Other-Regarding Preferences with Peer Workers in Labor Markets: An Experimental Investigation

Mark F. Owens *

Middle Tennessee State University, Murfreesboro, TN

Abstract

A peer worker is introduced in a controlled labor market experiment characterized by unobservable effort and incomplete contracts. Workers make decisions independently and without knowledge of each others' actions in a modified gift exchange experiment. Introducing a peer worker into an ongoing market has a negative and significant effect on effort provided in contrast to prior experimental studies of peer effects which find positive effects with observable effort. This decrease in effort is not driven by other-regarding equity concerns for the manager's payoffs.

Key words: Peer Effects; Incomplete Contracts; Other-Regarding Behavior; Gift Exchange; Experiment

JEL categories: D03, C91

* Mark F. Owens, Assistant Professor Department of Economics and Finance, Middle Tennessee State University, Murfreesboro, TN 37132, phone: 615-898-5617, fax: 615-898-5596, email: mfowens@mtsu.edu

1. Introduction

Economists have become increasingly interested in the influence of social factors on individual behavior. Much of this research has been focused on labor markets where workers observe and interact with other workers and simultaneously interact with management. Different channels of social influence have been investigated in the field and through controlled experiments. One branch of the literature relates to "other-regarding preferences" where agents consider the utility of others as well as their own utility when making decisions (see Cooper and Kagel, 2009, for a survey). The relevance of other-regarding behavior between employees and management in labor markets was established in a series of related studies starting with the gift exchange experiment in Fehr et al. (1993) designed to test the Akerlof (1982) theory of gift exchange in labor markets characterized by implicit contracts. These and other experimental results motivated the Fehr and Schmidt (1999) and Bolton and Ockenfels (2000) theories of outcome oriented other-regarding preferences where choices are influenced in part by preferences for equity in outcomes.[1] Another branch of the literature deals with social interactions or "peer effects" with which an individual's behavior can be influenced by observing the behavior of others in their peer group. The influence of peer effects on productivity between workers in labor markets has been demonstrated in the laboratory by Falk and Ichino, (2006) and in an actual workplace setting by Mas and Moretti (2009).[2]

This study presents a series of controlled laboratory experiments to investigate how other-regarding preferences are influenced by the presence of peers in the labor market. It extends the bilateral gift exchange framework established by Fehr et al. (1998) by introducing a second peer employee to study how this addition affects the effort provided in labor markets with unobservable effort and incomplete contracts. The introduction of a peer in this experiment does not change in any way the monetary incentives for providing effort. However, other non-monetary factors, such as shared responsibility for the manager's outcome, may increase the temptation for employees to free ride.

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[1] These outcome based preference models are consistent with many, but not all experimental results. More recently models have been extended to include the influence of intensions underlying actions and reference points. See Charness and Rabin (2002), Dufwenberg and Kirchsteiger (2004), Falk and Fischbacher (2006), Cox, Friedman and Gjerstad (2007), Koszegi and Rabin (2006), and Fehr and Schmidt (2006) for examples of models that include both outcome based preferences and intentions and reciprocity.

[2] The study of peer effects is not limited to labor markets. Peer influences on educational outcomes, and crime, for examples can be found in the applied literature.

In this experiment peer workers are introduced under treatments with different formulations of manager profits to account for other-regarding equity concerns. Comparing the effect on effort between treatments isolates the impact of the presence of an additional worker while holding manager and worker profit opportunities constant. The employees are paid according to the same profit functions whether one or two workers are employed so the monetary incentives are held constant throughout. Holding employee profit functions constant minimizes as much as possible any changes in managers' intentions that employees may perceive. The decisions of both employees are made independently from one another and their decisions have no impact on the earnings of another employee. The primary treatments introduce a peer employee into an ongoing labor market which initially has unemployed workers.

The data indicate the introduction of a peer worker has a negative and statistically significant influence on effort even though the addition is independent of employee payoffs. This decrease in effort is consistent with the one existing study of gift exchange with multiple workers by Maximiano et al. (2007). However, the present study shows the negative peer effects to be robust to three formulations of manager's profits which suggests that outcome oriented preferences for equity are not driving the decrease in effort. Since the decrease cannot be attributed to concern for equitable outcomes or to differences in intentions, the data suggest that the mere presence of a peer induces individuals to change their behavior even when actions by peers are not observable. This finding suggests the number of agents in a market presents another social influence to be considered in theoretical models of human behavior.

This paper is organized as follows. The following section presents a brief background of related literature and hypotheses. Section 3 presents the experimental design. The fourth section contains results and statistical analysis. The final section concludes and discusses the findings and limitations.

2. Background and Hypotheses:

Numerous studies have demonstrated the existence of other-regarding preferences between a worker and a manager in labor markets.[3] Versions of the Fehr et al. (1993) gift exchange experiment have been used to investigate behavioral patterns in labor markets with incomplete

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[3] These findings are not limited to laboratory experiments. Al-Ubaydli et al. (2008) and Kube et al. (2008) find gift exchange behavior in field experiments and Campbell and Kamlani (1997) and Bewley (1998) find evidence of other-regarding behavior in employer surveys.

contracts, unobservable effort and gains from cooperation. In this setting a manager cannot contract upon effort and the incomplete contract presents the worker with a decision in which free riding maximizes personal monetary earnings. Under the assumption of self interested money maximizing behavior employees always free ride and provide minimum effort. Managers anticipate this response and offer the smallest wage possible to maximize their earnings. As a result the Nash equilibrium in the absence of gift exchange has employees and managers providing the lowest effort and wages respectively. This outcome rarely emerges in experiments and in general higher wages are met with higher effort. Since these actions are inconsistent with self-interested money-maximizing behavior they are taken as evidence of some form of other-regarding preference.

There are many variations in the payoffs and procedures of the gift exchange experiment.[4] However, the vast majority of these studies examine outcomes that result from one worker interacting with one manager even though it is rare for a manager to be assigned to a single employee in the field.

Recent studies demonstrate the importance of peers in the work place. Mas and Moretti (2009) analyze cashier scanner data from a supermarket chain and find that a given cashier is more productive when working, independently, alongside high productivity peers - but only if they are visible to the high productivity peer. Cashiers free ride when they are out of sight of others. Falk and Ichino (2006) find that subjects filling envelopes alone exhibit lower productivity than those who perform the task while paired with another worker whose output is independent.[5] Together these studies show that workers increase personal productivity out of concern for how peers will view their actions. They also suggest that the impact of peers' presence is likely to have the greatest influence on effort in situations where individual workers can easily observe the output of a peer.

If peer effects on effort are, as suggested by Mas and Moretti (2009), driven by social pressure and not pro-social preferences, then the positive peer effects observed in previous studies will be absent when effort is unobservable. In the gift exchange experiment, the presence of a peer worker is entirely irrelevant to employees with preferences for self interested money-

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[4] See Gächter and Fehr (2002), for a survey of the gift exchange literature as well as other experiments on fairness.
[5] Bandiera et al. (2005) consider a natural experiment where output and performance are not independent. Lower output was observed for workers paid according to their relative performance than for workers paid a piece rate. Increasing output under the relative payment system increases personal earnings but simultaneously decreases the earnings of coworkers whereas the piece rate does not.

maximization because choosing low effort is always optimal for them. It is also irrelevant to employees whose behavior is driven solely by reciprocity since the wage offer made by a manager represents the same cost to the manager and benefit to the employee independent of the peer. However, other factors associated with the presence of a peer may increase the employees' non-monetary incentives to free ride.[6] The addition of a peer allows a worker to share the responsibility for the manager's earnings. As a consequence, an employee may not feel obligated to reciprocate a manager's generosity to the same extent when working with a peer as he or she would when acting alone and having full responsibility for a manager's earnings. Formally I test Hypothesis 1:

Hypothesis 1: Gift exchange behavior will be unaffected by the addition of a peer worker.

The effect from introducing a peer employee within an ongoing market is the primary comparison of interest of this study. A secondary test compares between markets that start with one employee and markets that start with two employees. The data are not expected to support Hypothesis 1 since Maximiano et al. (2007) find effort levels are significantly lower in gift exchange sessions where four workers are paired with a manager relative to sessions pairing a single worker with each manager.

Once a decrease in effort from a peer is established (as the data suggest) the second step is to determine why the introduction of a peer leads to reduced effort. Maximiano et al. (2007) attribute lower effort provision with more workers to the fact that employees decrease their gift in response to an increase in the share of manager's earnings rather than to a peer influence.[7] Hannan (2005) finds that workers decrease their effort response to wage decreases by a greater amount if the wage decrease followed an increase in firm profits. The decrease in effort in these studies is consistent with the Fehr and Schmidt (1999) and Bolton and Ockenfels (2000) theories of outcome oriented other-regarding preferences. To the extent that employees care about equality of payoffs, a worker may be willing to give higher effort when their earnings are higher

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[6] A related theoretical argument can be found in Kandel and Lazear (1992) which model peer effects in a case where additional workers lead to an additional incentive to free ride. In their setting worker's profits are determined by group output thus free riding can increase utility.

[7] All sessions with multiple workers in Maximiano et al. (2007) use the same payoffs which are potentially four times more profitable for managers than sessions paring a single employee with a manager. Their purpose was not to investigate peer effects.

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than the manager's because effort costs are outweighed by the utility gained from reducing inequality in profits.

The outcome based preference explanation is somewhat at odds with results from other gift exchange experiments that also vary managers' payoffs and labor supply.[8] Hannan et al. (2002) fails to find differences in effort provided to high productivity and low productivity firms by employees for given wages. Brandts and Charness (2004) find comparable levels of gift exchange with an excess supply of managers and an excess supply of workers. Both of these studies suggest employees' responses are not sensitive to the market conditions facing managers.

In order to clarify whether the decrease in observed effort with the introduction of a peer can in fact be explained by the concern for equitable outcomes, sessions are conducted with three different treatments which vary the managers' profit potential with the addition of a second worker. Differences in payoffs allow a test of Hypothesis 2:

Hypothesis 2: Holding the employees' payoffs constant, differences in the managers' payoff structure will have no effect on the decrease in gift exchange behavior observed when peers are introduced.

If other-regarding equity concerns are at play as Maximiano et al. (2007) and Hannan (2005) suggest, differences in manager payoffs will have a significant effect and Hypothesis 2 will be rejected. Conversely, if employees do not alter their behavior in response to differences in manager profits as in Hannan et al. (2002) the data will fail to reject Hypothesis 2.

3. Experimental Design:
In each session, and across all treatments, a gift exchange experiment was conducted with the same basic procedures.[9] All sessions were conducted with pen and paper. Subjects were divided into two main groups, with one group randomly chosen to be "managers" and the other group

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[8] Other experiments which utilize multiple second movers in prisoners' dilemma games have not generally found differences with the number of agents. Guth and Van Damme (1998) find the division of the money in an ultimatum game with a third player (with no decision making capability) to be similar to the standard game. The effect of the number of participants in public goods games seems less important than the marginal per capita return (Isaac and Walker 1988) or minimal profitable coalition (Isaac, Walker, and Williams 1991). More recently Andreoni (2007) shows that altruistic giving decreases with the number of recipients.

[9] The experimental materials and matching grid are available online at: http://frank.mtsu.edu/~mfowens/Exp_materials_Peer_GE.docx.

chosen to be "employees." In each period each manager chooses a wage for their employee(s). These wage offers were written directly on the employees' record sheet so that only the manager and employee in a pair know the wage offer. Employed workers observe the wage offer and choose an effort level, which is then transmitted back to the manager concluding the period.[10] Both wage offers and effort levels were private information for the manager and worker in each pairing.

The pairings between a worker and a manager were reassigned randomly before each period so that no employee and manager were paired together more than twice in the same session or paired in two consecutive periods.[11] Details regarding the random assignment of pairings were explained before the start of each session and were repeated before each of the first several periods within each session. Each participant was given a written copy of the instructions, which were also read aloud to all participants.

Different treatments are conducted to test for the influence of adding a peer employee to the market. Baseline sessions that pair one employee with one manager in every period serve to replicate prior findings. In addition three different treatments introduce peer workers into the labor market (AddPeer) so that each manager is simultaneously paired with two employees. In AddPeer sessions, the participants were divided into three groups with the same number of managers, "Regular" workers, and "Unemployed" workers. These sessions contain 10 market periods. In the first 3 periods each Regular worker receives a wage from a manager whereas the Unemployed workers do not receive a wage or make decisions.[12] Starting in period 4 the previously unemployed enter the market and all workers are employed with peers for the remainder of the session.

When the second worker is employed the manager chooses a single wage to pay to both employees. An employee's profits are determined entirely by the wage received and his or her own effort choice. The presence of a peer has no effect on employee earnings. When two

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[10] The term "effort" is used throughout this paper but in the experiment "amount of work" was used in its place.

[11] These procedures create a series of one-shot games so that the only motivation for offering efficiency wages is the potential gain from higher effort.

[12] Gift exchange experiments have been conducted both with unemployed workers (see for example Fehr, et al, 1993 and Brandts & Charness, 2004 in the ESL treatment) and without unemployed workers (see for example Charness, 2004). However, in previous studies with unemployed workers, the unemployed in a market period do not necessarily remain unemployed in the next period because wage offers are selected on a first-come, first-served basis. The unemployed workers in our study remain out of the labor market for three periods in order to generate enough data for analysis.

employees are paired with one manager in the labor market they make decisions anonymously and independently from one another.[13] The situation for the first worker is completely unchanged except for the presence of a peer working for the same manager and receiving the same wage.

The employee's profits in all periods and treatments were determined by the following:

$$\Pi_{Employee} \quad = 100 - e + 5w \qquad \text{if employed}$$
$$= 70 \qquad\qquad\qquad \text{if unemployed} \qquad (1)$$

where w is the wage offer and e is the effort provided. Both wages and effort were chosen as integers from the interval [0, 100]. In those periods where the Unemployed workers were unemployed they receive a fixed payment of 70 experimental dollars. This amount is strictly less than the 100 experimental dollars that an employed worker can earn by providing an effort of zero regardless of the wage received. This value was chosen in order to make unemployment less attractive than employment as is likely the case in most labor markets. Employees' payoffs increase in wage and decrease in effort and the marginal cost and benefit are constant.[14] Manager payoffs vary across treatments.

In the Baseline sessions, and in all periods of the AddPeer treatments with only one employed worker, the managers' payoffs were each calculated according to equation 2.

$$\Pi_{Manager} = 100 - w + 5e \qquad (2)$$

where w is the wage offer and e is the effort provided. Both wages and effort were chosen as integers from the interval [0, 100]. The manager payoffs increase in effort and decrease in wage, whereas the employee payoffs in equation 1 increase in wage and decrease in effort. The Nash equilibrium, in absence of gift exchange, for these profit functions (and all that follow) has employees providing zero effort, and managers offering a wage of zero. That both the employee's and manager's profit function is linear holds the marginal costs and benefits constant for any given effort level. These functions represent one of the many formulations of payoffs found in the literature. They are selected mainly because they are easy to adapt to include a second employee while still maintaining a straightforward calculation of earnings for participants. The data for periods pairing one manager with one employee generate a basis of comparison with periods employing peer workers and with prior studies.

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[13] The complete independence of worker's decision differs from studies of team behavior (e.g. Sausgruber, 2009).

[14] The payoff functions for employees and the managers (described below) are a rescaled version of the profit functions used in Brandts and Charness (2004).

Three versions of the AddPeer treatment vary the way in which manager payoffs are determined to test for the source of changes in other-regarding behavior. The payoffs in the Average, Double and Subsidy versions of the AddPeer treatments are all derived from the baseline manager payoffs. In the Average treatment each manager's income, for those periods when they employed two workers, is calculated according to equation 3:

$$\Pi_{Manager} = 100 - w + 5 \times \tfrac{1}{2}(e_1 + e_2)$$
$$\Pi_{Manager} = 100 - w + 5(\text{average } e) \qquad (3)$$

where e_1 and e_2 are the effort levels provided by each employee. This payoff function holds the expected total profit for managers constant between periods with and without peer employees, *ceteris paribus*. Thus, the introduction of the peer employee does not change the total expected profits for managers. The addition of a peer worker under this function will not change effort responses if employees are concerned with their individual earnings capability relative to the manager's.

In the Double treatment each manager's income, for those periods when they employed two workers, is calculated according to equation 4. This function sums the two the profit functions used when employing a single worker (compare to equation 2) - effectively doubling the manager's expected payoff within the session, *ceteris paribus*.

$$\Pi_{Manager} = (100 - w + 5e_1) + (100 - w + 5e_2)$$
$$\Pi_{Manager} = 200 - 2w + 5(e_1 + e_2) \qquad (4)$$

where e_1 and e_2 are the effort levels provided by each employee. This function holds constant the value of earnings generated for the manager for a given effort choice by the employee. The addition of a peer worker under this function will not change the effort response if an employee is concerned only with how their own choice affects the earnings of the manager. If other-regarding concerns for equitable outcomes between employees and managers are important, the peer periods of the Double treatment would exhibit lower effort than those in the Average treatment because, *ceteris paribus,* managers will earn double the profits.

The Subsidy treatment is similar to the Double treatment except that the cost to the manager for wages paid is lowered, as if the wage of the unemployed worker is subsidized.[15]

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[15] The subsidy sessions were conducted prior to other peer treatments. After analyzing these results the double treatment was conducted to test whether the subsidy on wages was responsible for the decrease in effort. When these two revealed no differences the double treatment was abandoned in favor of the average treatment since the contrast in manager payoffs between the subsidy and average treatments is greater.

Manager's income, for those periods when they employed two workers, in the Subsidy treatment is calculated according to equation 5.

$$\Pi_{\text{Manager}} = (100 - w + 5e_1) + (100 - \tfrac{1}{2}w + 5e_2)$$

$$\Pi_{\text{Manager}} = 200 - 1.5w + 5(e_1 + e_2) \qquad\qquad (5)$$

where e_1 and e_2 are the effort levels provided by each employee. The expected profits for managers in the Subsidy treatment are strictly greater than profits in the single worker periods and in the double treatment, *ceteris paribus*. Again, if employees are concerned about the relative total payoffs between their individual earnings and the manager's total earnings this treatment would generate lower effort in peer periods.

In addition to the AddPeer treatments, which are the primary treatments of interest, additional sessions are conducted with a Reverse treatment that uses the same payoff functions as the Average treatment but in the reserve order. All employees begin these sessions employed for seven market periods, and then half of the workers become unemployed for the final three periods. This treatment serves primarily to compare between sessions starting with two peer employees and those starting with unemployment.

Across all sessions the payoff functions were provided to all managers and all employees so that this information was common knowledge. Participants were provided with calculators and were required to compute, correctly, the payoffs for both managers and employees in several examples prior to the start of the experiment. The sessions did not begin until all subjects were clear about how the payoffs were determined. In peer treatments which involved a change in payoffs during the session, a new set of instructions was distributed prior to starting the periods with new payoffs. These instructions explained the payoff functions, pairing system, and other details. After these instructions were read aloud subjects were again required to correctly calculate a new set of examples.[16]

Each player's total payoff was the sum of the payoffs earned in each of the periods played. Participants were paid privately and individually at the rate of 250 experimental dollars to 1 US dollar, along with a $6 participation fee.

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[16] Monitors made every attempt to ensure that all subjects completely understood the payoffs before beginning the session so that the introduction of new payoffs and subsequent practice problems would not influence the play of the game. In every case subjects completed the second set of practice problems in far less time than the first. The timing of the *Reverse* treatment offers a test to see if this pause in the game has an effect on the provision of effort.

Table 1 presents a summary of the session and treatments. Data are generated from a total of 13 sessions. Six sessions of the Baseline gift exchange game from a total of 116 students from Ohio State University and Middle Tennessee State University.[17] A total of five AddPeer and two Reverse sessions were conducted at The Ohio State University and Middle Tennessee State University with 141 students enrolled in principles of economics courses. Average earnings were approximately $20.00 for regular workers, $17.00 for unemployed workers and $19.00 for managers. Sessions lasted about one hour and twenty-five minutes.

Table 1: Summary of Treatments

	Sessions	Employees	Managers	Market periods	Total observations	Peer periods
Baseline	6	58	58	5	290	NA
Average	2	26	13	10	214	4-10
Double	1	14	7	10	109	4-10
Subsidy	2	26	13	10	221	4-10
Reverse	2	28	14	10	238	1-7
Totals	13	152	105		1072	

4. Results

Table 2 shows the mean values of wage and effort by treatment and by the presence or absence of a peer. The average values by period, for the Baseline, AddPeer and Reverse treatments, can be seen in Figure 1. Consistent with previous studies of gift exchange, employees generally respond to higher wages with higher effort. For the entire sample the average wage and effort in periods with only one employee per manager are 58.76 and 30.05 respectively, and in periods with two employees per manager the average wage and effort are 53.70 and 22.84. In every treatment average effort is lower when a peer worker is present.

The primary comparisons of interest relate to the effect of introducing a peer into a market that starts initially with a single employee per manager. Wilcoxon Signed Rank tests using session averages as the unit of observation reject that effort is equal in periods of *AddPeer* treatments with one employee versus periods after adding the peer employees within a session

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[17] The data from both locations are pooled after regressions testing for differences by location failed to find any significant difference. The baseline data consists of the first five market periods of observations presented in Owens and Kagel (2010) for a different experiment.

Table 2: Mean Effort and Wage by Treatment

	Baseline	Average	Double	Subsidy	All AddPeer	Reverse	All peer sessions	All
No Peer								
Wage	59.01	71.51	58.05	57.56	63.16	46.62	58.23	58.76
	(1.78)	(3.59)	(4.62)	(3.44)	(2.27)	(5.53)	(2.37)	(1.42)
	[290]	[39]	[21]	[39]	[99]	[42]	[141]	[431]
Effort	28.97	40.64	43.67	24.21	34.53	27.26	32.32	30.05
	(1.80)	(5.21)	(8.29)	(3.21)	(3.08)	(5.86)	(2.79)	(1.52)
	[290]	[39]	[18]	[39]	[96]	[42]	[138]	[428]
Peer								
Wage	-	58.85	58.41	51.19	55.74	48.89	53.70	53.70
		(2.38)	(2.18)	(2.07)	(1.33)	(2.21)	(1.15)	(1.15)
		[91]	[49]	[91]	[231]	[98]	[329]	[329]
Effort	-	22.03	26.02	17.95	21.19	26.61	22.84	22.84
		(2.02)	(3.29)	(1.74)	(1.26)	(2.25)	(1.11)	(1.11)
		[175]	[91]	[182]	[448]	[196]	[644]	[644]
All								
Wage	59.01	59.01	58.34	52.31	57.05	48.49	54.50	55.70
	(1.78)	(1.78)	(1.96)	(1.81)	(1.17)	(2.06)	(1.04)	(0.90)
	[290]	[290]	[70]	[130]	[330]	[140]	[470]	[760]
Effort	28.97	28.97	28.94	19.05	23.54	26.73	24.51	25.72
	(1.80)	(1.80)	(3.12)	(1.57)	(1.19)	(2.11)	(1.05)	(0.91)
	[290]	[290]	[109]	[221]	[544]	[238]	[782]	[1072]

Notes: Standard Errors of the mean in parentheses, number of observations in brackets.

(Z = 2.023, p=0.043) and also reject that wages are equal with one employee versus two employees within a session (Z = 1.753, p=0.080).

Since both wages and effort decrease in the periods with a peer employee it is necessary to explore the effect of a peer on effort for given wages. As a first pass, all the data from the Baseline and AddPeer sessions are pooled for analysis. Figure 2 displays the mean effort provided for given wage ranges in the Baseline, and AddPeer sessions for periods with and without a peer worker. This figure shows lower effort for all given wage ranges in AddPeer

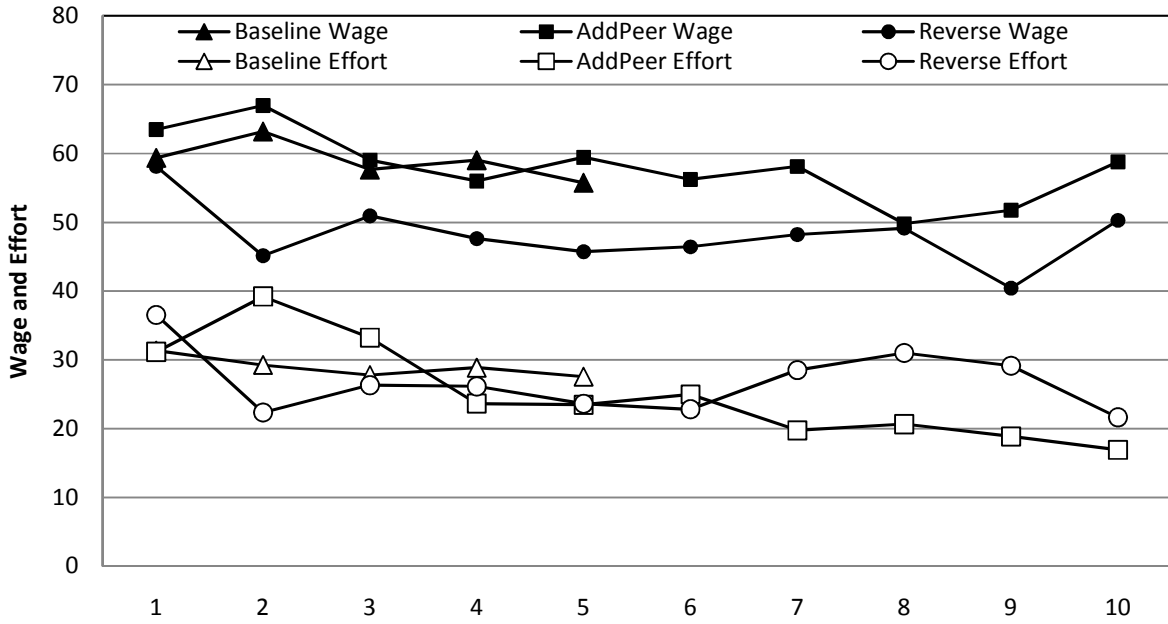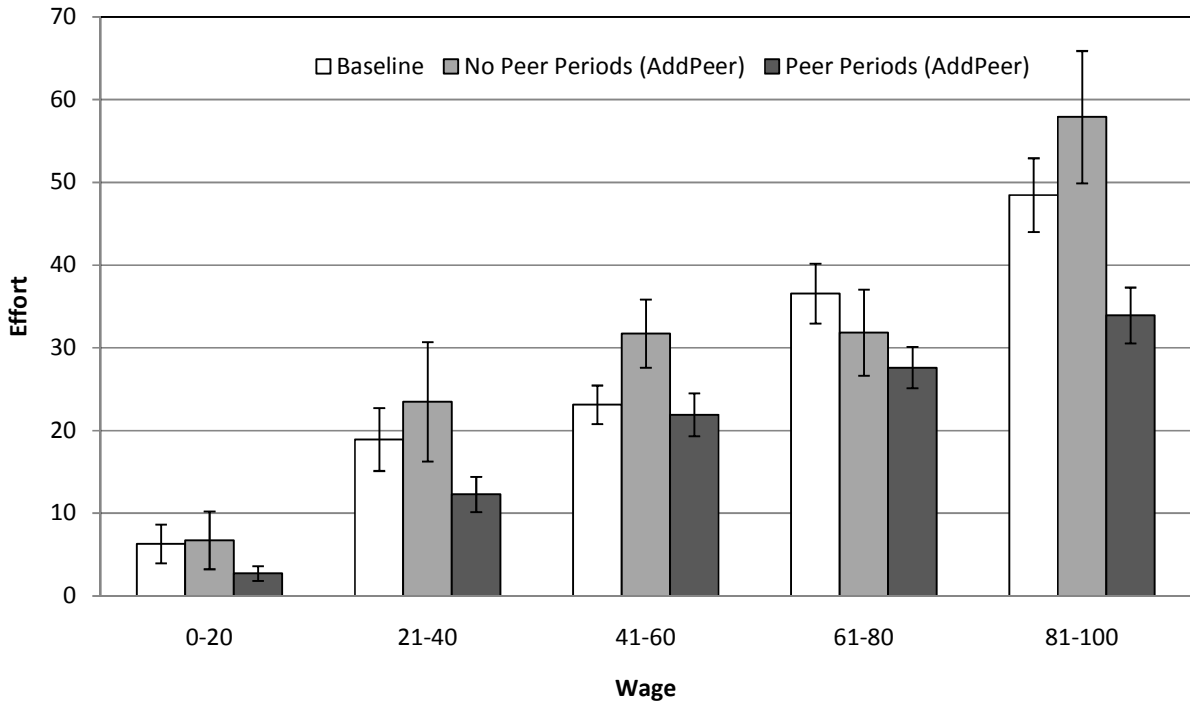## Figure 1: Wage and Effort by Period

Figure 2: Effort for Given Wages: Baseline and AddPeer

Note: The columns represent the mean. The error bars represent the standard errors at the mean.

sessions when a peer worker is present. The mean effort for given wages in the baseline sessions is comparable to no peer periods of the AddPeer sessions.[18]

Formal statistical analysis to test for effort differences in peer sessions is performed using random effects Tobit regressions as in equation 6.

$$Effort_{it} = \beta_0 + \beta_1 Wage_{it} + \beta_2\ Peer\ Period_{it} + \mu_{it} + \varepsilon_{it}\quad (6)$$

where the subscripts i and t index the individual employee and the market period respectively. *Effort* is the effort choice of employee i in period t, *Wage* is wage offer made by manager i in period t, and *Peer Period* is an indicator variable (equal 1 if two workers are employed per manager and 0 otherwise). These regressions account for censoring of employees' decisions at the minimum of zero and the maximum of one hundred and they include an individual specific random error term μ_{it} to account for subject specific factors. In addition equation 7 presents an

Table 3: Random Effects Tobit Regressions on Effort: AddPeer sessions

	Baseline and AddPeer		AddPeer	
	(1)	(2)	(3)	(4)
Wage	0.608***	-	0.558***	-
	(0.034)		(0.045)	
Wage × NoPeer Period	-	0.700***	-	0.732***
		(0.038)		(0.056)
Wage×Peer Period	-	0.518***	-	0.531***
		(0.038)		(0.045)
Peer Period	−12.183***	-	−13.168***	-
	(2.573)		(2.874)	
Constant	−9.454***	−15.663***	−4.366	−15.851***
	(3.399)	(3.176)	(4.877)	(4.186)
Observations	834	834	544	544
Log Likelihood	−3078.5	−3076.6	−1958.9	−1958.4
Test Wage×NoPeerPeriod	-	$\chi^2(1)$=26.43***	-	$\chi^2(1)$=22.20***
= Wage×PeerPeriod		p = 0.000		p = 0.000

Notes: Standard errors are in parentheses. *** Significantly different from 0 at the 1% level, two-tailed test.

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[18] Formal statistical analysis is performed using the following random effects Tobit regression to test for differences in response between the baseline sessions and the periods of the peer treatment prior to the peer workers' employment. $Effort_{it} = \beta_0 + \beta_1 Wage×Baseline + \beta_2 Wage×AddPeer + \mu_{it} + \varepsilon_{it}$. The regression coefficients are β_1 =0.66 (0.05) β_2=0.69 (0.08) are both significant at the 1 percent level. A test fails to reject equality of the two coefficients (χ^2 (1) =0.10, p = 0.758) which indicates that initial effort responses in peer sessions with one worker per manager are not different from the baseline sessions.

alternative specification which separates the effect of wages in peer periods from wages in no peer periods.

$$Effort_{it} = \beta_0 + \beta_3 Wage \times No\ Peer\ Period_{it} + \beta_4 Wage \times Peer\ Period_{it} + \mu_{it} + \varepsilon_{it} \quad (7)$$

Table 3 shows the estimates for AddPeer sessions. Columns 1 and 2 include the data from baseline sessions, and columns 3 and 4 do not. In both cases, the coefficient on the *Peer Period* indicator variable (columns 1 and 3) is negative and statistically significant at the 1% level. All else constant, the presence of a peer worker decreases the effort provided by employees by about 13 units of effort in peer sessions.[19] Considering that the average Effort provided by employees working alone in these sessions is 34.5 (Table 2, column 5), this represents about a 38% drop in effort on average. The regressions corresponding to equation 7 (Table 3, columns 2 and 4) indicate that wage offers have a positive and significant impact on effort whether one or two workers are employed (rows 2 and 3). However, F-tests (row 8) clearly reject that effort responses for given wages are equal in periods with one versus two employees ($\chi^2(1) = 22.20$, p = 0.000).

Table 4 displays regression results (from equation 7) for each treatment in isolation. Effort provided for given wages decreases significantly in each treatment upon the introduction of a peer worker. The data reject Hypothesis 1 leading to Result 1:

Result 1. Effort for given wages declines with the addition of a peer employee.

Having established that introducing peer workers has a negative impact on effort, the next step is to determine whether this change results from a "peer effect" or from changes in the manager's expected profit (Hypothesis 2). The first test of Hypothesis 2 can be found in the second column of Table 4 which indicates a significant difference in effort responses in the Average sessions comparing periods with one employee versus two employees ($\chi^2(1)=11.69$, p=0.001). Since the Average treatment holds manager's earnings potential constant with the introduction of a peer, the fact that a decrease in effort occurs without a change in manager profits suggest factors other

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[19] Regressions were also performed to test for differences between the behavior of regular and unemployed workers. The results did not reveal any significant differences between the responses of those employed throughout and those who were unemployed.

Table 4: Random Effects Tobit Regressions on Effort: AddPeer sessions by Treatment

	Baseline	Average	Double	Subsidy
Wage×NoPeerPeriod	0.676***	0.719***	0.791***	0.690***
	(0.052)	(0.073)	(0.199)	(0.084)
Wage×PeerPeriod	-	0.530***	0.511***	0.528***
		(0.062)	(0.156)	(0.063)
Constant	−15.152***	−17.593**	−12.786	−14.995***
	(4.852)	(6.844)	(13.944)	(4.961)
Observations	N=290	N=214	N=109	N=221
Log Likelihood	−1117.8	−742.0	−426.8	−778.6
Test of Wage×One Employee = Wage×Two Employees	-	$\chi^2(1) = 11.69$ $p = 0.001$***	$\chi^2(1) = 4.01$ $p = 0.045$**	$\chi^2(1) = 6.12$ $p = 0.013$**

Notes: Standard errors are in parentheses. *** Significantly different from 0 at the 1% level, two-tailed test.** Significantly different from 0 at the 5% level, two-tailed test.

than manager profits are the driving force. A further test for whether the effort responses differ with managers' payoff functions between the Average, Double and Subsidy treatments is conducted with equation (8):

$$Effort_{it} = \beta_0 + \beta_5 Wage{\times}NoPeerPeriod_{it} + \beta_6 Wage{\times}PeerPeriod_{it}{\times}treatment + \mu_{it} + \varepsilon_{it} \quad (8)$$

Where *treatment* is a vector of indicator variables corresponding the three manager profit formulations in AddPeer treatments. The results for these regressions are shown in Table 5. Chi-squared tests of the Wage×PeerPeriod×Treatment interaction terms in the AddPeer sessions fail to reject equality of all treatments ($\chi^2(2) =0.12$, P = 0.942).[20] The same trend emerges in Double and Subsidy treatments where the introduction of a peer simultaneously increases the earnings of the manager and in Average treatment which holds expected earnings of managers constant. The decrease in effort observed from the addition of a second employee (Result 1) does not appear to be driven by other-regarding concerns for equity in payoffs between employees and their manager. Thus the data fail to reject Hypothesis 2.

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[20] No individual treatment is significantly different from any other treatment.

Table 5: Random Effects Tobit Regressions on Effort: Test for Different Profit Functions

	AddPeer and Baseline	AddPeer
Wage×No Peer Period	0.699***	0.731***
	(0.038)	(0.056)
Wage×Peer Period×Average	0.516***	0.530***
	(0.051)	(0.056)
Wage×Peer Period×Double	0.497***	0.511***
	(0.078)	(0.082)
Wage×Peer Period×Subsidy	0.529***	0.541***
	(0.054)	(0.058)
Constant	-15.614***	-15.770***
	(3.180)	(4.195)
Observations	834	544
Log Likelihood	-3076.5	-1958.3
Test of equality of Wage×Peer	$\chi^2 (2) =0.14$	$\chi^2 (2) =0.12$
Period×Treatment variables	P = 0.933	P = 0.942

Notes: Standard errors are in parentheses. *** Significantly different from 0 at the 1% level, two-tailed test. None of the treatments are significantly different from each other.

Figure 3: Average Effort for Given Wage Ranges: Reverse and Baseline Treatments
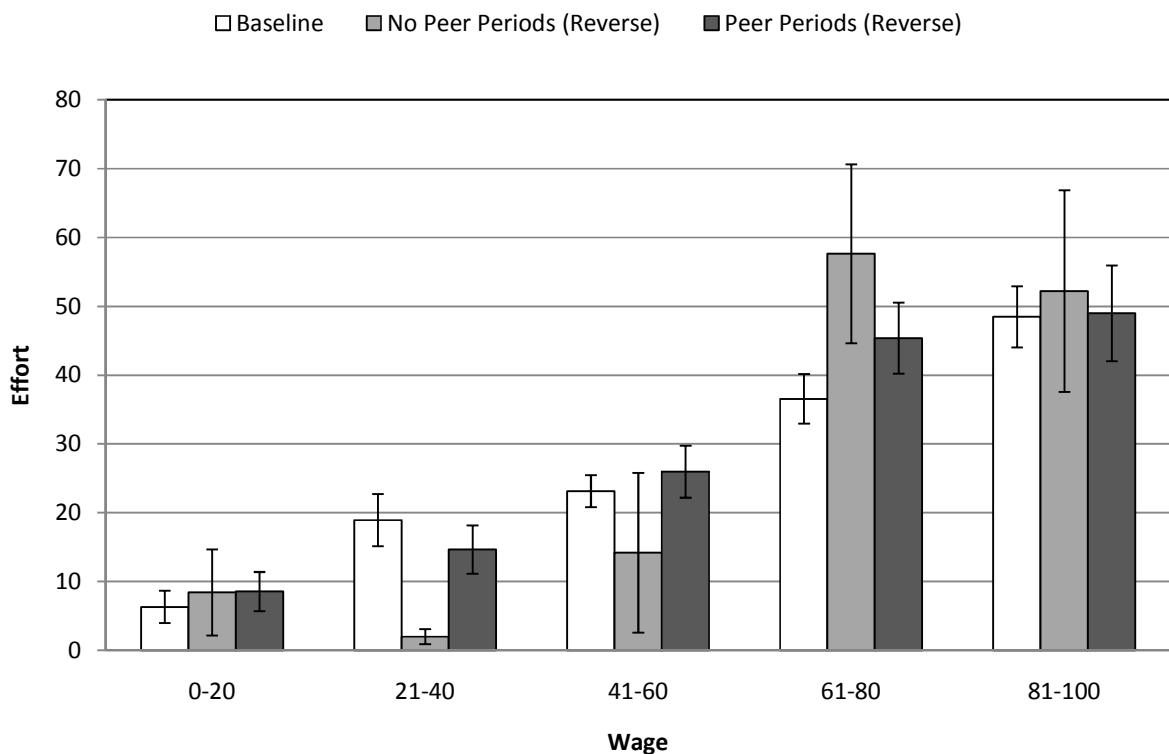
Note: The columns represent the mean. The error bars represent the standard error at the mean.

Result 2. The decrease in effort by employees with the introduction of a peer worker is not sensitive to differences in earnings capacity of the managers.

Results for the Reverse sessions presented in Figure 3 show similar mean effort provision confirm this statistically. There is no statistical difference between effort for given wage ranges for the Baseline, Peer, and No Peer periods. Table 6 presents results that responses in periods with and without a peer within the Reverse sessions (column 1) or in the reverse and baseline (column 2).[21] There is no difference in the initial effort responses comparing between the first 3 periods of AddPeer sessions and Reverse sessions (column 3). Further, the responses in peer sessions in periods with only one employee per manager do not differ by the timing of the unemployment (column 4). However, statistically significant differences do emerge when

Table 6: Random Effects Tobit Regressions on Effort: Analysis of Reverse Treatment

			All Peer sessions (Reverse and AddPeer)		
	Reverse Only	Reverse and Baseline	Periods 1-3	Only No Peer Periods	Only Peer Periods
	(1)	(2)	(3)	(4)	(5)
Wage×NoPeer	0.587***	0.637***	0.609***	-	-
	(0.097)	(0.046)	(0.091)		
Wage×Peer	0.587***	0.612***	0.602***	-	-
	(0.070)	(0.046)	(0.092)		
Wage×AddPeer	-	-	-	0.615***	0.526***
				(0.096)	(0.046)
Wage×Reverse	-	-	-	0.588***	0.650***
				(0.121)	(0.060)
Constant	−6.674	−11.185***	−6.020	−6.522	−13.984***
	(6.053)	(3.798)	(5.946)	(7.016)	(3.592)
Observations	N=238	N=528	N=180	N=138	N=644
Log Likelihood	−873.5	−1995.5	−729.0	−534.7	−2313.0
Test of					
Wage×NoPeer = Wage×Peer	$\chi^2(1)=0.00$ $p = 0.998$	$\chi^2(1)=0.20$ $p = 0.658$	$\chi^2(1)=0.00$ $p = 0.945$	-	-
Wage×AddPeer= Wage ×Reverse	-	-	-	$\chi^2(1)=0.04$ $p = 0.838$	$\chi^2(1)=3.39$ $p = 0.066*$

Notes: Standard errors are in parentheses. *** Significantly different from 0 at the 1% level, two-tailed test.* Significantly different from 0 at the 10% level, two-tailed test.

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[21] This finding indicates that the pause in the game and subsequent practice problems do not influence the choices in the Reverse sessions. This provides some support that the pause in the game is not driving the decrease observed in AddPeer sessions.

comparing between effort responses in peer periods in the Reverse and AddPeer treatments. The peer periods that follow single employee periods in AddPeer sessions exhibit significantly lower effort than the peer periods of the Reverse sessions which begin with peer workers (column 5) (χ^2(1)=3.39, p= 0.066).

The observed behavioral response to adding a peer within an ongoing market differs from that comparing between sessions that start without peers to sessions that start with peers. The difference likely arises from the lack of contrast in the between comparison. Employees observe a clear change in the decision making environment when a peer is introduced within an ongoing market and they respond by providing lower effort. The contrast is not present in the between comparison because workers making decisions in the peer environment have not experienced any other situation. In addition the potential earnings for managers in Reverse sessions with peer workers are identical to the potential earnings of mangers in sessions without a peer.

5. Discussions and Conclusions

This paper examines how peer effects interact with other-regarding preferences in experimental labor markets characterized by incomplete contracts and unobservable effort. An experimental labor market is constructed in which a bilateral gift exchange game is extended with the addition of a second peer employee. The two employees make decisions independently from one another and their decisions do not impact the other employee's earnings in any way.

The results indicate that adding a peer worker into an ongoing labor market has a negative and significant effect on effort when effort is unobservable. This finding differs from positive effects from peers found by Mas and Moretii (2009) and Falk and Ichino (2006) in cases with observable actions. The decrease in effort with peers is consistent with Maximiano et al. (2007), who compare between gift exchange sessions with one employee and sessions with four employees. Maximiano et al. (2007) attribute the decrease in effort to differences in manager payoffs, which alter the relative profits of managers and employees (and thus trigger concerns for equity of outcomes) rather than the influence of peers in the labor market.

The present study tests whether concerns for equity in outcomes are in fact the mechanism that decreases effort with peer workers. It does so by varying the relative profitability of managers upon introduction of a peer in three treatments while holding employee earnings constant throughout. The results show the decrease in effort to be robust to changes in the

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manager's payoff function, which is not consistent with equity concerns being the driving force for the behavioral change. The decrease in effort seems instead to be due to the mere presence of the second employee. One explanation for the decrease is that the addition of a peer allows a worker to share the responsibility for the manager's earnings. As a consequence, an employee may not feel obligated to reciprocate a manager's generosity to the same extent when working with a peer as he or she would when acting alone and having full responsibility for a manager's earnings.

While the results from this experiment clearly indicate that adding a peer to an ongoing market can influence other-regarding behavior, one should not, and cannot, claim that a reduction in effort will necessarily occur when workers are added in labor markets. In the field the addition of employees may increase productivity through other channels such as gains from specialization, and the tendency for workers to free ride may be entirely offset by these productivity gains. If this were not the case a firm would not find it in their best interest to hire another worker. Second, some indication of effort in the field is likely to be observed over time whereas this experiment is structured as a series of one shot games. To the extent that these results transfer to the field, a firm could benefit by trying to make employee effort as transparent to other employees as possible.

In order to determine the impact of a second employee on other-regarding concerns for management the potential for interactions between employees are removed. Allowing for interactions between employees is beyond the scope of this paper and is left for future study.

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