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How Robust is Laboratory Gift Exchange?*

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Abstract

The gift-exchange game is a form of sequential prisoner's dilemma, developed by Fehr et al. (1993), and popularized in a series of papers by Ernst Fehr and co-authors. While the European studies typically feature a high degree of gift exchange, the few U.S. studies provide some conflicting results. We 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. We also find significant and substantial time trends in responder behavior.

Keywords: gift exchange, robustness, framing

JEL Classification: A13, C91, D21, J30

1. Introduction

The *gift-exchange game* was first described in Fehr et al. (1993). The remarkable result in this experiment (and many successors) is that a person chooses to sacrifice money to help another person in exchange for the "gift" of higher wages received from the other person. As there is no direct benefit from making such a monetary sacrifice in a one-shot game, the conclusion is that this behavior represents some form of social preference, perhaps reciprocity. Despite the predictions of standard theory, both players typically realize higher income by cooperating (exchanging gifts) than would be received with Nash equilibrium play. This behavior is, however, consistent with the Akerlof (1982) model of gift exchange, in which employers receive higher productivity from employees by paying them non-minimal wages.

Gift exchange in labor markets has many important economic consequences, and many experimental studies of gift-exchange have been published. To the extent that the

*This research was conducted while Charness was visiting The Ohio State University.

employment relationship resembles a form of social exchange, a labor contract is partially implicit and therefore incomplete. Ernst Fehr and his co-authors have argued that incomplete contracts may be better from a social standpoint. Fehr and Gächter (2000) make the case that imposing explicit, but stochastically-enforced, sanctions for shirking can actually be counter-productive in some circumstances, as the intrinsic motivation to be productive and cooperative may be eroded in the process. Such considerations about real world labor markets are of interest only if experimental results from the gift exchange game are sufficiently robust.

At first glance, gift-exchange results seem to be robust, since numerous variations and replications have been conducted. However, the vast majority of these sessions have taken place in a compact region, Switzerland and Austria. Very few gift-exchange experiments have been conducted in the U.S.[1] Charness (forthcoming) observes a pattern of gift exchange (in Berkeley) similar to that seen in the Fehr et al. experiments. However, Hannan et al. (2002) find that subject characteristics strongly affect behavior. While results with MBA students resemble the standard pattern, there is only very limited gift exchange among Pittsburgh undergraduates.[2] Thus, there is at least a suspicion that factors such as culture and work experience can affect laboratory behavior.

In comparing the Charness (2002) and the Hannan et al. (forthcoming) designs, we noticed that in the latter paper, participants were provided with a comprehensive payoff table relating wages and effort levels to worker's payoffs and managers incomes.[3] As far as we know, payoff tables have not been included in any other gift exchange experiments (exclusive of the Hannan, 2001 study with MBAs). The inclusion of a comprehensive payoff table is arguably unimportant, given that subjects have all the information necessary to compute their own payoffs and the payoffs of the other person in their pairs, including the fact that increases in effort above the lowest level possible are increasingly costly to workers.[4] However, the inclusion of a payoff table does clarify the precise details of the exchange relationship between employers and employees for different wage rates and effort levels, and may introduce subtle (and unanticipated) framing/presentation format effects that impact on behavior.

The present experiment explores the role of the comprehensive payoff table on the level of gift-exchange reported. While we observe gift-exchange both with and without the payoff table, we find that behavior is surprisingly sensitive to this seemingly innocuous procedural change which results in a substantial and statistically significant reduction in both wages and worker effort. We also find substantial and statistically significant time trends both with and without the payoff table, suggesting that the gift exchange observed in our experiment was, at least in part, induced by strategic considerations rather than by social preferences *per se*.

Our results leave open the question of what exactly is responsible for the substantial and significant reduction in gift exchange with U.S. undergraduates as a result of providing a payoff table. We hold off discussing some of the more prominent possibilities until the conclusion of the paper. Whatever the ultimate explanation for the payoff table effect reported, our results clearly suggest that gift exchange in the lab is not as robust as previously thought, and that there is a need to replicate the gift-exchange experiments with European undergraduates with comparable payoff tables provided.

2. Experimental design

Six laboratory sessions were conducted at The Ohio State University during May, 2001. A total of 114 people participated in the study; no one participated in more than one session. Average earnings, including a $5 show-up fee, were about $18 for about 90 minutes.[5]

Participants met in a large classroom, and were divided into two groups on opposite sides of the room. A coin was flipped at the start of the session to determine which role (managers or employees) was assigned to each group. A session consisted of ten separate periods, with ten managers and ten employees in the session.[6] Each participant received a copy of the written instructions, which were read aloud to the group. Each manager was matched anonymously with a different employee in each period, using a "no-contamination" matching design. In each period, each manager chose a wage for her employee.[7] All wages chosen for the period were then displayed publicly on the blackboard, and then each individual employee was told his assigned wage. Employees then chose an effort level, with an associated cost of effort increasing monotonically with the level of effort chosen. The effort level chosen by an employee was then conveyed to the appropriate manager.[8]

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 100 "income coupons" in each period. The monetary payoff functions were given by:

$$\Pi_{\mathrm{M}} = (100 - w) * e \tag{1}$$

$$\Pi_{\mathrm{E}} = w - c(e) \tag{2}$$

where M represents the manager, E the employee, e denotes the employee's effort, w is the wage, and $c(e)$ is the cost of effort. Wages were limited to the range of 0 to 100, inclusive, and effort was chosen from $\{0.1, 0.2, \ldots, 1.0\}$; the cost 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

The payoff functions were common information, and participants were required to calculate both manager and employee payoffs in three exercises with hypothetical wage-effort pairs. These exercises were reviewed before proceeding with the experiment, insuring that subjects understood the payoff function and that higher effort meant higher employer earnings, but lower employee earnings. At the conclusion of a session, participants were paid individually and privately, at a conversion rate of 20 payoff units to each $1.

The only difference across treatments was whether a payoff table, showing manager and employee payoffs for all combinations of effort and wages (in multiples of 10), was provided. In the payoff-table treatment, the table was presented on the last sheet of the instructions, and was not mentioned until all warm-up exercises had been completed.

	Employee's quantity of work									
Wage	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
0	10, 0	20, −1	30, −2	40, −4	50, −6	60, −8	70, −10	80, −12	90, −15	100, −18
10	9,10	18, 9	27, 8	36, 6	45, 4	54, 2	63, 0	72, −2	81, −5	90, −8
20	8, 20	16, 19	24, 18	32, 16	40, 14	48, 12	56, 10	64, 8	72, 5	80, 2
30	7, 30	14, 29	21, 28	28, 26	35, 24	42, 22	49, 20	56, 18	63, 15	70, 12
40	6, 40	12, 39	18, 38	24, 36	30, 34	36, 32	42, 30	48, 28	54, 25	60, 22
50	5, 50	10, 49	15, 48	20, 46	25, 44	30, 42	35, 40	40, 38	45, 35	50, 32
60	4, 60	8, 59	12, 58	16, 56	20, 54	24, 52	28, 50	32, 48	36, 45	40, 42
70	3, 70	6, 69	9, 68	12, 66	15, 64	18, 62	21, 60	24, 58	27, 55	30, 52
80	2, 80	4, 79	6, 78	8, 76	10, 74	12, 72	14, 70	16, 68	18, 65	20, 62
90	1, 90	2, 89	3, 88	4, 86	5, 84	6, 82	7, 80	8, 78	9, 75	10, 72
100	0, 100	0, 99	0, 98	0, 96	0, 94	0, 92	0, 90	0, 88	0, 85	0, 82

The table shows (Manager earnings, Employee Earnings) for some wage and effort combinations.

3. Results

The data indicate that the presence of the payoff table reduces average wage and reduces average effort even more. The full results are presented in Appendix A. Table 1 is a summary.

The average wage is 19% higher without a payoff table, while the discretionary effort (the amount above the minimum of 0.1) is 69% higher without a payoff table. On average, it still pays for a manager to offer a positive wage as she earns 10 at the minimum wage of zero versus 15.1 at the average realized wage and the average realized effort level. But average manager earnings are 26% higher without a payoff table. The effect of the payoff table on the *average cost of effort* is statistically significant using a Wilcoxon (Mann-Whitney) rank-sum test.[9]

For the purpose of comparison, choices without a payoff table correspond fairly closely with those seen in Fehr et al. (1998) and Charness (forthcoming). The average effort (wage)

Table 1. Summary statistics by treatment and session.

Sessions		Avg. wage		Avg. effort		Avg. cost of effort	
Table	1	31.95	33.45	0.262	0.227	2.34	1.79
	2	26.20		0.217		1.79	
	3	33.75		0.183		1.25	
No table	4	48.98	39.76	0.402	0.315	4.89	3.34
	5	36.15		0.254		2.46	
	6	34.14		0.277		2.40	

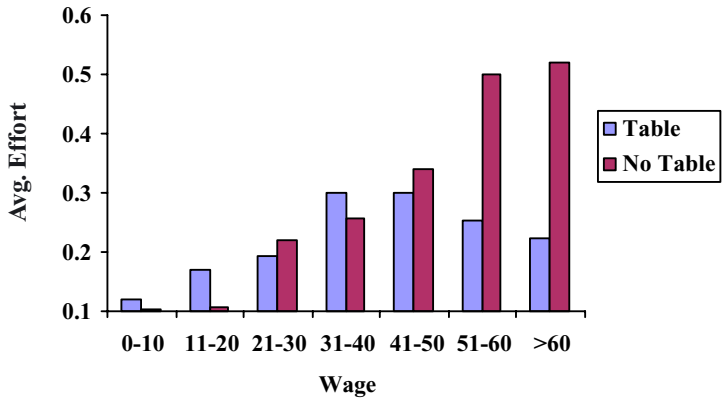

Figure 1. Average effort as a function wage.

in these studies was .34 (37.7) and .31 (34.9), respectively.[10] The effort level with the payoff table was much closer to that in Hannan et al. (.20), although the average wage in that study was also lower (25.2). Further, the average number of workers who always responded with minimum effort level, or almost always responded with minimum effort level (minimum effort in all periods but one), was 36.7% with the payoff table here compared to 22.2% without it, and compared to 39% of all undergraduates (with a payoff table) in Hannan et al.[11]

Figure 1 shows the average effort provided in various wage brackets.

The major difference between the effort choices made in the two treatments occurs at relatively high wages. This is highlighted in figure 2, where wages are divided into two brackets using a break-point of $w = 40$.

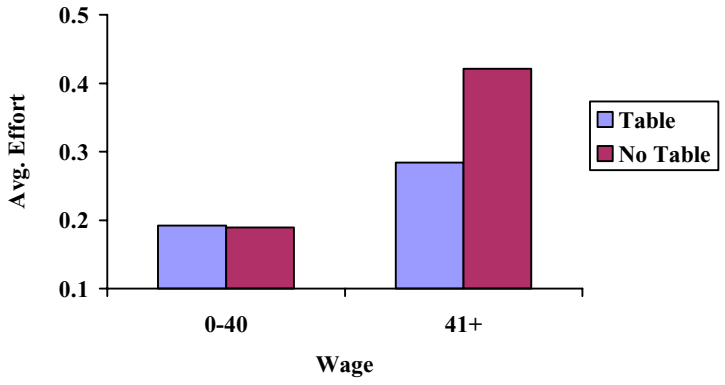

Figure 2. Average effort at low and high wages.

Most previous gift-exchange experiments (e.g., Fehr et al., 1993, 1998) find that behavior does not vary much over time. However, we find a strong period effect in our data for effort provision. Effort has a hump-backed pattern over time, peaking in periods 5 and 6, with this hump-backed pattern more pronounced in the payoff-table treatment.

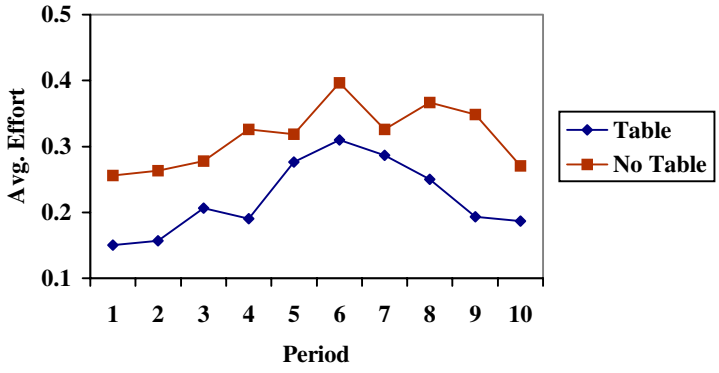

Figure 3. Avg. effort over time.

Wages also vary over time, but not as much as effort, peaking in the later stages of the sessions. Note the drop in wages in periods 2 and 3 in the payoff-table treatment (and to a lesser extent, periods 3 and 4 in the no-payoff-table treatment). As we shall see, this reflects low effort levels in the previous period. Further, effort levels seem to pick up after employees see that wages are being reduced, this being particularly true in the payoff-table case.

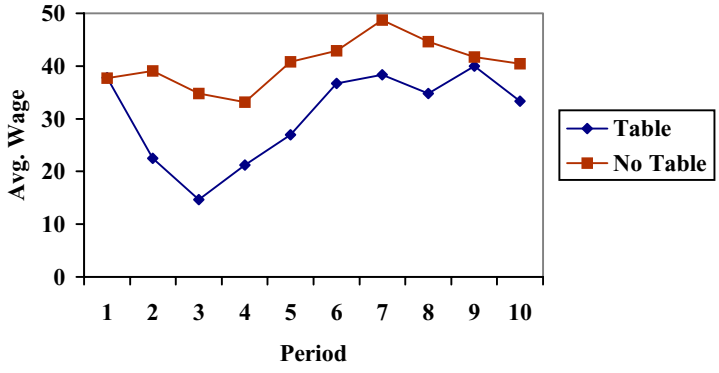

Figure 4. Avg. wage over time.

Regressions confirm that there is a significant difference in the effort/wage relationship across treatments. Due to the limited range of the dependent variable (effort), we employ censored regressions. To control for the panel nature of the data, we estimate both a random-effects two-sided tobit model and a random-effects ordered probit model. We report the results for the two-sided tobit model.[12] All regressions include dummies for period effects, using period 6 as the baseline period.[13] Thus, the estimated equation is:

$$\text{effort}^*_{it} = \sum_{t \neq 6} \beta_t 1\{\text{period} = t\} + \beta_0 + \beta_{11} T_i + \beta_{12} \text{wage}_{it} T_i + \beta_{13} \text{wage}_{it}(1 - T_i) + \epsilon_i + \mu_{it}$$

where effort^*_{it} is an index variable and effort_{it}, the observed effort by subject i in period t, is censored if effort^*_{it} is below 0.1, is above 1.0 and equal to effort^*_{it} otherwise, $1\{\text{period} = t\}$ is an indicator function taking value 1 at period t and 0 otherwise, T_i is a dummy variable taking value 1 when there is a payoff table and 0 otherwise, and both ϵ, and μ are i.i.d. normal.[14] Hence, we assess the effect of the payoff table by testing the joint hypothesis that $\beta_0 = 0$ and $\beta_{11} = \beta_{12}$.

This table confirms both the hump-backed nature of effort levels over time and the significant dependence of the cost of effort on the wage assigned. Average effort is highest in period 6 (the baseline here), and is substantially higher than in periods 1, 2, 9, and 10. While the presence or absence of the payoff table does not significantly affect the intercept, it has a substantial effect on the relationship between effort and wages. Testing for the joint hypothesis that Table $= 0$ and Table $*$ Wage $=$ (1 $-$ Table) $*$ Wage, we find that we can reject the hypothesis that the payoff table has no impact at $p = 0.01[X^2(2) = 8.91]$. We also ran separate regressions for each treatment, confirming significant period effects in both cases.

We can eliminate the likely group interaction effects over time by using only first-period data for our regression. In this case, the difference between treatments is stronger.

Here there is actually no significant relationship between effort and the wage when there is a payoff table in the instructions, while the coefficient is highly significant without the payoff table. Testing jointly for Table $= 0$ and Table $*$ Wage $=$ (1 $-$ Table) $*$ Wage, we find that we can reject the hypothesis that the payoff table has no impact at $p = 0.017$ $[X^2(2) = 8.13]$.

Given the observed time trends, it may also be useful to consider last-period behavior, as this should eliminate the possibility of strategic effort provision. Is there significant gift-exchange in the last period of the game when there will be no continuation effect for subjects to consider?

The regression results for the last period (Table 4) are very similar to those for the first period (Table 3). There is no significant gift-exchange in either the first or last period when the payoff table is included in the instructions. On the other hand, effort is sensitive to wage when there is no payoff table. Given the results in Tables 2–4, we can safely conclude

Table 2. Random-effects Tobit regression for effort (All periods).

Independent variable	Coeff.	Std. err.	Z	$P > \|Z\|$
Period 1	−0.237	0.054	−4.32	**0.00**
Period 2	−0.155	0.056	−2.77	**0.01**
Period 3	−0.046	0.056	−0.81	0.42
Period 4	−0.039	0.054	−0.72	0.47
Period 5	−0.029	0.052	−0.56	0.57
Period 7	−0.086	0.050	−41.71	**0.09**
Period 8	−0.085	0.052	−1.64	0.10
Period 9	−0.173	0.053	−3.26	**0.00**
Period 10	−0.223	0.054	−4.14	**0.00**
Constant	−0.289	0.082	−3.52	**0.00**
Table	−0.055	0.098	−0.56	0.57
Table ∗ Wage	0.011	0.001	10.02	**0.00**
No table ∗ Wage	0.014	0.001	10.72	**0.00**

Table 3. Tobit regression for effort (Period 1 only).

Ind. variable	Coeff.	Std. err.	Z	$P > \|Z\|$
Constant	−0.472	0.254	−1.86	**0.06**
Table	0.110	0.315	0.35	0.73
Table ∗ Wage	0.004	0.005	0.80	0.42
No table ∗ Wage	0.014	0.005	2.66	**0.01**

that the presence of a payoff table in the instructions reduces effort levels, and may well eliminate any gift exchange in a true one-shot game.

We claimed earlier that managers condition their choice of wage on the effort received in the previous period, so that low effort levels reduce future wages. Table 5 indicates that past effort is indeed a major influence, even controlling for period effects.[15]

The coefficient on the effort a manager observed in the previous period is highly significant and positive. A difference in effort of (for example) 0.4 in the previous period leads to a wage difference of 8.5. While this may seem a bit small, recall that managers know that they are facing new employees in each period, so that they are updating perceived population parameters.[16] Further, a manager's wage choice is significantly and positively correlated with the wages other managers chose in the last period (which were shown on the blackboard).

Finally, Table 6 shows the *ex post* profits for managers for different wages in the two treatments.

Overall, there is gift exchange in both treatments, in the sense that a manager can easily do better than the Nash equilibrium payoff of 10. In the payoff-table treatment, the *ex post*

Table 4. Tobit regression for effort (period 10 only).

Ind. variable	Coeff.	Std. err.	Z	$P > \|Z\|$
Constant	−0.474	0.266	−1.78	**0.08**
Table	0.207	0.305	0.68	0.50
Table ∗ Wage	0.006	0.004	1.58	0.11
No table ∗ Wage	0.014	0.005	2.68	**0.01**

Table 5. Random-effects Tobit regression for wage on Lagged effort and wage*.

Ind. variable	Coeff.	Std. err.	Z	$P > \|Z\|$
Period 2	−9.61	3.66	−2.62	**0.01**
Period 3	−16.98	3.72	−4.56	**0.00**
Period 4	−11.09	3.82	−2.90	**0.00**
Period 5	−3.84	3.69	−1.04	0.30
Period 7	1.69	3.65	0.46	0.64
Period 8	−3.13	3.80	−0.83	0.41
Period 9	−0.68	3.66	−0.18	0.85
Period 10	−5.07	3.71	−1.37	0.17
Constant	22.95	5.57	4.12	**0.00**
Lagged effort∗	21.56	3.94	5.47	**0.00**
Lagged Wage∗	0.265	0.132	2.00	**0.04**

*Lagged Effort is the effort observed by the manager in the previous period. Lagged Wage is the average of the wages chosen by the other managers in the previous period.

Table 6. *Ex Post* Manager income.

Wage range	Payoff table	No payoff table
0–10	11.81 (91)	10.07 (35)
11–20	13.68 (17)	8.75 (12)
21–30	13.61 (34)	15.82 (33)
31–40	18.00 (64)	17.18 (44)
41–50	15.02 (69)	17.42 (75)
51–60	10.24 (13)	21.35 (51)
>60	5.34 (12)	15.26 (20)

The number of observations in each category is shown in parentheses.

profit-maximizing wage is 40; it is 60 without the payoff table. The main difference between treatments occurs at very high wages (>50), with average expected income of 7.89 with the payoff table vs. 19.63 without it.

4. Summary and discussion

We have stumbled onto the surprising result that laboratory gift-exchange outcomes, at least for undergraduate students in the U.S., are quite sensitive to the arguably innocuous inclusion of a payoff table clearly demarcating the relationship between wages, effort, and payoffs for firms and workers. Gift exchange does not disappear completely in the presence of the payoff table, but it is sharply reduced: absent a payoff table average wages are 19% higher, discretionary effort is 69% higher, and effort increases in response to higher wages extends over a substantially wider wage range. Further, gift exchange is down sharply compared to all but one previously reported gift exchange experiment, with the lone exception (Hannan et al., 2002) also using U. S. undergraduate students and a payoff table similar to the one employed here.

The fundamental question left unanswered at this point is what exactly is responsible for the reduced gift exchange given the payoff table? The payoff table was employed with the idea of providing subjects with a crystal-clear layout of the experimental contingencies. Participants could all calculate manager and employee payoffs before the start of the experiment, and from the effort cost table provided in both treatments should have been aware that it is a dominant strategy (in a one-shot game) to provide minimal effort.

There are several possible explanations for the payoff table effect reported: First, it could be a framing effect, or a presentation format effect, either of which are known to impact significantly on behavior in some experiments. The particular mechanism at work in this case could be that the existence of the payoff table served to disconnect, in the workers' minds, the relationship between their work effort and the firms' wage decisions. This could happen in a couple of different ways: (1) By focusing the workers' attention on the payoff table, this may have crowded out the firm's intentions from the subjects' working memory, which cognitive studies have been shown to be rather limited (Miller, 1956). (2) The existence of the payoff table could cause workers to encode the wage column as given exogenously, so that they viewed their effort decision as relatively unrelated to the firm's decision regarding wages offered. In either case, the existence of the payoff table, by being an intermediating factor that the employees (who lacked outside work experience) worked through in deciding on their effort level, may have substantially weakened any social norm of higher effort in response to higher wages. One serious problem with this explanation as the sole factor accounting for the payoff table effects is that it does not account for the fact that most of the differences in effort response are concentrated at the higher wage rates (recall figures 1 and 2).

An alternative explanation lies in the fact that the payoff table provides a crystal-clear layout of the experimental contingencies, and in doing so might impact on the distributional considerations that at least partially underlie the gift exchange observed in these

experiments.[17] A quick look at the payoff table shows that a firm's marginal benefit from a worker's increased effort is decreasing monotonically as wages increase; for example, at wage rate 20 every unit increase in effort increases a firm's payoff by 8, while at wage rate 60 it increase by 4, half as much. Thus, the marginal benefit bestowed on firms for increased effort is decreasing at higher wage rates, which should, other things equal, result in reduced effort. For this explanation to hold water, we must then explain why effort does not decrease monotonically over all wage rates. A combination of reciprocity considerations in conjunction with the above distributional considerations would do the trick; in particular, suppose that workers are offended by very low wages, and so respond with very little effort. This negative reciprocity at low wages, combined with the inefficiency of "gifts" at high wages would generate the hump-backed effort response pattern found with the payoff table treatment.

Charness (forthcoming) provides some evidence for just such effects. As part of this experiment he compares effort responses of workers to cases where wage rates are determined by a real employer to cases where they are determined by a random device or by a third party. Charness finds that workers respond with positive effort levels even when wages are determined randomly or by a third party, clearly indicating that distributional considerations play some role in the greater-than-minimal effort levels provided towards employers.[18] In addition, workers almost invariably respond with minimal effort when employers select low wages, but often provide costly effort when low wages are determined randomly or by a third party. This provides rather definitive evidence that negative reciprocity is at work in producing lower effort levels at low wage rates. This is basically the same story as the second explanation provided here, but with the added element (which we consider eminently plausible) that the presence of the payoff table clarifies the fact that the return on effort is decreasing at the higher wage rates, resulting in the downturn in effort at the very highest wage rates.[19]

A third possible explanation, suggested by a referee, is that the payoff-table effect results from weak marginal incentives involved in the game; the marginal cost of choosing an effort level of .2 rather than .1 is only $0.05; similarly, the marginal cost of choosing a wage of 50 rather than a wage of 49 is at most $0.05. While we agree that the marginal incentives are weak, this is largely an artifact of the rich payoff space. The neo-classical equilibrium of zero wages gives workers a payoff of zero, compared to an average realized payoff of $1.65 per period (given average wages paid and average effort level of .3) or $16.50 over the 10 periods. These differences do not appear trivial to us. Of course, the average effort cost and wage payment differences between our two treatments are smaller, $0.08 and $0.30 respectively per period. However, the key point is that *incentives are the same across our two treatments*, so that incentive effects *alone* cannot be responsible for the payoff-table effect reported. Whether the payoff-table effect reported here would be present if marginal incentives were stronger is, of course, an open empirical question, as are the effects of heightened incentives on behavior in experiments in general, which we invite the interested reader to explore.

While we are partial to either the framing-effect explanation or the clarity-effect explanation in accounting for the payoff table effect reported here, these or any other explanations

are simply conjectures at this point, and require further experimentation to confirm or falsify. But regardless of the explanation, the evidence presented here indicates that U.S. undergraduates are sensitive to the seemingly innocuous impact of providing or not providing a payoff table to help clarify the experimental contingencies under the typical payoff structure employed in gift-exchange experiments.

In addition to the payoff table effect reported, we also report significant changes in behavior over time in the extent of gift exchange in both treatments, with a clear trailing off of reciprocal responses of workers as the end period draws near. This change in behavior calls into question the driving force behind what gift exchange there is in our experiment. One of the mysteries of the experimental literature is why cooperation unravels over time in the voluntary contribution games, but not in the gift-exchange games. In our experiment, both the payoff-table effect and the time trend in effort are inconsistent with utility models in which social preferences (to the extent they exist) are immutable.[20] Effort levels are extremely low in the first couple of periods in the payoff-table treatment, and wages are rapidly (in periods 2–4) adjusted downward as a result. After the wages are reduced (publicly), we see effort levels respond positively (in periods 3–6). This behavior is consistent with the realization that a positive wage is not necessarily a free lunch, and will disappear without some cooperation.

The patterns over time are consistent with some form of strategic behavior. If the subjects believe, or observe, the fact that past effort and wage affect future wages as shown in our regression, then they may think they can increase their expected benefits by providing more effort. We are not the first to suggest a strategic explanation for financial sacrifice in multi-period experiments. Ledyard (1995, p. 148) provides an overview of this issue in public goods experiments. We are also not the first to observe substantial time trends in a multi-period sequential prisoner's dilemma game. In a trust game, Brandts and Charness (1999) endow each participant with 10 units, and allow "managers" to send up to 10 units to "employees"; whatever is sent is quintupled. The employee can then send up to 10 units back to the manager, where each unit sent is quintupled. There is a dramatic decline in reciprocal responses of employees in the last two periods (of 10); there is also a substantial decline in units sent by managers, but the reciprocal responses of employees decreases significantly even controlling for this factor.

Our results are a reminder that experimental outcomes can be sensitive to seemingly innocuous changes in the way decision tasks are presented in the laboratory. The mere inclusion of a comprehensive payoff table was enough to substantially diminish the degree of gift exchange occurring in our sessions. One wonders what other hidden factors may be present.[21] For example, MBA students in the Hannan et al. (2002) study were given payoff tables, but their results were similar to those in Charness (forthcoming) and the numerous studies by Ernst Fehr and his colleagues. This suggests that experience with gift exchange in the work place is sufficient to overwhelm the payoff table effect reported here.[22] The question remains whether or not there are other cultural elements that influence reciprocal behavior in experimental labor markets, and whether we can better understand the basis for the behavior reported here.

Appendix A—Complete data set

Payoff table results

	Effort level									
Wage	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
0	70	1			1		1	1		
5	3									
10	14									
15	1									
20	10	2	3		1					
25	1									
27	1									
30	18	2	7	4	1					
40	25	5	9	11	7	4	1		1	1
42	1									
45	1									
50	34	2	3	7	7	7	3	4		
55	1									
57		1								
60	7		1	1		1				1
69	1									
70	1						1			
75	2									
80	1									1
90	1									
100	1									

No payoff table results

	Effort level									
Wage	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
0	25									
5	3									
10	4	1								
15	2									

(*Continued on next page*.)

(*Continued*).

20	9	1								
24		1	1							
25	4	3	2							
30	10	1	9		1			1		
32	1									
35	3	1	2	2	2	1				
38			2							
40	15	3	5	3	4	1				
42		1								
44				1						
45	9		2	1	3					
46				1				1		
48				1						
49	1									
50	19	4	6	4	4	3	12	2		
54					1		1			
55	3	1		5	2		2	3	2	
56		1					1		1	
58						1	1	1		
60	7		4	2	3	1		2	1	4
61	1									
64	1									
65								1	1	
68	1		1		1					
70	1	1	1	3				2		2
75							1			
80					1					1

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Notes

1. A number of gift-exchange experiments have been conducted in other parts of Europe: Fehr and Tougareva (1996) in Russia, van der Heijden et al. (2001) and Kirchsteiger et al. (2000) in Holland, Brandts and Charness (forthcoming) in Spain, Falk et al. (1999) in Hungary, Pereira et al. (2001) in Portugal, and Ortmann and

Englemann (2001) in Germany. However, many of these experiments used payoff functions rather different than those in the traditional gift-exchange design.

2. Hannan (2001) reports a third gift exchange experiment in the U.S. employing MBAs, with results entirely consistent with those reported for MBAs in Hannan et al.
3. We originally set out to test how robust gift exchange would be when output was based on the performance of a team of workers compared to individual worker performance. Our hypothesis was that the enhanced element of free-riding intrinsic to team output would have a substantial adverse effect on employee effort. However, we found only low levels of gift-exchange with individual workers, levels similar to those reported for the Pittsburgh undergraduates. These levels of gift exchange were sufficiently low that there was no point to exploring the effects of team production on further reductions in gift exchange. Rather, we set as our goal explaining these low levels of gift exchange compared to most other gift-exchange studies.
4. One of our referees suggests that the relationship underlying Eqs. (1) and (2) below determining the nature of firms and worker payoffs is nontrivial and doubts that most subjects can develop an intuitive feel for the exact nature of the tradeoffs absent a payoff table. Members of the present research team are split on this question, with some of us seconding this referee's views and others echoing the views reflected in the text. It is unclear exactly how to sort out between these two views.
5. A full description of the instructions and record sheets issued to the subjects is available at the web site http://www.econ.ohio-state.edu/kagel/instructions-record.pdf.
6. Only 14 people attended one session, so that there were some anonymous re-pairings in this session. With only 7 workers, we obtained only 70 observations in this no-payoff-table session. In one of the payoff-table sessions, three workers needed to leave after nine periods, so we had only 97 observations in this session.
7. We adopt the convention that managers are referred to as female and employees are referred to as male.
8. Our policy of displaying wages on a blackboard may seems curious to some observers, as this may tend to encourage group effects and dynamic considerations in a game meant to simulate a one-shot environment. We do so to replicate the standard procedure in the gift-exchange experiments by Ernst Fehr and his co-authors. In any case, there are some studies that have not employed this device (e.g., Charness, forthcoming; Kirchsteiger et al., 2000; van der Heijden et al., 2001), and results are not typically different in these sessions from behavior in sessions with this public display.
9. Clearly, the relevant variable here is the cost of effort and not effort as the latter could be re-labeled or recalibrated and the underlying game structure would not be affected. When subjects choose effort level, what they are choosing is the cost they are willing to bear. However, to make comparison to previous papers easier, the rest of our analysis will be in terms of effort since, it doesn't affect the results.
10. We thank Simon Gächter for providing the figures from Fehr et al. (1998). Wages in that study, in Charness (forthcoming), and in Hannan et al. (2002) could range between 20 and 120 compared to between 0 and 100 here. Thus, for comparative purposes we subtracted 20 from the average wages reported in these other studies.
11. Comparing aggregate "no-contribution" rates across experiments, we see that 194/297 (65%) of the effort choices in the payoff-table treatment were minimum effort and 121/270 (45%) of the effort choices in the no-payoff-table treatment were minimum effort. The corresponding rates were 45% in the employer-generated wage treatment in Charness (forthcoming) and 62% in Hannan et al. (2002).
12. Given the discrete nature of the dependent variable, the model should be estimated as a random-effects ordered probit (Fréchette, 2001) rather than a random-effects tobit. However, since the results are almost identical, for ease of exposition and comparability with other studies, we report the random-effects tobit results.
13. The tobits are not adjusted for the fact that the minimum effort level is .1.
14. A potential concern could be that controlling for subject-specific effects is not enough if there are session effects. However, introducing session dummies is not an option, as these would be perfectly correlated with the table dummy. Hence, this concern will be addressed by estimating an equivalent version of the effort equation for period 1 only. Clearly, in period 1, there cannot be any group effects.
15. The estimated equation is:

$$\text{wage}^*_{it} = \sum_{t \neq 1} \beta_t 1\{\text{period} = t\} + \beta_0 + \beta_{11}\text{effort}_{it-1} + \beta_{12}\text{avgwage}_{it-1} + \epsilon_i + \mu_{it}$$

where wage^*_{it} is an index variable and wage_{it}, the observed wage by subject i in period t, is censored if wage^*_{it} is below 0, is above 100 and equal to wage^*_{it} otherwise, $1\{\text{period} = t\}$ is an indicator function taking value 1

at period t and 0 otherwise, effort_{it-1} is the effort observed by subject i in period $t-1$, avgwage_{it-1} is the average wage in period $t-1$ of subject i's session, and both ϵ and μ are i.i.d. normal.

16. Note, however, that these feedback effects are not strong enough that any individual worker in unilaterally changing their effort level in period t could hope to improve wages sufficiently to recoup the cost in period $t+1$. It is not necessary to assume some sort of strategic behavior on the part of workers (rational or otherwise) to explain these lagged effort effects. It could simply be that firms who observe low (high) effort from a worker in response to a high wage reduce (raise) wages in the next period, as their expectations for the next period have been affected.
17. By distributional considerations, we refer to the "efficiency gains" for each marginal unit of effort provided (benefit to the employer vs. cost to the employee). The notion of such efficiency gains is central to the Charness and Rabin (2002) model of social preferences. An alternative payoff specification such as $\Pi_M = (100 * e) - w$ would keep the marginal return constant across wage levels. In this case, we conjecture that we would find a strictly increasing effort response as one moves to higher wages.
18. Effort responses are the same whether the wages are determined randomly or by a third party.
19. This explanation does not, of course, account for the hump-backed pattern of the effort response over time.
20. Cabrales and Charness (1999) and Charness et al. (2001) find evidence that people may in fact update their apparent social preferences with information about the behavior of others.
21. Simon Gächter mentions (personal communication) that this paper, Fehr and Gächter (2000), and Kirchsteiger et al. (2000) "suggest that perceptions (how people construe the situation) may influence motivations and an interesting task is to find out how." We agree.
22. Of course, it would require a control treatment (no payoff table) to confirm the absence of a payoff-table effect with the MBAs. But (i) There was extensive gift exchange with the MBAs with the payoff table in place, at levels comparable to, or higher than those reported by Fehr and his colleagues, so that one might presume a ceiling effect on the extent to which gift exchange might increase absent a payoff table and (ii) There is evidence from within the MBA subject population that those with more managerial work experience provided higher effort levels than those with less (Hannan, 2001).

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