consideration notwithstanding, one may argue that this "exit option" may induce subjects to severely underreport their friendship network. In game-theoretic terms, under "selfish preferences" (i.e., assuming that subjects are only concerned in maximizing the probability of winning the prize), Case 1 yields a weakly dominant strategy of the induced game, since it guarantees maximal monetary payoff, independently of the others' behavior. On the other hand, we can conjecture that the impact of CASE 1 could be significantly reduced if subjects hold *social preferences* (i.e., if they are also concerned about the monetary payoffs of their friends). The argument is straightforward: if subjects hold sufficiently strong beliefs that they would be named by their friends, not reciprocating them will turn them down. To the extent to which subjects exhibit *social preferences* (in the special form of guilt aversion, see Charness and Dufwenberg [6]) this breaks weak dominance of Case 1 (although a strategy profile in which everybody conforms to Case 1 still remains a strict Nash equilibrium of the induced game, not necessarily the most efficient one).[3]

"In media stat virtus"

Given Rule 2 of COORD-II, $s_{ij} = 4$ (1) is weakly dominated by $s_{ij} = 3$ (2), $\forall j$. The reason is that if i decides to name subject j with $s_{ij} = 3$, R3 will be satisfied whenever subject j names subject i with $s_{ji} > 1$ (instead $s_{ji} > 2$, as it happens with $s_{ij} = 4$). By the same token, $s_{ij} = 1$ is weakly dominated by$s_{ij} = 2$.

In other words, subjects have no incentive to label people as "close friends", or people they "hardly know", as less extreme statements adapt more efficiently to the degree of flexibility granted by **R2**. As we shall see, this -relatively straightforward- strategic clause has different impact depending on the means of reward.

Different means of reward

As we discussed, COORD-II is played under three increasing levels of incentives: *no reward* (TN), *monetary reward* (TM, 5 €) and *class points* (TP).[4]

[3]It can be shown that the above argument is not restricted to guilt aversion, but is applicable to a wider class of social preferences functionals, such those, for example, of Fehr and Schmidt [9], Bolton and Ockenfels [2] or Sobel [18].

[4]A rough calculation shows that an extra point may be much more valuable than 5 €. In Spain, students pay tuition fees per credit. The fee for a 6-credit subject (1 credit =

We conjecture (and find) that increasing the value of the prize amplifies the effects of the strategic properties of COORD-II.[5]

3 Results

This section report the main estimated differences in the network characteristics. We first look at links per capita (out-degree) in Section 3, moving then to links' correspondence and strength (Section 3).

Links per capita

Figure 1 compares the number of links per capita in Kovarik *et al.* [15] using BYF in a network of 291 students with Brañas-Garza *et al.*'s [4] network, elicited by way of HYPS in a network of 208 individuals.

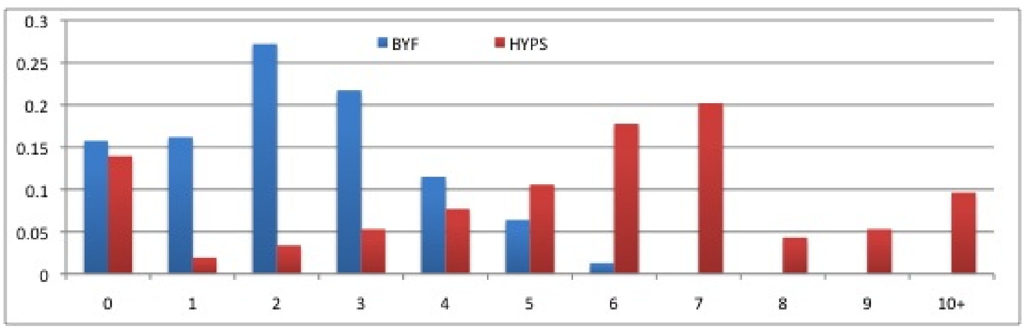

Figure 1: Average distribution of out–degree by subjects: BYF vs HYPS.

As Figure 1 shows, BYF yields a network with a lower number of links per capita. Interestingly, this does not translate into differences in terms of

10 hour), such as Micro II at the University of Granada, is approx. 60 €.. Given past exam history, we can estimate at approximately 15% the ex-ante probability of a student obtaining a grade between 4 and 5, that is, a grade for which 1 additional point would be crucial for passing the exam; and another 5% the ex-ante probability of receiving a grade of 8 to 9, that is, a grade for which 1 additional point more would imply Distinction, which in the Spanish university system implies 6 free credits in the following academic year. As rough as this calculation may be, this adds up to a 20% probability of the extra-point being worth 60 euros, with an expected benefit of $0.2 \times 60 = 12$ euros.

[5]We provide in the Appendix a sample of network maps for each treatment, together with some classical measures extracted from these graphs.

corresponded links, where relative frequencies sum up to 42.5% and 39% for HYPS and BYF, respectively.[6]

Figure 2 reports COORD-II's sensitivity to variations in the mean of rewards: points (TP), money (TM) or nothing (TN), with respect to the estimated out-degree.

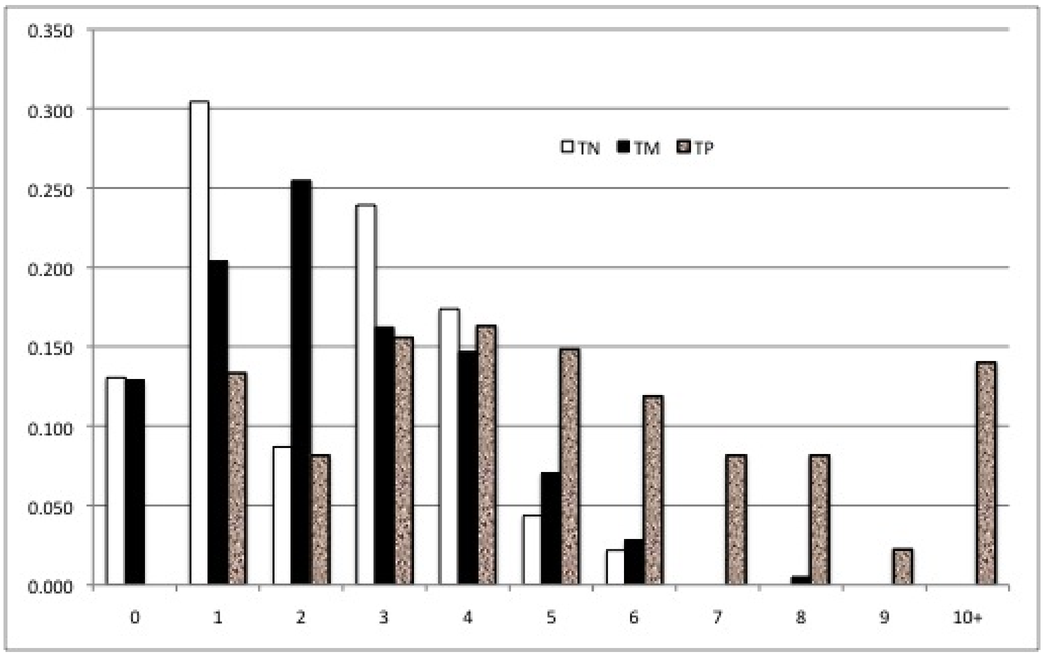

Figure 2: Average distribution of out–degree by subjects and incentive schemes. In the x-axis *10+* refers to subjects who sent 10 or more links.

Notice that, in TP, the distribution of links is more uniform than in TM. Also, the maximum number of links is higher in TP than in TM.

Another interesting finding is that about 10% of the participants do not name anybody in both TM and TN. This is the same percentage we found for BYF and HYPS (see Figure 1). Surprisingly, we find that *nobody in TP opt for the "safe" option of naming no friends*, thus ensuring the prize.

We also see that TN and TM are not that different in terms of friends per capita ($z = 0.399$; $prob = 0.6897$ two-tailed test) whether TP is distinct,

[6]Brañas-Garza et al [5] uses the same device but the sample is quite small (n=53. These subjects listed 2.79 friends on average and the correspondence level was 50.1.

as it provides a larger number of links [TP vs. TM $z = 6.502$ ($prob$ = 0.000, one-tailed) and TP vs. TN $z = 6.930$ ($prob = 0.000$, one-tailed test)]. We conjecture that this is a direct consequence of the incentives scheme: *guilt aversion is larger in the case of points*, the most valuable prize across treatments.

A simple summary of average results (pooling data from different treatments) indicates that COORD-II does not induce naming, compared with the other elicitation devices. Less than 10% of subjects name 6 or more friends while in COORD-I average and modal out-degree are 10. Although TP is the incentive scheme in COORD-II that provides more links, still it stays far away from the figures of COORD-I.

Result 1: COORD-II elicits very few links per capita compared to COORD-I.

As Figure 2 shows, nobody in TP (and a very small percentage in TM, 7%) decides to play the weakly dominant strategy of Case 1. In addition, 174 participants in TP and TM who name at least one link are reciprocated at least once. This confirms our "social preference" conjecture put forward in Section 2.

Correspondence and strength

We shall now look at the efficacy of the various devices in obtaining mutual links as a proxy of their performance. Since the probability of two subjects naming each other with sufficiently close strength at random is basically null, if the rate of mutual links captured by our mechanism is high, we may think that most of the links correspond to "true" relationships.

We are also interested in looking at the extent to which the differences in the design of COORD-II, compared with COORD-I and BYF, translate into differences in the estimated link correspondence. Recall that the main differences between COORD-II and COORD-I is that the former provides an exit option (CASE A) and, in general, lower incentives to name many friends (given the fact that only one link is paid off). Therefore, we expect COORD-II to capture "strong" relations, with average elicited links lower than in COORD-I. Regarding the comparison between COORD-II and BYF, in the latter subjects do not lose payoff if the link they send is not reciprocated, so we also expect a lower average out-degree -and higher frequency of mutual links- in COORD-II.

Table 1 looks at the efficacy of COORD-II in obtaining mutual links in the seven networks under consideration.

	TP1	TP2	TP3	μTP	TM1	TM2	TM3	μTM	μTN
$D = 0$	180	82	98	120	37	85	74	65	3
$D = 1$	34	31	16	27	33	16	40	24	2
$D > 1$	6	2	0	3	0	2	6	2	0
Total	220	115	114	150	70	103	120	97	5
	(76%)	(70%)	(75%)	(74%)	(69%)	(74%)	(75%)	(73%)	(5%)
Not Mut	69	50	38	52	32	35	40	36	98
links	289	165	152	202	102	138	160	133	103
subjects	53	51	31		39	65	70		40

Table 1: COORD-II: link correspondence across treatments.

The first three columns of Table 1 correspond to data from TP (TP1 to TP3), while column μTP reports treatment averages. Columns 5 to 8 correspond to the TM sessions (plus treatment average), while the last column summarizes TN statistics. Corresponded links in each network are partitioned into three categories according with the difference in strength (D = 0, D = 1 and D > 1).

As Table 1 shows, almost 74% and 72% of the links are reciprocated in TP and TM, respectively, while only 5% of the links are corresponded in TN.[7] Recall that COORD-I shows 37% of mutual links, while this frequency is a bit larger in case of BYF: 50% in Brañas-Garza *et al.* [3] and 42.5% in Kovarik *et al.* [15].[8] All in all, we can say that COORD-II with incentives (TP and TM) provides higher correspondence than COORD-I and BYF. So, we can conclude that COORD-II is more likely to identify mutual links.

Result 2: Incentivized COORD-II elicit reciprocated relations "of close friends".

Brañas-Garza *et al.* [4] find an average degree of correspondence of 39.5% in four (HYPS) networks containing 208 students who sent 1158 links (5.56

[7]We do not find differences among treaments: TP vs TM $z = 0.160$ ($prob = 0.873$, two-tailed test) while strong differences emerge among TP vs TN $z = 9.956$ ($prob = 0.000$, two-tailed test) and TM vs TN $z = 9.834$ ($prob = 0.000$, two-tailed test).

[8]Goeere *et al.* [11] found a coordination of around 50% within a subject pool of children using a survey.

per capita).[9] This percentage is much larger than the 5% of correspondence found in TN.

Figure 3 reports the relative frequency of each strength s_{ij} across TP, TM and TN.[10]

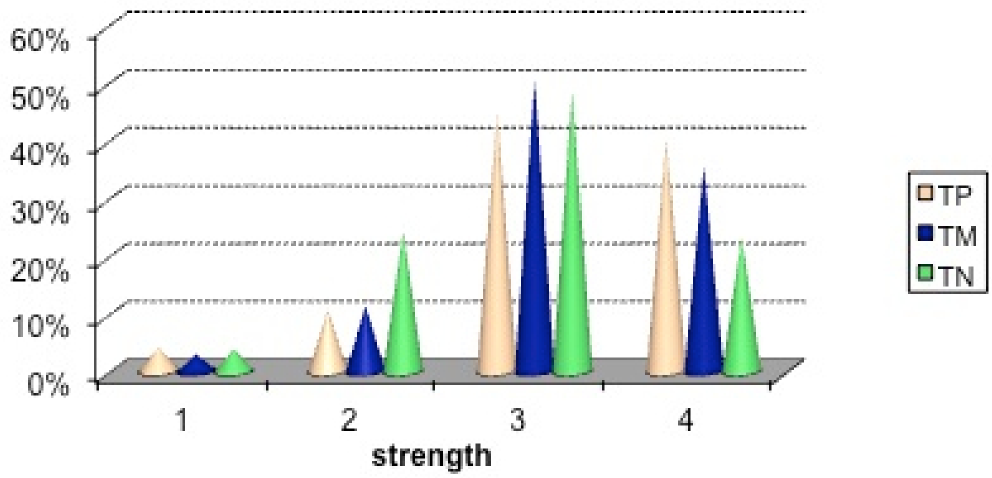

Figure 3: Average % of links corresponding to acquaintances or friends: TP, TM & TN.

As Figure 3 shows, the relative frequency of links associated with "acquaintances" ($s_{ij} = 1$ and $s_{ij} = 2$) in TP is very small (4% and 11%, respectively). Moreover, the frequencies of links associated to "friendships" ($s_{ij} = 3$) and "close friendships" ($s_{ij} = 4$) are very similar (45% and 40%, respectively).[11] Recall that $s_{ij} = 4$ is weakly dominated by setting $s_{ij} = 3$.

Regarding TM, Figure 3 shows that the links associated to "acquaintance" relations are also low (identical percentages than in TP, that is, 4% and 11%, respectively). Instead, frequencies of links $s_{ij} = 3$ and $s_{ij} = 4$

[9] Data shown in figure 1, page 9, labeled as HYPS correspond to Brañas-Garza *et al.* [3] .

[10] The displayed frequency of TP and TM is an average of the three sessions conducted for each treatment.

[11] In fact we do not find any significant difference between number of links with strength 3 and 4 in TP $z = 0.601$ ($prob = 0.548$, two-tailed test) but strong differences in TM $z = 2.473$ ($prob = 0.013$, two-tailed test).

are different (50% and 35%, respectively) and this difference is statistically significant (see footnote 11), showing that weak dominance of $s_{ij} = 3$ (see Section 2 seems more compelling in TM, while in TP social norms seem to prevail to strategic consideration (exactly as for the case of the exit option).

Result 3: COORD-II mostly captures reciprocated relations of "close friends" (especially in TP).

4 Which mechanism should we use?

This paper reports on four different devices to elicit social networks. Table 2 summarizes the main features of each of them.

	Incentives	L	Strength	Mutual	N
BYF	yes	220	0/1	45%	79
HYPS	not	1753	0/1	39%	398
COORD-I	yes	5690	0/1	37%	569
COORD-II TM	yes	133	0 to 4	74%	58
COORD-II TP	yes	202	0 to 4	74%	45
COORD-II TN	not	103	0 to 4	5%	40

Table 2: A comparison among elicitation devices

The main conclusions from Table 2 are that

1. COORD-I can be useful to obtain a graph with a high number of asymmetric links. On the other hand,

2. COORD-II seems to work better to obtain a *high percentage of mutual links*, that is, a non directed network. Moreover,

3. BYF is not very good in term of links per capita and it is modest in term of mutual links. Finally,

4. HYPS it is fairly good in terms of links per capita but moderate in terms of mutual links.

In sum, depending on the researchers' objectives, one mechanism turns out to be better than others, with no "clear winner" on all dimensions. COORD-I is better when a large network with a high number of nodes is needed and the fact that the induced network is directed (i.e., with a relatively small number of corresponded links) is not important (for example for analyzing individual behavior in non-strategic environments). By contrast, COORD-II seems more appropriate when analyzing strategic environments and games played in pairs, since, if we want to analyze how pairs of friends play a specific game, we need bidirectional links. Finally, BYF and HYPS seem to work worse than COORD-I and II COORD-II in terms of the number of links although they are easier to implement.

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Appendix 1: more on the experimental designs

COORD-II: treatments and subjects

As we just mentioned, we conducted three treatments which differed only in terms of the nature of rewards: extra-credit points (TP), a monetary reward (TM) and no incentives (TN).

In the three TP sessions (TP1, 2 and 3), subjects could gain an additional point (out of 10) for a final "bonus question" on the exam. To check the robustness of our results to the change in rewards, we also run 4 additional sessions. Sessions TM1, 2 and 3 use a monetary prize (5 €), while the last –treatment TN - uses no reward at all. Instructions for all the treatments were identical, except for the description of the outcome (reward) function. A copy of the instructions is available in the Appendix.

All the sessions were non-computerized classroom experiments conducted with subjects with no (or minimal) prior exposure to game theory. The three TP sessions were conducted in June 2004 during the Microeconomics II exam; a first-year undergraduate course in economics at the University of Jaen, Spain. We included a "special question" as an additional item on the final exam. We ran the experiment with three different classes: TP1 and TP2 with students in the Business Degree program and TP3 3 with students in the Law and Business Degree program. These three groups consisted of 51, 53 and 31 students, respectively.

The TM1 session was conducted in February 2006 at the University of Granada. The group was comprised of 39 students from Microeconomics I; a first-year course in economics. Identical first-year students are used for TM2 (February 2009) and TM3 (February 2012) with 65 and 70 students respectively.

Finally, the TN session was also conducted at the University of Granada in February 2006. The sample was composed of 40 students from Microeconomics I; a first-year course in the Business Administration program.

The format of the classroom experiment was chosen to ensure the maximum participation of the social networks under scrutiny. If subjects named friends or acquaintances who were not present at the sessions, the corresponding links were removed from the network since correspondence could not be checked.[12] This problem is due to simultaneous play in our experi-

[12] As for the TP sessions, in Net 1 (2) [3] we removed 10 (8) [12] links out of a total number of 175 (160) [289], that is, a percentage of 5.7% (5%) [4%], respectively. The rate

mental design. This feature has the advantage that subjects could not agree to name each other during the experiment. The main disadvantage is that we could only consider subjects who were present as network nodes.

COORD-II: design details[13]

Hello, you are now going to take part in an economic experiment. We thank you in advance for your collaboration. This is part of a project coordinated by a teacher from the University of Alicante who has requested your collaboration to carry it out. The aim of this experiment is to study how individuals make decisions in certain environments. The instructions are simple.

If you follow them carefully, you will receive an additional POINT TOWARDS YOUR FINAL GRADE IN MICROECONOMICS II [AMOUNT OF MONEY] confidentially at the end of the experiment.

You may ask questions at any time. To do so, just raise your hand, but do not speak. Except for these questions, any kind of communication between you is forbidden and will be cause for expulsion from the experiment.

Please write a list with the name and surname of all your friends in the class. Next to their names, you have to write a number:

1 if you hardly know him/her; 2 if he/she is an acquaintance; 3 if he/she is your friend; 4 if he/she is a very close friend.

How do I GET THE POINT [RECEIVE THE MONEY]? We will take your list and randomly choose the name of one (only one) of your friends (the ones you have mentioned). We will then look at your friend's list and see whether:

i) he/she has mentioned you and

ii) he/she has given you a similar score to the score you have given him/her (by "similar" we mean a maximum difference of one point between the two scores).

If i) and ii) are affirmative, you will win THE POINT [5 €]. If i) or ii) fails, then you will win nothing (0 POINT [0 €]).

Let me give you an example. My list is:

---

of link removal for the TM and TN sessions, Net 4 and Net 5, were much higher (both around 19%). This is because they were conducted during a regular lesson. Given that they were not run during an exam, maximum group attendance could not be guaranteed.

[13] The differences between TP and TM (TM in brackets) are highlighted in CAPITAL letters.

- Jose Pérez with a 3.
- Juan Martínez with a 4.
- Emilio López with a 1.
- Jose Antonio Rodríguez with a 2.

José Pérez is then randomly chosen from my list. The experimenter then looks at José Pérez' list and sees that he has given me a score of 4. Given that the difference in scores was just one point, I win THE POINT FOR MICROECONOMICS II [5 €]. If I had given José Pérez a score of 2 points, I would win nothing.

NOTICE 1. If you mention no-one, you also receive THE POINT FOR MICROECONOMICS II [5 €].

NOTICE 2. (about the above notice). Be aware that if you mention no-one, but someone mentions you, this may be prejudicial to him or her. In other words, a friend who mentions you would not receive THE POINT FOR MICROECONOMICS II [5€] because you didn't include him/her on your list of friends [14].

[14]For the TNI treatment, instructions were as follows:

Hello, you are now going to take part in an economic experiment. We thank you in advance for your collaboration. This is part of a project coordinated by a teacher from the University of Alicante who has requested your collaboration to carry it out. The aim of this experiment is to study how individuals make decisions in certain environments. The instructions are simple.

You can ask questions at any time. To do so, just raise your hand, but do not speak. Except for these questions, any kind of communication between you is forbidden and will be cause for expulsion from the experiment.

Please write a list with the name and surname of all your friends in the class. Next to their names, you have to write a number:

1 if you hardly know him/her; 2 if he/she is an acquaintance; 3 if he/she is your friend; 4 if he/she is a very close friend.

Thank you very much.

Appendix 2: Map of networks across different means of rewards

Figures 4 to 6 show the structure of some example of networks obtained using the different devices. Particularly we display the networks for TP2, TM1 and TN.

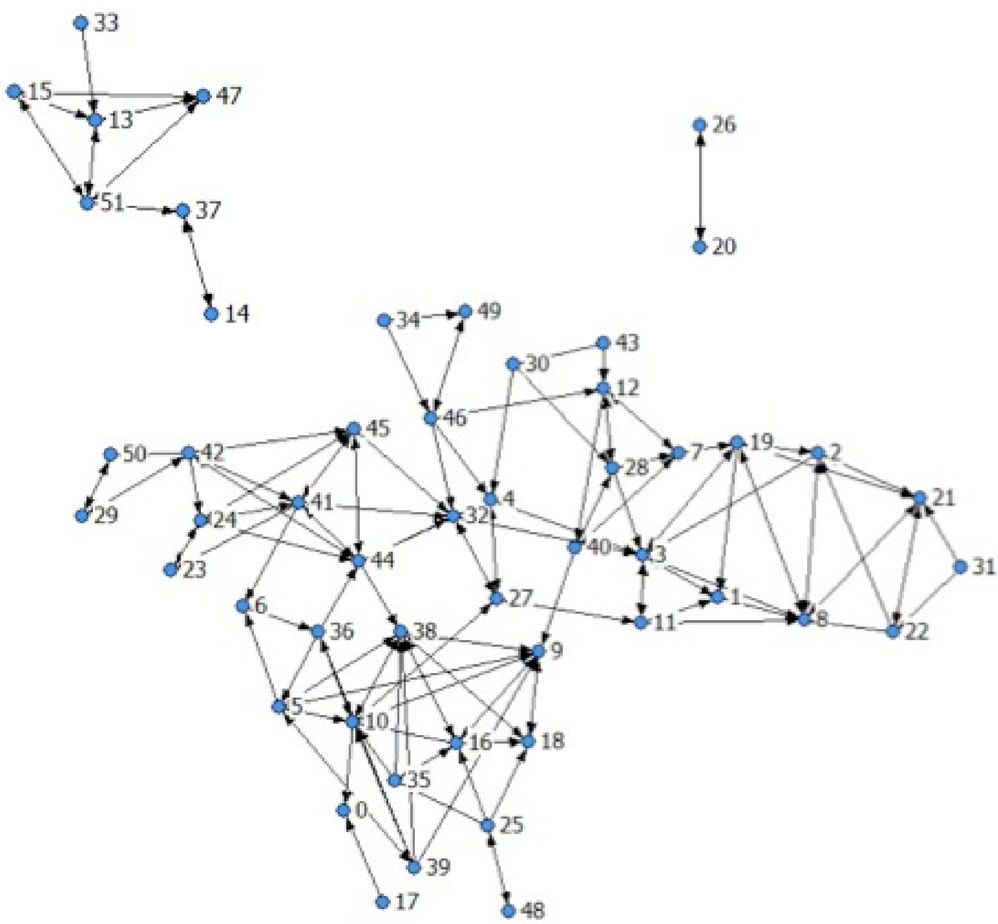

Figure 4: TP2 network (51 subjects and 165 links)

The elicited networks, displayed in Figure 4 and 5, share most features of typical social network architecture (see Newman [17]). More precisely, there is a giant component encompassing 42 (61%) and 43 (82%) of network vertices for TP2 and TM3, respectively; the second largest component only contains 7 and 5 nodes and there are 0 (0%) and 9 (13%) unconnected nodes, for TP2 and TM3, respectively.

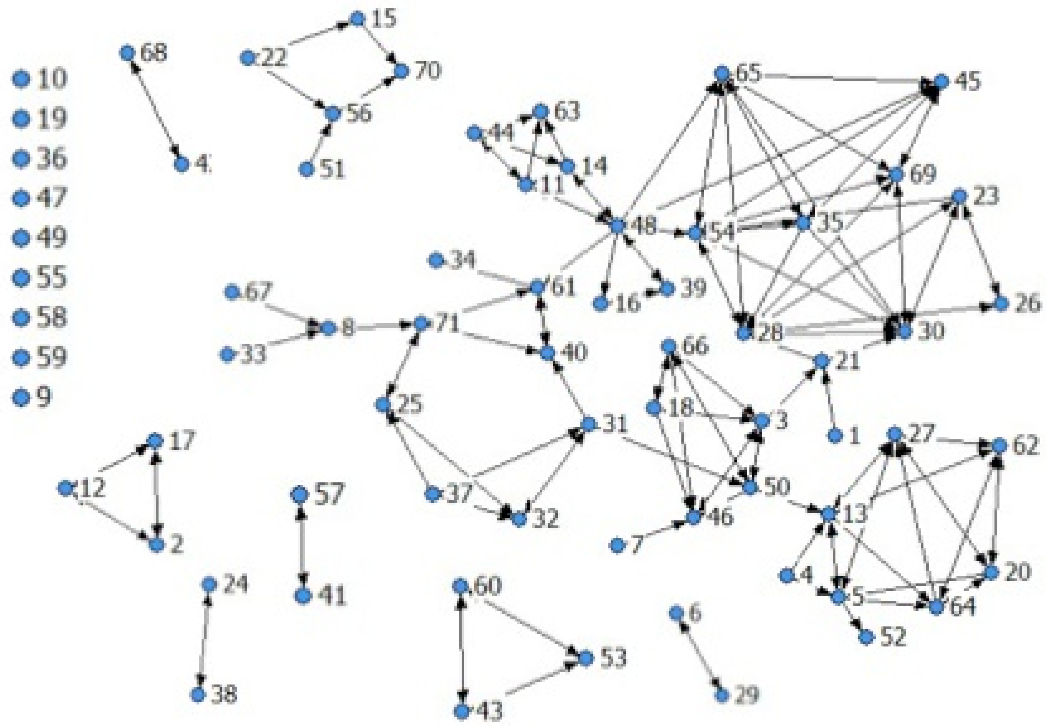

Figure 5: TM3 network (71 subjects and 160 links)

The average (undirected) degree is 4.36 neighbors (Std. Dev. 1.87) and 3.46 (Std. Dev. 2.44), respectively. The clustering coefficient, i.e., the average fraction of links of a node that are linked themselves, is 0.45 and 0.53, respectively. Notice that, in a randomly generated network of the same size and connectivity, the expected clustering would be roughly 4.36/165=0.026 and 3.46/160=0.022, one order of magnitude lower that the observed level. We also observe small distances (the average and maximum distance, diameter, in the giant component are 3.73 and 11, 4.32 and 11, for TP2 and TM3, respectively).

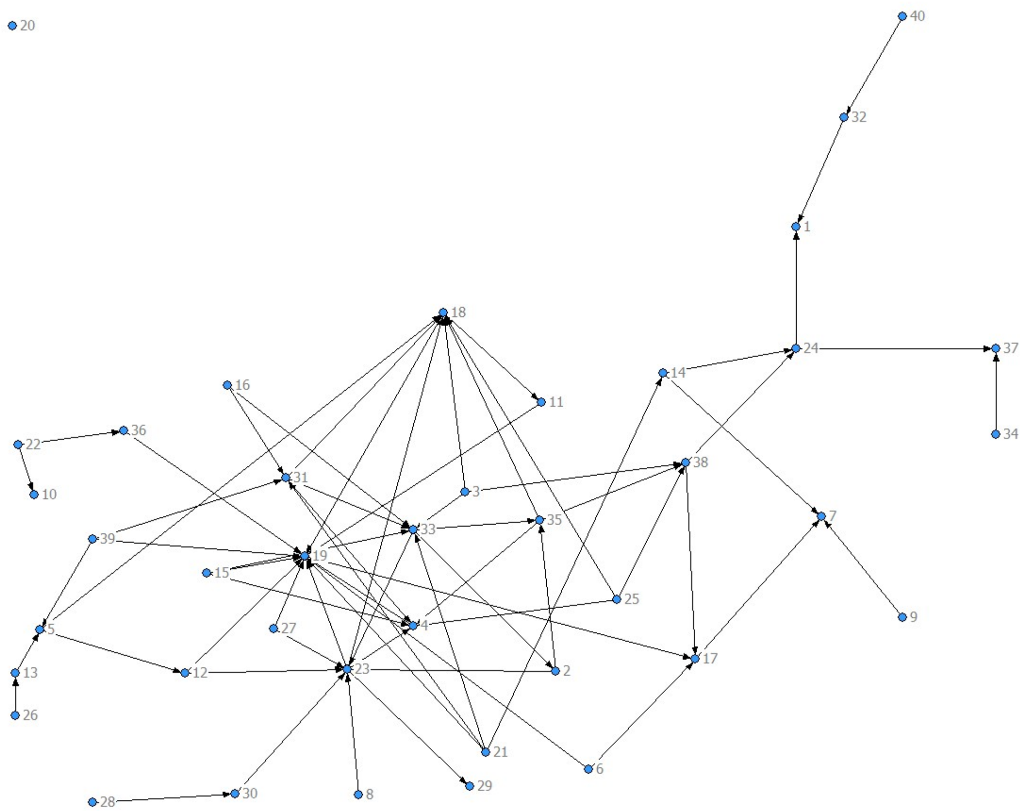

Figure 6: TN network (40 subjects and 103 links)