Social Networks and Employment
- An Experimental Analysis -

Siegfried Berninghaus, Sven Fischer and Werner Güth [1,*,2]

University of Karlsruhe (TH) and Max Planck Institute of Economics

Abstract

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 explore this experimentally. Participants first play a simple public good game with two interaction partners ("friends"), and share whatever they earn this way with two different sharing partners ("cousins") who in turn have different friends. Thus a participant'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 others be recommend for the additional job in spite of this competition, will "friends" or "cousins" be preferred and how does this depend on contributions (of "friends") or shared profits (with "cousins")? Our findings are partly puzzling. Most participants, for instance, recommend quite actively but compete very fiercely for the bonus.

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Unemployment can be reduced by better match formation (see Roth (1984), 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

* Max Planck Institute of Economics. Strategic Interaction Group. Kahlaische Strasse 10, D-07745 Jena, Germany, Tel: +49-3641-686-627, Fax: -667.
   Email address: `fischer@econ.mpg.de` (Siegfried Berninghaus, Sven Fischer and Werner Güth).
[1] University of Karlsruhe (TH), Institute WIOR, Zirkel 2, Rechenzentrum, D-76128 Karlsruhe, Germany, Siegfried.Berninghaus@wiwi.uni-karlsruhe.de.
[2] also Max Planck Institute of Economics, guth@econ.mpg.de

recent debate (see, e.g., The Economist (2006)) regarding its records of success, it is, however, rather inefficient especially in finding jobs for the long term unemployed. In reaction to this, the law now allows to rely on private intermediaries who supposedly are better matchmakers. 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 lower percentages 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 and relatives, and together with direct applications, this method yields the most offers and final matches. Blau and Robins (1990) who compare search behavior by employed to that of unemployed persons observe that only about 30% search via friends and relatives. Nevertheless, they find that search via friends and relatives and direct employer contact yield the highest job finding rates for both employed and unemployed persons. Similar 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 figures are even higher and, averaged over a number of EU member states, as high as 67% for those who rely on social networks and 41% for those who find 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. Moreover, 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 supporting him otherwise. There are several more self-serving aa well as altruistic reasons why relatives or friends may help find a job. But there are also risks involved. If the newly hired employee turns out to be lazy, inadequate, etc., this may also be bad for the recommender. But even when the match is a success, it may be that the recommender suffers, e.g., when having to compete with the newly hired employee for a promotion or a bonus. In our experiment, we capture only this latter risk of competing for a bonus. For the employer this raises another question. What effect does it have on the effectiveness of wage incentive schemes, if one of the employees owes his job to one of his colleagues.

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, counterarguments. 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 larger group of subjects 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, so that, the weaker ties are counterbalanced by less rewarding "jobs". Furthermore, results by Falk et al. (2004) indicate that such an approach may indeed 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 the rewards. As far as this study is concerned, we simply hoped, inspired by the "minimal group paradigm" experiments, that thus induced social networks would 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 friends or cousins at all and, if so,
- whether this depends on
  · the type of the relation (friends vs. cousins),
  · the results of the previous interaction with friends, and the shared payoffs with cousins.
- Do those who were recommended finally refrain from competing for the

bonus?

More details about the experimental protocol will be described in section 1 and can also be deduced from the (translated) instructions (App. A). Section 2 presents the data and statistically answers the questions stated above. Section 3 concludes.

1 Experimental Design

We rely on the same terminology as in the instructions (App. A) and refer to the so-called friends of a participant as X and Y and to the cousins as I and J. The instructions avoid such loaded terminology and just say that everyone 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.
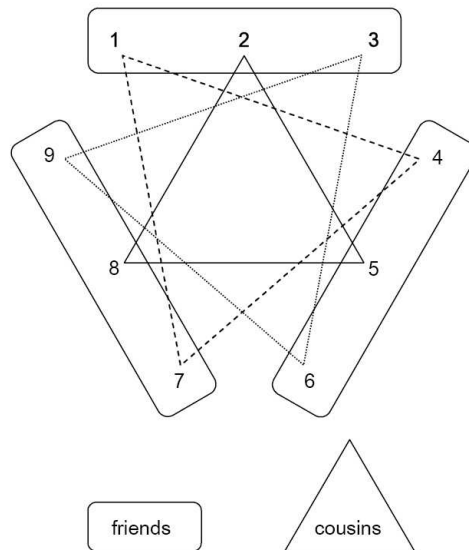

Fig. 1. Closed wider network including indirect links

Friends with an endowment of $e = 18$ each play a three-person public good

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game with a marginal per capita return of $2/3$ and one's own payoff

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

where o is the own and x or, resp., y, the contribution of X or, resp., Y. The payoff of a participant's friends X and Y is analogously defined. Similarly, 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 a participant's own total payoff is

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

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

In more detail, the 1st phase of an experimental session started by reading the instructions for the situation just described, and answering a few control questions. Then participants played the game just once and shared the rewards as specified. A participant learned 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 receive 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 a direct 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 $B = 18$ attributable to the worker with the higher output (if both produce the same output each gets $B/2 = 9$).

If a participant does not receive or accept a job, he is paid the unemployment benefit $U = 12$. If employed and producing a units, earnings are

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

where $\frac{a^2}{8}$ are the effort costs $C(a)$ and, where δ equals 1 if an employee 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.[3] When stating whom they would recommend, subjects basically submit a ranking. In detail, subjects are asked sequentially up to four 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 or with someone else and being directly or indirectly employed. This allows us to test whether competing for bonus B with a friend or cousin triggers greater 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 are determined.

In more detail, phase 2 of the experiment started by reading the second part of the instructions[4] which were only distributed after the first phase, and answering new control questions. Then all participants chose,

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

After collecting all choices, jobs were directly assigned to half of the participants. Their recommendations regarding the additional job offerings were implemented as were the effort choices of those who were thereby (co)employed. The experiment concluded 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. In 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 would 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

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[3] Thus, one can refuse a direct offer but nevertheless recommend someone for the second position in the firm.

[4] For a translation, see App. A.

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for the bonus 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). [5] 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.

2   Results

Nine sessions with 18 subjects each were conducted at the Computer Laboratory of the Max Planck Institute of Economics in Jena in 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) which guaranteed 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, amounting to a total endowment in the public good game of €3.60 and a 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.
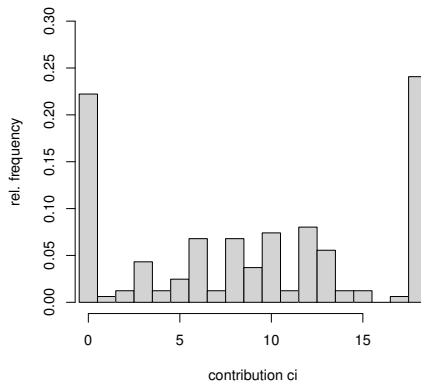

Fig. 2. Histogram of contributions to the public good.

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

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[5] Assuming that the other player exerts an effort of $e_j \leq 16$, the 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, the best reply is to play $e_i = 8$; thus, there exists no equilibrium in pure strategies.

nothing and another quarter (24%) give their entire endowment. The average and median contribution is 9 (standard deviation 6.68).

2.1 Who is recommended how often?

Altogether 91 of the total of 162 subjects (56.2%) [6] were recommended at least once by another subject. In detail, 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 was recommended. We first look whether more cooperative or more successful players are recommended. A first impression is given in the boxplots of figure 3. The left plot shows that subjects who were never recommended contributed substantially less than those who were recommended 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-value< 0.01) [7] smaller than those who are recommended once (p=0.0007) or twice (p=0.0029). There is no significant difference in contributions between those being informed once or twice.

How 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, higher contributions imply smaller profits, subjects with a smaller income tend to be recommended more often. A Mann-Whitney U test, however, finds only a weakly significant (p= 0.0101) difference between those recommended never or once.
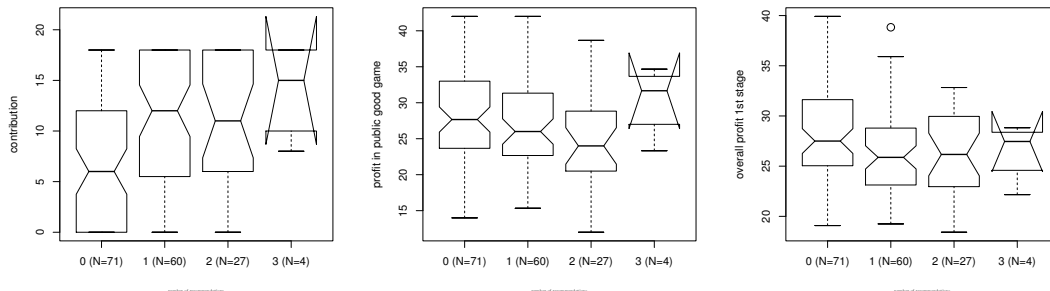

Fig. 3. Boxplots of contributions and profit by number of recommendations

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, x_i stands for the

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[6] Binomial 99% confidence interval: $[45.8\%, 66.2\%]$.
[7] If not stated otherwise, significance level is set to p< 0.01 throughout.

Table 1
Poisson Regressions of the Number of Received Recommendations

	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.

vector of regressors, β represents the vector of (true) coefficients and $\zeta_{m(i)}$ is a random effect specific to i's matching group[8] m. Our estimation maximizes the likelihood function

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

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

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

contributions by friends, $\sum_{-i} c_j$.

Regression model 1 confirms that a subject is recommended more often 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 the own contribution. Model 2 validates the results from model 1.

Regression 3 finds only 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 a subject's cousins ($\pi_i^{X,Y}$). Model 5 explains our data best according to the Akaike and Schwartz information criteria. Here dummy $D_{c_i=0}$ indicates that the subject did not contribute. The coefficients of model 5 indicate that the number of recommendations is increasing with contributions and that free riders are heavily punished by being recommended significantly less often. A similar 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 thus no special acknowledgement of full contributions.

We summarize our first results by the following two observations:
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 with 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 is given. However, there is some indication that subjects obtaining less (more) from their cousins are more (less) often recommended.

2.2   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 recommendee 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

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.
$\log \mathcal{L} = -1443$, $\sigma_\varsigma = 1.50$, $\sigma_\zeta = 0.16$, $\sigma_{\text{Residual}} = 0.59$

by x_{ij} a vector of regressors possibly including both, variables characterizing recommender i and recommendee 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 $m(i)$.[9] The mean function of our probit estimations is then defined by

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

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

The same variables for recommender i also proved to be insignificant and did not improve significantly the explanatory power 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 Individual characteristics of the recommender like, e.g., his contribution or payoff, is not significantly correlated to his recommendation policy.

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[9] As in (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.

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 who rejected 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 four times to submit an effort choice: in case of a direct as well as an indirect offer and working 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 working alone vs. being coemployed on the effort level are plotted in figure 4. The first boxplot plots the differences in efforts between being directly and indirectly employed. The third and fourth boxplots basically plot the same differences though separately for efforts by the employee working alone (third plot) or when being coemployed (fourth 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.[10] 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 regarding working alone or being coemployed in the second boxplot, reveals a strong competition effect. 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 seven maintain the optimal effort. Overall, when working alone efforts are significantly smaller than in case of being coemployed (Wilcoxon signed rank test, p<0.1%).

Observation 5 When coemployed, subjects make significantly greater efforts than when working alone.

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[10] 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.
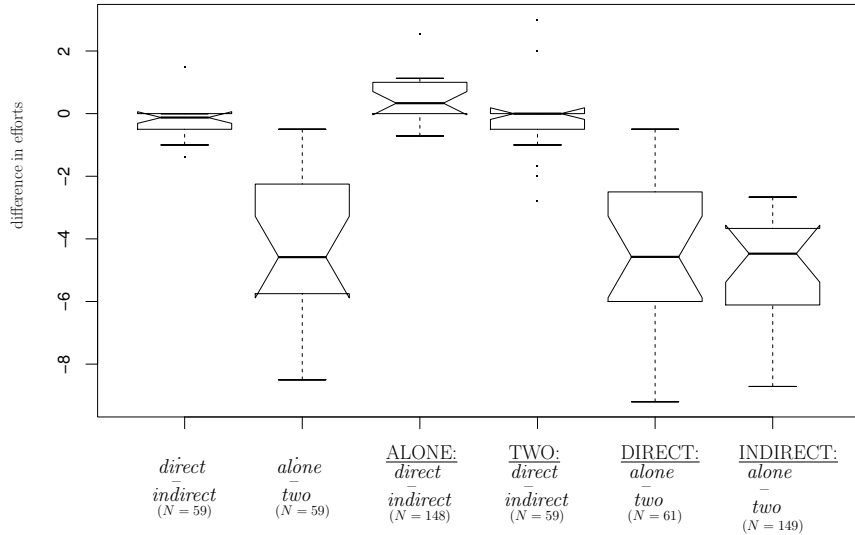
NOTE: Differences of averages per matching group. N is number of subjects for whom observations are available in both conditions.

Fig. 4. Boxplots of Differences in Efforts

This result is partly confirmed by the remaining boxplots. Only for an employee working alone are efforts significantly (Wilcoxon signed rank test, p=0.007) greater in case one was hired directly. With an average of 0.5, this difference is, however, rather negligible.

The strong evidence of a (destructive) competition for the bonus in case of coemployment raises an important question: Are more cooperative players of the public good game recommended in the hope that they refrain from competing for the bonus? The fourth boxplot in figure 4 gives a first answer to this question: Under coemployment, efforts of those directly employed do not differ significantly from efforts of those indirectly employed. Thus, subjects do not care about the source of their employment when competing for the bonus. But is there at least a negative correlation between the own effort and the contribution of the recommended coworker?

Table 3 lists several tobit regressions of effort choices for being directly employed and competing for the bonus with someone the subject has himself recommended. 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 working 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 recommended: $c_{j,1}$ 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.

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Table 3
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)	
$\bar{c}_j$	0.241	0.172	-
	(0.196)	(0.211)	
$\log \mathcal{L}$	-144	-150	-148

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

The only significant variable, remaining after a stepwise elimination of insignificant and nonexplanatory (LR tests) variables, is the same subject's effort choice when working alone.

Observation 6 Although 56% recommend someone of their network, and although being recommended depends positively on the recommendee's contribution (in the public good game), this does not translate into cooperative behavior when being coemployed.

3 Conclusions

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

Our results show that it is not the type of relation nor individual earnings (in the public good game) which affect the chances on the job market, but rather cooperativeness toward 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. Here it is important to stress that this behavior cannot be explained merely by direct reciprocity, as not only "friends" but also "cousins" are equally rewarded for cooperative behavior. Interestingly, despite creating an anchor for discrimination, behavior in the first stage is ignored when competing for a bonus. While a subject is more likely to recommend someone with higher contributions and is more likely to be 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 a participant competes very seriously for promotion or a bonus when being coemployed. It reminds us of doing sports together where, for example, I might give someone a lift to the racetrack but will nevertheless try to outrun him or her in the race. 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, e.g., 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). We seem to recommend someone suitable, even when afraid of suffering from that later on. Concern that a workforce consisting of friends and relatives may be 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. [11] Compared to our approach, a network first has to be established endogenously, rendering such voluntary network formation experiments rather intractable when being followed by a job market.

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[11] See, e.g., Calvó-Armengol and Jackson (2004) for an analysis of voluntary networks and their effects on the job market.

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 the 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 total *points* are converted to €according to the following exchange rate:

$$\textbf{5 points = 1 €}$$

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 whom 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 or all of them** in a **project**. Every point not invested into the project will automatically be 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. Conversely it holds that you profit from the investment of the other group members. The income of each member from the project is defined as follows:

Income from the project = Sum of all investments into the project times $^2/_3$

If, for example, the sum of 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 from your income of the private account and from the project. Thus:

$$\begin{array}{c} \textit{Income from your private account (= 18 - contribution to the} \\ \textit{project)} \\ \underline{+ \textit{ Income from the project (= }{}^2/_3 \times \textit{ sum of contributions to the project)}} \\ = \textit{interaction income} \end{array}$$

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

That is, 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 can 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 acquaint you with the calculation of incomes. The examples are chosen such that you can easily solve them without a calculator.

Please answer all questions, 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 into 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 – together invest 9 points into the project? Your interaction income:

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b) How much is your interaction income if the other group members – in addition to your 12 points – together invest 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 – together invest 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 receive?
7. What share of J's interaction income do you receive?
8. What share of your interaction income does participant K receive, who directly interacted with J and obtained interaction income P_K?
9. Assume your interaction income is 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 as employers. [12] Each employer has two vacancies. However, all employers first demand only 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 they accept the direct job offer, these participants can recommend one or several of participants X, Y, I, and J for that second position. A participant who was recommended can in turn 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 a **bonus** $B = 18$. Quantity a must at least be 0 and cannot 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 both 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 on

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

quantity a and equal a^2/b. Thus, your payoff of being employed and producing a equals:

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

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

Implementation

Direct Offer

At first you will not be informed about whether you received a direct job offer. Initially, you will decide in case you received a direct job offer if and, if so, who of X, Y, I and J you recommend for the second vacancy. Thereby, you can make up to four statements. That is you submit a ranking which specifies who you would recommend in which order. [13]

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

No Direct Offer but Recommended for Second Position

After deciding in the case of receiving a direct offer, you are asked to decide in the case of not receiving a direct offer but for being recommended 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 participants X, Y, I, and J, assigned to you, obtains a direct offer. Finally, your income and, if you have a colleague, that of your coworker are calculated and listed on your screen.

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[13] If several participants recommend the same participant, a random draw decides.

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

Control Questions 2nd Part

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

Please answer all questions, always noting the entire formula.

1. Assume you receive a direct offer:
   a) How much do you earn if you recommend someone for the second vacancy, he then accepts, produces $a = 11$, but you yourself reject the direct job offer?
   b) How much do you earn if you accept the direct job offer, do not recommend someone and produce $a = 4$?
   c) How much do you earn if you accept the direct job offer, recommend someone for the second position, he rejects, and you yourself produce $a = 16$?
   d) How much do you earn if you accept the direct job offer, recommend someone for the second position, he accepts, you yourself produce $a = 4$, and the other produces $a = 16$?
   e) How much do you earn if you accept the direct job offer, recommend someone for the second position, he accepts, you yourself produce $a = 4$, and the former produces $a = 4$?
2. Assume you receive **no** direct job offer:
   a) How much do you earn if you are not recommended for the second vacancy?
   b) How much do you earn if you are recommended for the second vacancy but reject?
   c) How much do you earn if you are recommended for the second vacancy, accept, produce $a = 16$ but work alone as the participant who recommended you rejected the direct job offer?
   d) How much do you earn if you are recommended for the second vacancy, accept, are coemployed, produce $a = 16$ yourself and your colleague produces $a = 4$?
   e) How much do you earn if you are recommended for the second vacancy, accept, are coemployed, produce $a = 4$ yourself and your colleague produces $a = 4$?
   f) How much do you earn if you are recommended for the second vacancy, accept, are coemployed, produce $a = 4$ yourself and your colleague produces

$a = 17$?