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Do Social Networks Inspire Employment? - An Experimental Analysis -

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There is robust field data showing that a frequent and successful way of looking for a job is via the intermediation of friends and relatives. Here we want to test this experimentally. Participants first play a simple public goods game with two interaction partners ("friends"), and share whatever they earn this way with two different sharing partners ("cousins") who have different friends. Thus one's social network contains two "friends" and two "cousins". In the second phase of the experiment participants learn about a job opportunity for themselves and one additional vacancy and decide whom of their network they want to recommend and, if so, in which order. In case of coemployment, both employees compete for a bonus. Will one recommend others for the additional job in spite of this competition, will one prefer "friends" or "cousins" and how does this depend on contributions (of "friends") or shared profits (with "cousins")? Our findings are partly quite puzzling. Most participants, for instance, recommend quite actively but compete very fiercely for the bonus.

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1. Introduction

Unemployment can be reduced by better match formation (see Roth,..., on improving bilateral matching in general). In Germany, for instance, the gigantic network of Arbeitsvermittlungsagenturen (job intermediation agencies) is supposed to alleviate failures in match formation. As revealed by a recent debate (see, e.g. The Economist (2006)) regarding its records of success it is, however, rather inefficient especially in finding a job for long term unemployed. In reaction to this, one has allowed to rely on private intermediaries who supposedly are better match makers. Here we focus on a third alternative, namely social networks which account for a large share of successful job assignments.

Granovetter (1974), for example, finds that 56% of new vacancies are filled via social contacts. Later studies for the United States found smaller shares but, nevertheless, confirmed that searching via friends and relatives is a very common and efficient search method on the job market. Holzer (1988) finds that 85% of unemployed youth search via friends an relatives and together with direct applications, this method yields the most offers and the most acceptances. Blau and Robins (1990) who compare search behavior by employed to that of unemployed observe that only about 30% search via friends and relatives. Nevertheless, they find that search via friends and relatives and direct employer contact yields the highest job finding rates for both employed and unemployed. Similarly results can be found in Corcoran et al. (1980) who, furthermore find that informal channels are used more among young unemployed and less educated workers. For Germany, Noll and Weick (2002) find that 74% of unemployed job searchers state to use their social network of friends and relatives and that 31% finally find a job this way. For southern European states, these shares are even higher and, averaged over a number of EU member states as high as 67% for relying on social networks and 41% for finding a job this way.

One reason for this success may be that a network consists partly of professional contacts. For the employer, hiring an employee's friend or relative, has several advantages. The intermediary is likely to know more about the applicant than any job talk could reveal and, furthermore, risks his own reputation and/or position if the applicant is inadequate. Furthermore, the new employee has not only professional but also private reasons to prove worthy of the position.

Helping a friend or relative to find a job may avoid to support him otherwise. There are several more self-serving and altruistic reasons why relatives or friends may help to find a job. But there are also risks involved. If the newly hired turns out to be lazy, inadequate etc., this may also be bad for the recommender. But even when the new match is a great success, it may be that the recommender suffers, e.g. when having to compete with the newly hired for a promotion or a bonus. In our experiment, we only capture this latter risk of competing for a bonus.

The major challenge is, of course, to experimentally induce social networks. Whatever one tries can be questioned by arguing that true relatives or friends will care more for each other. There are, however, counterobjections. One is the evidence of experiments using so-called "minimal group paradigms" (Tajfel, 1970) showing that minor and partly artificial partitioning devices for substructuring a society can be quite effective in stimulating ingroup favoring and outgroup discrimination (see, however, Güth et al. (2005)). Another counterargument is that we do not only induce rather weak and shaky social networks but also rely on minor favors and risks, i.e. we induce weak links but allow also only for minor favors and risks, i.e., the weaker ties are counterbalanced by less rewarding "jobs". Furthermore, results by Falk et al. (2004) indicate that such an approach may indeed be able to induce different group identities or social networks.

More specifically, we let participants

- interact with two "friends" with whom they play a public good game and
- share whatever they earn in the public good game with two "cousins" who each also play a three-person public good game with their respective "friends".

For each participant, we define his social network (excluding the friends of cousins or the cousins of friends) by the set of his two friends and his two cousins. In future research, one can try to strengthen these links by face-to-face communication or simply by repeating interaction in public good games and sharing its rewards. As far as this study is concerned, we simply have hoped, inspired by the "minimal group paradigm" experiments, that so induced social networks suffice to inspire active job intermediation by friends and/or cousins.

After the initial phase of experimentally inducing social networks by interacting or sharing, each participant

- receives a job offer together with the information about one additional job opening at the same firm
- can accept or reject the own offer and, regardless of this, recommend only own friends and/or cousins for the additional job opening and
- has to compete via effort choice for the bonus when both are employed.

What we want to test experimentally via such a design is

- whether participants recommend at all friends or cousins and, if so,
- whether this depends on
  - the type of the relation (friends versus cousins)
  - the results of the previous interaction with friends and the shared payoffs with cousins.

More details about the experimental protocol will be described in section 2 and can be also deduced from the (translated) instructions (App. A). Section 3 presents the data and answers statistically the questions, stated above. Section 4 concludes.

2. Experimental Design

We rely on the same terminology as in the instructions (Appendix A) and refer to the so-called friends of a participant by X and Y and to the cousins by I and J. The instructions avoid such loaded terminology and just say that one interacts with X and Y and shares with I and J. To avoid ambiguities cousins have different friends. By including only direct friends (and not friends of cousins) and direct cousins (and not cousins of friends) a participant's social network is the set

$$N = \{X, Y, I, J\}.$$

Including indirect links the set becomes larger. Altogether nine subjects are linked via direct or indirect links and form one matching group. The closed set of nine subjects is illustrated in figure 1.

Friends with an endowment of $e = 18$ each play a three-person public good game with a marginal per capita return of 2/3 and one's own payoff

$$P_o = 18 - o + \frac{2}{3}C \quad \text{with} \quad C = o + x + y \text{ and } 0 \leq o, x, y \leq e$$

where o is the own and x, resp. y, the contribution of X, resp. Y. The payoff of one's friends X and Y is analogously defined. Similarly, one's cousins I and J earn P_i and P_j in their separate public good games. Cousins share payoffs so that each of the three cousins earn half of the own payoff P_o and a quarter share of what each cousin has achieved. Thus one's own total payoff is

$$U_o = \frac{1}{2}P_o + \frac{1}{4}P_i + \frac{1}{4}P_j$$

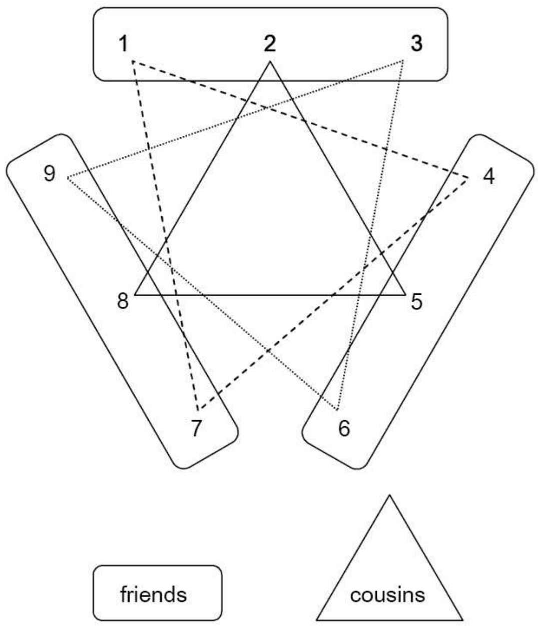


Figure 1: Closed wider network including indirect links

what, of course, applies also to one's cousins. Each participant is a friend, resp. a cousin of two (different) other participants.

The 1st phase of an experimental section starts with reading the instructions for the situation just described, and answering a few control questions. Then participants play the game just once and share the rewards as specified. A participant learns afterwards about

- the contribution vector in the own as well as in the two cousins' games and thereby
- the payoffs in these three games.

The 2nd phase starts by informing each participant that half of the participants will finally get a job offer and that each job offer goes along with another vacancy in the same firm for which they can recommend anybody of their social network. Thus, in principle, it is possible that each participant finds a job. Actually, our assignment of job offers will guarantee that anybody, who has not received directly a job offer, has at least one friend and one cousin, who could recommend him for the additional job opening. All job offers specify

- a fixed payment $S = 4$
- a piece rate of $s = 2$

- a bonus $B = 18$ attributed to the worker with the higher output (if both produce the same output each gets $B/2 = 9$).

If one does not get or accept a job, one earns the unemployment benefit $U = 12$. If employed and producing a units, one earns

$$S + \delta B + 2a - C(a) = 4 + \delta 18 + 2a - \frac{a^2}{8}$$

where $\frac{a^2}{8}$ are the effort costs $C(a)$ and where δ equals 1 if one works alone or, if not, has chosen the higher effort level, equals $1/2$ when both produce the same, and is zero otherwise. The entire second stage is implemented using a modified strategy vector method. Specifically, subjects first state whether and if so whom they would recommend for the second vacancy before stating whether they would accept such a direct or indirect offer themselves.[1] When stating whom they would recommend subjects basically submit a ranking. In detail subjects are asked sequentially up to 4 times whether they want to recommend someone (else) and if so whom. Finally subjects submit their output choices, if applicable for the four cases of working alone, working with someone else, being directly or indirectly employed. This allows us to test whether competing for bonus B with a friend or cousin triggers higher efforts. In order to avoid substantial losses, maximal effort was bounded from above.

We are, of course, especially interested in how recommendations depend on

- the type of relationship (are friends or cousins primarily recommended?) and
- the contributions (of friends) and the payoffs (of cousins) and how the latter ones are determined.

Phase 2 starts by reading the second part of the instructions[2] , which were only distributed after the first phase, and answering new control questions. Then all participants choose

- for the case of a direct job offer whether to accept it and their recommendation policy as explained above
- for the cases of receiving and accepting a direct and/or indirect job offer their (up to four) effort choices.

[1] Thus, one can refuse a direct offer but nevertheless recommend someone for the second position in the firm.
[2] For a translation, see appendix (A).

After collecting all choices, jobs are directly assigned to half of the participants and their recommendations regarding the additional job offerings are implemented as are the effort choices of those who are thereby (co)employed. The experiment concludes by informing participants about the outcome concerning themselves and their direct network. Payments were made privately as to preserve anonymity.

The strategic analysis of the experimental game is straightforward. On the second stage, the rules of the labor market are independent of the entire first stage. When playing the first stage, subjects are not informed about the second. But even if they were informed about both stages, the outcome of first-stage interaction does not affect the rules of the labor market. The optimal effort if working alone is $e^* = 8$ yielding a payoff of 30. If coemployed, each employee has an incentive to outperform the other by one unit in order to secure the bonus. Due to the quadratic cost function the resulting tournament can be very destructive. We have restricted efforts to a maximum of 17, implying that there exists no pure strategy equilibrium of the labor market (sub)game(s).[3] Efficiency would require both to produce $e^* = 8$ and sharing the bonus, yielding 21 for each. Unless the second employee resorts to a dominated effort below 7, working alone yields a higher payoff than being coemployed. Thus, the equilibrium play of the labor market is to accept a direct job offer, recommend nobody and produce $a = 8$ units as the only employee.

3. Results

Nine sessions with 18 subjects each were conducted in the Computer Laboratory of the Max Planck Institute of Economics in Jena featuring visually separated PC Cabins. The experiment relied on the Z-tree software (Fischbacher, 1999) and subjects were students recruited from the Friedrich Schiller Universität Jena using the recruitment software ORSEE (Greiner, 2004) guaranteeing that no subject participated more than once.

Including payment, sessions lasted for about 70 minutes. The exchange rate was set to €1 for 5 points implying a total endowment in the public good game of €3.60 and maximum possible income from employment of €6. No show up fee was paid. On average subjects earned €9.26 (standard deviation 1.94) with a minimum earning of €5.40, a median of €8.94 and a maximum of €13.36.

A first impression of results is given in the histogram of contributions to the public good in figure 2. Almost one quarter of subjects (22%) contribute nothing and another quarter (24%) give their entire endowment. Average and median contribution is 9 (standard deviation 6.68).

[3] Assuming that the other player exerts an effort of $e_j \leq 16$, one's best reply is to exert an effort of $e_i^\star(e_j) = 8$ for $e_j < 8$ and $e_i^\star(e_j) = e_j + 1$ else. For $e_j = 17$, however, one's best reply is to play $e_i = 8$ and, thus, there exist no equilibrium in best replies.

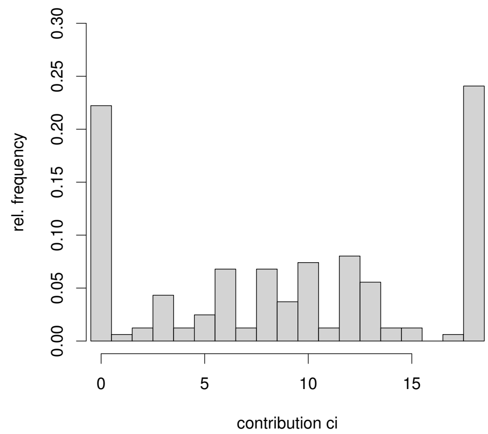


Figure 2: Histogram of contributions to the public good.

3.1. Who is How Often Recommended?

Altogether 91 of the total 162 subjects (56.2%)[4] were recommended at least once by someone. 60 subjects were named by one, 27 by two and only 4 were named by three in their network. The main question is, of course, who is recommended. We first look whether more cooperative or more successful players are recommended. A first impression is given in the boxplots of figure 3. In the left plot one can see that subjects who were never recommended contributed substantially less than those who were at least once. Comparing the distributions by a Mann-Whitney-U test confirms this observation. Contributions of those, not recommended at all, are significantly ($p \leq 0.01$)[5] smaller than those who are once ($p=0.0007$) or twice ($p=0.0029$). There is no significant difference in contributions between those being informed once or twice.

How (shared) payoffs, obtained in the public good game, affect the number of recommendations is shown in the center boxplot of figure 3. There are no significant differences in location between the distributions for 0, 1 and 2 recommendations (Mann Whitney U test, p-value< 0.01). The right most boxplot in figure 3 shows distributions of the profits made in the first stage of the experiment, i.e. after sharing income among cousins. Since, ceteris paribus, larger contributions imply smaller profits, subjects with a smaller income tend to be recommended more often. A Mann Whitney test, however, finds only a weakly significant ($p= 0.0101$) difference between those never and those recommended once.

For a more detailed analysis, several generalized linear mixed effects poisson regressions of the number of recommendations received, are listed in table 1. For subject i, the number of received recommendations is y_i and x_i the vector of regressors, β represents the vector of

[4]Binomial 99% confidence interval: $[45.8\%, 66.2\%]$.

[5]If not mentioned otherwise, significance level is set to $p \leq 0.01$ throughout.

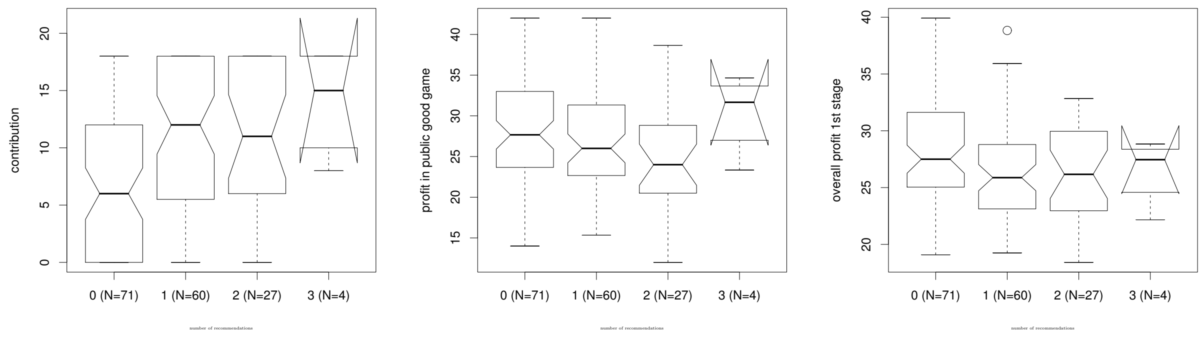


Figure 3: Boxplots of contributions and profit by number of referrals.

(true) coefficients and $\zeta_{m(i)}$ is a random effect specific to i's matching group[6] m. Our estimation maximizes the likelihood function

$$\mathcal{L} = \int \prod_{i=1}^{n} \frac{e^{-\mu_i} \mu_i^{y_i}}{y_i!} \phi\left(\zeta_{m(i)}\right) \mathbf{d}\zeta \tag{1}$$

where $\mu_i = E[y_i] = E[x_i'\beta + \zeta_i]$ and ϕ stands for the standard normal density $N(0, \sigma_\zeta^2)$.

Among the regressors tested are a subject's own contribution c_i, the profit a subject obtained in the public good game, π_i^{pg}, all earnings obtained in the first stage, π_i, the income i obtained from cousins, $\pi_i^{I,J}$ and the sum of contributions by friends, $\sum_{-i} c_j$.

Regression model 1 confirms that a subject is more often recommended the more he contributed to the public good. Due to the strong correlation between the two regressors c_i and π_i^{pg}, model 2 substitutes profit by total contributions by friends ($\sum_{-i} c_j$) which is strongly correlated to the public good profit but not to one's own contribution. By and large model 2 validates the results from model 1.

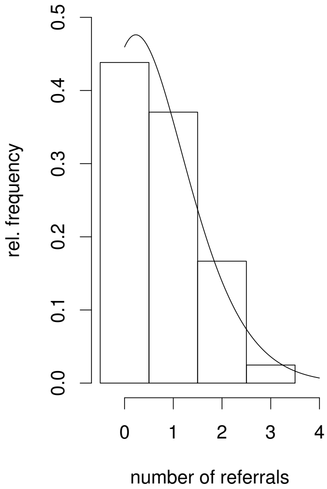
Regression 3 only finds a weakly significant effect of the overall profit. Model 4 qualifies this result by showing that the number of recommendations are negatively correlated with the profit obtained from one's cousins ($\pi_i^{X,Y}$). Model 5 explains our data best according to the Akaike and Schwartz information criteria. Here a dummy, indicating full contribution ($D_{c_i=18}$), was tested but proved to be insignificant and not contributing to the accuracy of the model: there is no special acknowledgement of full contributions. The coefficients of model 5 indicate that the number of recommendations is increasing with contributions and that free riders are heavily punished by being significantly less often recommended.

We summarize our first results by the following two observations:

[6] Every larger network consisting of 9 subjects constitutes a matching group.

Table 1: Poisson Regressions of the Number of Received Recommendations.

Histogram of number of recommendations and Poisson distribution.



	model				
	1	2	3	4	5
Intercept	0.448*	0.367**	1.185**	1.333**	0.452**
	(0.215)	(0.128)	(0.379)	(0.411)	(0.153)
c_i	0.044**	0.045***	0.037***	0.040***	0.034**
	(0.008)	(0.007)	(0.008)	(0.008)	(0.013)
$D_{c_i=0}$	-	-	-	-	-0.450**
					(0.153)
π_i^{pg}	-0.005	-	-	-0.007	–
	(0.006)			(0.007)	
π_i	-	-	-0.030*	-	
			(0.012)		
$\pi_i^{X,Y}$	-	-	-	-0.059**	
				(0.019)	
$\sum_{-i} c_j$	-	-0.003	-	-	–
		(0.003)			
$\log \mathcal{L}$	-162	-162	-160	-158	-147

NOTE: *: p< 5%, **: p< 1%, ***: p< 0.1%. Standard error in parentheses.

Observation 1 The best predictor for the number of received recommendations is a subject's contribution to the public good. While the number of recommendations is increasing in a subject's contribution, those contributing nothing are additionally punished compared to those contributing at least something.

Observation 2 The profit a subject obtains in the public good stage has no direct effect on the number of recommendations he obtains. However, there is some indication that subjects obtaining less (more) from their cousins are more (less) often recommended.

3.2. Who recommends whom

A different way of approaching the data is by analyzing it from the perspective of the recommender. A subject could recommend each of his two friends and cousins. In the following we therefore define the dependent variable as follows: The bivariate dependent y_{ij} stands for subject i 's decision to recommend j. This interpretation of the data allows to test whether not only characteristics of the recommended but also characteristics of the recommender matter. With a bivariate dependent the model of choice is a generalized linear binomial model with a probit link.

To control for correlations within the four observations of each subject and within matching groups we have added (nested) random effects. We define by x_{ij} a vector of regressors possibly including both, variables characterizing the recommender i and the recommended j, by ς_i an i specific random effect nested in matching group $m(i)$ and by $\zeta_{m(i)}$ a random effect specific to i's matching group $m(i)$.[7] The mean function of our probit estimations is then defined by

$$\Phi^{-1}(p_{ij}) = x_{ij}\prime\beta + \varsigma_i + \zeta_{m(i)}, \tag{2}$$

where Φ represents the standard normal c.d.f. and p_{ij} is the latent probability that subject i recommends subject j.

Table 2 lists the results of the probit estimation model which explains active recommendation behavior best according to the Akaike and Schwartz information criteria. Results are in line with those of model 5 in table 1. It is the contribution of the recommendee (c_j) which determines wether i recommends j or not. Other estimations included the same variables which were already tested in the previous section and, in addition, a dummy indicating whether j is a friend or cousin. All proved to have no effect, neither alone nor in interaction with other regressors.

[7] Equivalently to (1) it is assumed that $\varsigma \sim N\left(0, \sigma_{\varsigma}^2\right)$ and $\zeta \sim N\left(0, \sigma_{\zeta}^2\right)$. Furthermore the standard assumptions concerning cross moments and conditional expectations hold.

Table 2: Probit Regressions of Decision of Subject i to inform j.

	Intercept	c_j	$D_{c_j=0}$
y_{ij}	-1.780***	0.053***	-1.003***
std.error	(0.202)	(0.012)	(0.209)

NOTE: ***: p< 0.1%. Standard error in parentheses.
$\log \mathcal{L} = -1443$, $\sigma_{\varsigma} = 1.50$, $\sigma_{\zeta} = 0.16$, $\sigma_{\text{Residual}} = 0.59$

Observation 3 The type of relation ("friend" vs. "cousin") has no effect on the likelihood of being recommended.

The same variables for the recommender i also proved to be insignificant and did not improve significantly the relevance of the estimation. There is, however, considerable but unsystematic heterogeneity between subjects as reflected in the relatively high variance of random effect ς.

Observation 4 Controlling for other effects, individual characteristics of the recommender like, e.g. his contribution or payoff, is not significantly correlated to his recommendation policy.

3.3. Accepting Offers and Working Effort

After deciding whether and whom to recommend subjects had to state whether they would accept a direct and/or indirect offer. Except for two subjects everyone (160) would have accepted a direct offer and altogether 149 (92%) would have accepted an indirect offer. Given the small number of rejections no meaningful inferences can be made concerning differences between those accepting and rejecting an offer. Interestingly the 13 subjects, rejecting an indirect offer, on average contributed more (10 vs. 8.98) and earned less in the public good game (23.4 vs. 27.4) and overall in the first stage (24.5 vs. 27.3).

The number of effort levels a subject has to submit depends on whether or not he would recommend one of his network and whether he accepts a(n) (in)direct offer. Those who recommended at least one and would have accepted any offer were, for instance, asked 4 times to submit an effort choice: in case of a direct as well as an indirect offer and remaining alone, and in case of a direct as well as an indirect offer but being coemployed. On the other hand a subject who rejected every job offer did not submit any effort level.

The marginal effects of obtaining a direct vs. an indirect offer and of being solely working vs. coemployed on the effort level are plotted in figure 4. The first boxplot plots the differences in effort between being directly and being indirectly employed. The third and forth boxplots basically plot the same differences this time, however, separately for efforts as the only employee (third plot) or when coemployed (forth plot). All boxplots use data of only those subjects with observations for all relevant cases. The first boxplot, e.g. requires data for all four possible encounters, which was the case for 59 subjects.

As observations within one matching group are likely to be correlated, averages over matching groups are used to obtain independent data.[8] According to the first boxplot efforts do not depend on whether one is employed directly or indirectly (Wilcoxon signed rank test, p=0.103). Comparing efforts when working alone or being coemployed in the second boxplot, reveals a strong effect of competition. When working alone, 24 of the 59 subjects with four effort choices play optimally (effort of 8). When being coemployed most increase their effort and only 7 maintain the optimal effort. Overall, efforts when remaining alone are significantly smaller than in case of being coemployed (Wilcoxon, p-value<1%).

Observation 5 When coemployed, subjects exert significantly higher efforts than when working alone.

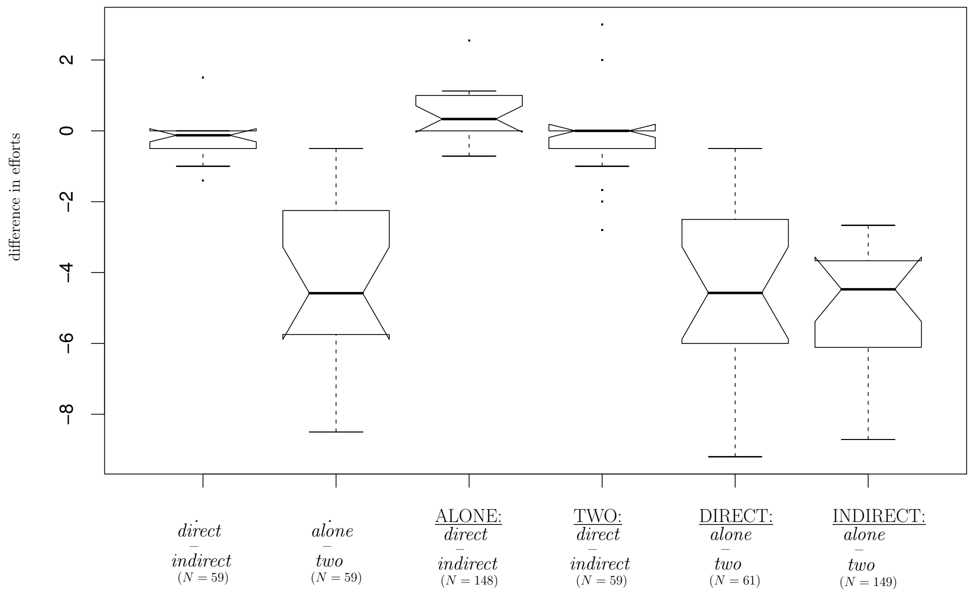
This result is partly confirmed by the remaining boxplots. Only as the only employee, efforts are significantly (Wilcoxon, p-value=0.007) larger if one was hired directly. With an average of 0.5, this difference is, however, rather negligible.

The strong evidence for a (destructive) competition for the bonus in case of coemployment raises an important question: does one recommend more cooperative players of the public good game in the hope that they refrain from competing for the bonus? This should be reflected in a negative correlation between one's own effort and the contribution of the suggested coworker.

Table 5 lists several tobit regressions of effort choices for being directly employed and competing for the bonus with someone, one has suggested. Ignoring the intercept, the first three variables are characteristics of the decider: $e_{d,i}^{alone}$ is the effort of the decider when being directly employed but remaining alone, c_i his own contribution to the public good and $ratio_i$ a dummy with 1 for $e_{d,i}^{alone} = 8$. The last four variables concern the one suggested: $c_{j,1}$ is the contribution to the public good of the one recommended first, D_{j1}^{friend} a dummy with value 1 when this first recommendation refers to a friend, $c_{j,1}D_{j1}^{\text{friend}}$ the interaction between the two variables and $\bar{c}_j$ the average contributions by all recommended by i. According to model 1 and 2, the effort choice is completely independent of what happened previously.[9] The only significant variable, remaining after a stepwise elimination of insignificant and non explanatory (LR tests) variables, is the same subject's effort choice when working alone.

[8]While producing pairwise independent observations, this method is not unproblematic as the number of observations per matching group may differ. For that purpose, all tests reported were also conducted with individual level data, ignoring possible dependencies. Qualitative results are identical.

[9]Theoretically there is a possible endogeneity of variable $e_{d,i}^{alone}$. A possible source of this endogeneity could, however, not be identified.



NOTE: Differences of averages per matching group. N is number of subjects for whom observations are available in both conditions.

Figure 4: Boxplots of Differences in Efforts

Figure 5: Tobit Regressions of Effort Choices if Directly Coemployed

	Model		
	1	2	3
Intercept	10.62***	13.53***	8.51***
	(2.53)	(2.13)	(1.539)
$e_{d,i}^{alone}$	0.568**	-	0.584**
	(0.176)		(0.183)
c_i	-0.145	-	-
	(0.089)		
$ratio_i$	-0.110	-	-
	(1.052)		
$c_{j,1}$	-0.170	-0.070	-
	(0.203)	(0.217)	
D_{j1}^{friend}	-1.361	-0.704	-
	(2.488)	(2.659)	
$c_1 D_{j1}^{\text{friend}}$	-0.055	-0.147	-
	(0.182)	(0.193)	
$\overline{c}_j$	0.241	0.172	-
	(0.196)	(0.211)	
$\log \mathcal{L}$	-144	-150	-148

NOTE: **: p< .01, ***: p< 0.001. Standard error in parentheses.

Observation 6 Although 56% recommend someone of their network and although being recommended depends positively on one's contribution (in the public goods game), this does not translate into cooperative behavior when being coemployed: efforts are significantly larger and less efficient when coemployed than when working alone. Furthermore, effort choices are independent of the contribution of one's competitor.

4. Conclusions

To experimentally observe why and when friends or relations help to find a job, we have created a stylized social network. We could explore whether the type of relation ("friends" playing a public goods game versus "cousins" with whom one shares profit) and how former behavior influences whom one recommends and how likely it is to obtain a job. To capture and model the possible competition when being coemployed, participants finally had to choose effort.

Our results show that it is not the type of relation nor individual earnings (in the public goods game) which affect the chances on the job market, but rather one's cooperativeness towards others, as measured by the contribution to the public good. We were thus able to identify an endogenous characteristic by which subjects discriminate among their network peers. Interestingly, despite creating an anchor for discrimination, behavior in the first stage is ignored when competing for a bonus. While one more likely recommends someone with larger contribution and is more likely recommended when contributing more, this does not affect effort choices when competing.

We conclude from this that our participants view filling job vacancies by someone suitable, i.e., with a high contribution revealing cooperativeness, as a moral obligation. This, however, does not question that one competes very seriously for promotion or bonus when being coemployed. It reminds us of doing sports together where I, for example, might give someone a lift to the race track but will nevertheless try to outrun him or her when running. That some of our choices, here job recommendations, are guided by ethical motives and others by opportunism, is a familiar idea in welfare economics (see, for instance, the distinction between individual welfare and individual utility functions by Harsanyi, 1977). Our findings show that this distinction may apply even when facing the same person.

Related to the job market, we seem to justify using social networks for recruitment in a worst-case scenario of rather weak links (but also of rather minor effects). One seems to recommend someone suitable, even when having to fear to suffer from that later on. The fear that a workforce consisting of friends and relatives is burdened by sluggishness and inefficiency is not confirmed by our data.

We do not claim that our conclusions are generally transferable to the real world. While the lack of carry over effects from the first to the last stage is one main observation, it may also question the effectiveness of inducing a social network experimentally and of distinguishing "friends" and "relatives". Of course, we could have relied on voluntary network formation games.[10] Compared to our approach, a network first has to be established endogenously what renders such voluntary network formation experiments rather untractable when being complemented by a successive job market.

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A. Translation of Instructions and Control Questions

The following subsections give a translation into English of the German instructions and control questions. Emphasizes are as in the original.

A.1. Instructions for the Public Good Game

General Instructions

Welcome and thank you for participating in this experiment. Depending on your decisions and the decisions of other participants you will earn money. Therefore it is of utmost importance that you read these instructions carefully.

During the experiment any kind of communication with other participants is categorically forbidden. In case you have questions, please raise your arm and ask one of the supervisors. If you break this rule, we will have to exclude you from the experiment and you will not receive any money. Instructions are identical for all participants.

During the experiment monetary amounts are not denoted in €but in "*points´´*. At the end of the experiment your attained sum of *points* are converted in €according to the following exchange rate:

5 points = 1 €

Now please read the following instructions carefully.

Detailed Instructions

The Decision Environment

You will interact with two interaction partners X and Y. Furthermore, you will share your interaction income with two other participants: I and J. The same holds for all other participants in the experiment. However, I and J neither interact with each other nor with participant X or Y, with who you interact.

Thus you (denoted as O in the following) are a member of the **group of 3** O**,** X**,** Y. Each member of this group has to decide how to use 18 points. You can assign your 18 points to your **private account** or you can invest **some of it or everything** into a **project**. Every point you will not invest into the project will automatically assigned to your private account.

Income from the private account:

For every point you leave on your private account you will earn exactly one point. If, for example you leave 18 points on your private account (and therefore do not invest anything into the project) you will earn exactly 18 points from your private account. Or, if you leave exactly 1 point on your private account you will receive exactly 1 point from your private account. *No one except you earns something from your private account.*

Income from the project:

From the amount you invest into the project, every group member earns an equal share. Vice versa it holds that you profit from the investment of the other group members. The income of each member in the project is defined as follows:

$$\textit{Income from the project} = \textit{Sum of all investments to the project times } {}^2\!/_3$$

If, for example, the sum of the investments into the project of all group members equals 30 points, then you and every other group member each earn $30 \times {}^2\!/_3 = 20$ points from the project. If the three group members invest altogether 1 point into the project, then you and each other group member each earn $1 \times {}^2\!/_3 = 0.67$ points from the project.

Interaction income:

Your interaction income P_o is the sum of your income of the private account and your income from the project. Thus:

Income from your private account (= 18 - contribution to the project)
+ Income from the project (= 2/3× sum of contributions to the project)
= interaction income

In different notation: $P_o = 18 - o + C \times {}^2\!/_3$ where $C = o + x + y$ equals the sum of your contribution o plus contributions x from X and y from Y.

Total income after sharing:

Similarly participants I and J assigned to you earned, together with their interaction partners, their interaction income P_i and P_j. From your interaction income P_o participants I and J now receive one quarter each. Equivalently you receive one quarter of each of I and J's interaction income. Your total income is thus defined as follows:

You keep half of your interaction income
+1/4 interaction income of I
+1/4 interaction income of J
= total income

I.e. you obtain ${}^{P_o}\!/_2 + {}^{P_i}\!/_4 + {}^{P_j}\!/_4$. Equivalently participant I earns ${}^{P_i}\!/_2 + {}^{P_o}\!/_4 + {}^{P_j}\!/_4$ and J earns ${}^{P_j}\!/_2 + {}^{P_i}\!/_4 + {}^{P_o}\!/_4$.

You make this decision only once. There will be no repetition.

A.2. Control Question for the Public Good Game

Control Questions

Please answer the following questions. They are designed to make you acquainted with the calculation of incomes. The examples are chosen such that you can easily solve them without a calculator.

Please answer all question, always noting the entire formula.

1. Each participant of group O, X, Y has 18 points at his disposal. Assume that all thre group members (including O) invest nothing into the project.
   How much is your interaction income?
   How much is the interaction income of each of the other group members?

2. Each participant of group O, X, Y has 18 points at his disposal. You invest 18 points into the project. The other group members also invest 18 points each. How much is your interaction income?
   How much is the interaction income of each of the other group members?

3. Each participant of group O, X, Y has 18 points at his disposal. The other two group members, together invest 18 points to the project.

   a) How much is your interaction income if you, in addition to the 18 points, invest nothing into the project? Your interaction income:

   b) How much is your interaction income if you, in addition to the 18 points, invest 9 points into the project? Your interaction income:

   b) How much is your interaction income if you, in addition to the 18 points, invest 18 points into the project? Your interaction income:

4. Each participant of group O, X, Y has 18 points at his disposal. You invest 12 points into the project.

   a) How much is your interaction income if the other group members – in addition to your 12 points – invest together 9 points into the project? Your interaction income:

b) How much is your interaction income if the other group members – in addition to your 12 points – invest together 21 points into the project? Your interaction income:

c) How much is your interaction income if the other group members – in addition to your 12 points – invest together 36 points into the project? Your interaction income:

5. What share of your interaction income do you keep for yourself?

6. What share of your interaction income does I get?

7. What share of J's interaction income do you get?

8. What share of your interaction income does participant K, who directly interacted with J and obtained interaction income P_K, get?

9. Assume your interaction income equals 12, that of I is 40 and that of J is 24.

   a) How much is your total income?

   a) How much is the total income of J?

A.3. Instructions Labor Market

Instructions 2nd Part

Situation

You, as well as participants X, Y, I, and J, assigned to you in the first part of the experiment are workers. In total there are twice as many workers then employers.[11] Each employer has two vacancies. However, all employers first only demand one employee. One half of all participants therefore gets a *direct job offer*. You are free to decide whether to accept a job offer or not. Together with the direct offer, participants obtain the *information* that there is a second vacancy with that employer. Independently of whether one accepts the direct job offer, these participants can recommend one or several of participants X, Y, I and J for that second position. Someone who was recommended in turn can accept or reject that position.

A job offer consists of a **fixed wage** $S = 4$, a piece wage of $2a$, where a is the quantity produced by the employee, and **bonus** $B = 18$. Quantity a must at least be 0 and can not be greater than 17.

You will only obtain the bonus either if you are the only employee or, if not, if your quantity is larger than that of your colleague. If the two of you produce the same quantity, each employee obtains half of the bonus, i.e. $B/2 = 9$.

Furthermore, working is costly for the employee. These costs are dependent from quantity a and equal a^2/b. Thus your payoff of being employed and producing a equals:

[11] In the experiment the employers are atomized and not represented by participants.

$$\begin{array}{c} \textit{fixed wage } S = 4 \\ + \textit{ if you work allone or, if not, if your quantity} \\ \textit{is greater than your colleague's: Bonus } B = 18 \\ \textit{or, if quantities are identical: } B/2 = 9 \\ + \textit{ piece wage: } 2a \\ - \textit{ costs of working: } a^2/8 \\ \hline = \textit{labor income} \end{array}$$

If you remain **without a job** you obtain a payment of $U = 12$.

Implementation

Direct Offer

At first you will not be informed about, whether you obtained a direct job offer. Initially you will decide for the case that you obtained a direct job offer if, and if so who of X, Y, I and J you suggest for the second vacancy. Thereby you can make up to four statements. I.e. you submit a ranking which specifies who you would suggest in which order.[12]

Subsequently you indicate whether you want to accept a direct offer. If you do so, you are asked for your quantity a. If you suggested at least one participant for the second vacancy you are asked to make two statements concerning a: Once in case you remain alone – i.e. the second vacancy remains vacant – and once in case you are one of two employees.

No Direct Offer but Suggestion for Second Position

After deciding for the case of obtaining a direct offer, you are asked to decide for the case of not obtaining a direct offer but for being suggested for the second vacancy. Thereby you first indicate, whether you accept this position and if so, how much you produce. Once in case you work alone (the participant who obtained the direct offer rejected.) and once in case you are one of two employees.

Calculation of Incomes

After making all your decisions a random draw decides who obtains a direct offer. Thereby it is guaranteed that **at least one** of participant X, Y, I and J, assigned to you, obtains a direct offer. Finally your income and, if you have a colleague, that of your co-worker are calculated and listed on your screen.

You will make your decisions only once. There will be no repetition.

[12] If several participants suggest the same participant, a random draw decides whose decision counts.

A.4. Control Question for Labor Market

Control Questions 2nd Part

Please answer the following questions. They are designed to make you acquainted with the calculation of incomes. The examples are chosen such that you can easily solve them without a calculator.

Please answer all question, always noting the entire formula.

1. Assume you obtain a direct offer:

   a) How much do you earn if you suggest someone for the second vacancy, that one accepts, produces $a = 11$, but you yourself reject the direct offer?

   b) How much do you earn if you accept the direct offer, do not suggest someone and produce $a = 4$?

   c) How much do you earn if you accept the direct offer, suggest someone for the second position, this person rejects, and you yourself produce $a = 16$?

   d) How much do you earn if you accept the direct offer, suggest someone for the second position, this person accepts, you yourself produce $a = 4$ and the other produces $a = 16$?

   e) How much do you earn if you accept the direct offer, suggest someone for the second position, this person accepts, you yourself produce $a = 4$ and the other produces $a = 4$?

2. Assume you obtain **no** direct offer:

   a) How much do you earn if you are not suggested for the second vacancy?

   b) How much do you earn if you are suggested for the second vacancy but reject?

   c) How much do you earn if you are suggested for the second vacancy, accept, produce $a = 16$ but remain alone as the participant who suggested you rejected the direct offer?

   d) How much do you earn if you are suggested for the second vacancy, accept, have a colleague, produce $a = 16$ yourself and your colleague produces $a = 4$?

   e) How much do you earn if you are suggested for the second vacancy, accept, have a colleague, produce $a = 4$ yourself and your colleague produces $a = 4$?

   f) How much do you earn if you are suggested for the second vacancy, accept, have a colleague, produce $a = 4$ yourself and your colleague produces $a = 17$?

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