ATTRIBUTION AND RECIPROCITY IN AN EXPERIMENTAL LABOR MARKET

Gary Charness^

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Abstract: Papers such as Akerlof and Yellen (1990) and Rabin (1993) argue that considerations such as fairness and reciprocity are important in individual decision-making. The gift-exchange game (Fehr, Kirchsteiger & Reidl, 1993, and many others) has established that, in the laboratory, higher wages offered by an employer lead to considerably more costly effort provision. However, it is unclear whether this behavior reflects reciprocity or other forms of social preferences. This paper tests whether attribution of volition in choosing a wage has a significant effect on subsequent costly effort provision. Treatments varied whether wages were chosen by the employer or by an external process. We see that both distributional concerns and reciprocity play a major role. The data are examined in the light of recent utility models.

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^ Contact: Gary Charness, Dept. of Economics, UCSB, 2127 North Hall, Santa Barbara, CA 93106-9210. E-mail: charness@econ.ucsb.edu. Web page: http://www.econ.ucsb.edu/~charness.

1. INTRODUCTION

Standard economic models presume that people maximize their own financial interest, without regard for social norms and issues such as fairness and reciprocity. This assumption is parsimonious and facilitates analysis; however, while it is generally useful and often innocuous, it leads to unrealistic predictions of behavior in some economic situations. While it is difficult to isolate the influence of social preferences in the field, a large number of laboratory experiments have demonstrated that often one cannot adequately explain behavior on the basis of pure self-interest. Although these experiments demonstrate that social forces can have substantial effects on the economic decisions made by individuals, the underlying composition and determinants of these social forces are often left unconsidered.

This paper describes the results of an experiment designed to test whether causal attribution influences the level of material payoffs an individual is willing to sacrifice to benefit another person. In one treatment, self-interested employers choose individual wages, while in two other treatments an external process (a draw from a bingo cage or an assignment by a neutral third party) determines wages.

In all cases, there is a strong positive relationship between the wage and the effort level subsequently chosen. The proportion of the effort/wage gradient that is a direct consequence of reciprocity is estimated to be about 35%. Reciprocity in this case indicates the degree to which an *intentional* choice by a self-interested party induces a change, relative to the same choice being made without that party's volition, in a responding party's willingness to sacrifice money to help her. Effort choices when low wages are intentional appear to reflect negative reciprocity - workers never sacrifice to help the employer when a low wage is intentional, but do so with some regularity otherwise. It is not clear that the effort provided for intentionally high wages is higher than for equivalent exogenous high wages, as would be expected with positive reciprocity.

Causal attribution refers to beliefs about the determinants of an outcome. One key aspect of attribution is whether a result has been decided through the volition of a party whose material

payoffs are affected by the choice. The psychology literature strongly suggests that people often consider context and interpersonal history when determining their actions in social exchange situations. Heider (1958) introduced the idea that causal inference, where a person takes into account another actor's motives and situational constraints, is an important cognitive process for perceiving social contexts. Individuals have a need to infer causes and to attempt to assign responsibility for outcomes. When volition is absent, feelings of revenge and gratitude dissipate or vanish.[1]

More recently, models of social utility indicate that these feelings are quite sensitive to normative expectations about "appropriate" behavior. An abundance of psychology experiments supports these views - for example, Greenberg and Frisch (1972) find that help that is deliberately given leads to more reciprocity than does accidental help.[2] Blount (1995) examines negative reciprocity in the ultimatum game, finding that responders will accept substantially lower offers when the offer is generated randomly than when chosen by a self-interested party.[3]

There has been a growing focus on psychological concerns as an explanation for deviations from pure material self-interest. Akerlof (1982) and Akerlof and Yellen (1990) present formal models that demonstrate how issues of social custom and fairness can affect wages. The Akerlof (1982) gift-exchange model characterizes the offer of employment as an offer to "exchange gifts" and the worker's effort level indicates the size of the reciprocal gift. Rabin (1993) models reciprocal altruism, the notion that people take into consideration the actions and intentions of others when determining their own actions. He assumes that people in two-person

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[1] "Feelings of both revenge and gratitude become markedly attenuated ... upon the discovery that the harm or the benefit [to the individual] was not the true goal of the agent. ... Gratitude is determined by the will, the intention, of the benefactor. Attribution to source and intention has similar significance in the case of revenge." (Heider, 1958, p. 265)

[2] See also Thibaut and Riecken (1955), Goranson and Berkowitz (1966), Kelley and Stahelski (1970), Kelley (1972), and Kahn and Tice (1973).

[3] Blount's design elicited (strategy method) minimum acceptable offers (MAOs), and also included a third-party treatment. Her results are mixed with respect to whether MAOs made by a third party differ from those made a self-interested party. In Study 1, the mean MAOs (from a \$10 pie) are \$2.91, \$2.08, and \$1.20 for the self-interested, third-party, and random cases, respectively. The first two numbers are not significantly different. However, in Study 3, there is a significant difference ($\chi^2 = 5.99$, $p < 0.02$) between the third-party and self-interested party conditions.

normal-form games experience psychological payoffs in addition to the underlying material payoffs, where the former payoffs depend on the players' kindness. Beliefs about how "kind" another person is being can affect one's willingness to sacrifice money to help or harm that person.

Although these papers argue convincingly that fairness is important in economic environments, there is little direct evidence for reciprocal altruism in such a context. Fehr, Kirchsteiger & Riedl (1993) and Fehr, Kirchler, Weichbold & Gächter (1998) perform gift-exchange experiments and find that social forces play a major role in this context. A self-interested worker should provide the minimum possible effort, yet effort levels at higher wages tended to be much higher, rewarding firms for setting high wages. These results contradict the standard money-maximizing theory. Yet these studies do not establish whether employees are simply choosing to share their greater wealth with employers, or whether workers are truly acting reciprocally.

This issue is relevant for performance issues and labor markets. Bewley (1999) considers that morale is important for performance and states (p. 56) that "reciprocity and even humanitarian feelings have an important impact on behavior, and these may be among the factors making morale important." Thus, if workers respond more negatively to a wage reduction voluntarily chosen by management than to a wage reduction mandated by poor business conditions, management should be cautious about reducing wages unless this can be convincingly portrayed as being necessary. Kahneman, Knetsch & Thaler (1986) find a large difference in the perceptions of the fairness of a 5% pay cut, depending on whether a business is losing money or doing ok – 32% thought this pay cut was unfair when the firm was losing money and 77% thought it unfair when business was ok.[4]

Such a difference in perceptions regarding the justification for a wage reduction is likely to lead to a difference in performance when effort is to some degree voluntary, as a worker is less

[4] Charness and Levine (2002) have similar results in a more contemporary survey, with a difference of around 40 percentage points across these conditions.

likely to retain some degree of loyalty to the firm when she feels fairly treated. Procedural justice theories (e.g., Tyler, 1988) emphasize that people are quite concerned with whether decision-makers are trying to be fair and respectful or self-interested and disrespectful; when the latter set of attributions predominate, field evidence suggests that people quit more, work less hard, and are generally less productive. Levine (1993) concludes that an employee who feels that she is receiving a fair deal is more likely to perform above any minimum requirement.

The attribution of cause may also affect the performance resulting from a wage increase. For example, a voluntary wage increase of a low wage may be more effective than one that is mandated by the government (such as with an increase in the minimum wage). Overall, there are many labor contexts in which job performance may plausibly be affected by the attribution for a compensation policy or policy change.

The experiment presented in this paper adapts the Blount (1995) and Fehr *et al.* (1998) experiments, using a simulated labor market and separate treatments in which wages are determined by either the employer or by an external process. Blount does not examine generosity,[5] whereas Fehr *et al.* do not test for the source of the apparent worker generosity or reciprocity. If intentions are irrelevant, we should expect a wage to induce the same level of effort, regardless of the causal attribution. On the other hand, reciprocity models predict that intentionally high (low) wages should lead to higher (lower) voluntary effort than when these wages are assigned by an external process.

Outcome-based models of monetary sacrifice posit that people dislike unequal payoffs and may lower their material payoffs to lessen the disparity. Bolton (1991) suggests that people only care about relative payoffs when they are at a relative disadvantage and predicts that, given the experimental parameters, minimum effort will always be chosen. Bolton and Ockenfels (2000), henceforth B & O, assume people have a symmetric dislike for inequality. Fehr and Schmidt (1999), henceforth F & S, develop the notion of self-centered inequality aversion, in which one dislikes all inequality, but cares more about this when at a relative payoff

[5] There were no actual proposers in her study, and acceptances in an ultimatum game do not constitute generosity.

disadvantage. The latter two papers predict a positive relationship between effort and wage, but one which is unaffected by causal attribution for the wage.

Although the Rabin (1993) model does not explicitly take into account the sequential structure of a strategic situation, Dufwenberg and Kirchsteiger (1998) extend it to sequential games by imposing a requirement of sequential rationality.[6] They show (pp. 13-18) that, if reciprocity concerns are sufficiently large, cooperation can be sustained in a sequential Prisoners' Dilemma. Since the gift-exchange game is essentially a sequential Prisoners' Dilemma with multiple actions, this implies that we should observe effort increasing with volitional wages, since low wages should always lead to minimal effort.[7] Intuitively, these reciprocity models reflect the idea that kindness is proportional to the "size of the gift." One robust prediction is that the difference between effort provided at high vs. low wages should be higher with employer-chosen wages than otherwise.

A natural interpretation of the gift-exchange model is that an exogenous wage would not be considered a gift, so that effort choice should be affected by causal attribution and the effort/wage relationship should differ across treatments. The Rabin (1993) and Dufwenberg and Kirchsteiger (1998) models predict positive reciprocity when an employer chooses a high wage, but assume that a player is neutrally disposed toward (and so will not help) another player if the other player has no choice of actions.[8] If an employer has not chosen the wage, this means we should expect minimum effort regardless of the wage, since an employee should be unwilling to sacrifice any material payoff to benefit a non-volitional employer.

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6 Rabin notes (1993, p. 1296) that "extending the model to sequential games is also essential for applied research." In sequential games players may revise their beliefs as play proceeds and, since perceived kindness depends on beliefs, reciprocity concerns may need to be revised accordingly.

7 Dufwenberg and Kirchsteiger (1998) consider an individually-indexed parameter for reciprocity concerns and probabilistic levels of cooperation for a range of parameter values. In fact, we see considerable heterogeneity among players, increasing strategic uncertainty when a wage is higher.

8 This feature conflicts with the well-established phenomenon of positive allocations in the dictator game, where the other person in a pair has no choice to make, but can nonetheless benefit from an allocator's generosity. The appendix to Rabin (1993) presents two models that permit reciprocity-free altruism, thus addressing this issue. Throughout this paper, I refer to the model described in the text of that paper as "the Rabin (1993) model."

The results suggest that distributional models can explain much of the positive relationship between effort and wage, but there is also evidence of considerable reciprocity. Neither pure reciprocity models nor pure outcome-based models are alone sufficient to explain the observed behavior.

2. EXPERIMENTAL DESIGN

Participants were students recruited from classes and by posting notices on campus at UC-Berkeley in February of 1996. A total of 122 subjects participated in this experiment; 61 had the role of "employee" and the other 61 had the "employer" designation. Average earnings, including a $5 show-up fee, were between $16 and $17 for about 100 minutes of time. A full description of the instructions and record sheets issued to the subjects is in Appendix A.

There were, in general, ten employers and ten employees in an experiment with ten periods. Employers and employees initially all met in one large room; after a brief introduction and a random assignment of roles, the employers were moved to another room. Having all participants meet in one room at the outset made it more credible that another real person's payoffs were dependent on the employee's action choice. Pairings were anonymous and a "no-contamination" matching design was used. It was common knowledge that workers and firms were matched only once, so that reputation-formation should not be a concern.[9]

An employee was given a wage, which she knew had been assigned by either an employer (in three sessions) or an external process. This external process was either a draw from a bingo cage (in two sessions) or an assignment made by the experimenter (in two sessions).[10] Balls were drawn individually, in front of successive subjects. In the third-party condition, subjects were informed that wages had been pre-selected by the experimenter for each employee in each period.

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[9] There were sessions with less than 10 pairs, so that there were occasional anonymous re-pairings. However, this issue didn't appear very salient and, as will be seen, the data does not show any indication of reputation-building, which might occur if a subject expected his choice to be a factor in a re-pairing.

[10] In fact, the distribution of wages assigned by employers was mapped onto the numbers of the bingo balls to simulate the same wage distribution. The workers were not told this distribution; while this could conceivably mean that they had incorrect beliefs about this distribution, this approach more closely resembles a field context with wage secrecy. An effort was made in the third-party treatment to replicate the wages in the random treatment.

Each employee was in only one session, and the same treatment was maintained throughout the entire session. Once assigned a wage, each employee was asked to record an effort choice (between 0.1 and 1.0, inclusive) on a record sheet and to fold this sheet before turning it in to the experimenter. This sheet was then given to her employer in the other room, so that the employer had salient physical evidence of the employee's choice. Unlike Fehr *et al.* (1998), employees could not reject the wage[11]; thus, an employer could guarantee herself a monetary payoff of at least 10 guilders in each round by choosing a wage of 20.[12]

The combination of wage and effort determined outcomes and monetary payoffs for each pair of subjects in a period. Each employer was given an endowment of 120 "income coupons" in each period. The monetary payoff functions were given by:

$$\pi_F = (120 - w) * e \quad (1)$$

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

where F represents the employer, E the employee, e denotes the employee's effort, w is the wage (between 20 and 120, inclusive), and c(e) is the cost of effort, a function increasing in e.[13] The schedule of cost as a function of effort is shown below:

EFFORT	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
COST	0	1	2	4	6	8	10	12	15	18

It is important to note that the return to the employer is much greater than the cost to the worker for the effort levels usually recorded; the ratio of employer benefit to employee cost depends on the wage chosen.[14]

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11 I thank Ernst Fehr for this suggestion, which allows a cleaner comparison across treatments.

12 Experimental "guilders" were converted to dollars at the rate of 25 to $1.

13 Note that the cost of minimum effort (.1) is 0. This functional form was used in Fehr et al (1998) and was replicated here to allow comparisons. While it is not the usual profit/wage/effort relationship, it does ensure that profits are non-negative. The functional form has the feature that more productivity (effort) generally leads to greater joint income, so that higher levels of effort are encouraged from the standpoint of total welfare.

The payoff functions were common information and participants were required to calculate both employer and employee payoffs in three exercises with hypothetical wage-effort pairs. These exercises (see Appendix A) were reviewed before proceeding with the experiment, insuring that subjects understood the payoff mechanism and that higher effort meant higher employer earnings, but lower employee earnings. The only difference across the attribution treatments was the wage-generating mechanism. In all cases, for the purposes of calculating income, the wage was subtracted from the employer endowment of 120. At the conclusion of a session, all participants were paid privately.

If psychological considerations are important, we should expect to see deviations from own money-maximization. Many previous gift-exchange experiments represent the wage-effort relation with the linear form:

$$e = \alpha + \beta * w \qquad (3)$$

The Fehr *et al.* (1998) experiment finds that $\beta > 0$.[15] It was expected that this result would be replicated in the volitional case. Given this linear form, the slope hypothesis is:

The slope of the wage-effort relationship will be significantly higher when wages employers choose wages than when wages are determined exogenously.

If we represent the wage-effort relation by:

$$e_1 = \alpha_1 + \beta_1 * w_1 \qquad (4)$$
$$e_2 = \alpha_2 + \beta_2 * w_2 \qquad (5)$$

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[14] For example, at w = 50, effort of 0.1 gives (Employer, Employee) material payoffs (30,7) and effort of 0.3 yields (28, 21). At w = 90, effort of 0.1 gives (Employer, Employee) material payoffs (70,3) and effort of 0.3 yields (68, 9).

[15] Given that $P_F = (120-w)*e$ and $P_E = w-c(e)-20$, note that β should be <u>less</u> than 0 for an employee who only cares about the sum of the payoffs for one's self and the employer. This is so, since a higher level of effort yields greater benefits for the employer when the wage is low, as the effort level would then multiply a larger number of employer income coupons, this effectively allows the altruist to trade-off welfare at a more favorable ratio.

where the subscripts 1 and 2 refer to the exogenous and employer cases, respectively, this hypothesis states that $\beta_2 > \beta_1$. A difference between β_2 and β_1 would be attributed to reciprocal altruism. Note that we cannot assume that α_1 and α_2 are the same.

3. RESULTS

The results from all treatments indicate a positive relationship between effort and wage. Only 13 of the 61 employees acted in accordance with the predictions for pure money-maximizers by always selecting the minimum effort. The remaining 79% of the subject population demonstrated a contingent willingness to consider an employer's welfare and choose higher effort with a higher wage.

Table 1 presents a summary of the data in each treatment, aggregated by wage brackets so that each cell includes at least 30 observations. More detailed results are presented in Appendices B and C.

Table 1 –Average Effort by Wage Range and Treatment

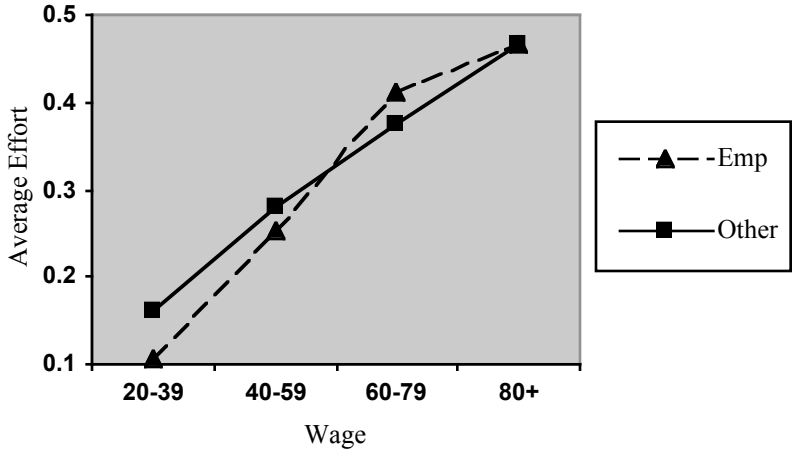
Wage range	*Employer*	*Random*	*Third party*	*Pooled*
20-39	.1060 (50)	.1697 (33)	.1438 (32)	.1569 (65)
40-59	.2537 (54)	.3051 (39)	.2571 (42)	.2802 (81)
60-79	.4125 (80)	.3784 (88)	.3613 (93)	.3696 (181)
80+	.4667 (36)	.4867 (30)	.4394 (33)	.4619 (63)
Aggregate	.3127 (220)	.3442 (190)	.3175 (200)	.3305 (390)

The number of observations in each cell is in parentheses

In the lowest wage bracket, average effort is considerably lower with employer-determined wages than in the other treatments (recall that the minimum effort level was .1). Comparing the 20-39 and the 60-79 wage brackets, we see that average effort increases by .31 in the employer case and by .21 when wages are exogenous. However, at the highest wages (80+), effort levels in the intentional case are no higher than the other treatments, even though positive reciprocity would predict a large gap. As the slope for the two exogenous treatments is nearly

identical (confirmed by regressions below), these treatments are pooled in Figure 1 to offer a clearer pattern.[16]

Figure 1 - Wage vs. Average effort



Previous studies of experimental labor markets have typically used two-sided Tobit regressions to analyze the results.[17] There is a repeated measures problem, since each employee chooses effort 10 times. One standard approach to this problem is to employ a random-effects model, where the participant is the random component. Table 2 shows the values and t-statistics for α and β in the various treatments, for random-effects regressions on $e_0 = \alpha + \beta * w_0$, where e_0 = effort - 0.1 and w_0 = wage - 20:[18]

16 In Appendix B, the data are partitioned into narrower wage ranges and the corresponding charts are provided. While the graph is less smooth, a similar pattern is observed.

17 Overall, effort was either .1 or 1.0 in 266 of the 610 observations, so that an approach accounting for censoring is indicated.

18 The slope hypothesis was the original motivation for this study and so it is tested, even though the linear formulation is a simple representation of the data. See Charness and Haruvy (2002) for a more general estimation and a nested maximum-likelihood comparison of several models of nonpecuniary behavior.

Table 2 – Random-effects Tobit Regression Results

Treatment	N	α	Z(α)	β	Z(β)
Employer	220	-.409	-4.34	.01200	11.21
Random	190	-.215	-3.63	.00883	8.39
Third party	200	-.184	-5.63	.00851	13.56
Pooled Random & Third party	390	-.229	-5.76	.00884	14.39

The β coefficients for the two exogenous treatments are quite similar. A Wald test on [β_{RANDOM} - $\beta_{THIRD\text{-}PARTY} = 0$] gives a test statistic of $\chi^2 = 0.04$ (n.s.), so that we can pool the slopes in these treatments.[19] We see that the slope in the volitional case is 36% higher than in the pooled exogenous treatments. The value for α, the Tobit intercept for the average amount by which effort differs from the minimum at the lowest wage, is significantly negative in all cases; however, it is substantially more so with employer-generated wages. The difference suggests negative reciprocity with intentional low wages. When we perform a Wald test on [$\beta_{EMPLOYER}$ - $\beta_{EXOGENOUS} = 0$], we get $\chi^2 = 4.35$ ($p = 0.04$), showing that the difference between these slopes is significantly positive, in accord with the slope hypothesis.

We can also perform nonparametric tests on employee behavior. Figures 1 and 2 and Table 1 suggest that effort is more sensitive to the wage in the employer treatment, but only at low and moderate wages. We can see the influence of intention by examining the effort responses to low wages. In the 50 occasions where an employer chose a wage less than 40, an employee chose costly effort only twice. On the other hand, costly effort is chosen 17 of 66 times when a wage not chosen by an employer is below 40. The difference between these proportions is highly significant ($\chi^2 = 9.8$, $p < 0.01$).[20] The effect of negative reciprocity is illustrated by a comparison of Figure 2 and Figure 3:

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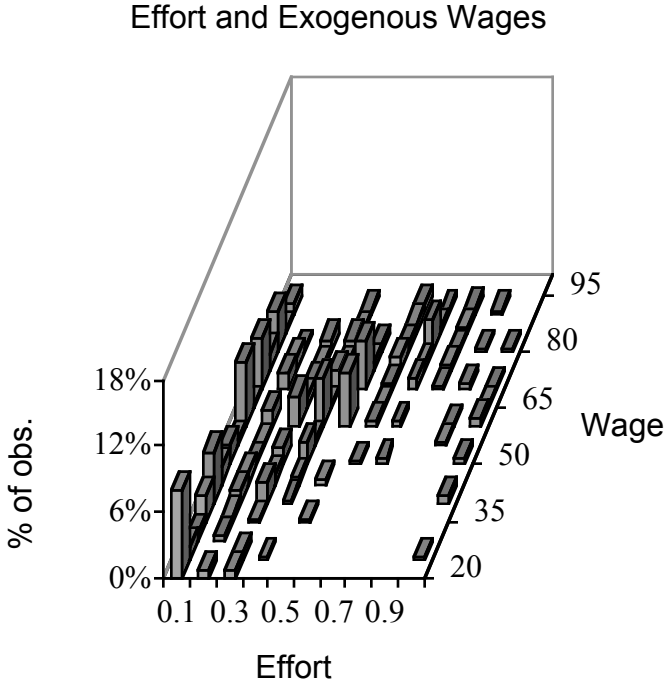
[19] The Wald test reported stems from estimating the random-effects Tobit on the pooled exogenous sample with a common intercept and separate slopes. Likelihood-ratio tests were also performed, with similar results.

[20] It is true that there may be more than one such observation for some individuals, rendering the assumption of independence somewhat suspect. However, the wage was less than 40 less than 20% of the time. Assuming two

Figure 2

observations per employee (10 periods per session), we can obtain a lower bound for the correct test-statistic by dividing the one obtained by $\sqrt{2}$; doing so gives a value of $\chi^2 = 6.9$, with $p < 0.01$.

Figure 3



In Figure 2, the large diagonal area to the lower right is free of observations, with the exception of two isolated points. By contrast, although low wages still usually lead to minimum effort in Figure 3, there are many observations where this is not the case.

Each employee's effort/wage slope can be estimated from his ten observations, using a two-sided Tobit regression. If we rank the 61 individual estimates from high to low, we can use a Wilcoxon-Mann-Whitney rank-sum test (see Siegel and Castellan, 1988) to test for differences across treatments. If effort is more sensitive to wage with volitional wages, we should expect that the average rank in this treatment to be significantly lower than otherwise. The Wilcoxon test is significant at $p = 0.05$ (one-tailed test).

However, there may be a problem with treating these individual slopes as being independent, since there is an interaction process over time. To the extent that this is the case, we can only analyze data on a session basis, treating each session as one independent observation.

We can run a separate Tobit regression for each session, and then rank the slope (β) coefficients. Pooling the exogenous sessions (recall the lack of difference for the β coefficients in these treatments) gives Table 3:

Table 3 – β Coefficients for Employer-generated and Exogenous Wages, by Session

Employer-generated Wages		Exogenous Wages	
Session	β	Session	β
1	.01305	Random 1	.00928
2	.01242	3rd-party 2	.00903
3	.01200	Random 2	.00872
		3rd-party 1	.00806

Notice that the fitted slope coefficient in each session with employer-generated wages is greater than the fitted slope coefficient in each session with exogenous wages. The Wilcoxon test states that the difference in the sum of the ranks is significant at $p = 0.03$. Thus, there is a significant difference in slopes across treatments, even when using a rather strict statistical test.

4. DISCUSSION

Although the values of β may appear small, they lead to dramatic differences in effort level and consequent employer profits over the wage range. In the employer case, the effort given a wage of 20 is .10. In contrast, with an assigned wage of 75, the expected effort is .42. When an employer assigns a wage of 75, her expected earnings of 19 guilders (calculated using the fitted values for α and β from Table 1) are nearly double. The results from the employer treatment indicate that employer profits were *ex post* highest (25) when the wage was 70, while the fitted values tell us that the profit-maximizing wage should be 75. An employer using the standard economic model would select the minimum wage of 20.

These results lend support to distributional models of nonpecuniary utility, since most of the slope in the volitional case can be attributed to non-reciprocal considerations. Most people are at least potentially willing to contribute a portion of their monetary payoff in order to

increase the payoffs of others, even if these others have done nothing on their behalf (i.e., with exogenous wages). The willingness to contribute at any specified exchange rate depends on the payoffs that would be the consequence of one's choice.

Given the experimental payoff structure, the purely distributional models by B & O and F & S both predict that effort will increase with wage. Minimum effort leads to greater disparities in payoffs as the wage increases; to the extent that an employee is averse to an overly-lopsided payoff in her favor, the higher the effort she will choose. However, these models make no allowance for the effect of causal attribution. Thus, behavior should be identical across wage-determination treatments, and we have seen that there is a substantial reciprocity component in the data. On the other hand, the positive wage/effort relationship even when wages are visibly drawn from a bingo cage is at odds with the Rabin (1993) and Dufwenberg and Kirchsteiger (1998) models. An approach that accounts for both distributional preferences and reciprocity would seem best.[21]

The model presented in Charness and Rabin (2002), henceforth C & R, highlights the importance of social preferences as an influence on choice. While the full model is rather complex, a fair simplification is that people have preferences for increasing a combination of the total payoff of the group (efficiency) and the minimum payoff for any player (maximin, or Rawlsian), and these preferences can induce personal financial sacrifice. However, concern for the welfare of others is withdrawn to the extent that these others "misbehave" by making choices that don't respect these social preferences. There may also be a taste for sacrificing to lower a misbehaver's payoff.

The maximin component of the utility function works here in the same manner as the difference-aversion components of the B & O and F & S (1999). The efficiency element actually

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[21] I do not use the term 'reciprocity' in the purely behavioral sense sometimes found in the literature. In this usage, a responder sacrificing a portion of her material payoff to increase that of a first mover is positive reciprocity and a responder sacrificing to lower the first-mover's payoff is negative reciprocity. This strong version of negative reciprocity is not possible here, as an employee refusal to provide costly effort is consistent with own money-maximization. However, the extent to which there is less costly effort provision at low wages is indicative of a weaker form of negative reciprocity termed *concern withdrawal* in Charness and Rabin (2002).

works in the opposite direction, as the effective yield for a marginal unit of effort *diminishes* as the wage increases. Nevertheless, there is a high benefit/sacrifice ratio except for very high wages – for example, even when the wage is 80, the first marginal unit of effort increases the total payoff by four and costs only one. So, the overall prediction of the distributional element of the C & R model would be largely the same as that of the other models.

However, an employer who intentionally chooses a low wage can be perceived to have misbehaved in a social sense. In the extreme, a wage of 20 guarantees a non-positive payoff for the employee, clearly an unappealing distributive outcome. There would be some tendency for employees to withdraw their natural willingness to be helpful when an employer acts unfairly. Thus, the C & R model predicts more effort provision at low wages when these wages are exogenous. Effort should be no different across treatments for high wages, since there is no concern withdrawal with either employer-chosen or exogenous wages.

It may be useful to segment wages into three categories. First, when the wage is less than 30, the employee will inevitably receive less than the employer. By choosing non-minimal effort, employees increase the total payoffs but reduce the minimum payoff. Thus, any such choices must reflect a pure efficiency motivation, as they are also inconsistent with any type of difference (inequality) aversion. In this range, when wages are not determined by the employer, we see costly effort provided 23% (11/47) of the time.[22] Thus, efficiency can dominate both own money-maximization and Rawlsian considerations for a substantial proportion of the population. However, efficiency concerns are overwhelmed when negative reciprocity is added to the mix: The employee never (0/41 cases) provides costly effort when the employer has exercised her volition by choosing a wage below 30. The test of differences of proportions (Glasnapp and Poggio, 1985) across negative reciprocity conditions gives $Z = 3.31$, $p < 0.01$.[23, 24]

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[22] In fact, when the wage was 20 with random wage-determination, subjects voluntarily chose a negative payoff in 5 cases of 22 (23%), opting to greatly enhance a blameless employer's payoffs at a small personal cost.

[23] Of course, this test-statistic assumes independent observations, not always the case here. However, it was rare that any employee was faced with $w < 30$ more than twice in a session, so a worst-case correction can be performed by dividing 3.31 by the square root of 2, giving $Z = 2.34$, $p = 0.01$.

[24] If we include all wages under 40, the comparison is 17/65 (26%) vs. 2/50 (4%), $Z = 3.17$, $p < 0.01$.

When the wage is at least 30 but less than 79, the employee's effort choice determines whether he or the employer receives the larger monetary reward. We can ask if the efficiency motive is strong enough to cause an employee to come out behind, and whether this varies across the source of the wage. It turns out that this occurs about 1/6 of the time, regardless of the treatment (16.3% with endogenous wages, and 16.6% with exogenous wages). If we interpret these wages as non-minimum or "reasonable" wages, there should be little concern withdrawal even with employer-generated wages, so perhaps no substantial difference should be expected across treatments.[25]

The employee cannot come out behind if the wage ≥ 79. The efficiency effect diminishes substantially at high wages (recall that $\pi_F = [120 - w]*e$), and the smaller efficiency gains could inhibit effort provision.[26] Regarding this wage range, recall from Table 1 that there was almost no difference across treatments in average effort for wages of 80 or more. However, there are relatively few observations in this wage range, and our conclusions are also sensitive to the threshold chosen for "high wages" – if we include wages of 70 and over, the average effort level is .4667 for employer-determined wages and .4151 for exogenous wages (see Appendix B).[27,28]

Thus, it is not clear whether we observe positive reciprocity in this experiment. First, the gradients may differ significantly even if there is only negative reciprocity, or concern withdrawal, and behavior at high wages is identical across treatments. Nevertheless, the main point is that there is a substantial effect from reciprocity, as seen in the difference in the effort/wage gradients across treatments.

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[25] Overall, employees chose to receive a smaller material payoff than the employer in 80 of the 509 cases (16%) where the employer can potentially receive a higher payoff than the employee (w < 79).

[26] Note that a very high wage could be considered sub-optimal by the quasi-maximin criterion; for example, the highest possible symmetric payoff of (41,41) requires a wage of 79 and an effort choice of 1.0.

[27] Also note that average effort for wages between 60 and 79 is higher with employer-generated wages, so that the higher slope value in the employer-based regression has overcome the larger negative intercept by this point, which is at least consistent with positive reciprocity

[28] In some sense the wage range in which positive reciprocity should apply is unclear. It is *ex post* own-payoff-maximizing for an employer to choose a wage of 70. If she anticipates this, is it really kindness to offer this wage? This consideration could affect an employee's motivation.

The results are in accord with a number of studies showing reciprocity that cannot be explained by distributional models. Kahneman, Knetsch, and Thaler (1986b) instruct people to make the binary choice of splitting $20 (10,10) or (18,2) with an anonymous second party. In a 2nd stage, participants were asked to choose between (Self, Even Chooser, Uneven Chooser) payoffs of (6,0,6) or (5,5,0); 74% of participants choose own payoffs of $5 instead of $6, clearly demonstrating negative (indirect) reciprocity for the uneven chooser's past selfishness. Offerman (2002) studies the effects of random choice mechanisms while allowing for both positive and negative reciprocity. He considers players' responses to a helpful or hurtful choice, as a function of whether the "choice" was made by an interested party or generated at random. Following this choice, the responder could either let the choice stand or sacrifice 1 unit to either increase the first mover's payoff by 4 or decrease it by 4. Results indicate clear negative reciprocity, but the limited positive reciprocity observed is not statistically significant.

Brandts and Charness (forthcoming) test for punishment and reward in a cheap-talk game and find that intention is a critical issue, finding substantial negative reciprocity and significant, but limited, positive reciprocity. One player sends a message about her intended play to another player; after play takes place, the other player is then given an opportunity to punish or reward the first player; this second player was much more likely to punish unfavorable play if the first player had lied about his play than if he had told the truth. Brandts and Solà (2001) and Falk, Fehr, and Fischbacher (forthcoming) consider mini-ultimatum games and find that intentions (as exemplified by foregone choices) matter, indicating negative reciprocity is present. Charness and Rabin (2002) observe significant negative reciprocity, but so little positive reciprocity that their model excludes this motivation.[29]

Overall, these studies lend support to the view that negative reciprocity is widespread, but that positive reciprocity is not nearly as prevalent.

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[29] Some other studies yield more equivocal or negative evidence regarding reciprocity. Bolton, Brandts, and Katok (1997) find no evidence of positive reciprocity. Bolton, Brandts, and Ockenfels (1997) find no evidence of positive reciprocity, and only statistically insignificant evidence of small levels of negative reciprocity. Cox (2000) and Cox and Deck (2001) provide mixed evidence regarding positive and negative reciprocity and finding that the results are sensitive to certain aspects of the experimental procedures employed.

Behavior over time: A potentially serious concern is whether repeat-game effects might be affecting behavior. For example, one explanation for costly effort provision is that employees are attempting to develop a reputation, either for themselves or for the group of employees as a whole. Even though the structure of the experiment would seem to rule out individual reputations, it could still be the case that a subject would attempt to develop one. We can check this by testing for changes in subjects' choices over time, as reputation effects should diminish sharply near the end of a session. Graphs and regressions of effort measures over time are presented in Appendix D. Effort decreases very slightly with time in both treatments, but at a statistically insignificant rate. Perhaps a better test is to use the ratio of non-minimal effort to non-minimal wage, e_0/w_0. While there is a very slight decline in the ratio over time in both treatments, in no case are the t-statistics for the time coefficients close to significance. The lack of a substantial time trend and the comparison across regressions provides no evidence for reputation effects.

Appendix D shows that the average wage chosen by employers does not vary much by period. There is a slight, but not significant, trend upward over time. As the average wage is always considerably below the empirically optimal wage, employers seem to lack a good estimate of how employees will react, even though most employers do choose non-minimum wages. If this disparity were also found in the field, it could lead to sub-optimal efficiency. It is possible that employers mistakenly expect a higher effort level for mid-range wage choices. Charness and Haruvy (2000) analyze employer assertions (in the exogenous treatments) about the hypothetical effort they would have chosen and find support for a self-serving bias.

5. CONCLUSION

There is little doubt that monetary concerns are the most important factor in most economic choices made. However, as Kahneman, Knetsch, and Thaler (1986) and Akerlof and Yellen (1990) suggest, fairness considerations cannot be ignored in socio-economic environments.

The results indicate that even a purely profit-maximizing firm should consider issues of gift exchange. An employer who selects the minimum wage has, on average, much lower income than one choosing a wage of 70.

In this experiment, we see costly effort provision, the extent of which depends on both the wage and the mechanism for its determination. Distributive concerns have the larger role here, but the influence of causal attribution is also well-supported by the results. The greatest impact of reciprocity here appears to be at the low end of the wage distribution. In this experiment, an employee can do nothing more harmful than to choose minimum effort. However, in a natural setting, a worker may be able to effectively choose "negative effort" (sabotage) if resentful. Causal attribution for a wage seems important for work performance, as a worker who believes that a high wage is voluntary or a low wage is involuntary is more likely to help the employer. There may be serious economic consequences for a firm to be considered to be taking advantage of its employees. Parties' perceived intentions are also a crucial element in both civil and criminal law, as well as key factors in negotiations and dispute resolution.[30]

There is evidence that reciprocity is a learned phenomenon and that it is stronger in a homogeneous population. Hannan, Kagel & Moser (forthcoming) find undergraduate students provide substantially less effort than do MBAs; their evidence suggests "this difference results from differences in prior work experience that carry over into the laboratory." Holm and Nystedt (2002) find that 70-year-old responders chose to return a higher percentage with higher amounts received in a mail "trust game" in Sweden. This percentage was nearly constant in a parallel 20-year-old responder cohort, suggesting that sensitivity to the amount sent increases with experience. To the extent that reciprocity concerns vary across sub-populations or individuals, further research might delineate the conditions under which such concerns are likely to manifest.

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[30] See Charness (1996).

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APPENDIX A: EXPERIMENTAL INSTRUCTIONS

You are an employee

GENERAL INFORMATION FOR EMPLOYEES

You will be taking part in a study of the labor market. This research is being funded by the Vice Chancellor for Research at UC - Berkeley. If you read these instructions carefully, you may earn a significant sum of money. During the experiment your income will be calculated in Guilders. At the end of the experiment, Guilders will be converted into dollars at the rate of:

25 Guilders = $1

You will also receive a $5 payment for showing up for the experiment on time. At the end of the experiment your income will be paid to you in cash.

Stage 1: Each of the participants will be randomly assigned to one of two groups: half will be "employees" and half will be "employers". This is known by each participant. Whether you are an employer or an employee is noted at the top right hand corner of this page. [**Employer-generated wages:** At the first stage employers offer employees wages. **Randomly-generated wages:** At the first stage employees will be offered wages. These wage offers will be randomly determined by draws from a bingo cage. **Third-party generated wages:** At the first stage employees will be offered wages. These wage offers are determined by a neutral third-party.] Employees must accept a wage offer, which must be at least 20 Coupons. After 3 minutes the second stage begins.

Stage 2: At the second stage, each employee makes a decision. According to the procedure described below, they determine how much they work (quantity or amount of work).

Attached to these instructions you will find decision-sheets on which you must record the wage. Furthermore, you will record the amount of work which you have chosen. After this you will calculate the income you have earned. At this point the first period of the labor market will be over. Overall, there will be ten periods in this experiment. You will generally be matched exactly once with each person in the employer group. You will never be matched with the same person in successive periods. Further, you will not know with whom you have been matched in any of the periods. Your total income for the participation in this market will be the sum of the earnings in each of the ten periods.

How the Labor Market Works

1. At the beginning of each period we will open the labor market. In the first stage of the labor market each employer may offer a wage to an employee. This employee must accept this wage offer, forming a labor contract with the employer.

2. You must **immediately record the wage on the decision sheet for that period**.

3. You will have travel costs of 20 Guilders, which are subtracted from your wage..

4. **No employer will know with which employee s/he has concluded a contract, and no employer will know the employee**.

5. After all wage offers are collected, the second stage begins. After seeing a wage offer, you must now choose a quantity of work. We will then relay your chosen quantity of work to your employer. Please do not tell anyone what quantity of work you chose. No other employee and no other employer will be informed about your chosen quantity of work.

How do you Calculate Your Income in Each Period?

1. You will receive the wage you have accepted. From this wage you must then subtract the travel costs and the costs of your amount of work.

2. You determine your quantity of work by choosing a number between 0.1 and 1.0 from the schedule below. The lowest amount of work you can choose is 0.1, 0.2 is a slightly higher amount, and so on up to 1.0, the highest amount.

3. The higher the quantity of work you choose, the better it is for your employer. The higher the number you choose, that is, the quantity of work, the higher "your" employer's income.

4. The higher the amount of work you choose the higher your work related costs will be. You can find out how these costs are related to quantity of work by looking in the schedule below.

5. Your income in Guilders will be determined by the following formula:

Income(4) = Wage(1) - Costs of Quantity of Work(2) - Travel Costs(3)

Schedule of feasible amounts of work (AW) and corresponding
work related costs to employees (COST)

AW	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
COST	0	1	2	4	6	8	10	12	15	18

How do you Calculate the Income of Your Employer in Each Period?

1. Each employer receives from the experimenter 120 coupons which he may use to pay for wages. If s/he offers you a wage of 120 Guilders, then s/he will have no income coupons left. If s/he offers you a wage of 20 Guilders then s/he will have 100 income coupons left. In general, your employer will have

120 coupons - wage

income coupons left.

2. How are the remaining coupons converted into Guilders? The number of coupons retained by the employer, whose wage offer you accepted, is multiplied by the quantity of work you choose. This result is the income of your employer in Guilders. Thus:

Employer's Income in Guilders = Coupons Retained x Quantity of Work

Please Note: The income of all employees and employers will be computed according to the same rules. Every employer has 120 Coupons and the work related cost-schedule as well as the travel costs are the same for every employee. Every employer is able to compute the income of "his" or "her" employee, and every employee is able to compute the income of "his" or "her" employer.

Let's Have an Exercise

1. Let's assume that an employer, who has 120 Coupons, offers a wage of 110 Guilders, which you accept. At the second stage of this period you choose a quantity of work of 0.5.

What will your income and the income of your employer be?

My Income = ... Guilders

Employer's Income = ... Guilders

2. Let's assume that an employer, who has 120 Coupons, offers a wage of 28 Guilders, which you accept. At the second stage of this period you choose a quantity of work of 0.6.

What will your income and the income of your employer be?

My Income = ... Guilders

Employer's Income = ... Guilders

3. Now let's assume again that an employer, who has 120 Coupons, offers a wage of 28 Guilders, which you accept. However, suppose that at the second stage of this period you now choose a quantity of work of 0.1.

What will your income and the income of your employer be?

My Income = ... Guilders

Employer's Income = ... Guilders

Schedule of feasible amounts of work (AW) and corresponding work related costs to employees (COST)

AW	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
COST	0	1	2	4	6	8	10	12	15	18

Employee Number:

Period Number:

Wage (1)	.....
Amount of Work Chosen	.....
Cost of Amount of Work Chosen (2)	.....
Travel Costs (3)	20 Guilders
Your Income in Guilders (4)	..... Guilders

Employer's Income in Guilders = (120 Coupons - Wage) x Amount of Work Chosen

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Employees will choose one of the feasible amounts of work (AW) from the first row. The higher the number, the higher the amount of work.

The second row of the schedule shows the cost of each amount of work (COST) for the employee. The higher the amount of work, the higher the costs to the employee.

Schedule of feasible amounts of work (AW) and corresponding work related costs to employees (COST)

AW	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
COST	0	1	2	4	6	8	10	12	15	18

You are an employer

GENERAL INFORMATION FOR EMPLOYERS

You will be taking part in the study of the labor market. This research is being funded by the Vice Chancellor for Research at UC - Berkeley. If you read these instructions carefully, you may earn a significant sum of money. During the experiment your income will be calculated in Guilders. At the end of the experiment, Guilders will be converted into dollars at the rate of:

25 Guilders = $1

You will also receive a $5 payment for showing up for the experiment on time. At the end of the experiment your income will be paid to you in cash.

Stage 1: Each of the participants will be randomly assigned to one of two groups: half will be "employees" and half will be "employers". This is known by each participant. Whether you are an employer or an employee is noted at the top right hand corner of this page. [**Employer-generated wages:** At the first stage employers offer employees wages. **Randomly-generated wages:** At the first stage employees will be offered wages. These wage offers will be randomly determined by draws from a bingo cage. **Third-party generated wages:** At the first stage employees will be offered wages. These wage offers are determined by a neutral third-party.] Employees must accept a wage offer, which must be at least 20 Coupons. After 3 minutes the second stage begins.

Stage 2: At the second stage, each employee makes a decision. According to the procedure described below, they determine how much they work (quantity or amount of work).

Attached to these instructions you will find decision-sheets on which you must record the wage you have offered. Furthermore, you will record the amount of work that the employee has chosen. After this you will calculate the income you have earned. At this point the first period of the labor market will be over. Overall, there will be ten periods in this experiment. You will generally be matched exactly once with each person in the employer group. You will never be matched with the same person in successive periods. Further, you will not know with whom you have been matched in any of the periods. Your total income for the participation in this market will be the sum of the earnings in each of the ten periods.

How the Labor Market Works

1. At the beginning of each period we will open the labor market. In the first stage of the labor market each employer may offer a wage to an employee. This employee must accept this wage offer, forming a labor contract. **Wage offers must be no less than 20 Guilders and no more than 120 Guilders**.

2. You must **immediately record this wage on the decision sheet for that period**.

3. Each employee has to bear travel costs of 20 Guilders.

4. **No employer will know with which employee s/he has concluded a contract, and no employer will know the employee**.

5. After all wage offers are collected, the second stage begins. Now employees must choose a quantity of work. We will then relay "your" employee's chosen quantity of work to you. Please do not tell anyone what quantity of work s/he chose. No other employee and no other employer will be informed about the quantity of work "your" employee has chosen.

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How do you Calculate Your Employee's Income in Each Period?

1. An employee will receive the wage s/he has accepted. From this wage s/he must, however, subtract the travel costs of 20 Guilders and the costs of the quantity of work s/he has chosen.

3. Employees determine their quantity of work by choosing a number between 0.1 and 1.0 from the schedule below. The lowest amount of work you can choose is 0.1, 0.2 is a slightly higher amount, and so on up to 1.0, the highest amount.

3. The higher the quantity of work s/he chooses, the better it is for you. The higher the number s/he chooses, that is, the quantity of work, the higher your income.

4. The higher the amount of work s/he chooses, the higher the work related costs will be. You can find out an employee's work related costs by looking in the schedule below.

5. An employee's income in Guilders will be determined by the following formula:

Income(4) = Wage(1) - Costs of Quantity of Work(2) - Travel Costs(3)

Schedule of feasible amounts of work (AW) and corresponding work related costs to employees (COST)

AW	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
COST	0	1	2	4	6	8	10	12	15	18

How do you Calculate Your Income in Each Period?

1. You will receive from the experimenter 120 coupons which you may use to pay wages. If you offer a wage of 120 Guilders, then you will have no income coupons left. If you offer a wage of 20 Guilders then you will have 100 income coupons left. In general, you will have

120 coupons - wage

income coupons left.

2. How are the remaining coupons converted into Guilders? The number of coupons retained by you is multiplied by the quantity of work your employee has chosen. This result is your income in Guilders. Thus:

Your Income in Guilders(4) = {# of Coupons(1) - Wage(2)} x Quantity of Work(3)

Please Note: The income of all employees and employers will be computed according to the same rules. Every employer has 120 Coupons and the work related cost-schedule as well as the travel costs are the same for every employee. Every employer is able to compute the income of "his" or "her" employee, and every employee is able to compute the income of "his" or "her" employer.

Let's Have an Exercise

1. Let's assume that you used your 120 Coupons to offer a wage of 110 Guilders, which is accepted. At the second stage of this period this employee chooses a quantity of work of 0.5.

What will your income and the income of your employee be?

My Income = ... Guilders

Employee's Income = ... Guilders

2. Let's assume that you used your 120 Coupons to offer a wage of 28 Guilders, which is accepted. At the second stage of this period this employee chooses a quantity of work of 0.6.

What will your income and the income of your employee be?

My Income = ... Guilders

Employee's Income = ... Guilders

3. Now let's assume again that you used your 120 Coupons to offer a wage of 28 Guilders, which is accepted. However, suppose that at the second stage of this period this employee now chooses a quantity of work of 0.1.

What will your income and the income of your employer be?

My Income = ... Guilders

Employer's Income = ... Guilders

Schedule of feasible amounts of work (AW) and corresponding work related costs to employees (COST)

AW	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
COST	0	1	2	4	6	8	10	12	15	18

Employer Number:

Period Number:

# of Coupons (1)	120
Wage (2)	.....
Amount of Work Chosen by	.....
Your Income in Guilders (4)	..... Guilders

Travel Costs = 20 Guilders

Employee's Income in Guilders = Wage - Costs of Amount of Work Chosen - Travel Costs

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Employees will choose one of the feasible amounts of work (AW) from the first row. The higher the number, the higher the amount of work.

The second row of the schedule shows the cost of each amount of work (COST) for the employee. The higher the amount of work, the higher the costs to the employee.

Schedule of feasible amounts of work (AW) and corresponding work related costs to employees (COST)

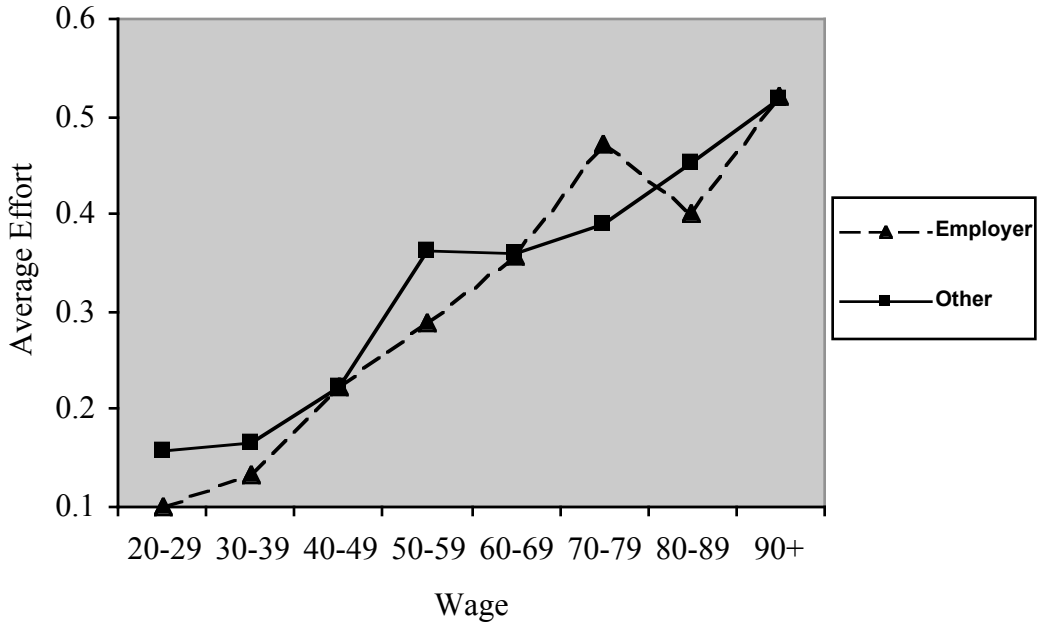
AW	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
COST	0	1	2	4	6	8	10	12	15	18

APPENDIX B

Results by wage bracket

Wage range	*Employer*	*Random*	*Third party*	*Pooled*
20-29	.1000 (41)	.1778 (27)	.1300 (20)	.1574 (47)
30-39	.1333 (9)	.1333 (6)	.1667 (12)	.1556 (18)
40-49	.2241 (25)	.2348 (23)	.2120 (25)	.2229 (48)
50-59	.2880 (29)	.4062 (16)	.3235 (17)	.3636 (33)
60-69	.3463 (41)	.3711 (45)	.3447 (47)	.3576 (92)
70-79	.4718 (39)	.3860 (43)	.3783 (46)	.3820 (89)
80-89	.4000 (16)	.4708 (24)	.4321 (28)	.4500 (52)
90+	.5100 (20)	.5500 (6)	.4800 (5)	.5182 (11)
Aggregate	.3127 (220)	.3442 (190)	.3175 (200)	.3305 (390)

The number of observations in each cell is in parentheses



APPENDIX C - Wage/effort pairs

Employer-generated wages

	Effort									
Wage	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
20	30									
21	5									
22	1									
25	5									
30	6									
35	1		1							
37		1								
40	7	13	4	1						1
45		3								
50	7	1	7	4						1
55	2			3						
60	9	3	2	10	6	5				
61				1						
65	1	1	1	1			1			
70	6		2	1	5	5	6	2	2	
75	3		1	2			1	1		
79	1						1			
80	5		1		2		2		1	2
85	3									
90	3						2			1
92	1									
94	1									
95			1				1	1		
97	1									
98										1
99								1		
100	2						1			1
101										1
105							1			

Random-generated wages

	Effort									
Wage	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
20	17	3	2							
25	2		1	1						1
30	2									
35	2	2								
40	9	1	3							2
45	5	2			1					
50	4	1	2	3		1				2
55		1		1					1	
60	10	4	7	10	5		1		1	3
65	1		2							1
70	8	4	1	2	7		4	1		1
75	4	3		1	2	3		2		
80	4	1	4	3	1	1	4	1	1	
85						2	1	1		
90	2					1		2	1	

Third-party-generated wages

	Effort								
Wage	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
20	14		1							
25	3		2							
30	1	2								
35	7		1		1					
40	9	3	4	1						
45	1	2	3	2						
50	3		4	5			2			
55	2			1						
60	13	2	4	7	14	2	1			
65			2	1		1				
70	10	2	2	5	10	2			2	
75	2	2	2	1	1	2	3			
80	10			1	2	2	7			1
85	1			1		1	1	1		
90	1			1		2	1			

Pooled non-volitional wages

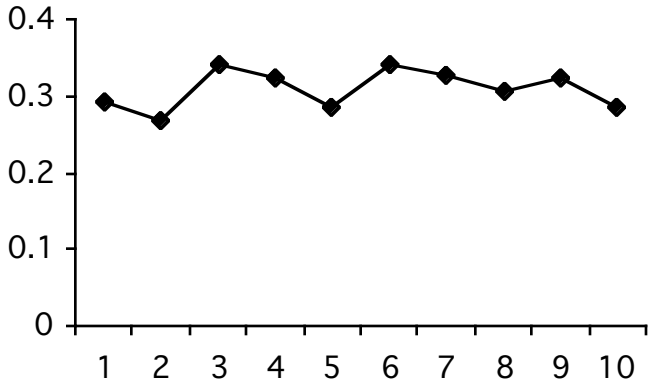
	Effort								
Wage	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
20	31	3	3							
25	5		3	1						1
30	3	2								
35	9	2	1		1					
40	18	4	7	1						2
45	6	4	3	2	1					
50	7	1	6	8		1	2			2
55	2	1		2					1	
60	23	6	11	17	19	2	2		1	3
65	1		4	1		1				1
70	18	6	3	7	17	2	4	1	2	1
75	6	5	2	2	3	5	3	2		
80	14	1	4	4	3	3	11	1	1	1
85	1			1		3	2	2		
90	3			1		3	1	2	1	

APPENDIX D -PERIOD EFFECTS

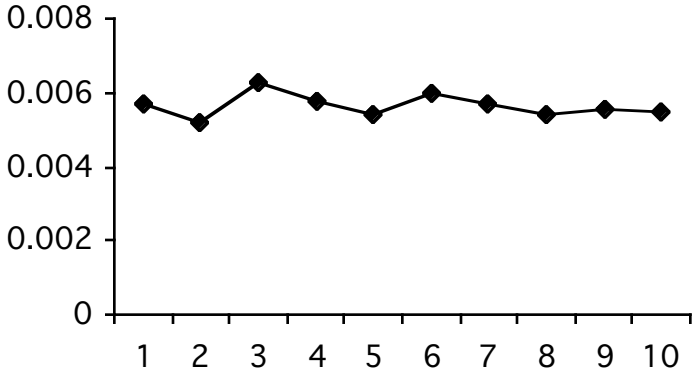
Average wage by period

Period	1	2	3	4	5	6	7	8	9	10
Wage	51.2	52.0	54.6	55.8	52.8	57.2	57.7	56.6	58.4	52.4

Average effort by period



Effort/wage ratio by period



If reputation were important in effort determination, we should expect effort and the ratio (defined as e_0/w_0) to decrease over time. However, OLS regressions give the results:

Employer-generated wages

EFFORT = .3015 + .001381*PERIOD (0.47) RATIO = .00620 - .0000380*PERIOD (-0.69)

Exogenous wages

EFFORT = .3338 + .000094*PERIOD (0.04) RATIO = .00635 - .0000342*PERIOD (-0.57)