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Charness, Gary, Cobo-Reyes, Ramón, Jiménez, Natalia, Lacomba, Juan A and Lagos, Francisco (2012) The hidden advantage of delegation: pareto-improvements in a gift-exchange game. *American Economic Review*, 102 (5). pp. 2358-2379. ISSN 0002-8282
(doi:10.1257/aer.102.5.2358)

First submitted uncorrected version (with author's formatting)

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The Hidden Advantage of Delegation: Pareto-improvements in a Gift-exchange Game

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July 1, 2011

Abstract: This paper analyzes the effect on performance and earnings of delegating the wage choice to employees. Our results show that such delegation significantly increases effort levels. Moreover, we observe a Pareto-improvement, as the earnings of both employers and employees increase when employers delegate than when they do not. Interestingly, we also find that the employees' performance under delegation is higher than under non-delegation, even for similar wages. While there is strong evidence that behavior reflects strategic considerations, this result also holds for one-shot interactions. A possible non-strategic motivation explaining the positive reaction to delegation is a sense of enhanced responsibility.

JEL Classification: C91, D01, J3, J41

Keywords: labor market, gift exchange-game, delegation, experiment, responsibility.

Acknowledgements: We acknowledge helpful comments from Jordi Brandts, Ernst Fehr, and Peter Kuhn as well as seminar audiences at the ESA meeting in Tucson, the IMEBE meeting in Bilbao, and the University of Munich. Special thanks go to Joel Sobel and two anonymous referees for their very useful comments. Financial support from the Spanish Ministry of Education and Science (SEJ2010-17049/ECON; SEJ2009-11117/ECON) and Junta de Andalucía (P07-SEJ-02547; P07-SEJ-3261) is gratefully acknowledged.

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1. Introduction

Many employment relationships are characterized by incomplete labor contracts in which the worker's performance is not always enforceable. The firm's profits depend (in part) on workers' behavior. Thus, some combination of control and incentives devices is needed to get the best performance. The standard approach is to control the self-interested worker to the greatest extent possible, in order to avoid shirking and behavior not in the best interest of the firm and to provide direct financial incentives to motivate this worker to be productive.

According to standard economic theory, employees' effort collapses to the minimum in either one-shot games or in repeated interactions with a finite time horizon. Thus, the employer has no incentive to pay an above-minimum wage. Nevertheless, a positive relationship between wage and effort has been found in a large number of gift-exchange experiments and people have been shown to have a variety of non-pecuniary motivations.¹ Furthermore, in an illuminating paper, Falk and Kosfeld (2006) find that exerting control can be counter-productive for firm profits.

It may well be possible to find alternative mechanisms to harness alternative motivations to achieve higher profitability and potentially even better social outcomes. In this vein, Semco, a Brazilian manufacturer company, has operated as a real-world laboratory in the last two decades. One of Semco's policy innovations was to allow workers to set their own salaries and working hours.² It seems that the Semco experiment has been a huge success. An investment of \$100,000

¹ See, for instance, Fehr et al. (1993), Fehr and Gächter (1998), Hannan et al. (2002), Charness (2004) or Charness et al. (2004) for one-shot games; and Gächter and Falk (2002) and Brown et al. (2004) for repeated interactions settings.

² Besides allowing workers to set their own salary, at Semco workers set their own production quotas, they choose the time they arrive, redesign products and formulate marketing plans.

made in Semco 20 years ago would be worth \$5.4 million today.³ Ricardo Semler (1989, 1993), CEO and majority owner of Semco SA, summarizes his philosophy as follows: “Most companies hire adults and treat them like children. All that Semco does is give people the responsibility and trust that they deserve”.

While such a policy may still be rare, it is still worth considering. Accordingly, this paper considers how laboratory ‘employers’ and ‘employees’ change their behavior when the option of delegating the wage decision is present. We conduct an experiment in which an employer can decide either to choose the employee’s wage or to let him choose it, in other words to ‘delegate’ the wage choice.⁴ In this experiment, subjects play a modified version of the gift-exchange game proposed by Fehr, Kirchsteiger and Riedl (1993), where in each period the employer first may decide on the wage level or delegate this decision to the worker. In this first stage, the employer also announces a desired effort level. After observing the employer’s decision and the desired effort level, the worker subsequently decides how much effort to supply (and her own wage level, in the appropriate case).⁵

The novel feature of our experiment is the employer’s decision. Standard economic theory predicts the employer would never delegate the wage decision to the employee since the employer anticipates that the worker would choose the highest wage jointly with the lowest level

³ The success can be seen not only from the point of view of the company, but also from workers’ perspective. They have more than 2000 job applications and hundreds of people who say “they would take any job just to be at Semco”.

⁴ Throughout the paper, we shall presume that the firm is female and the worker is male.

⁵ The gift-exchange game has been widely analyzed in the experimental literature. In recent years, Abeler et al. (2006) study the interaction of different payment modes with reciprocity; Kocher and Sutter (2007) analyze how groups behave in the gift exchange game and the role of communication; Charness et al. (2004) find that the degree of gift exchange is surprisingly sensitive to an apparently innocuous change - whether or not a comprehensive payoff table is provided in the instructions; in Maximiano et al. (2006) the gift exchange game is extended to a situation in which the employer employs several workers.

of effort, resulting in the worst scenario for the employer. Nevertheless, we hypothesize that if the employer allows the worker to choose his own wage each period, the performance of the worker will be even better than if he were to receive the same high wage from the employer. In a repeated-game environment, which prevails in the field, there is a clear strategic motivation to provide higher effort, so that the employer chooses to delegate the wage decision in the subsequent period.

In addition, (at least) two behavioral motivations might contribute to this improvement. One possibility is that the employee could conceivably enhance her performance due to some form of positive reciprocity. Employees may perceive the fact of being delegated the wage decision by firms as a better *gift* than a high wage. Thus, workers could react positively to delegation, providing greater effort. A second possibility is that people may react positively to having greater responsibility. The *responsibility-alleviation* effect (Charness 2000) states that an agent who bears the responsibility for an outcome will behave in a more ‘pro-social’ manner, as an increase in responsibility augments internal impulses towards honesty, loyalty, or generosity. According to this principle, we should expect impulses toward generosity to be increased if the employee determines his own wage.⁶ A wage assigned by the employer may enable the employee to rationalize shifting some of the responsibility for the final outcome onto the shoulders of the employer. Conversely, if the employer uses the delegation option, the employee cannot avoid accepting full responsibility for the final allocations.

Our data support the main hypothesis that the decision to delegate significantly increases

⁶ Morgenstern (2004) and Charness and Jackson (2009) also provide evidence that people behave in a more pro-social manner when they perceive that they are responsible for an outcome. Fehr, Hart and Zehnder (2010) show that when workers bid for wages, they are less likely to shirk, even though their wages are much lower, suggesting that responsibility might be a significant force in such a set-up.

effort levels. Moreover, the earnings of both the firms and the workers are larger when the firms delegate than when they do not. These results hold both in one-shot and in repeated interactions (stranger and partner matching schemes), although effort and profitability are considerably higher in the latter case, showing a strong influence for strategic considerations. We also find that, in both scenarios, the employee's performance under delegation is higher than under non-delegation for similar wages. These results seem to confirm that delegation has motivational effects *per se*.

In order to try to test whether positive reciprocity is a factor in driving these results, we also conduct a treatment in which the worker always decides on both the wage and the effort. The data suggest that positive reciprocity, in the sense of a more favorable response than would occur with a neutral play or no play, is not an explanation for workers' better performance, as we did not find significant differences in effort levels in response to a wage either set through delegation or by a dictator-worker. This makes it more likely that the increment to responsibility is an important factor for explaining the observed patterns of behavior.

Our results complement those of Falk and Kosfeld (2006). They analyze the consequences of control on motivation in an experiment where the employer can control the agent by implementing a minimum performance requirement before the agent chooses a productive activity. They find that control entails hidden costs since most agents reduce their performance as a response to the employer's controlling decision. In this sense, we find hidden advantages in delegating, in counterpoint to their hidden costs of control.

Our paper is also related to the experimental literature on the decision of delegating in different settings. Gneezy and Fershtman (2001) analyze the effect of strategic delegation in an ultimatum game, showing that when the proposer uses an agent her share is increasing. Bartling

and Fischbacher (forthcoming) conducted an experiment where subjects could delegate the choice between a fair or unfair allocation in a Dictator game, using a punishing option to elicit responsibility attribution. They find that responsibility attribution is effectively shifted, which constitutes a motive for the delegation of the decision right. Hamman, Loewenstein and Weber (2009) provide the results from experiments in which principals either decide how much money to share with a recipient or hire other agents to make decisions on their behalf. They show that recipients receive significantly less when hired agents make allocation decisions; Coffman (forthcoming) additionally finds that a selfish principal receives less punishment when she delegates even a necessarily-selfish allocation to an agent. Fehr, Herz and Wilkening (2010) study the motivation and incentive effects of authority in an authority-delegation game, suggesting that authority has a value *per se*. Gneezy, Gneezy, Nelson and Brow (2010) in their field experiment allow people at a theme park and on a boat cruise to pay what they wished for the services received. In many cases, this delegation led to higher profits for the firm.

There is also some theoretical literature on the effects of delegation. Sliwka (2001) finds that delegation may increase workers' motivation, so that if a worker is involved in the decision the effort will be higher. Corts and Neher (2003) find that an observable commitment to multi-lateral delegation coupled with decentralized ownership generates credible strategic commitment effects even when control contracts are unobservable. Ziss (2001) shows that the delegation of the output decision to a downstream agent positively affects the profitability of mergers in an oligopoly. Finally, a non-experimental study by Levitt (2006) reports results when the choice of how much to pay (if anything) has been delegated to the purchasers. Nevertheless, payments are around 90% of the posted price, without any monitoring cost.

This paper also contributes to the recent literature on psychological and economic

incentives (see, among others, Frey, 1997; Gneezy and Rustichini, 2000a, b; Pahlia, Kassam, Green and Bazerman, 2010). We are unaware of any previous study that gives firms the option of allowing workers to choose their own wages in a standard gift-exchange experiment.

The rest of the paper is organized as follows. Section 2 explains the experimental design. Section 3 provides the main results obtained, along with a discussion. We conclude in Section 4.

2. Experimental design

The experimental design consists of five treatments: the Partners treatment, the Strangers treatment, the Dictator treatment and two Control treatments (one for partners and one for strangers). Each is a modified version of the gift-exchange game introduced by Fehr et al. (1993).

Partners Treatment: In the first stage of this treatment, the firm may either assign the paired worker a wage, w , or allow him to assign one to himself. In this stage, the employer also asks for a non-binding effort, \hat{e} . The second stage depends on the decision in the previous one. If the employer has decided the wage, then the worker must only choose his effort level, e . If the employer has chosen to delegate, the worker chooses both his own wage and effort level.

The combination of wage and effort determine outcomes and monetary payoffs for both employer and employee in each period. The monetary payoff functions are given by:

$$\Pi_F = (240-w)*e \quad (1)$$

$$\Pi_W = w-c(e)-20 \quad (2)$$

where F denotes the firm, W the worker, e represents the worker's effort level, w is the wage and $c(e)$ is the cost of effort, a function increasing in e . Wages are integers between 20 and 120. The

feasible effort levels and the cost of effort are as described in Table 1.⁷

Table 1. Effort levels and costs of effort

Effort e	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Cost $c(e)$	0	1	2	4	6	8	10	12	15	18

A firm is anonymously paired with the same worker for all periods, and this is common information. That is, this treatment uses a partners matching protocol. We are not the first to use this approach, as both Gächter and Falk (2002) and Brown *et alii* (2004) have used this partner protocol in gift-exchange games.⁸ Additionally, we consider that wage delegation is bounded. In the field, all parties would realize that workers could not make a decision that threatens the firm's profits. Thus, we assume a maximum wage ($w = 120$) that is lower than the firm's redemption value of 240. In this manner, it is not possible for the worker to seize the firm's entire profit.⁹

Strangers Treatment: The only difference from the Partners treatment is that a strangers matching protocol is used instead. That is, workers were randomly re-matched with firms in each period.

⁷ This cost of effort function was introduced by Fehr *et alii* (1998) and has been widely used in this literature. See, among others, Charness (2004) or Maximiano *et alii* (2007).

⁸ The partner protocol used in Brown *et alii* (2004) is different from ours. They use a partner design in a gift-exchange context with endogenous relationships.

⁹ See Charness *et alii* (2009) for the analysis of the impact of delegating in the case in which the redemption value is equal to 120, that is, when workers can threaten the employer's profits with his wage decision. Results are very similar to the case with a redemption value of 240 (the only difference is in the level of the firms' profits).

Dictator Treatment: In the first stage of this treatment, the firm only asks for a non-binding effort, \hat{e} . In the second stage, the worker chooses both his own wage and effort level. In this treatment, as in the previous one, we use a strangers matching protocol.

Control Partners Treatment and Control Strangers Treatment: There is no possibility of delegation in the Control treatments. Thus, participants play a gift-exchange game in which the firm selects the wage and a non-binding desired effort level and the worker chooses the effort level he will provide. These control treatments were run using partners and strangers matching protocols, respectively.

The experiment was conducted at the University of Granada with 236 participants, who were recruited via posters in the Faculty of Economics. All sessions were conducted in the lab, using Z-Tree software (Fischbacher, 2007), and all sessions were conducted during a short span of time, so that seasonality effects are unlikely to affect the results. Participants played for 15 periods in all treatments. Upon arrival at the lab, each participant was randomly assigned a role as either a firm or a worker; this role was fixed throughout the whole session. No one participated in more than one treatment or session. Forty-eight people participated in each of the Partners, Strangers and Control treatments, with two sessions per treatment and 24 people in each session. Forty-four people participated in the Dictator treatment, with two sessions and 22 people in each session. No one participated in more than one session. On average, each person received around 16.89€ for a one-hour session.

3. Experimental results and discussion

Table 2 presents a summary of the average wage and effort levels across time in our

treatments. We also provide tables showing wage/effort outcomes in each of these treatments in Appendix A. We provide detailed discussion by treatment below.

Table 2: Summary of behavior

	Partners PND	Partners PD	Partners Control	Strangers SND	Strangers SD	Strangers Control	Dictator
Wage	76.79	114.70	75.95	45.60	117.85	51.24	113.05
Desired effort	0.78	0.81	0.72	0.61	0.67	0.59	0.68
Actual effort	0.43	0.78	0.46	0.15	0.34	0.17	0.36
Firm earnings	64.29	84.62	68.36	27.53	41.91	30.24	45.93
Worker earnings	51.09	84.15	50.01	24.93	93.81	30.35	88.96
Total earnings	115.38	168.77	118.37	52.46	135.72	60.59	134.88

Partners treatment

We distinguish between decisions made under delegation (workers choose both wage and effort, hereafter PD) and under non-delegation (firms choose the wage and workers choose effort, hereafter PND). Workers chose higher wages and supply higher effort levels when the firm delegated (PD). In particular, the average wage and the average effort level in PD are 114.70 and 0.78, respectively, while those in PND are 76.79 and 0.43; thus, both the wage and the effort provided are substantially higher with delegation than without it. A Wilcoxon matched-pairs signed-rank test, using each individual as one observation, confirms that these differences are statistically significant for wages and effort levels, respectively ($Z = 3.980$, $p =$

0.000; $Z = 3.234$, $p = 0.001$; $Z = 3.702$, $p = 0.000$, two-tailed tests).^{10,11}

There is little difference between the results in the PND case and the Control Partners treatment, where delegation is not feasible. We find that the average wages in the non-delegation case and the control are 76.79 and 75.95, respectively; the difference is not statistically significant ($Z = 0.144$, $p = 0.885$, two-tailed Mann-Whitney test). We also find that effort levels are quite similar (0.43 and 0.46, respectively); this difference is not at all statistically significant ($Z = 0.000$, $p = 1.000$). Thus, neither the average wage nor the average effort level differs, so that the responsiveness to the wage also seems quite similar across these two cases, and so choosing not to delegate does not seem *per se* deleterious.

Figures 1 and 2 show the evolution of average wages and effort levels in the Partners treatment, with a comparison to the Partners Control treatment.

[Figures 1 and 2 about here]

The visual pattern confirms the results in Table 2. In addition, note that there is almost no difference between behavior across time between the PND case and the Partners Control treatment.

Strangers treatment.

As it can be observed in Figure 2, there is a sharp drop in effort in the last period in all cases, indicating that strategic behavior appears to be a strong force here.¹² In order to check the

¹⁰ We round off all probabilities to three decimal places.

¹¹ In all of the treatments and sub-treatments, a positive correlation between wage and effort level is found, as in the previous literature. This is strongly supported by a Spearman rank test ($\rho = 0.781$, $p = 0.000$).

¹² Of course, in principle, we should observe unraveling all the way back to the first period, but it is typical to observe this in experimental games only in the last period or periods.

extent to which these strategic considerations play a relevant role on behavior, we conduct a Strangers Treatment in which strategic considerations are ruled out. Here we also distinguish between decisions made under delegation (workers choose both wage and effort, hereafter SD) and under non-delegation (firms choose the wage and workers choose effort, hereafter SND).

We compare behavior across the Partners and Strangers treatments, for both delegation and non-delegation cases. Table 2 shows that workers provide lower effort in SD and SND (0.34 and 0.15, respectively) compared to PD and PND (0.68 and 0.43, respectively). Differences are statistically significant ($Z = -3.231$, $p = 0.001$; $Z = -4.746$, $p = 0.000$, for the delegation and non-delegation cases, respectively) and large. These results highlight how long-term employment relationships greatly influence subjects' behavior, showing that strategic considerations could lead workers to provide larger effort levels thinking ahead.

However, in the Strangers treatment we still observe that workers chose higher wages and supply higher effort levels (leading to larger firms' profits and a more efficient total outcome) when the firm delegated (SD). In particular, the average wage and the average effort level in SD are 117.85 and 0.34, respectively, while those in SND are 45.6 and 0.15 (see Table 2). Differences are statistically significant ($Z = 4.197$, $p = 0.000$; $Z = 3.031$, $p = 0.002$, for wages and effort, respectively). Thus, delegation has a positive effect on both wages and effort under both repeated and one-shot interactions.

There are only modest differences between the results in the SND case and the Control Strangers treatment, where the delegation is not feasible (45.60 versus 51.24 and 0.15 versus 0.17, for wages and effort levels, respectively). A Wilcoxon ranksum test confirms that these differences are not significant for effort levels ($Z = -1.308$, $p = 0.191$). Although the difference in wages is significant ($Z = -2.248$, $p = 0.025$), this does not support the existence of a negative

reaction to deliberate non-delegation, since wages are in fact slightly higher in the Control Strangers than in the SND but effort levels are not different.

Regression analysis.

The higher effort level displayed under delegation (both in Partners and Strangers conditions) may be driven not only by the higher wages *per se*, but also potentially by a positive response to delegation or to workers' negative reaction when firms do not delegate. In order to isolate the delegation (or intentional non-delegation) effect and to confirm the robustness of our previous results we provide an econometric analysis controlling for the wage effect. In Table 3, we consider a GLS random-effects model in which the dependent variable is the effort level in either the Partners or Strangers treatment; we have also controlled for time trends in these models. The explanatory variables are wage, desired effort and a Delegation dummy that takes the value 1 when the firm used the delegation option and 0 when the firm chose the wage. We consider two different subsets of covariates (columns (1) and (3), or columns (2) and (4) in Table 3). We also control for individual heterogeneity.¹³ From Table 3, we may conclude that even controlling for the wage effect, delegation has a significant positive effect with both Partners and Strangers matching protocols.¹⁴

¹³ At the end of the experiment subjects answered a questionnaire consisting of the following items: gender, altruism, the Big Five Inventory (see John and Srivastava, 1999) and the ten paired lotteries proposed by Holt and Laury (2002) to test for risk aversion. The Big Five Inventory consists of the most relevant traits that configure the personality. Many psychologists believe that those attributes are extraversion (talkative, energetic), agreeableness (cooperative, truthful), conscientiousness (responsible, orderly), neuroticism (easily upset, neurotic) and openness (curious, wide interests). Each characteristic is computed as an average of 8 or 9 questions, which range from 1 to 5. For instance, "I see myself as a person who likes to do plans and follow them" "1= I completely agree, 5 = I completely disagree". These variables were used to control for heterogeneity, although none of them had a significant effect for employees' effort except agreeableness, which (perhaps strangely) has a negative effect.

¹⁴ To test the robustness of the econometric model, we have also conducted regressions considering a tobit random-effects model left and right-censored by 0.1 and 1, respectively. Significance levels for the explanatory variables are the same, with the coefficients only slightly different. We do not show every combination with and without heterogeneity, as the coefficients very similar in these cases.

Table 3: GLS Random effects regressions on effort, Partners and Strangers treatments

	Partners		Strangers	
	(1)	(2)	(3)	(4)
Wage		0.006*** (0.000)		0.0011*** (0.0004)
Desired effort		0.095 (0.059)		0.031 (0.026)
Delegation	0.282*** (0.036)	0.073** (0.033)	0.173*** (0.042)	0.105** (0.050)
Heterogeneity	NO	YES	NO	YES
Constant	0.451*** (0.037)	-0.049 (0.155)	0.150*** (0.010)	0.079*** (0.020)
R-squared	0.236	0.583	0.149	0.177
N	360	360	360	360

Notes: ***, **, * denote significance at $p = 0.01$, 0.05 , and 0.10 , respectively (two-tailed tests). Robust standard errors are in parentheses. Delegation takes the value 1 if and only if the firm delegated the wage decision.

Turning to earnings, the data show that delegating pays for both firms and workers. Similarly, total earnings are 50% higher with delegation. As Table 2 indicates, for the case of Partners matching, the firm's average earnings with delegation are 84.62 versus 64.29 without delegation, while the worker's average earnings are 84.15 and 51.09, respectively. These differences are again statistically significant ($Z = 2.937$, $p = 0.002$; $Z = 3.980$, $p = 0.000$, one-tailed Wilcoxon matched-pairs signed-rank tests). The total earnings (a measure of social efficiency) are 50% higher in PD relative to PND. Average firms' earnings in the Strangers matching protocol are 52% higher under delegation (41.91 versus 27.53), although surprisingly the difference is not statistically significant ($Z = 0.731$, $p = 0.465$, two-tailed test).¹⁵ Average

¹⁵ This test statistic is skewed by the fact that five of the fourteen firms for whom we have internal comparisons delegated exactly once, as when they did so they received minimum effort while being required to pay the maximum wage; thus, the average delegation profit for each of these firms is only 12, the lowest possible profit. To illustrate

worker earnings are much higher with delegation in the Strangers matching protocol (93.81 versus 24.93, $Z = 11.651$, $p = 0.000$). The difference in total profits is highly significant ($Z = 10.986$, $p = 0.000$, two-tailed test).

The evidence presented above leads to our first result:

Result 1: *Delegating the wage decision enhances worker performance and increases the earnings of both firms and workers relative with the case where firms do not delegate.*

Next, to check for a negative reaction to non-delegation, in Table 4 we again consider a GLS random-effects model in which the dependent variable is the effort level in the Partner and the Control Partners treatments. The explanatory variables are wage, desired effort and a non-delegation dummy. *Non-delegation* takes the value 1 when a firm did not choose a feasible delegation option and 0 in the Control. Observe that in specification (1), the non-delegation dummy is not statistically significant controlling for the wage; recall that there is no correlation between the wage and the non-delegation dummy in this case, as the wage is almost identical in these two cases. Even in specification (2), when we consider the non-delegation dummy as the only covariate of the effort, it is still not statistically significant. Hence, there does not appear to be a negative effect on workers' behavior when the firm did not choose to delegate, controlling for the wage effect, for each of Partners and Strangers matching protocols.

This leads to our second result:

Result 2: *The increment in the effort level with delegation is not due to a negative reaction to non-delegation, but instead seems due to the positive effect of delegation, controlling for the wage received.*

the skew, the median average profit with delegation over these firms is 25.75 while the aggregate average profit is 41.91. This imbalance is taken into account in the regression format.

Table 4: GLS Random effects regression on effort

	Non-delegation Partners vs. Control Partners		Non-delegation Strangers vs. Control Strangers	
	(1)	(2)	(1)	(2)
Wage	0.006*** (0.000)		0.001*** (0.0002)	
Desired effort	0.118** (0.038)		0.041** (0.018)	
Non-delegation	-0.024 (0.036)	-0.024 (0.061)	-0.010 (0.018)	-0.018 (0.018)
Heterogeneity	YES	NO	YES	NO
Constant	-0.069** (0.029)	0.458*** (0.038)	0.070*** (0.018)	0.166*** (0.013)
R-squared	0.582	0.002	0.081	0.005
N	611	611	662	662

Notes: ***, **, * denote significance at $p = 0.01, 0.05,$ and $0.10,$ respectively (two-tailed tests). Robust standard errors are in parentheses. Non-delegation takes the value of 1 if and only if the firm chose not to delegate.

Delegation and effort

An important issue is why the choice to delegate leads to greater effort. Of course, in part this is a ‘response’ to the higher wages that workers choose to pay themselves. Yet this begs the question of why workers feel the urge to provide higher effort levels under delegation than when the high wage has been assigned by the firm.

While strategic considerations in relation to worker expected earnings are certainly a key factor in the Partners treatment, workers may also perceive the delegation option as a non-pecuniary prize. Thus, they might well increase their effort levels to gain this right. This is in line with the results obtained by Fehr, Herz and Wilkening (2010) in which they find that subjects exhibit a strong tendency to retain authority even when this decision is against their pecuniary profits, suggesting that they value authority *per se*.

Nevertheless, the difference in effort levels between the delegation and the non-delegation cases in the Strangers treatment cannot be completely explained by strategic effects, so that there must be some additional element that may explain our findings. This could be the result of a number of behavioral motivations. One of these could be a form of positive reciprocity. Workers could perceive delegation by the firms as a better gift than a high wage. If this is so, workers could react more positively to delegation, providing greater effort. Another possibility is that the improvement in the workers' performance could be triggered by some kind of responsibility effect (see Charness, 2000); according to this view, having a greater degree of responsibility for an outcome leads one to engage in more pro-social behavior.

To test for positive reciprocity, we can compare the effort levels in the sub-game that follows delegation in the Strangers treatment and in the Dictator treatment (recall that the Dictator treatment uses strangers matching). In the Strangers treatment the worker can set her own wage only in the case that the employer decides to delegate while in the Dictator treatment the worker always sets both her wage and the effort and the employer has no decision on this. This fact would rule out (in the Dictator treatment) the positive reaction a worker might have towards an employer who delegates in the Strangers treatment. So, greater efforts in the Strangers treatment under delegation than in the Dictator treatment would suggest that workers indeed react positively to the delegation, with positive reciprocity an attractive explanation for the results. On the contrary, similar effort levels would suggest that 'responsibility' is a primary non-strategic force.

Table 2 indicates the worker's average efforts are 0.34 both in the Strangers under delegation and the Dictator treatment. Tests show that there are no significant differences in effort ($Z = 0.319$, $p = 0.750$, two-tailed test). This result casts some doubt on the interpretation

that positive reciprocity is a force here. Indeed, if we consider positive reciprocity as a significant positive difference when a favorable action has been deliberately chosen rather than randomly assigned, there is little evidence of positive reciprocity in the experimental literature (see Charness and Levine, 2007 and Charness and Kuhn, 2011, for discussions).¹⁶

This suggests that another force besides positive reciprocity motivates the workers' better performance. While we cannot exclude all other possibilities,¹⁷ we can make a case that the increased level of responsibility that workers have when they set their own wage is a potential explanation. Recall from the introduction that impulses towards honesty, loyalty, or generosity may well be triggered by an increase in one's perceived responsibility for an outcome.¹⁸ According to this principle, we should expect higher effort if the employee determines his own wage, as it seems clear that a worker who has the choice of both effort and wage bears a greater degree of responsibility than one who simply chooses effort.

However, it is true that the set of feasible payoff pairs is smaller without delegation than with it, so that some form of interdependent preferences could conceivably be generating the observed behavior. Still, if behavior is really explained by distributional interdependent

¹⁶ Clearly there is a positive relationship between wage and effort, but this does not in itself constitute positive reciprocity. One explanation for the positive wage-effort relationship is that workers are responding to distributional consideration; for example Charness (2004) finds that effort in the gift-exchange game is driven by distributional consequences as well as negative reciprocity. Distributional considerations are an important part of the models in Fehr and Schmidt (1999), Bolton and Ockenfels (2000), Charness and Rabin (2002), and Falk and Fischbacher (2006).

¹⁷ For example, nother possible social motivation could be guilt aversion, as discussed in Charness and Dufwenberg (2006) and Battigali and Dufwenberg (2009). However, we did not measure beliefs, so we can neither reject nor confirm such an effect. We suspect that guilt and responsibility may well be counterparts.

¹⁸ Morgenstern (2004) and Charness and Jackson (2009) also provide evidence that people behave in a more pro-social manner when they perceive that they are responsible for an outcome. Fehr, Hart and Zehnder (2010) show that when workers bid for wages, they are less likely to shirk, even though their wages are much lower, suggesting that responsibility might be a significant force in such a set-up.

preferences, one should observe the same effort choice at the same wage, independently of whether the wage was chosen by the firm or by the worker.¹⁹

We can consider subsets of comparable wages offered in each treatment. Since there are few non-high wages with delegation, we compare effort for wages of 100 or more. The average effort for this range in the PD treatment is 0.803, compared to 0.684 in the PND treatment, while the average effort in this wage range in the SD treatment is 0.332, compared to 0.234 in the SND treatment (see Tables A2-A3 and A6-A7). The Wilcoxon-Mann-Whitney ranksum test finds that effort choices differ significantly in both cases ($Z = 5.064$, $p = 0.000$ and $Z = 1.826$, $p = 0.034$, respectively, one-tailed tests). Thus, this difference in effort for comparable wages supports the idea that there is something beyond more standard interdependent preferences that underlies the non-strategic motivation for higher effort after delegation. Again, our candidate for this is increased responsibility.

Result 3: *The higher observed effort when the worker has been delegated this choice not due to positive reciprocity, but seems to reflect the increased responsibility that the worker has for the final outcome.*

Delegation decisions over time

Does delegation become more frequent over time, in line with the increase in the observed profits when the choice of wage is given to the worker? With respect to the evolution of delegation over time, Figure 3 shows the proportion of firms that choose to delegate over time for the Partners and Strangers matching protocols. We observe that wage delegation occurs more frequently in long-term employment relationships than in one-shot interactions. This result

¹⁹ More broadly, there are 1010 feasible payoff pairs with delegation and only 10 without delegation. It is certainly conceivable that the most-preferred payoff pair is only in the larger set. Nevertheless, the same effort should be chosen at the same wage, regardless of who chose that wage. It is true that using a wage range rather than exact wage matches muddies the waters to some extent, but this should not change the qualitative conclusions.

shows that it is less likely that an employer offers a temporary worker (or day laborer) the possibility of choosing his own wage. We also find an increasing trend in both cases, although the Spearman test finds that this is only significant for the Partners case ($\rho = 0.654, p = 0.008$ for Partners and $\rho = 0.047, p = 0.372$ for Strangers).

While delegating the choice of the wage may not come naturally, firms appear to learn (in the Partners condition) that doing so is a profitable strategy; the delegation rate in the final three periods is nearly twice as high as in the first three periods. When firms face a different worker in each period the expected benefits from delegation are not so clear, which may explain the barely positive although non-significant trend in the Strangers case.

[Figure 3 about here]

Determinants of delegation

We explore the reasons why firms delegate the wage decision to their workers and how this evolves over time. For the analysis we perform probit regressions for the Partners and Strangers treatments in Table 5, controlling for individual heterogeneity.

Table 5: Probit regressions on delegation

	Partners treatment			Strangers treatment		
	(1)	(2)	(3)	(4)	(5)	(6)
π_{t-1}		0.002* (0.001)			0.001* (0.0006)	
$\hat{e}_{t-1} - e_{t-1}$			-0.402*** (0.128)			-0.151** (0.058)
Delegation _{t-1}		0.279** (0.121)			-0.020 (0.059)	
$(Delegation * \pi)_{t-1}$	0.004*** (0.001)			0.0005 (0.0005)		
Heterogeneity	Yes	Yes	Yes	Yes	Yes	Yes

LL	-170.86	-174.38	-177.91	-141.76	-140.92	-177.91
N	336	336	336	336	336	336

Notes: ***, **, * denote significance at $p = 0.01, 0.05, \text{ and } 0.10$, respectively (two-tailed tests). Robust standard errors are in parentheses. Reported numbers are estimated marginal effects.

The dependent variable is a binary variable that takes the value 1 if employer delegates the wage decision and 0 otherwise. As our first explanatory variable we use the earnings obtained by the employers in the previous period, π_{t-1} , multiplied by a dummy, Delgation_{t-1} , which is 1 when the firm delegated in the previous period and 0 otherwise. This allows us to check if higher firm earnings (conditioned on delegation in the previous period) increase the likelihood that the firm delegates in the next period.²⁰

To disentangle which of these effects is more relevant for inducing delegation, we also conduct regressions (specification (2) and (5) of Table 5) in which the two previous explanatory variables are separated and do not interact with each other.²¹ Our third covariate is the difference between the desired and the actual effort in the previous period, $\hat{e}_{t-1} - e_{t-1}$. This allows us to see if firms that receive effort levels close to their demands reward this behavior by delegating the wage decision in the next period.²²

Table 5 shows that the employers' profits conditioned on having delegated in the

²⁰ We thank an anonymous referee for this suggestion.

²¹ The intuition behind firms' earning being unconditional on delegation (the first covariate in Table 5) is as follows. Firms may use the delegation option more often when they trust workers more, and the trust may increase when workers provide high efforts, resulting in high earnings for the firm.

²² The explanatory variables wage and actual effort levels are correlated. Therefore, they should not be included in the same regression (Greene, 2003). This is the reason why we chose the profit in the last period as a proxy that accounts for the effect of the wage.

previous period (the interaction term) have a positive effect on the probability of delegating.²³ For the case of Partners treatment, it is worthwhile to note that firms' profits *per se* have a positive effect on the propensity of delegation in the next period, independently of whether the firm has delegated or not in the previous period.²⁴ Nevertheless, the latter effect dominates that of the unconditional earnings. In the same way, the closer the actual effort level to the desired effort, the more likely it is that the firm allows the worker to choose his wage in the next period. These results suggest that firms use wage delegation as a tool to reward good employees.²⁵

For the case of Strangers treatment, the only variables that influence the decision of delegating in one specific period are the difference between the desired effort and the actual effort in the previous period and the lagged profit; it would seem to make sense that past delegation doesn't matter much, since it's most likely a different worker is involved. The smaller the difference between the two effort levels and the larger the lagged profits, the less likely it is that the firm delegates.

4. Conclusion

This paper investigates the consequences of delegating the wage decision in a principal-agent relationship where principals may allow agents to choose their own remuneration. Our results indicate that workers in our environment provide considerably higher effort levels when firms delegate than when they do not, even compared to the higher salary range. This results in a

²³ We used the same variables as in Table 3 (see footnote 13) to control for heterogeneity, however those variables had no significant effect on firms' delegation except altruism, which has a positive effect.

²⁴ There is almost no difference in estimated coefficients in Table 5 when we do not control for heterogeneity, so we do not present the regressions without this control.

²⁵ We have also performed probit regressions with other two explanatory variables: wage and effort levels in the previous period. As with the results reported above, both variables had a positive and significant effect on the probability of delegation.

Pareto-improvement, with substantially higher earnings for both firms and workers. This holds for both anonymous re-matching and repeated interactions, although effort and earnings are substantially higher in the latter case, which is perhaps a better representation of the field environment.

Our results suggest that agents perceive the delegating decision as an increase of their choice autonomy and control. This fact may create a greater sense of responsibility and, as a consequence, enhanced worker performance. Even though it may make more sense that wage delegation will occur primarily in long-term employment relationships (it does not seem likely that an employer would offer a temporary worker or day laborer the possibility of choosing his own wage), we find that the wage delegation is also useful in a setting with no reputation.

In the Semco example, all workers are treated equally with respect to delegation. But since we find no evidence of a negative reaction to non-delegation, one issue is whether it might be better for the company to delegate the wage choice only to those workers who have earned the right by achieving certain goals. This remains as an open question for the field.

Our findings potentially have important implications for the labor market. To the extent that they generalize to the field environment, they suggest that this approach could potentially be more effective in increasing worker productivity.

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Figure 1a: Average wages over time, Partners vs. Control

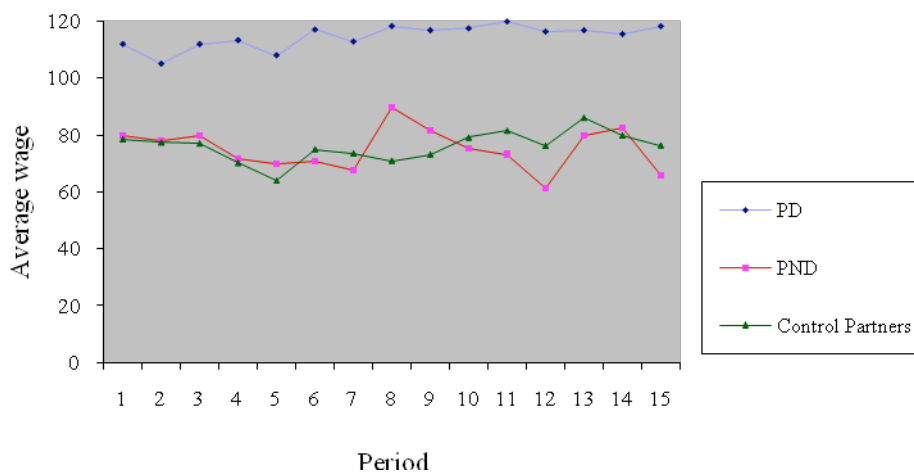


Figure 1b: Average wages over time, Strangers vs. Control

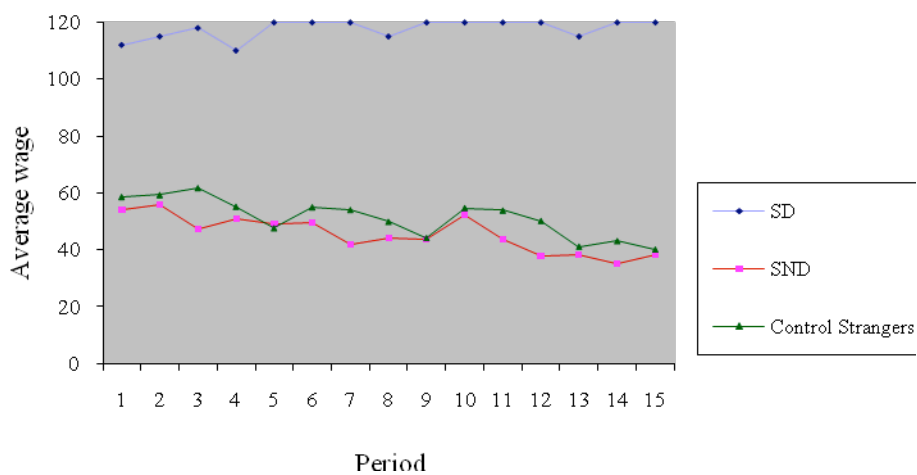


Figure 2a: Average effort over time, Partners vs. Control

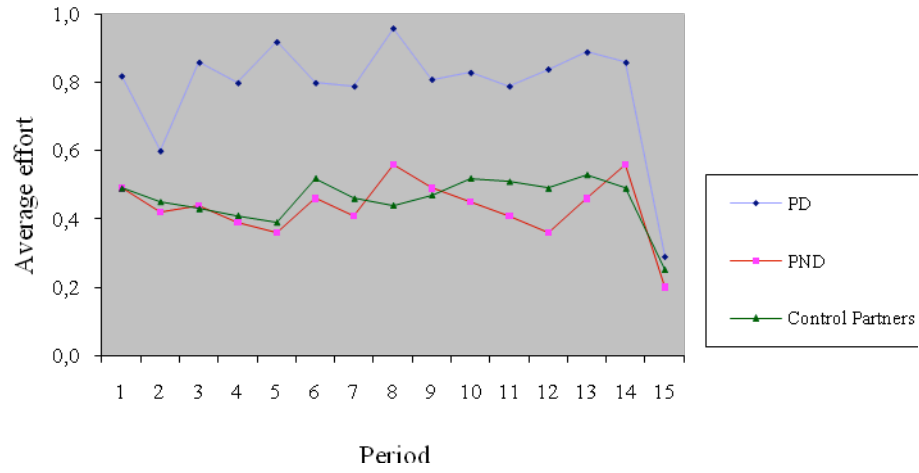


Figure 2b: Average effort over time, Strangers vs. Control

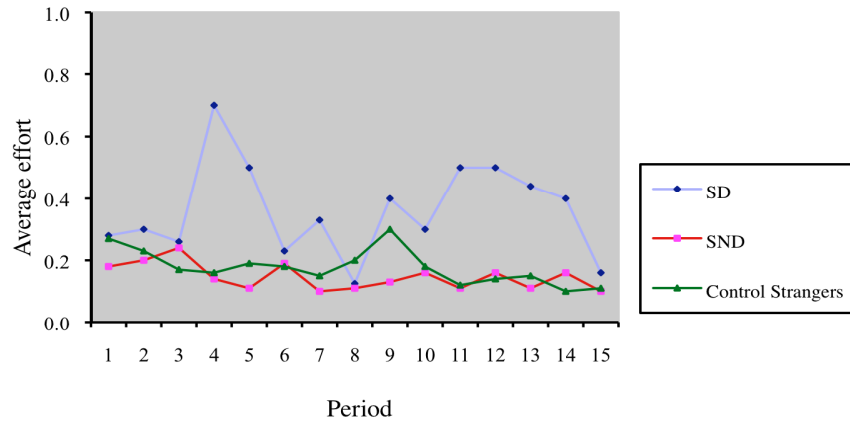
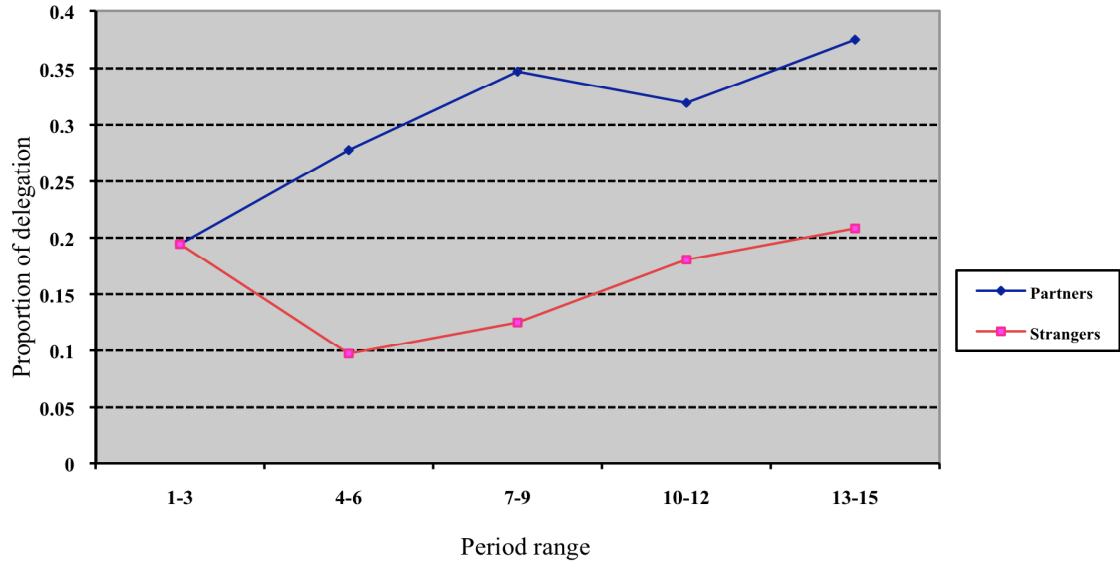


Figure 3. Delegation over time



Appendix A: Wage/effort outcomes

Table A1: Wage/effort outcomes in Strangers Baseline

Effort

Wage range	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	Average
20-29	71	4		1						1	0.121 (77)
30-39	36	2	1	1				1			0.134 (41)
40-49	42	7	3	1		1					0.139 (54)
50-59	29	14	2	1	1						0.153 (47)
60-69	30	9	4	4	1	1					0.178 (49)
70-79	14	2	3	1	3	3				1	0.274 (27)
80-89	14	2	4	1	2						0.191 (23)
90-99	9		3		1	1					0.207 (14)
100-109	8	5	2	2	1		1		1		0.265 (20)
110-120	5	2			1						0.175 (8)
Overall	258	47	22	12	10	6	1	1	1	2	0.166 (360)

Table A2: Wage/effort outcomes in Strangers No Delegation

Effort

Wage range	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	Average
20-29	108	3		1	2		1		1		0.124 (116)
30-39	29	2									0.106 (41)
40-49	27										0.100 (27)
50-59	24	3	2	1							0.143 (30)
60-69	24	4	5	1		1				1	0.189 (36)
70-79	11	2	1	1	3						0.206 (18)
80-89	6	4	1	1							0.175 (12)
90-99	5		1								0.133 (6)
100-109	9	1	1	1	2		1			1	0.281 (16)
110-120	8		1		1						0.160 (10)
Overall	251	19	12	4	9	1	3		1	2	0.146 (302)

Table A3: Wage/effort outcomes in Strangers Delegation

Effort

Wage range	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	Average
20-29											
30-39											
40-49											
50-59											
60-69											
70-79											
80-89						1					0.600 (1)
90-99						1					0.600 (1)
100-109	1	1									0.150 (2)
110-120	28	2	2	6	2	3	4	2	1	4	0.339 (54)
Overall	29	3	2	6	2	5	4	2	1	4	0.341 (58)

Table A4: Wage/effort outcomes in Strangers Dictator

Effort

Wage range	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	Average
20-29											
30-39											
40-49					1						0.500 (1)
50-59	1										0.100 (1)
60-69		1	1		1						0.333 (3)
70-79				1		1		1			0.600 (3)
80-89	2	1	2	2			1				0.313 (8)
90-99	7	2	4	4	4	2	3				0.354 (26)
100-109	5	6	5	2	4	4	3	1		2	0.416 (32)
110-120	122	18	22	19	24	20	33	16	7	5	0.354 (286)
Overall	137	28	34	28	34	27	40	18	7	7	0.360 (360)

Table A5: Wage/effort outcomes in Partners Baseline

Effort

Wage range	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	Average
20-29	37	2				1					0.118 (40)
30-39	9	2	1					1			0.185 (13)
40-49	14	4	6	3	1						0.204 (28)
50-59	9	4	1	7	3						0.262 (24)
60-69	10	5	3	4	9	7	2	1			0.376 (41)
70-79	2	3	7	5	6	2	2	1			0.404 (28)
80-89	2	7	4	2	1	5	3	1	5	2	0.516 (32)
90-99	4		5	4	6	1	9		1		0.477 (30)
100-109	1		2	3	9	6	8	10	1	1	0.622 (41)
110-120	5	1	4	2	1	2	17	16	14	21	0.755 (8)
Overall	93	28	33	30	36	24	41	30	21	24	0.458 (360)

Table A6: Wage/effort outcomes in Partners No Delegation

Effort

Wage range	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	Average
20-29	37	1			2	1				1	0.155 (42)
30-39	10	1	1	1				1			0.193 (14)
40-49	11		1								0.117 (12)
50-59	8		1	3	1						0.215 (13)
60-69	8	3	2	2	2	1	2				0.290 (20)
70-79	6	4	2	2	2	2	2				0.320 (20)
80-89	4		3	2	3	1	1	1			0.380 (15)
90-99	1	1	1	2	4	3	2	4		1	0.568 (19)
100-109	2	1		4	6	6	1	8	1		0.572 (29)
110-120	2		2	1	1	4	27	16	7	7	0.733 (67)
Overall	89	11	13	17	21	18	35	30	8	9	0.429 (251)

Table A7: Wage/effort outcomes in Partners Delegation

Effort

Wage range	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	Average
20-29											
30-39											
40-49											
50-59											
60-69											
70-79						1					0.600 (1)
80-89					2						0.500 (2)
90-99					4		1				0.540 (5)
100-109				1	1		2	2	2		0.712 (8)
110-120	10				3	3	12	10	3	52	0.811 (93)
Overall	10			1	10	4	15	12	5	52	0.783 (109)