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Overcoming moral hazard with social networks in the workplace: An experimental approach*

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Abstract

The use of social networks in the workplace has been documented by many authors, although the reasons for their widespread prevalence are less well known. In this paper we present evidence based on a lab experiment that suggests quite strongly that social networks are used by employers to reduce worker moral hazard. We capture moral hazard with a dictator game between the referrer and worker. The worker chooses how much to return under different settings of social proximity. Social proximity is captured using Facebook friendship information gleaned anonymously from subjects once they have been recruited. Since employers themselves do not have access to social connections, they delegate the decision to referrers who can select among workers with different degrees of social proximity to themselves. We show that employers choose referrals over anonymous hiring relatively more when they know that the referrer has access to friends, and are willing to delegate more often when the social proximity between referrer and worker is potentially higher. In keeping with this expectation, referrers also choose workers with a greater social proximity to themselves and workers who are closer to referrers indeed pay back more to the referrer. The advantage of the lab setting is that we can isolate directed altruism as the only reason for these results.

Keywords: Efficiency wage contracts, Moral hazard, Dictator game, Referrals, Altruism, Reciprocity, Directed altruism, Social proximity, Facebook, Experiment, Social networks, Strength of ties, Spot market.

JEL Classification Numbers: D21, D85, D86, J41, J6, O12, O17.

1 Introduction

Much of the recent literature in labor markets (e.g. Granovetter (1995), Bandeira et al. (2009), Beaman et al. (2012), Dustman et al. (2011), Munshi(2006)) has been focused on the use of social networks in the workplace and how it affects various employer decisions such as recruitment and discipline within the firm. Recruitment decisions, in particular have attracted

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a lot of interest. Starting with Montgomery (1991), a theoretical and empirical literature has developed trying to understand why referrals are used for recruitment by employers rather than anonymous hiring.[1] Empirically, there is increasing evidence that such social networks matter much more than previously assumed.[2]

Social networks and connections thus appear to be vital for recruitment and the use of strong ties, i.e. close friends and family also seems to be a recurring pattern in these jobs. Yet the empirical literature on the underlying reasons for the use of social networks is handicapped by the difficulties in separating out the different possible reasons for the use of social networks. In this paper, we try to understand whether social networks are used by employers to reduce employee moral hazard using a laboratory experiment. The advantage of the experiment relative to an empirical study is that we can rule out other explanations for the use of employee referrals such as the reduction of search costs, adverse selection and improving the match quality as potential explanations of referrals. We can also rule out other explanations than social proximity as the exact mechanism that helps to reduce worker moral hazard and we can control for referee incentives directly. Finally, we can quantify the extent to which social networks matter in this setting.

Our theoretical framework is described below and follows the model developed in Dhillon et al. (2013). An employer is faced with moral hazard in the workplace. He has the choice to hire anonymously through the spot market[3] or delegate the hiring decision to a referee when the referee is socially connected to a set of potential workers. The advantage of the referee is that the referee and worker have some (directed) altruism towards each other via their social connection and the closer they are, the higher is the altruism. Altruism implies that the worker will internalize any repercussions on the referrer (referee) due to his own opportunistic behavior. In addition, he has some utility from giving to the referrer which is increasing in the strength of the tie. This is the key ingredient that allows the employer to induce less opportunistic behavior by the worker. The higher the possible repercussions on the referee

[1] In Montgomery's (1991) theory, employers invite the more talented in the workforce to recruit new staff: homophily or assortative matching by talent in employee networks makes employee referral a screening device. Marsden and Gorman (2001) propose an alternative screening mechanism where referral, by virtue of an employee's informational advantage, reduces uncertainty about a known candidate's labor productivity. Simon and Warner (1992) and Fernandez et al. (2000) highlight, instead, gains in the quality of the match between workplace and employee. Topa (2003), Calvo-Armengol and Jackson (2004, 2007) assume instead that referrals are used by employers and employees to reduce the costs of search. Kugler (2003), studying high skill industries in the United States, suggests that employers, through peer pressure from referee to the new recruit, gain from a reduction in monitoring costs. Heath's (2010) research on garment factories in Bangladesh, finds that referrals serve as a disciplining device by employers. Dhillon et al. (2013) assume that social proximity encourages altruistic behavior between workers and referrers and provide evidence suggestive of a moral hazard explanation as well.

[2] For example, Munshi and Rosenzweig (2006), confirming similar findings by Gore (1970), report that 70% of blue collar jobs in Dadar, Mumbai were found through referral (with a corresponding figure for white collar jobs of around 44%).

[3] It is assumed that he cannot choose his own friends, capturing the smaller network of the employer relative to all the employees in his company.

and the closer the relationship between the two, the lower the chances that the worker will shirk. The predictions of the model are that we should expect to see a higher use of referrals in jobs with a significant moral hazard component. Moreover we should expect referrals to be strong tie referrals whenever referrals are used. We use the laboratory experiment to test whether the key predictions of the model hold: the employer prefers to delegate the hiring decision to a referrer who is potentially socially connected to the workers. Second, the referrer should accept with a higher probability when he has the possibility to choose closer friends. Third, workers should be willing to work harder when they are socially closer to referrers. Finally, the mechanism through which the employer is able to prevent opportunistic behavior by employees is directed altruism on the part of workers towards referrers who are socially connected to them.

The experiment assigns subjects three roles: employer, referrer workers. Decision making takes place over two stages. In the first stage, the employer decides whether to hire a worker via the spot market or to outsource the hiring to the referrer. When there is a successful outsourcing, the referrer is delegated the hiring decision. In either case, there is a choice between two workers who differ in the extent of social proximity to the referrer. In case the employer decides to hire via the spot market, in the second stage, one of the two random workers will be assigned to him. Each worker who is chosen (whether by referrer or spot market) is given a fixed budget of 30 units out of which he chooses how much to return to the relevant player (employer or referrer). This feature of the design captures moral hazard: the title "worker" suggests that the agent is expected to return some amount of the money he receives to the employer/referrer. The setting is common knowledge to the four agents. In particular; the employer is aware of the workers and referrer being given information on their bilateral social relationships (but does not know the content of it). We use two levels of social proximity. The first level of social proximity measures whether agents are directly connected or not. The second level of social proximity measures the strength of social ties via the number of friends agents have in common. For our experiment we use information available via Facebook. So, for a referrer-worker pair social proximity is given by a pair (f, c), where f takes a value of 1 in case the referrer and worker are friends on Facebook and 0 otherwise and c indicates the number of friends the referrer and worker have in common on Facebook. If social networks are used to reduce moral hazard in the workplace then we hypothesize that (1) Employers use referrers rather than the spot market when they know that referrers have access to friends, (2) Referrers refer friends more often than non-friends and they refer close friends more often than further friends. (3) Workers return more to referrers who are friends and close friends relative to non-friends and relative to the spot market. Our results support these predictions unambiguously.

In addition, the experiment helps us to tease out the underlying mechanism for the worker

returning more to friends and to close friends relative to others. The paper is related to the experimental literature on dictator games and trust games. The average returns by dictators in the literature are about a third of the pie (Engel (2011)) which is higher than the returns to the spot market that we get. In the decision to return money to the referrer, there are three parties involved, there is only a one shot interaction and there are social networks involved. Our experimental design is able to eliminate other motivations for giving on the part of the worker apart from directed altruism and directed reciprocity. Leider et al (2009) use laboratory experiments to separate out various reasons for prosocial giving: baseline altruism, directed altruism and the prospect of future interaction. They find that directed altruism increases giving to friends by 52% relative to random strangers. In our paper, comparing giving in the spot market to giving to a friend with some close friends the figure is 54%. We thus provide supportive evidence of the importance of directed altruism when social networks are salient.

2 Conceptual Framework

There are 3 players: an employer, a referee and n workers. There are two periods. At the beginning of period 1, the worker is hired, either through referral or through the spot market. The prospective referee earns a rent R at this workplace. In addition there is utility $v(\rho)$ from choosing a worker, this captures the patronage benefits to the person choosing the worker. We assume that $v(0) = 0$, so if the worker is unknown to the agent selecting him, there are no patronage benefits, also that process matters: patronage benefits only accrue if the choice of worker is not random. The parameter ρ captures the social ties between the referee and the worker. We will assume that $\rho \in [0, \bar{\rho}]$ is distributed on the unit interval and that a higher ρ signifies closer social ties between the referee and the worker. Workers are heterogenous with respect to ρ.

If referral is used, the firm outsources the hiring decision to the referee, at an asking price P. The referee can accept or reject the offer. If he rejects, the firm then must hire through the spot market with a cost of delay $c > 0$. If the referee accepts, he then has the task of finding a worker with strength of ties ρ.

If the spot market is used, a worker is chosen at random by the employer: the probability of any one worker being chosen is therefore $\frac{1}{n}$, regardless of ρ. If the worker is hired in the spot market, the employer earns a profit $\pi = f(e)$ if the worker exerts effort e with $f'(e) > 0$. If the decision to hire is outsourced to the referee then the firm earns an amount $P \geq 0$.

In period 2 the worker makes a fully voluntary effort choice $e \in [0, E)$. It costs the worker e to exert effort but he is paid w regardless of effort. The worker's utility function is given by $U = w - e + \alpha(\rho)U_R(\rho)$, when referral is used and $w - e + \alpha(\rho)\pi(e)$, if the spot market is used. The referee utility function is $U_R(\rho) = R - P + g(e) + v(\rho)$ where g is the payoff that

depends on worker's effort with $g'(e) > 0$. We assume $\alpha'(\rho) > 0$, i.e. altruism is increasing in ρ. We assume that $\alpha(0) \geq 0$. If a worker is chosen randomly, moreover, we will assume that his anticipated ρ equals 0 - this captures anonymous hiring.

Solving by backward induction: When referrals are used, then he chooses e to maximise $U = w - c(e) + \alpha(\rho)U_R$. Assuming all second order conditions are satisfied, this leads to an e^* that is increasing in ρ. If he is in the spot market, he chooses e to maximise $w - e + \alpha(0)\pi(e)$ which generates an e^{**} that is independent of ρ.

The referee anticipates $e^*(\rho)$ and chooses ρ to maximize $U_R(\rho) = R - P + g(e^*(\rho)) + v(\rho)$. He accepts if ρ^* and e^* satisfies: $v(\rho^*) + g(e^*(\rho^*)) \geq P$. The employer anticipates this, and will choose referrals rather than the spot market if $P \geq \pi(e^{**})$.

Solution by backward induction: (1) $e^*(\rho)$ is increasing in ρ (2) The referee anticipates this and chooses the maximum ρ subject to feasibility. (3) Thus $e^*(\rho^*) > e^{**}$ (4) The referee is willing to accept the deal if $P \leq g(e(\rho^*)) + v(\rho^*)$. (4) The employer is willing to outsource if $P \geq f(e^*)$.

3 The Experiment

We conducted our referral-recruitment experiment in a laboratory using the social relationships between participants as they are in real-life, thereby incorporating a feature that is typical to field experiments.

3.1 Design

In our setting there is an employer, a referrer and two workers. Decision making takes place over two stages and the decisions made determine how a fixed surplus of 30 units is divided among the four agents.

In the first stage, the employer decides whether to hire a worker via the spot market or to outsource the hiring to the referrer. In case of the latter, he is asked to set the price to be paid to him by the referrer in case of a successful outsourcing. Simultaneously to the employer's decision making, the referrer has to announce the maximum price he is willing to pay to take over the task to hire a worker. In case the price charged by the employer does not exceed the maximum price the referrer is willing to pay, there is a successful outsourcing and the referral is given the hiring task for the price charged; otherwise, the employer and referrer disagree on the price, and the employer is send to the spot market.

In case the employer decides to hire via the spot market or has failed in his attempt to outsource the hiring task, in the second stage, one of the two random workers will be assigned to him. Without knowing whether being assigned the job or not, both workers have to indicate how much of the 30 units they return to the employer if they are assigned the job. In this case, the payment to the employer equals the return of the worker that is assigned the

job (minus 0.5 in case of a failure to outsource), the worker that is assigned the job receives 30 minus his return, the other worker and the referrer both receive nothing.[4]

In case of a successful outsourcing, in the second stage, the referrer has to choose which of the two workers to hire. Simultaneously, both workers have to indicate how much of the 30 units they return to the referrer if they are assigned the job. As the referrer has imperfect information on the returns of the workers, he cannot condition his choice among them on such information. The only distinguishing information about the worker that the referrer has, is about his social proximity to each of the workers. Moreover, he knows that also the workers, while deciding how much to return conditional on being hired, know their social proximity to him. Workers do not have information on the social distance between the other worker and the referrer. In this case, the payment to the employer equals the price, the payment to the referrer equals the return by the hired worker minus the price to be paid to the employee, the hired worker receives 30 minus his return, and the other worker receives nothing.

We use two levels of social proximity. The first level of social proximity regards agents being directly connected or not. The second level of social proximity regards the number of friends agents have in common. For our experiment we use the information available via Facebook. So, for a referrer–worker pair social proximity is given by a pair (f, c), where f takes a value of 1 in case the referrer and worker are friends on Facebook and 0 otherwise and c indicates the number of friends the referrer and worker have in common on Facebook. Notice that this distance is symmetric as long as the absolute number of common friend is regarded.[5]

The setting is common knowledge to the four agents. In particular, the employer is aware of the workers and referrer being given information on their bilateral social relationships, but does not know the content of it nor we he ever learn about it later. Employers also never learn how much is returned to the referrer by the workers.

3.2 Procedures

For each experimental session we created two sessions in Orsee (Greiner, 2004). For one of sessions three-fourth of the participants signed up; for the other the remaining one-fourth. The participants in the larger group were playing the roles of employer and workers; those in the smaller group that of referrer. The two groups were kept physically separated throughout the entire experimental session, such that referrers never saw whom they could be interacting with or could have been interacting with during the session. So, despite information on real-life social relations being provided throughout the session, we maintained the highest degree

[4]The small penalty of 0.5 for the employer in case of a failure to outsource is introduced to make charging a reasonable price when trying to outsource incentive-compatible.

[5]The distance may be not symmetric in case the relative number of common friends is regarded (that is, the number of friend in common relative to the own total number of friends).

of anonymity possible.

Prior to a session, all participants in this session were asked (via email) to accept a link that would allow us (the experimenters) to retrieve information on their social relations on Facebook. The only information we gathered regarded the bilateral connection between any two participants in the session as summarized by their direct relation (first level of social proximity) and the number of common friends (second level of social proximity).

In total we ran six sessions. All sessions took place in December 2012 in the BEElab, the experimental laboratory of Maastricht University. Instructions and comprehension questions were paper-based (see Appendix A); the decision stage was computerized using zTree (Fischbacher, 2007). Four sessions were run with 24 participants; the other two sessions we had to run with 20 participants due to a low show-up. So, in total 136 students participated.

One-fourth of the participants in a session was assigned the role of employer, one-fourth that of referrer, and the remaining half were given the role of workers. These roles were kept fixed throughout the entire experimental session. The participants interacted in a sequence of 30 rounds, where every round anew they were regrouped with three other participants, such that each group consisted of one employer, one referrer and two workers. So, six groups were formed every round in four sessions and only five groups in the other two sessions. In the first 15 rounds only first level social proximity information was given to the referrer–worker pairs; in the second 15 rounds first and second level social proximity information was given. After each round of play, participants received feedback on decisions as long as they were payoff-relevant.

Payments accumulated over all rounds and were handed out immediately after the session. For each unit of payoff in the experiment, participants received 0.04 Euros. In addition, they received a show-up fee of 3 Euros, and an initial endowment of 3 Euros in experimental currency units to avoid any bankruptcy (for the referrers).

4 Results

This section consists of four subsections. After having provided descriptive information on the friendship relations among the participants, we deal consecutively with the three types of decisions in the experiment. First we deal with the outsourcing decisions by the employers, where we investigate if employers prefer the spot market or to outsource the hiring decision to a referrer, how often a deal is made and how bids and prices change over time. Thereafter, we consider on the hiring decisions referrers make, and how (relative) social proximity to the workers affects these. Finally, we investigate the returns by the workers and how these depend on whether being hired via the spot market or via the referrer and, in case of the latter, on the social distance to the referrer.

4.1 Descriptives

Our aim in the experiment is to examine the effect of friendship on referrer decisions and worker returns while avoiding establishing such relationships superficially in the lab and use real-life relations instead. In order to obtain many friendship relations of different levels while keeping the anonymity, we restricted the subject profile to undergraduate students at the School of Business and Economics.

Table 1 summarizes the social proximity between participants prior to the role division. Among the 1,484 possible different pairs, 46 direct friendship relations existed. In 680 possible pairs the two respective participants had at least one friend in common. The average number of common friends over all possible pairs is 1.71, and this number is 4.18 when averaging over the pairs with at least one common friend.

	$c > 0$	$c = 0$
$f = 1$	45 (3.03%)	1 (0.07%)
$f = 0$	635 (42.79%)	803 (54.11%)

Table 1: Friendship relations among all possible pairs of participants prior to the role division.

Table 2 summarizes the same information for all possible referrer–worker pairs after the roles had been decided. After the role division, there were 388 different possible referrer–worker pairs; among those there are 10 direct friendship relations. 186 possible referrer–worker pairs had at least one friend in common. The average number of common friends over all possible referrer–worker pairs is 2.14, and this number is 4.47 when restricting attention to the pairs with positive number of common friends.

	$c > 0$	$c = 0$
$f = 1$	10 (2.58%)	0 (0.00%)
$f = 0$	176 (45.36%)	202 (52.06%)

Table 2: Friendship relations among all possible referrer–worker pairs.

Referrers only make hiring decisions in periods where a deal between the employer and the referrer has been established. Only in these cases the friendship relation of the referrer with the two workers matters. Out of the 68 participants who were assigned the role of a worker, only 9 of them ever matched, in a successful outsourcing, with a referrer with whom he shares a direct friendship relation. Such a matching, in a successful outsourcing, between a worker and a referrer who is her friend occurred in total 31 times.

4.2 Outsourcing by employers

Employers have two options to choose from, either to hire from the spot market directly or to outsource the hiring to a referrer. If employers expect workers to return more to the referrer,

then they may opt for outsourcing to exploit this difference. This comes only at a slight risk due to the small amount employer needs to pay if his offer is declined. We find that, despite the small cost in case of a failure to set a deal, employers prefer to hire via the referrer rather than via the spot market. Over 30 rounds 34 employers made in total 1,020 hiring decisions, and in 831 of them (81%) a deal is offered to a referrer. This preference to outsource is rather robust over time.[6]

In case the employer makes the attempt to outsource the hiring by offering a deal to the referrer, whether a deal is reached depends on the referrer's bid (which is his revealed maximum price that he is willing to pay to take over the responsibility to hire). Out of the 1,020 hiring decisions, 397 (39%) resulted in a deal between the employer and the referrer. Figure **??** shows the percentage of successful outsourcings with respect to all hiring decisions for each session. In order to better picture a possibly available time-trend, the graph presents moving averages over clusters of 10 periods.

The figure suggests that heterogeneity across matching groups grows over time. Before the first vertical line, the graph is based only on the first fifteen periods where subjects have no information about the second level of social proximity. After the second vertical line, it is only based on the last fifteen periods, where referrers and workers receive information also on second level of social proximity. Between the two lines, the data is based on a mixture of these two informational variations.

Between first and second fifteen periods, where subjects do not know and know about the number of common friends, there is no significant difference between gross percentage of deals ($p = 0.2489$; two-sided Wilcoxon signed-rank test on session averages). When allowing for a learning effect and considering only the last five periods under the two different information conditions, we find a significant increase in the number of deals ($p = 0.0345$).

Whether a deal is established depends on the prices and the bids. Figure 1 shows the prices and bids by period averaged over sessions.[7] The average price is based on the instances where employers decide to outsource the hiring; so, given that employers try to outsource in 81% of the time, the average price in each period is based on 28 employer decisions on average. As referrers do not know about the employers' intention to outsource at the moment of setting their bids, the average bid in each period is based on 34 referrer decisions. We see that both bids and prices are declining over time.

Referrers are expected to adjust their bids to the returns they receive from the workers. In case the returns are below the bid such an adjustment prevent potential losses; in case returns are above it such an adjustment increases the opportunity to make a profit. Figure 2 shows the trend of bids and returns to the referrer. The graph suggests that the (relatively)

[6]Over the six consecutive bundles of five periods the respective percentages by which employers opted for outsourcing are 73, 87, 77, 82, 73 and 85.

[7]Graphs of the individual sessions do not look much different.

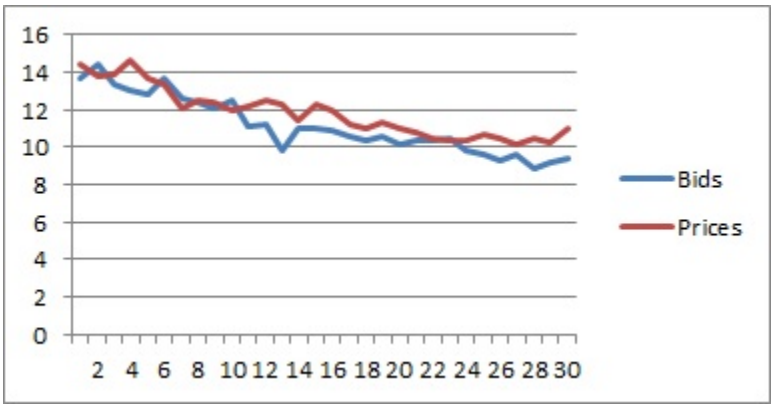

Figure 1: Average referrer bids and employer prices over time.

low returns to the referrers drive down the bids referrers make. Still, referrers bid above the returns from the workers in almost all periods.

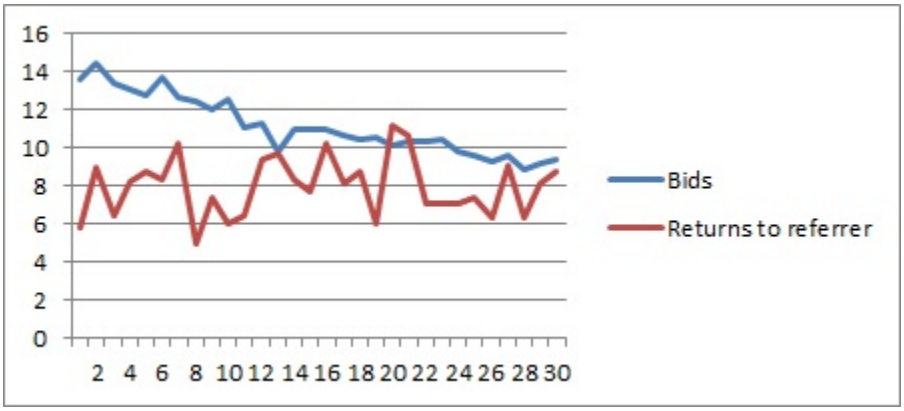

Figure 2: Average referrer bids and and worker returns to referrers over time.

Employers, on the other hand, are expected to adjust their prices to the returns they receive from the spot market. Figure 3 shows the trend of prices and returns from the spot market to the employer. Although employers keep prices far above spot market returns, both quantities show a decreasing trend. Overall, prices seem to be more responsive to bids (recall Figure 1) than to spot market returns. The high prices charged lead us to think that employers do not choose to outsource in order to involve referrers in the sharing of the surplus, but mainly for the sake of self-interest.

4.3 Hiring by referrer

When there is a successful outsourcing, a referrer is randomly matched with two workers, either of whom may be a friend or not. Before deciding whom of the two workers to hire, the referrer receives information on his social proximity to each of them. If this choice is between a friend and a non-friend, we find that referrers choose more often for the friend: 7 referrers

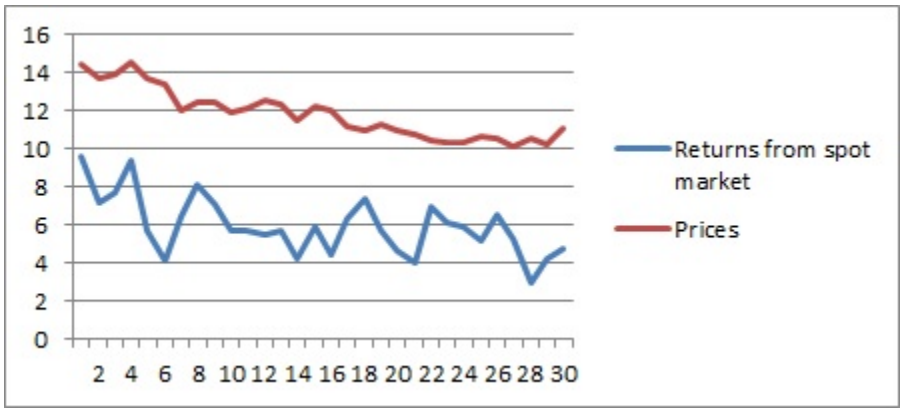

Figure 3: Average employer prices and worker returns to employer via spot market over time.

were together 29 times in the position to choose between a friend and a non-friend and 22 times they decided to hire the friend (this is significant at $p = 0.0208$; two-sided Wilcoxon signed-rank test on individual percentages).

Not only the direct friendship relation, but also the number of common friends plays a role in the hiring decision of the referrer. We find that when a worker has more friends in common with the referrer, he is more likely to be chosen. In the last fifteen periods, where referrers have information on both levels of social proximity, referrers hire the worker with the higher number of common friends in 72.79 percent of the occasions (this is significant at $p = 0.0277$). Restricting attention to those cases where the referrer is matched with two non-friend workers, this percentage is 73.11 ($p = 0.0269$). If this choice is between a non-friend worker with zero common friends and a non-friend with a positive number of common friends, this percentage is 73.86% ($p = 0.0269$), when both non-friend workers share at least one common friend, this percentage is 70.97% ($p = 0.0796$).

Table 3 presents the results of a regression with as dependent variable the probability that worker 1 is selected. As information on the number of common friend is only given in the last fifteen periods, only these periods are considered in the regression. The table presents the result for three different selection of the data: (1) when both workers are non-friends, (2) when both workers are non-friends and one of them shares a positive number of common friends while the other one does not have any friend in common, and (3) when both workers are non-friends and both have at least one friend in common with the referrer.

The results in the table indicate that referrers generally prefer to hire the worker who has more friends in common with him, which supports the earlier findings on basis of the nonparametric tests. If both workers have at least one friend in common with the referrer, this result is not significant, unlike in the earlier nonparametric tests. This is likely to be due to the limited number of observations in which a referrer is matched with two workers who are both non-friends and share an unequal positive number of common friends with him.

	All data (1)	$c_i > 0$ and $c_j = 0$ (2)	$c_1 > 0$ and $c_2 > 0$ (3)
$c_1 - c_2$	0.02^{***}	0.02^{**}	0.01
	(0.01)	(0.01)	(0.01)
Period	0.01	0.01	0.01
	(0.01)	(0.01)	(0.02)
Constant	0.40^{*}	0.21	0.13
	(0.20)	(0.25)	(0.51)
Observations	194	88	44
R-squared	0.05	0.08	0.05

Table 3: Probability that worker 1 is selected. Both workers are not friends of the referrer. Robust standard errors (clustered on individual level) in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

4.4 Returns by workers

Table 4 provides the average returns by workers to referrers and in the spot market for each sessions. We see that the overall average return to a referrer is significantly higher than the average return in spot market ($p = 0.0747$; Wilcoxon signed-rank on session level). Possible explanations for this difference include reciprocity, egalitarian taste, or social proximity. A detailed description and discussion of these motives is provided in the final section.

	To referrer			To spot market		
Session	1–30	1–15	16–30	1–30	1–15	16–30
1	7.10	7.02	7.15	4.20	4.84	3.35
2	10.02	9.55	10.43	7.39	7.22	7.58
3	5.18	5.79	4.65	5.93	6.18	5.65
4	8.58	9.17	8.04	7.59	7.86	7.30
5	8.50	8.41	8.57	4.46	5.12	3.52
6	4.40	4.33	4.54	4.14	4.28	4.02

Table 4: Average returns by workers in the different informational conditions over different clusters of periods.

In order to be able to disentangle the importance of social proximity, we categorize the possible relationship situations between a worker and a referrer into five different type-classes, based on first and second levels of social proximity. Type $(f = 1, c > 0)$ refers to workers who are matched with a referrer that he has a friendship relation with and with whom he has a positive number of friends in common. As there were no worker–referrer pairs whom had a friendship relation but no common friends in our experiment, the class of Type $(f = 1, c = 0)$ workers is empty. Type $(f = 0, c > 0)$ refers to workers who are matched with a referrer that he has no friendship relation with, but does have a positive number of friends in common. Finally, Type $(f = 0, c = 0)$ refers to workers who have maximal social distance for as far captured in our data. These four types are only relevant once a successful outsourcing of

the hiring process is reached. Moreover, full type information is revealed to relevant parties only in the last fifteen periods; in the first fifteen rounds the first two type-classes and the latter two are not distinguishable. The last type is the Spot Market, which refers to a worker who is not matched with a referrer but hired by the employer via the spot market. Table 4 summarizes the average returns of the different types when all workers have full information about their type (last fifteen periods), with in parentheses the standard deviation and number of observations.[8]

	$c > 0$	$c = 0$
$f = 1$	8.24 (7.31, 17)	– (–, 0)
$f = 0$	9.33 (6.73, 184)	6.00 (6.36, 221)

Spot market
5.34 (5.67, 598)

Table 5: Average returns by workers in the different informational conditions.

Table 6 present the result of a OLS and Tobit regression of the returns from the workers in the last fifteen periods on the types just described relative to the omitted spot market type. The regression results indicate that workers do not return significantly more to a

	OLS	Tobit
Type $(f = 1, c > 0)$	2.99	2.56
	(3.02)	(4.24)
Type $(f = 0, c > 0)$	4.00^{***}	4.81^{***}
	(0.95)	(1.16)
Type $(f = 0, c = 0)$	0.66	0.55
	(0.85)	(1.16)
Period	-0.07^{**}	-0.09^{***}
	(0.03)	(0.03)
Constant	6.93^{***}	6.11^{***}
	(0.93)	(1.19)
Observations	1,020	1,020
R-squared	0.06	

Table 6: Returns by the various types of workers. Robust standard errors (clustered on individual level) in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

non-friend referrer without common friends than they return in the spot market; as such these referrers are considered total strangers and treated as such. Unlike for workers of type $(f = 1, c > 0)$, this lack of significance is not due to a poor number of observations (see Table 5). However, when the referrer is not a total stranger to the worker, as expressed by a nonzero number of common friends, the worker returns a significantly higher amount than in the spot market. Also the difference between types $(f = 0, c > 0)$ and $(f = 0, c = 0)$ is significant $(p = 0.0023)$. We argue that social proximity is the main driver for this difference.

[8] To compare these returns to reciprocal behavior in related famous game situations: the average return in trust games is usually about 37% of the investment (which would suggest a return of 11.1 at the spot market) and the average return in dictator games is about 28% of the endowment (which corresponds to a return of 8.49 at spot market).

For reciprocity to be the main driver, one would have expected also a higher return by a worker of type $(f = 0, c = 0)$; likewise for egalitarian preferences where a higher return would be expected for type $(f = 0, c = 0)$ as well, just because of the awareness that the surplus is divided among three, rather than two, individuals.

Table 7 presents the results of the regressions that aim to unravel how the effect of friendship on returns interacts with the number of common friends. We see from the regressions

	Periods 1–15		Periods 16–30	
	OLS	Tobit	OLS	Tobit
Type $(f = 0, \bullet)$	1.42^{**}	1.74^{***}	1.59^{**}	1.82^{*}
	(0.54)	(0.63)	(0.77)	(0.99)
Type $(f = 1, \bullet)$	1.60	1.41	10.50^{***}	14.57^{***}
	(2.52)	(3.20)	(3.19)	(4.50)
Type $(f = 0, \bullet) \times c$			0.38^{***}	0.46^{***}
			(0.10)	(0.13)
Type $(f = 1, \bullet) \times c$			-0.23^{***}	-0.44^{***}
			(0.05)	(0.11)
Period	-0.11^{**}	-0.13^{**}	-0.06^{**}	-0.08^{**}
	(0.04)	(0.05)	(0.03)	(0.03)
Constant	6.85^{***}	6.18^{***}	6.78^{***}	5.87^{***}
	(0.66)	(0.84)	(0.92)	(1.18)
Observations	1,020	1,020	1,020	1,020
R-squared	0.02		0.06	

Table 7: Relation of returns to the number of common friends. Robust standard errors (clustered on individual level) in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

over the data of the first fifteen periods, that workers return more to a non-friend referrer than they return in the spot market. Notice here that in these first fifteen periods no information is given on the number of friends workers have in common with the referrer and, hence, they cannot assess properly their social proximity to the referrer. There is no significant difference in returns to friend and non-friend referrers ($p = 0.9421$ in OLS; $p = 0.9197$ in Tobit). Like earlier, this lack of significance can be attributed to the low number of direct friendship relations among worker–referrer pairs. In total there are only nine workers who are ever matched with a referrer who is a friend. If we only consider the average return by these nine workers to referrers who are friends and referrers who are non-friends, we still do not find any significant difference between returns to friends in non-friends by means of a nonparametric test ($p = 0.2123$).[9]

In the regressions over the last fifteen periods we see that the return to non-friends is increasing in the number of common friends, while to friends the returns are decreasing in this number. The numbers in the table indicate that up to about fifteen common friends more is returned to a friend and beyond this number more is returned to a non-friend. Though,

[9]Notice that there is no direct interaction between workers and may consider their returns as independent observations.

the negative impact of the number of common friend on returns to friends should be taken with some reservation. During the last fifteen periods, only seven workers have been matched with a referrer who is a friend (in 17 decision situations). Those seven individuals mostly adopt a fixed return to friends and none of them was ever matched with at least two different referrers that are friends and with whom a different number of common friends is shared. A decent within-subject analysis is therefore not possible.

5 Discussion

In this section we discuss the main findings and the motives behind the behavior of the participants. Firstly, we are interested in understanding why workers return anything at all when they are in a position to keep the full surplus to themselves. Possible explanations are reciprocity, egalitarian preferences, baseline altruism, directed altruism, or motivation by future prospects.

A reciprocal individual responds to actions he perceives to be kind in a kind manner and to actions he perceives to be hostile in a hostile manner. When a referrer hires a worker, this may be perceived by the worker as a kind gesture as the referrer risks making a loss (he pays a price to the employer while not being sure of a return above this prices) and actively chooses the one worker over the other. The worker may want to return this favor. Instead, in the spot market, the employer does not risk a loss and the worker is not selected by decision; reciprocity should not prevail in this information state.

Egalitarian preferences of workers is another possible explanation. An egalitarian individual attempts to produce equality even at a cost to himself (Dawes et al. (2007)). A perfectly egalitarian individual will return 15 in the spot market (the endowment is only shared between the worker and the employer), and return 20 if he is hired by a referrer (the endowment is shared between the worker, the referrer and the employer). Even if we do not observe this perfectly egalitarian behavior, some workers may simply return more to the referrer to be relatively more equal.

Leider et al. (2009) mention three more possible motives. First, baseline altruism, which entails being nice unconditionally (even to strangers). Although the presence of this factor cannot be rejected, it cannot explain the differences in workers' returns across the different informational conditions. Second, directed altruism, which entails being nicer to socially closer people. According to this notion different types should return differently and returns should be responsive to the number of common friends. Third, motivation by future prospects. Since decisions take place in anonymity, workers are rematched to referrers every period anew, may not be hired in some rounds, or hiring may have taken place via the spot market, there is no scope for building a reputation relationships during the session and this factor appears irrelevant.

Hence, only three of the five factors have potential to be of explanatory value for behavior observed throughout our experiment: reciprocity, egalitarianism and directed altruism.

Average returns to referrers are found to be higher than average returns in the spot market. If this difference were to be attributed to reciprocity or egalitarianism, then we should also see a difference between average returns to non-friend referrers with zero common friends and average returns in the spot market. However, we did not find such a difference (and this is not due to a lack of observations). This supports the earlier claim that social proximity is the main driving force behind observed differences.

However, in the first fifteen periods (when workers do not know their exact social proximity to the referrer), workers return more to a non-friend referrer than they return in the spot market. This can be explained by reciprocity and egalitarian preferences. It appears that in the absence of exact social proximity information, workers base their decisions on on of these other factors.

Additional support of the role of social proximity if found in the hiring decisions by the referrers. Referrers tend to hire friends over non-friends, and tend to hire workers with more common friends when neither of them is a direct friend. Moreover, workers return significantly more when they have more friends in common with a non-friend referrer.

In conclusion, social ties generally induce higher returns and hiring decisions on basis of social ties lead to a selection of the more returning worker. The decisions to outsource and to exploit the social ties of referrers to workers by the employers therefore leads to an increase in the joint payoff of the employer and the referrer and justifies the use of job referrals.

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A Instructions

Welcome

You are about to participate in a session on interactive decision-making. Thank you for agreeing to take part. The session should last 60 to 90 minutes.

You should have already turned off all mobile phones, smart phones, mp3 players and all such devices by now. If not, please do so immediately. These devices must remain switched off throughout the session. Place them in your bag or on the floor besides you. Do not have them in your pocket or on the table in front of you.

The entire session, including all interaction between you and other participants, will take place through the computer. You are not allowed to talk or to communicate with other participants in any other way during the session.

You are asked to abide by these rules throughout the session. Should you fail to do so, we will have to exclude you from this (and future) session(s) and you will not receive any compensation for this session.

We will start with a brief instruction period. Please read these instructions carefully. They are identical for all participants in this session with whom you will interact. If you have any questions about these instructions or at any other time during the experiment, then please raise your hand. One of the experimenters will come to answer your question.

Compensation for participation in this session

In addition to the 3 Euros participation fee, what you will earn from this session will depend on your decisions, the decisions of others and chance. In the instructions and all decision tasks that follow, payoffs are reported in Experimental Currency Units (ECUs). You will receive an initial endowment of 75 ECU which will cover some loss that might occur during the experiment. Just like a profit is automatically added to your total payoff at the end of a round, a loss will be automatically deducted. If at the end of the experiment your total payoff is negative we will ask you to donate this amount to a charity organization of choice. This situation is not likely to occur and under your control. At the end of the experiment, the total amount you have earned will be converted into Euros using the following conversion rate:

1 ECU = 0.04 Euros.

The payment takes place in cash at the end of the experiment. Your decisions in the experiment will remain anonymous.

Instructions

In the beginning of the experiment, you will be assigned one of three possible roles: *employer*, *referee* or *worker*. You will keep this role throughout the entire session in which the decision situation explained below is repeated for 30 rounds.

Every round anew, new groups are formed consisting of one employer, one referee and two workers. You will never be informed about identities of the people you are interacting with: neither during nor after the experiment.

Employer

First the employer decides whether s/he wants to hire a random worker from the *spot market* or to hire one via the *referee*.

When the employer chooses to hire a random worker from the spot market, one of the workers is randomly assigned the job. This worker is given an amount of 30 ECU and has to decide how many of this 30 ECU to return to the employer.

If the employer wants to hire via the referee, s/he has to ask a *price* between 0 and 30 ECU at which s/he is willing to outsource the hiring decision. In case the price-offer is accepted, the referee is given the task to hire a worker and will collect the return, but has to pay the price to the employer. In case the price-offer is rejected, no deal is made and the employer will be assigned a random worker from the spot market and collects the return from this worker. However, in this case, the employer loses 0.5 ECU for the delay.

Referee

The referee (whom does not know which way the employer likes to hire a worker, nor the offered price in case s/he wants to hire via the referee), is asked to indicate the maximum price – the *bid* – at which s/he is willing to accept the task to hire a worker. Afterwards s/he learns whether a price-offer has been made by the employer. The offer results in a successful deal in case the price asked does not exceed the bid.

In case no successful deal is made, the referee is not assigned the task and does not have to make any further decision this round.

In case a successful deal is made, the referee has to choose to hire one of two possible *workers*: Worker 1 or Worker 2. Once the deal is realized, the referee observes his/her friendship-connection on Facebook to each of the workers. In the first 15 rounds the information released is whether a worker is a friend on Facebook or not; in the remaining 15 rounds the referee also observes how many friends s/he has in common with the workers on Facebook.[1] The

[1]Remark: Some Facebook-users use security options that do not allow us a perfect counting. As a result, the actual number of common friend may be larger than the number that is presented.

hired worker decides how much of the 30 ECU to return.

The referee chooses to hire one of the workers before s/he sees how much they would return.

Worker

In case a worker is randomly hired through the spot market (either because the employer prefers so or because the employer has not been successful in making a deal with the referee), both workers in the group are asked how much of the 30 ECU they want to *return* in case they are hired.

In case a deal is realized between the employer and the referee, both workers observe their friendship-connection on Facebook to the referee. In the first 15 rounds the information released is whether the referee is a friend on Facebook or not; in the remaining 15 rounds each worker also observes how many friends s/he has in common with the referee on Facebook (see Footnote 1). Both workers are asked how much of the 30 ECU they want to *return* in case they are hired.

The workers do not know each other's Facebook-relationship to the referee.

Additional informational details

If the employer wants to hire via the referee, the employer only learns if a deal is made or not. That is, s/he learns whether the bid of the referee is below the price or not, but s/he will never learn the precise bid. In case of a successful deal, the employer will not learn which worker is hired by the referee and how much this worker has returned.

In case the worker is not hired via the referee, the return goes to the employer and the referee will not learn about the amount returned.

In case the worker is hired by the referee, the amount that s/he returns goes to the referee, who in turn pays a price to the employer (and the price is not known by this worker).

Notice that a worker decides how much to return before knowing whether s/he is hired or not. At the end of the round the worker learns if s/he is hired for the job.

Also notice that when the referee does the hiring, s/he does not see how much each worker returns before s/he makes a choice between them. Similarly the employer does not see any returns before s/he makes a decision to go to the spot market or to hire via the referee.

Earnings

Employer:

– If s/he chooses to hire a random worker from the spot market:

  Earnings = return

– If s/he offers the task to the referee and the offer is accepted:

Earnings = price

– If s/he offers the task to the referee and the offer is rejected (and a random worker from the spot market is assigned the job):

Earnings = return - 0.5

Referee:

– If the employer hires a worker from the spot market (either directly or after an unsuccessful deal):

Earnings = 0

– If a deal is made with the employer:

Earnings = return - price

Worker:

– If the worker is hired for the job (either randomly selected from the spot market, or chosen by the referee):

Earnings = 30 - return

– If the worker is not hired:

Earnings = 0

The earnings (in ECU) are accumulated over (all 30) rounds and transferred to Euros at the end of the experiment (at the exchange rate given on the first page).

Hypothetical examples for demonstration purposes

Example 1

Suppose the employer wants to hire via the referee and asks a price of 20 (price=20), while the referee indicates to be willing to pay a price of 15 at maximum (bid=15). Then, no deal is realized between the employer and the referee, and the employer will be hiring from the spot market. This means that a randomly selected worker is assigned the job. Suppose this worker returns 6 of the 30 ECU. Then the earnings of the employer are 5.5 ECU, that of the referee 0 ECU and that of the worker 24 ECU.

Example 2

Suppose the employer wants to hire via the spot market directly, while the referee indicates to accept all prices up to 7 (bid=7). The referee learns that no offer is made and that the employer is hiring from the spot market. Like in the previous example, a randomly selected worker is assigned the job. Suppose this worker returns 14 of the 30 ECU. Then the earnings of the employer are 14 ECU, that of the referee 0 ECU and that of the worker 16 ECU.

Example 3

Suppose the employer wants to hire via the referee and asks a price of 12 (price=12), while the referee indicates to accept all prices up to 16 (bid=16). As the bid is not lower than the price, a deal is made between the employer and the referee at a price of 12. As a result, the referee will be hiring a worker and will collect the return. Suppose that Worker 1 and the referee are friends on Facebook, this information will be revealed to both of them now. Suppose that Worker 2 and the referee are not friends on Facebook, this information will be revealed to both of them now. Suppose that Worker 1 indicates to return 20 of the 30 ECU and Worker 2 indicates to return 16 in case being hired. Suppose the referee (who cannot observe the returns of the two workers) hires Worker 2. Then the earnings of the employer are 12 ECU, that of the referee is 4 ECU and that of Worker 2 is 14 ECU; Worker 1 receives 0 ECU.

True or False?

After reading the instructions, before proceeding with the experiment you should be able to tell if the following sentences are true or false. Please write down your answers on this sheet. You will be approached by the experimenter and the answers will be checked.

1. If I am a worker, when I return more I increase my chances of being hired in that round.
2. Every round I will keep the same role, but I will be rematched with others to form a new group.
3. If I am a referee, when there is a deal I need to return the price to the employer.
4. If I am an employer and a deal is made, I will receive the price from the referee for sure.