Promises in Contract Design

Gary Charness[a], Ninghua Du[b], Chun-Lei Yang[c], and Lan Yao[d]

Abstract:
In this paper, we propose a new channel of contract design to boost efficiency. If deviating from one's own words induces a self-imposed moral burden, the optimal contracting procedure with regard to cheap talk shall assign the responsibility for installing the nonbinding promise in the contract to whoever has the residual right to break such promise, in the spirit of Grossman and Hart (1986) and Hart and Moore (1990). To study whether a worker's own promise of effort level governs his real choice of effort in a gift exchange game, we implement four treatments in our experiments by varying two factors: (1) who (the firm or the worker) takes the *position of the proposer* to propose the contract and (2) whether the proposed contract includes a *nonbinding specification* of the worker's effort level. Our key finding is that when it is the worker who proposes the contract and the contract includes the worker's promised effort level, both the worker's actual effort choice and the aggregate profits are significantly higher than in each of the other three treatments (and there is little difference in worker effort otherwise).

Keywords: Promise, Contract Design, Gift Exchange, Experiment

JEL Codes: C91, D02, D03

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Contact: [a] *Department of Economics, University of California Santa Barbara, Santa Barbara, CA 93106-9210, USA, email: charness@econ.ucsb.edu, fax: 1-805-893-8830*

[b] *School of Economics, Shanghai University of Finance and Economics; Key Laboratory of Mathematical Economics (SUFE), Ministry of Education, Shanghai 200433, P. R. China, email: ninghua.du@mail.shufe.edu.cn, fax: 86-21-65904198*

[c] *Research Center for Humanity and Social Sciences, Academia Sinica, Taipei 115, Taiwan, Republic of China, e-mail: cly@gate.sinica.edu.tw, fax: 886-2-27854160*

[d] *School of Economics, Shanghai University of Finance and Economics; Key Laboratory of Mathematical Economics (SUFE), Ministry of Education, Shanghai 200433, P. R. China, email: yao.lan@mail.shufe.edu.cn, fax: 86-21-65904198*

1. Introduction

In the realm of economics, individual self-interest may not favor cooperation even though all members of a group would benefit from mutual cooperation. Thus, how to achieve social gains by resolving the conflict between self-interests and group-interests becomes an important theme in economics research.

Both field experience and previous literature in economics indicate that pro-social behavior is crucial for economic performance.[1] Nonetheless, social (distributional) preferences are not always sufficient to induce the social cooperative outcome. For example, in the sequential game in Charness and Dufwenberg (2006), standard preferences predict that there will be no joint cooperative play and no Pareto-optimal outcomes. In fact, social preferences do help to some extent, as this outcome is observed 20% of the time without communication. However, when the second mover can send a costless, non-binding message, she might promise to be cooperative. If the second mover keeps and is believed to keep such promises, the best social outcome can be attained. In fact, when such a promise is made with free-form communication, the rate of joint cooperative play climbs to 67%. In sum, as suggested by Camerer and Fehr (2006), whether "Economic Man" dominates the outcome of social interaction heavily depends on the institution that defines the rules and the procedures of transactions.

The example above captures the characteristics of incomplete contract as a special type of cooperation problem in general economic settings. A contract is incomplete in the sense that one party in the transaction has the residual right to deviate from the non-binding agreement to improve their own benefits at the price of harming the other party. Incomplete contracts have many important implications in the field. When the buyer has the residual right, the situations include a diner who decides how much of a tip to leave in a restaurant, or a worker providing service for her company where a promotion or a salary raise is a future possibility decided by the

[1]Kenneth Arrow (1972) stated: "Virtually every commercial transaction has within itself an element of trust, certainly any transaction conducted over a period of time. It can plausibly be argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence."

employer. When the seller has the residual right, the examples include medical treatment by doctors, services provided by lawyers or financial planners, and some types of auto repair work, in all of which the fees charged to the customer are often decided upfront while the quality of service may depend on the efforts of the provider.[2]

There is previous literature that has investigated the role of social behavior in incomplete contracts. Chen (2000) studies transactions in which people have a tendency to keep agreements and enforcing the contract is costly. Incomplete contracts that partially rely on people's propensity to keep their promises may be optimal if the enforcement costs associated with complete contract are too high. Following Grossman and Hart (1986) and Hart and Moore (1990), Chen finds that the residual right in such situations should be assigned to the trading party who is directly involved in generating social surplus.

Earlier communication experiments have indicated that one may have a self-imposed moral burden when deviating from his/her own words and there are several possible driving forces. For example, in the *guilt-aversion* model, people care about what others expect of them, feeling guilty if their behavior falls short of expectations. With guilt aversion, communication may influence motivation and behavior by influencing beliefs about beliefs.[3] Charness and Dufwenberg (2006) examine experimentally the impact of communication on trust and cooperation with hidden-action (moral hazard). The evidence is consistent with people striving to live up to others' expectations so as to avoid guilt. Another possibility is *cost-of-lying*. Vanberg (2008) provides an example in which the effects of promises cannot be accounted for by changes in expectations, suggesting that people have a preference for promise keeping *per se*. Both Charness and Dufwenberg (2006) and Vanberg (2008) implement free-form communication. Charness and Dufwenberg (2010) find that bare promises have little trust-enhancing effect and marginally significant trustworthiness-enhancing effect.[4]

[2] Reputation/repeated interaction is definitely one effective approach to solving the inefficiency problem in incomplete contracts. As discussed later, Brown Falk and Fehr (2004) is a classic study along this line.

[3] We refer here primarily to simple guilt, rather than guilt-from-blame. For further discussion, see Battigali and Dufwenberg (2007, 2009).

[4] A number of previous studies have suggested that free-form communication may be more effective to generating pro-social behavior. In this study, however, we choose 'bare form' cheap talk design for a more demanding test and to facilitate analysis.

Based on these findings and the Hart and Moore (1990) idea that the optimal ownership of a joint venture should assign the residual right to the party with the most relationship-specific asset, we conjecture that the optimal contracting procedure should align the initiation of the target level of effort/quality/service in the contract with the subject who provides it. The general principal of the procedure should be read as that whoever has the residual right to break down the nonbinding promise in the contract, should be given the responsibility for installing such promises. In addition to the study of residual right of deviating from the contract in the previous literature, in this paper we study the residual right of writing the contract. Whether people tend to keep agreements could potentially rely on who proposes the agreement.[5]

Note that the property-rights approach and the psychological mechanism in this study are not the same, although the two are related. First, while in the property rights theory there is a financial incentive to increase the investment if the bargaining power has increased, such a financial incentive is absent in our experiment. Secondly, the organizational implications are not the same. In the property-rights approach asset ownership is crucial, i.e., for example, if the worker has to undertake an important investment, it is better if he is the owner of his own tools (an independent contractor) than if he is an employee who uses the firm's tools. For the mechanism identified in this paper, it is not asset ownership, but rather the decision right about the wage, which is crucial. Although the two can be related, one can also imagine employment contracts in which the worker uses the tools of the firm (the worker is a true employee), but still has an influence on his wage (for example, if the firm gives him "voice" in this decision).

To examine whether the suggested contract design works, we set up bilateral gift exchange games in the laboratory: a labor contract between a firm (employer) and a worker (employee) is incomplete, with the worker's effort not enforceable. After receiving the wage from the firm, the worker can choose an effort level lower than the agreement to improve her own benefits at the expense of the firm's profit margin. In gift-exchange games, the output depends on the worker's effort and this effort creates surplus. According to the principle described above, the worker

[5] Note that this could also reflect a responsibility effect, rather than guilt.

should specify the proposed effort level in the contract.

We experimentally investigate whether the contracting procedure triggers promise-keeping behavior by varying two factors: (1) who (the firm or the worker) proposes the contract and (2) whether the proposed contract includes a non-binding specification of the worker's effort level. Our key finding is that when it is the worker who proposes the contract and the contract includes the worker's promised effort level, the worker's actual effort choice is the highest amongst all four treatments (and there is little difference otherwise). This supports the notion of optimal ownership expressed in Hart and Moore (1990).

The remainder of this paper is structured as follows. Section 2 discusses the further related experimental literature. Section 3 presents the details of our experimental design. Results are in section 4 and we conclude in section 5.

2. Related Literature

We implement gift-exchange games in our laboratory sessions. In the context of this game, a firm can give a "gift" by offering a high wage, and a worker can give a reciprocal "gift" by working at a higher effort level. In the first published paper reporting results from the gift-exchange game, Fehr, Kirchsteiger, and Riedl (1993) find that both wages and effort levels far exceed the predictions with self-interested workers and that there is a very strong positive correlation between effort and wage. Social preferences thus appear to play an important role in generating surplus, both directly through the effort channel and indirectly through the wage channel. These stylized facts are repeatedly observed in a considerable number of subsequent gift-exchange-style experiments.[6]

As we mentioned earlier, repeated interactions and reputation have considerable scope for

[6] Other gift exchange experiments include Abeler, Altmann, Kube and Wibral (2010), Bauernschuster, Duersch, Oechssler and Vadovic (2010), Brandts and Charness (2004), Charness (2004), Charness and Kuhn (2007), Duersch, Oechssler and Vadovic (2012), Fehr and Falk (1999), Fehr, Falk, and Zehnder (2006), Fehr, Gaechter and Kirchsteiger (1997), Irlenbusch and Sliwka (2005), Maximiano, Sloof and Sonnemans (2007) and Owens and Kagel (2010). For a more complete survey, see Charness and Kuhn (2011).

generating greater efficiency through the alternative channel of enlightened self-interest.[7] Brown, Falk and Fehr (2004) allow repeated interactions between firms and workers by providing fixed ID numbers of the participants. They find that rents are shared in the long-term bilateral relationships, which are disciplined by the threat of non-renewal of contracts.[8]

Fehr, Klein and Schmidt (2007) compare the performance of three types of contracts. A "trust" contract (TC) is pure gift exchange with w and e^*. An "incentive" contract (IC) also includes a fine f being enforced with probability p when the worker chooses an effort less than e^*, while a "bonus" contract (BC) describes an unenforceable bonus b when the real effort is no less than e^*. The results, in two separate treatments, show that incentive contracts perform better than trust contracts and bonus contracts dominate incentive contracts. Their payoff function is the closest to ours (their benchmark TC is essentially our P_F). While FKS manipulate different post-effort actions by the firm with direct payoff implications, our design changes only the content (e* or no such target level) of the proposal and the role of proposer (firm or worker).

Among the previous gift-exchange experiments, the contract set-up in Charness *et al.* (2012) seems the most similar to ours. In their design, the firm proposes a desired effort level e^*; the firm has the right to choose the wage, but in some treatments the firm could delegate the wage choice to the worker. Their main result is that both the firm and the worker earn more when the firm delegates the wage choice. Charness *et al.* (2012) tacitly supports Hart and Moore (1990) in the sense that when the firm delegates the salient yet alienable wage decision in the (binding) contract to the worker whose effort decision is inalienable, a bigger pie can be eaten by the parties involved in the transaction.

The current paper departs from Charness *et al.* (2012) in several ways. Our research question is different from theirs, in that we focus on how cheap talk and the self-imposed moral burden disciplines the worker. While the worker is made a dictator in their design, here the worker finds herself in an environment with strategic uncertainty (having certain elements of the ultimatum

[7] In principle, this only applies to infinitely-repeated games, but in fact behavior rarely unravels back more than one or two periods in the laboratory.
[8] Studies along this line include Brown, Falk and Fehr (2012) and Falk, Huffman and MacLeod (2008).

and trust games). It is not possible to reject contracts in Charness *et al.* (2012), while here the worker's proposal can be either accepted or rejected by the firm. We also use a different payoff structure, where the worker's effort *e* unilaterally determines total surplus and the wage affects only the redistribution of wealth between the firm and worker (and of course the effort chosen).[9]

Finally, the study by Fehr, Kremhelmer and Schmidt (2008) is a direct experimental test of Grossman and Hart (1986) and Hart and Moore (1990). In their experiments, both the firm and the worker have a salient and inalienable action to make regarding production, and they bargain over the ownership right of the firm. While the theory predicts that the sole ownership by one party generates the most efficient allocation, the experimental evidence is in support of joint ownership. Their explanation to this observation is that fairness concerns may promote cooperation and efficiency under joint ownership.

3. Experimental Design

The common structure of the games employed in our experiments is as follows. There is a firm and a worker, one of them takes the position of the proposer and the other one is the responder.[10]

- *Stage* 1: The proposer proposes a contract that includes a binding wage offer *w*, where *w* is an integer between 0 and 100 (including 0 and 100).
- *Stage* 2: After reading the offer, the responder decides whether to accept the contract. If she accepts, the game enters the next stage. If she rejects, the game ends.
- *Stage* 3: The worker chooses the effort level *e*, where *e* is an integer from 1 to 10 (including 1 and 10).

[9] The payoff structure in our experiments is along the line of Brown, Falk and Fehr (2004) and Fehr, Klein and Schmidt (2007), where wage is no longer salient in determining the production output. This has the advantage of avoiding an undesirable effect present in the standard gift-exchange game payoff design, where the marginal value of effort decreases as the wage increases.

[10] We know that in many gift exchange experiments, there exists excess labor supply and the wages are determined via markets. However, Fehr, Kirchler, Weichbold and Gaechter (1998) find that there is no significant difference between gift exchange markets and bilateral gift exchange games. Charness (2004), Fehr, Klein and Schmidt (2007) also implement bilateral gift exchange.

If the responder rejects the contract, both the firm and the worker earn 35 experimental dollars. If the responder accepts the contract, the firm's earning is $35 + 10e - w$ while the worker earns $35 + w - c(e)$. Function $c(e)$ is the cost of effort given by Table 1:

Table 1: The Cost of Effort

Effort *e*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Cost c(*e*)	0	1	3	5	8	12	16	20	25	30
Surplus 10*e* – c(*e*)	10	19	27	35	42	48	54	60	65	70

Since after accepting the contract the firm's surplus is $10e - w$ and the worker's surplus is $w - c(e)$, the aggregate surplus is $10e - c(e)$. Once the responder accepts the contract, the created aggregate surplus $10e - c(e)$ is a nonlinear transformation of the worker's actual effort e.

As we wished to maintain a constant ratio with respect to the effectiveness of effort and also wished to avoid negative earnings, we imposed a "limited-liability" restriction that when $35+10*e < w$, the wage paid is reduced to $35+10e$, the firm earns 0, and the worker earns $35+(35+10e) - c(e)$. This restriction was binding in only four of the 96 accepted contracts. We point out that this limited-liability restriction implies that a worker who cares only about own payoffs should choose effort, e_s, greater than 1 if the wage is greater than 47.[11]

Notice that the marginal benefit of increasing one unit of effort is fixed at 10. From Table 1, the marginal cost of each unit of effort is always less than 10. Therefore, the social optimal effort level is 10. When $w > 30$ and $e = 10$, the firm and the worker share the maximum total surplus from the market.

There are two factors in our experimental design, helping us to investigate how promise-keeping works: (1) who has the *position* of the proposer and (2) whether the proposed contract includes a *non-binding specification* of the worker's effort level e^*. Hence we implemented the following four games:

P_F: The firm proposes the contract; the contract includes both w and e^*.

[11] The own-maximizing effort function, $e_s(w)$, is illustrated in Figure 3. It is 1 if $w < 46$, is either 1 or 2 if $46 = w$, is 2 if $46 < w < 57$, is 2 or 3 if $57 = w$, is 3 if $57 < w < 67$, is 3 or 4 if $67 = w$, is 4 if $67 < w < 78$, is 4 or 5 if $78 = w$, is 5 if $78 < w < 89$, is 5 or 6 if $89 = w$, is 6 if $89 < w < 99$, is 6 or 7 if $99 = w$, and is 7 if $100 = w$.

P_W: The worker proposes the contract; the contract includes both *w* and *e**.

F: The firm proposes the contract; the contract only includes *w*.

W: The worker proposes the contract; the contract only includes *w*.

With purely self-regarding preferences, where the worker proposes the contract (in W and P_W), the Subgame Perfect Nash Equilibrium (SPNE) predicts $w = 9$ or w =10 and $e = 1$, while in F and P_F where the firm proposes the contract the SPNE predicts $w = 1$ or w = 0 and $e = 1$.[12] If the worker's promised effort *e** governs the worker's real choice of effort *e*, we should observe effort higher than the self-regarding SPNE in P_W. One of many potential possibilities is that the worker is a strong promise-keeper, with a cost-of-lying known by all to be negative infinity. In this case, the worker proposes $w = 99$ (or $w = 100$, if the firm always accepts when indifferent) and $e^* = 10$ in the contract and the firm accepts the contract, and finally the worker exerts effort $e = 10$ in the SPNE in P_W.

Note that an important feature of our design is that there is only one period. This removes even the possibility of group-reputation effects (see Healy, 2007). Reciprocal effects are likely to be considerably attenuated without multiple periods, even with anonymous re-matching.[13] In this sense, we are tying our hands to our backs and our results should represent a lower bound. The cleaner one-shot design is rather rare in gift-exchange experiments, as the cost of gathering data is much higher without multiple periods (and non-independent observations).

We conducted our experiments at the Experimental Economics Laboratory, Shanghai University of Finance and Economics (SHUFE). The participants were recruited from a campus-wide list of undergraduate students who had previously responded to advertisements in public courses. None of the participants had any experience with gift exchange game experiments. There were 12 sessions (232 participants) in total: 4 sessions (76 participants) in each of P_W and P_F, 2 sessions (40 participants) in each of W and F. No participant was

[12] These solutions are from backward induction. When the worker proposes the contract, w = 10 if the firm always accepts under the indifferent case, otherwise w = 9. When the firm proposes the contract, w = 0 if the worker always accepts when indifferent, otherwise w = 1.

[13] See for example the results in Brandts and Charness (2004), where both approaches are used.

permitted to participate in more than one session.

All laboratory sessions were computerized using z-Tree (Zurich Toolbox for Readymade Economic Experiments, Fischbacher, 2007); both the instructions and the information shown on the computer screen were in Chinese (see Appendix A for the translated sample instructions).

In each session, half of the participants were firms and the rest were workers. The firms and workers were randomly and anonymously matched into pairs. Each participant plays one of the four games once.[14]

We used a psychological questionnaire TOSCA-3 (Test of Self-conscious Affect-3, by Tangney, Dearing, Wagner and Gramzow, 2000) to test participants' attitude toward guilt. TOSCA-3 is a scenario-based self-report questionnaire measuring proneness to shame, guilt, detachment and externalization. In the original TOSCA-3, each scenario consists of four questions to test four feeling items respectively. We picked the question for guilt feelings as Question B, our main focus, and randomly picked one of the other questions as Question A. We chose scenario 5, 6, 9, 11 and 13 in TOSCA-3, where 5, 9 and 13 were negative scenarios and 6 and 11 were positive scenarios. The answers were scaled from 0 to 4. "0" indicates no guilt feelings while "4" is with strong guilt feelings.

The average payment was 22 yuan in RMB (the exchange rate was 1 yuan = 4 experimental dollars), including a 5-yuan show-up fee.

4. Results

In this section we present our main findings. We provide an overview of treatment averages in Table 2. The rank-sum test statistics for the main treatment effects are shown in Table 3.

[14]We know that most of the gift exchange experiments implement multi-round games. Here we implement one-shot games to control for confounds from the past experience and to increase the number of independent observations.

Table 2: Summary Statistics

All	Obs.	w	e*	e	e_s	π_F	π_W
P_W	38	51.00 (2.85)	7.61 (0.37)	5.11 (0.58)	2.18 (0.21)	11.76 (3.42)	27.24 (2.92)
P_F	38	43.53 (3.41)	7.84 (0.33)	4.63 (0.51)	1.84 (0.19)	4.26 (3.77)	32.00 (3.00)
W	20	45.10 (3.51)		2.65 (0.70)	1.80 (0.25)	3.00 (3.71)	18.7 (3.90)
F	20	34.05 (5.02)		3.95 (0.66)	1.65 (0.24)	5.95 (4.13)	26.15 (3.86)

Accepted	Obs.	w	e*	e	e_s	π_F	π_W
P_W	30	49.93 (2.92)	8.03 (0.29)	6.47 (0.50)	2.07 (0.22)	14.90 (4.16)	34.50 (2.72)
P_F	36	44.56 (3.52)	7.86 (0.35)	4.89 (0.51)	1.89 (0.19)	4.53 (3.98)	33.78 (2.89)
W	12	39.58 (4.09)		4.42 (0.83)	1.42 (0.19)	5.00 (6.22)	31.17 (2.91)
F	18	37.28 (5.01)		4.39 (0.66)	1.72 (0.27)	6.61 (4.58)	29.06 (3.68)

$\mathbf{e > e_s}$	Obs.	w	e*	e	e_s	π_F	π_W
P_W	26	49.73 (3.26)	8.00 (0.33)	7.19 (0.41)	2.08 (0.23)	22.19 (2.68)	32.27 (2.24)
P_F	23	49.61 (3.63)	8.26 (0.34)	6.74 (0.43)	2 (0.26)	17.78 (3.19)	33.52 (2.84)
W	9	41.11 (4.52)		5.56 (0.78)	1.44 (0.24)	14.44 (4.39)	29.89 (2.39)
F	16	36.81 (5.61)		4.75 (0.69)	1.18 (0.30)	10.69 (4.09)	27.63 (3.97)

Notes: We report treatment averages of wage *w*, proposed effort *e**, the worker's own maximizing effort e_s, actual effort *e*, firm profits π_f and worker profits π_w. In each cell, the numbers refer to mean, with standard errors in parentheses. Average profits are net of the initial endowment of 35. The table includes three panels: all contracts, accepted contracts, and contracts in which the worker exerts effort *e* higher than the selfish level e_s. When considering all contracts, actual effort *e* is zero for rejected contracts.

Table 3: Rank sum test *p*-values

3A. Wages

	Proposed Wages			***Accepted Wage***		
	P_F	W	F	P_F	W	F
P_W	0.106	0.178	0.008	0.316	0.060	0.046
P_F		0.902	0.110		0.358	0.206
W			0.080			0.580

3B. Actual Efforts

	***e* in accepted offers**			***e* - e_s, *accepted offers***			***e* - e_s, *all offers***		
	P_F	W	F	P_F	W	F	P_F	W	F
P_W	*0.018*	*0.020*	0.016	*0.015*	*0.043*	0.012	*0.013*	*0.003*	0.016
P_F		0.638	*0.319*		0.932	*0.423*		0.614	*0.465*
W			0.949			0.638			0.970

3C. Profits

		Profits from accepted offers			***Profits from all offers***		
		P_F	W	F	P_F	W	F
P_W	Firm	*0.090*	*0.030*	0.232	*0.021*	*0.069*	0.098
	Worker	*0.228*	*0.042*	0.928	*0.292*	*0.182*	0.310
	Total	*0.292*	*0.008*	0.246	*0.015*	*0.021*	0.016
P_F	Firm		0.465	*0.497*		0.991	*0.460*
	Worker		0.014	*0.151*		0.677	*0.204*
	Total		0.018	*0.252*		0.791	*0.339*
W	Firm			0.475			0.799
	Worker			0.195			0.595
	Total			0.113			0.932

Note: *p* values of one-tailed rank-sum tests are italicized, otherwise two-tailed.

Table 2 and Table 3 indicate that the wages in P_W (both proposed and accepted) are the highest amongst all treatments. When considering accepted wages, including nonbinding e^* in the contract increases the wages if it is the worker who proposes the contract, while this is not true when the firm proposes the contract. The real effort level e, an indicator of the total surplus, is easily the highest in P_W amongst all treatments. The total profit from the firm and the worker, another measurement of the total surplus, is again the highest in P_W when considering all offers. Detailed in-depth analysis follows below.

4.1 Contract Outcomes

Looking at treatment distributions of wage offered yields no interesting insight. Henceforth we put wage distribution in four treatments in Figure B1 in Appendix B. In fact, in the P_W and P_F treatments, where contracts include both wage w and proposed effort e^*, each separately only offers a partial/skewed aspect of how contract offers differ. By combining w and e^*, the proposed worker's surplus $w - c(e^*)$ provides a more encompassing comparison, which is summarized in Table 4. Since the proposed aggregate surplus is $10e^* - c(e^*)$, the proposed worker's share of surplus is thus $[w–c(e^*)]/[10e^*–c(e^*)]$. By comparing all contracts in both treatments, the proposed worker's surplus is higher in P_W than that in P_F, and the proposed worker's share of surplus is also higher in P_W than in P_F. For the accepted contracts, both the proposed level and share of worker's surplus are not quite different between P_W and P_F.

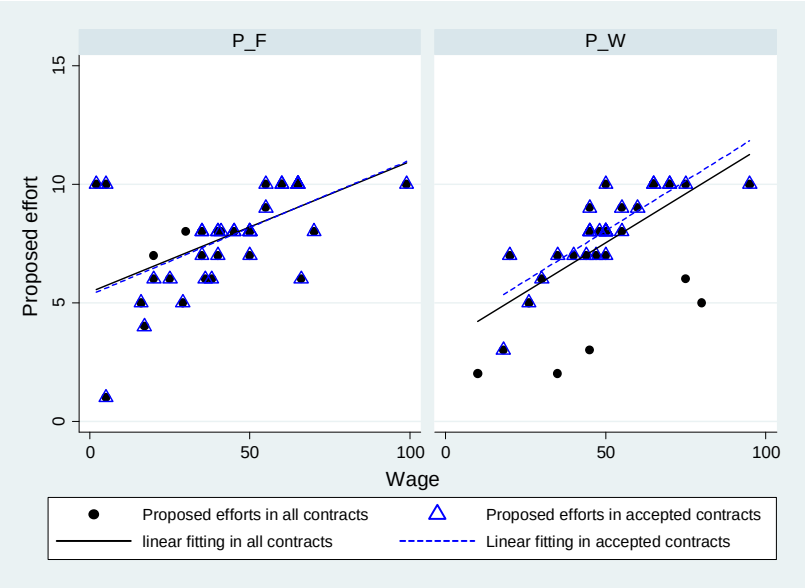
Table 4: Descriptive Statistics and Rank-Sum Tests of Proposed Worker's Surplus

	All contracts			Accepted contracts		
	Mean(std.)		Rank-sum	Mean(std.)		Rank-sum
	P_F	P_W	*p* value	P_F	P_W	*p* value
Obs.	38	38	76	36	30	66
Level	23.26 (2.88)	31.55 (2.20)	0.027	24.17 (2.97)	29.13 (1.97)	0.221
Share	0.40 (0.04)	0.60 (0.06)	0.005	0.42 (0.05)	0.485 (0.03)	0.078

We plot the proposed effort e^* against the wage w in Figure 1.A and the proposed worker's

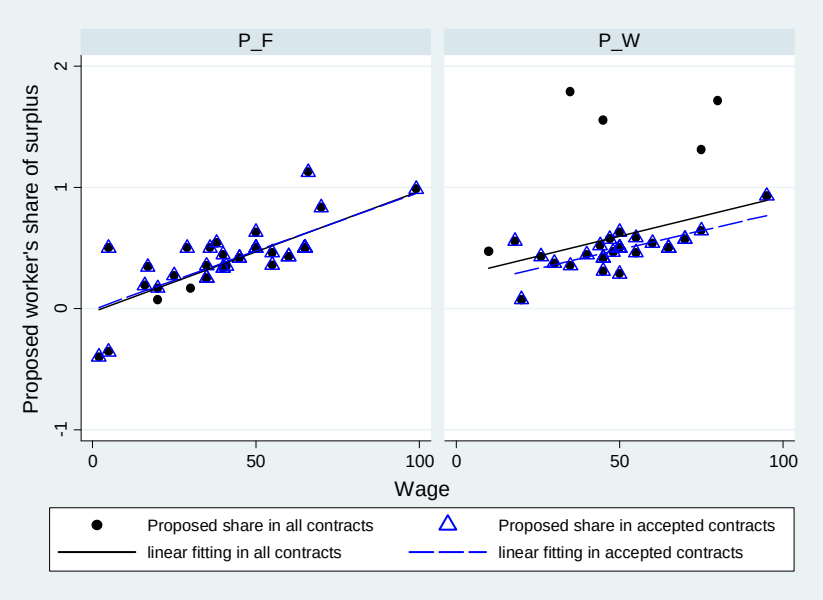
share of surplus against the wage in Figure 1.B. Figure 1.A shows positive correlation between *w* and *e**. In P_W, Figure 1.B shows that when the worker asks for a share of surplus higher than 1 (so that the firm would get less than the initial endowment), the firm rejects the contract offer.[15] For the accepted offers, the proposed shares in P_F are close to those in P_W. This observation is consistent with what we found in Table 4.

Figure 1.A: Proposed Contract (w, e*) in P_F and P_W



[15] In some sense, these are outliers without proper comprehension of the game rule. Similar outlier cannot reveal themselves in this obvious way in P_F. Excluding them, we have 30/34= 0.882 acceptance rate in P_W, instead of 30/38.

Figure 1.B: Proposed Worker's Surplus in P_F and P_W



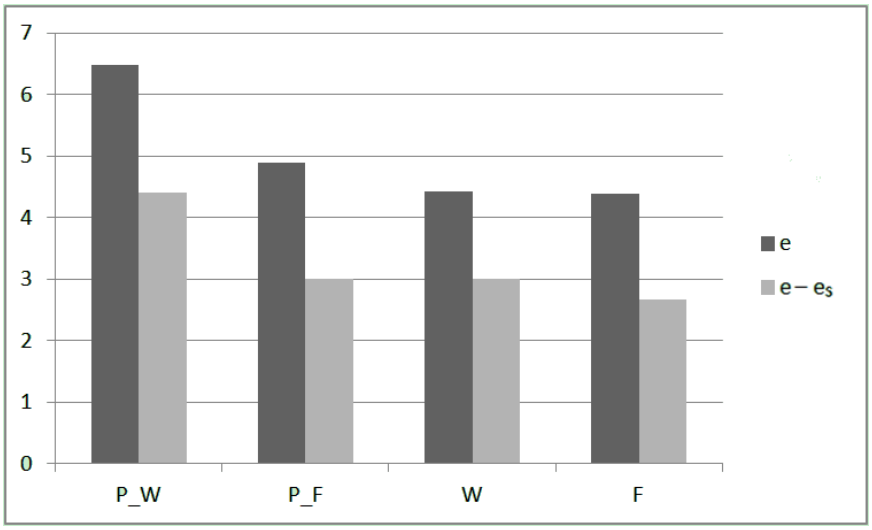
Acceptance rates are higher when the firm proposes the contract, since the wage is binding and the effort level is not. The rates in P_F and F are 0.947 (36 of 38) and 0.900 (18 of 20), compared to 0.789 (30 of 38) and 0.600 (12 of 20) for P_W and W, respectively. The rate when the worker specifies an effort level in the contract is significantly higher than when this is not feasible (p = 0.062, two-tailed test of equality of proportions), while there is no such difference when the firm requests an effort level (p = 0.249). Finally, the acceptance rate in the P_W treatment is significantly lower than that in the P_F treatment (p = 0.021). However, if we exclude the proposals that make the firm loose from the initial endowment, then the acceptance rate in the P_W treatment is not different from that in the P_F treatment (p = 0.319).

4.2 Performance: Effort and Surplus shares

According to our laboratory settings, the worker's actual effort choice unequivocally sets the realized total surplus/profit. The average effort after acceptance is shown in Figure 2. As mentioned earlier, the limited-liability feature of our design leads to a higher wage inducing a higher optimal effort for even a selfish worker (see footnote 12 and Figure 3). Therefore, a better measurement of discretionary effort would seem to be the difference between the actual effort

choice e and the own-maximizing effort, denoted by e_s. $e - e_s$ is also shown in Figure 2.

Figure 2: Average Actual Effort with Accepted Offers



If the cheap-talk message e^* restrains the workers, then effort in the cheap-talk treatments should be higher than otherwise, holding all else equal. If people are inclined to keep their own promises, then effort in P_W should be higher than effort in P_F and in W. If it is effective for the firm to request an effort level, then effort in P_F should be higher than effort in F.

Referring back to the pairwise rank-sum tests between treatments in Table 3B, effort *promise* in a worker's proposal increases real effort levels (P_W vs. W) over the no-cheap-talk controls, while the effort *request* in a firm's proposal does not (P_F vs. F). In the left panel and the middle panel with accepted offers, both e and $e - e_s$ are the highest in P_W amongst the four treatments. In the right panel, with $e - e_s$ for accepted offers and zero effort for rejected offers, P_W is again easily the highest with all offers amongst all four treatments, and no other difference comes close to statistical significance.

Figure 3: Wage-Effort Correlations

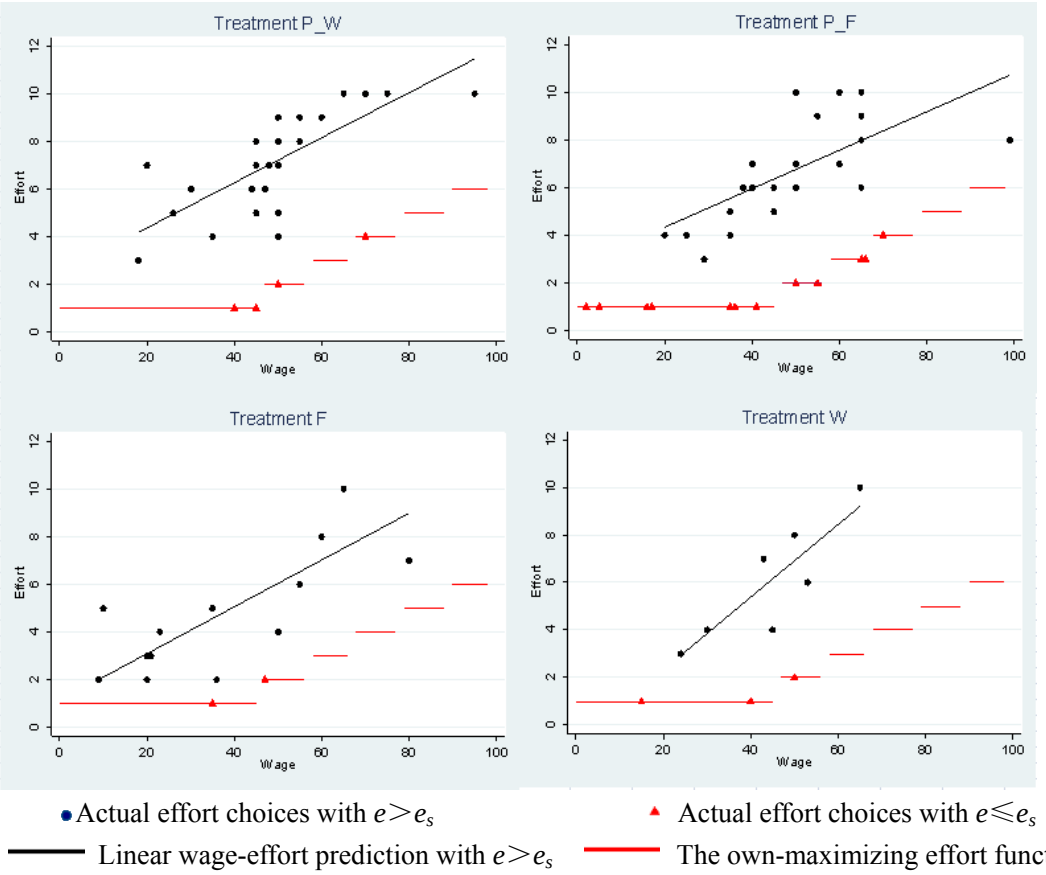


Figure 3 plots the wage-effort outcomes. As shown in red, the own-maximizing effort e_s is a step function increasing in wages. Effort levels with $e \leq e_s$ are presented by small red triangles. For the effort choices with $e > e_s$, we observe positive wage-effort correlations in all four treatments and the slopes do not vary much.

In Table 5, the ordered-probit regressions of effort show that the Wage coefficients are significantly positive at the 1% level. In specification 2, the χ^2 test of equal wage-effort correlation in all four treatments gives $p = 0.2394$, not statistically significant. This verifies what we observed in Figure 3.

Table 5: Ordered-probit Regression of Actual Effort on Wages

	Effort (Accepted offers with $e > e_s$)	
	Specification 1	Specification 2
W		-1.057 (1.368)
P_F		-1.700* (0.892)
P_W		1.109 (0.992)
Wage	0.071*** (0.009)	
F*Wage		0.076*** (0.014)
W*Wage		0.113*** (0.031)
P_F*Wage		0.054*** (0.014)
P_W*Wage		0.081*** (0.018)
Obs.	74	74
R square	0.2160	0.2565
Log likelihood	-124.108	-117.704

* indicates 10% significance level. *** indicates 1% significance level. Standard errors are in parentheses.

Once the contract is concluded, the created aggregate surplus is a nonlinear transformation of the worker's actual effort *e*. The worker's share of surplus is given by the worker's payoff from the contract offer over the surplus created by the worker's effort. The share of surplus captures two parties' bargaining positions in the game and reflects a nonlinear relationship between the wage and the worker's earning-maximizing effort. We focus on workers who exert effort that at least allows the firm to receive the initial endowment of 35 (denoted by e_0) after receiving the wage from the firm, since the share of the surplus for workers with $e \geq e_0$ cannot be greater than 1.

In Table 6, we calculate the share of surplus for such workers. Across all four treatments, this share of surplus is not statistically different for either medians (Kruskal-Wallis test, p=0.658) or for distributions (χ^2 test, p = 0.276). These test results confirm our previous observation of constant wage-effort correlation across all treatment for non-selfish workers. The test results also indicate that workers do not see themselves as being in different bargaining positions in different treatments, as long as they concede a positive share of the surplus to the firms. The findings in Table 6 are also consistent with those in Figure 3 and Table 5.

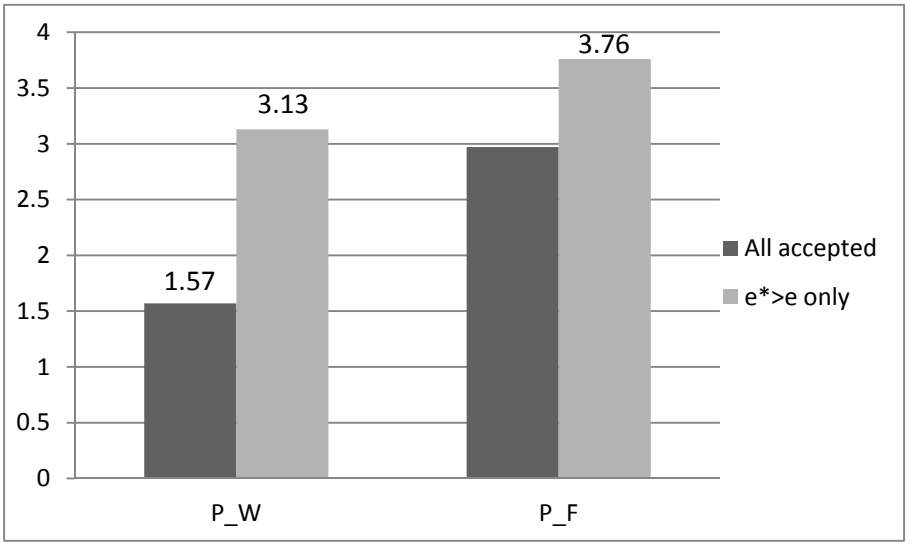
Table 6: Worker's Share of Surplus

$e \geq e_0$	P_W	P_F	W	F
Median	0.571	0.577	0.714	0.630
Mean	0.585	0.595	0.659	0.624

4.3 Proposed Effort versus Actual Effort Choices

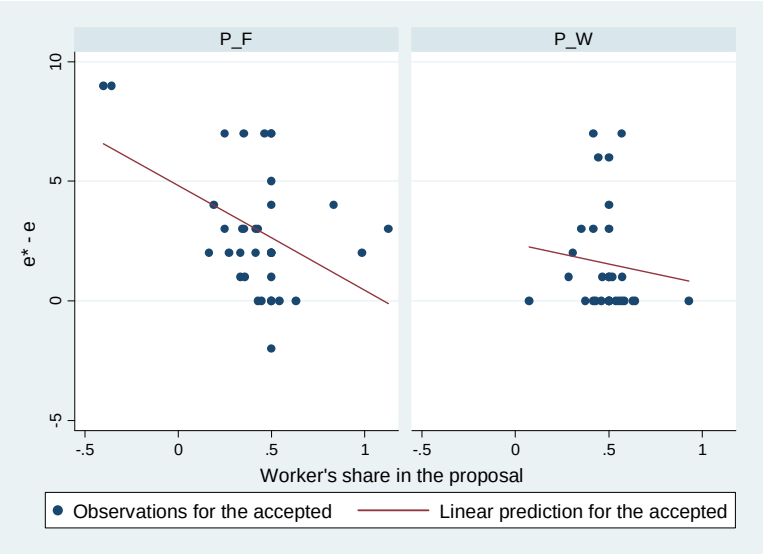
A straightforward way to check whether workers keep their promises is to check the distance between the proposed effort e^* in the contract and the actual effort level e in practice. Figure 5 gives the average $e^* - e$ in P_W and P_F treatments. The distance between e^* and e in P_W is significantly smaller than that in P_F (two-tailed rank sum test gives $p = 0.008$).

Figure 5: Average Distance Between Actual Effort and Proposed Effort



This already strongly suggests that worker own promises matter more than the suggestions of the firms. To investigate this further, Figure 6 shows e* – e, conditional on the proposed contract (w, e*) as measured in the proposed worker's share of surplus on the x-axis. As shown, as the worker's proposed share of surplus increases, e* – e decreases, i.e. promise keeping increases, in both P_F (Spearman's rho = -0.317, $p = 0.060$ and P_W (Spearman's rho = -0.255, $p = 0.174$, two-tailed tests).

Figure 6: e* – e Conditional on (w, e*)



Given the similar wage-effort correlations across treatments observed in Figure 3 and the similar realized share of surplus in Table 6 for the workers, we must check whether the lower effort level in P_F is driven by the notion that "workers stick to a certain share of the pie". If we observe that for a given proposed offer (w, *e**) the actual effort is higher in the P_W than in P_F, then we find evidence that workers care more about their own promises than requests from firms. To elicit additional behavioral determinants, we compare actual effort provision conditional on the proposed wage w and proposed effort *e** in all realized trades, as seen with Specification 1 in Table 7. Given that we control for (w, *e**), the average effort is lower in P_F than in P_W. This is the evidence that workers care more about their own promises. When checking the wage-effort correlation for $e > e_s$ (here we focus on the workers who are not simply maximizing their earnings) in P_F and P_W, Specification 2 identifies both proposed effort *e** and the interaction term of *e** and dummy P_W as significant explanatory variables. We find a stronger impact of *e** on real effort *e* in P_W than in P_F, and this is consistent with guilt aversion (or people adhering more to their own words) being a real driver of high effort.

Table 7: Ordered-Probit Regressions for P_W/P_F comparison

	Effort			
	(All accepted)		(Accepted offers with $e>e_s$)	
	Specification 1		Specification 2	
Wage	0.033***	(0.010)	0.023	(0.017)
Proposed_Effort	0.190*	(0.107)	0.630***	(0.190)
P_W*Proposed_Effort			0.079**	(0.038)
P_F	-0.590**	(0.265)		
Obs.	66		49	
R square	0.1328		0.2596	
Log likelihood	-127.3107		-72.6527	

In order to delve more deeply into the source of the difference between e and e*, we categorize workers by types. One approach is to categorize workers into "promise-keepers" and others. Promise-keepers are those who chose $e \geqslant e^*$ in the accepted contracts, so that the firm enjoys a share of surplus no smaller than promised by the worker in the contracting stage; the others are those who chose $e < e^*$. For the proportion of promise keepers, both the *t*-test and the equality of proportion test show that 7/36 in P_F is significantly lower than 15/30 in P_W ($p = 0.001$ in both cases). Consequently, with respect to living up to the proposed effort levels, workers disappoint firms significantly more frequently in the firm-proposing treatment (P_F) than in the worker-promising one (P_W). Note, however, among those who chose not to live up to the proposed effort levels, i.e. those with $e < e^*$, these treatments do not differ significantly (two-tailed rank-sum test $p = 0.272$).

Another approach to categorizing workers is to separate those who exert own-maximizing effort e_s or less from the rest. The percentage of workers who chose $e \leq e_s$ in P_W is 13% (4/30), which is significantly lower than that proportion of 36% (13/36) in P_F, with $p = 0.017$ with a one-tailed test of the equality of proportions. This in turn suggests that the efficiency-boosting effect in P_W is potentially due to fewer workers with $e \leq e_s$.

In sum, the contracting procedure of P_W where the worker has the control over proposal of desired share of surplus is much more effective in inducing effort than that in P_F.[16]

4.4 Guilt Score

Why are there so many more uncooperative workers in the P_F treatment? Our questionnaire data provides evidence that it is not due to a potential selection bias of subjects (reassuring since we used random assignment to treatments), but rather due to the impact of the switching institution, so that workers guilt (or promise-keeping) sentiment is evoked by having to propose e^* themselves.

The TOSCA-3 questionnaire measures people's general propensity towards guilt feelings; one might expect that such intrinsic characteristics of personality should not be affected by casual decisions in a laboratory session. Based on χ^2 tests, these scores do not differ significantly for workers and firms ($p = 0.943$); the scores also do not differ significantly between participants who reject the offer and those who accept the offer ($p = 0.630$) or across the four treatments ($p = 0.958$). As a by-product, these statistics imply both a lack of a selection bias for our samples and a lack of an effect on TOSCA-3 by individual choices in the laboratory.

We do find a significant positive correlation between TOSCA-3 scores and workers' effort in all treatments. The one-tailed Spearman test gives $\rho = 0.295$ ($p = 0.002$, N = 96). We also find a marginally-significant negative correlation between TOSCA-3 scores and $e^* - e$ in the P_W and P_F treatments. The one-tailed Spearman test gives $\rho = -0.194$ ($p = 0.059$, N = 66).

TOSCA tests a sort of *generic* sensitivity to guilt that in fact turns out to be invariant across treatment conditions. As there seems to be some moral burden associated with cheap-talk promises for many people, TOSCA may be considered a measure of how easy it is for the worker

[16] Note, two additional variations of P_W with this very same property are conceivable, by having the firm first propose one of the terms {w, e*}, with the worker then setting the other. Both would introduce additional strategic uncertainties and there is no clear theoretical prediction whether the performance in either would be better or worse than in our P_W. For example, if we only test the case where the firm first sets e*, and we find that the performance is worse than in P_W, it is not clear whether the difference originates from added uncertainty or from the fact of worker not controlling e*. Once we have an intuitive hypothesis, it may be worthwhile to also conduct these alternative treatments for comparison in a future study. In this sense, when we say "keeping promise" of e*, it is a figurative and a simplified version of "sticking to one's own promised intention of division of surplus" which implies e is equal or close to e*.

to excuse herself from this burden. P_W has the effect of heightening workers' sensitivity regarding the moral issue of breaking promises. This issue is discussed briefly in Charness and Dufwenberg (2006), but to our knowledge there has been little or no work in this area. An alternative notion is that P_W sharply restricts any moral wiggle room (Dana, Weber, and Kuang, 2007) that might be present. Consistent with this, when we compare the guilt-feeling scores of workers with $e \geqslant e_0$, we find that the guilt scores in P_W are lower than those in P_F (one-tailed rank sum test $p = 0.065$).

5. Conclusions

We conduct one-shot gift exchange experiments to explore the implications of promises in contract design. We are unaware of any previous case of worker communication to firms in gift-exchange games, apart from suggested effort from the firm to the worker.[17] Contracts including suggested effort are endogenous, rather than the binary choice (contract or not) in typical "trust" games.

In the previous literature, bare promises have been largely ineffective.[18] However, in our experimental design, having the residual claimant (here the worker) make the proposal with a bare promise of effort seems to substitute for the lack of free-form communication and restrains opportunism. Our study suggests that communication might be more effective with endogenous contracts. Perhaps the sense of heightened responsibility leads to more pro-social behavior by the workers, as seen in Charness (2000a) and Charness *et al.* (2012). More research in this area is needed to delineate the conditions under which bare promises can be effective.

Several important findings emerge from our study. The wages proposed by workers are higher than the wages proposed by firms. When the worker's proposal includes the worker's own promise of effort, high wages are more likely to be accepted by the firms. When the firm's proposal includes the firm's specification of the worker's effort, there is no impact on the wages

[17] Examples of studies with suggested effort include (but are not limited to) the Prisoner's Dilemma in Charness (2000), Brown, Falk and Fehr (2004), Fehr, Klein and Schmidt (2007), and Charness *et al* (2012).
[18] Examples include Bracht and Feltovich (2009), Charness and Dufwenberg (2010).

accepted by the workers.

Our key finding is that the efficiency (i.e., the chosen effort) is higher when the worker rather than the firm proposes an effort level. The distance between the worker's promised effort and the actual effort choice is significantly smaller than the distance between the firm's requested effort and the actual effort.

We conjecture that people's tendency to live up to their own promises is indicative of a certain kind of underlying moral burden to not break these. To test for a potential confounding effect associated with belief-elicitation stages between salient game decisions during the experiments, we conducted an exit poll in the form of the standard TOSCA-3 questionnaire. The TOSCA-3 guilt scores prove not to be different across treatments, thus showing no evidence of a sample bias. We find a significant positive correlation between guilt scores and effort. When the contract includes a nonbinding specification of the effort level, guilt scores are positively correlated with promise-keeping behavior (i.e., negative correlation between TOSCA-3 scores and $e^* - e$ in the P_W and P_F treatments). These correlations are consistent with our conjecture.

Combining the fact that workers exert the highest effort when they propose the effort level with the observed positive effort-guilt correlation, we find that even workers with low general guilt scores exert high effort if they state that they will do so. This suggests that a worker who promises own effort is subject to some internal pressure, thus providing a motivation for the low-guilt-score workers to avoid the associated guilt feelings.

Our experiments provide a concrete example in which nonbinding promises in the contract discipline the contractor to create surplus. For the labor market, our results suggest that letting the worker propose the contract and claim the target level of final output could potentially be more effective in generating surplus.

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Appendix A: Sample Instructions (P_W)

Welcome to the economic decision experiment supported by several research funds. If you have any question, please raise your hand and one of us will come to your desk to answer it. From now on till the end of the experiment any communication with other participants is not permitted.

At the end of the experiment, you will receive 5 Yuan for showing up on time for the experiment and you will also be paid, in cash, the sum of the payoffs that you will have earned in the experiment. The payoffs in the experiment are represented by Experimental Currency Units (ECU). Your payment in the experiment will be converted to Yuan at a rate of 1 Yuan=4 ECU. **The more ECU you have earned in the experiment, the more monetary payoffs you will have.**

General Information

Before the experiment starts, you will be given an initial endowment of 35 ECU. There are totally 20 participants. 10 participants are the employers and the other 10 participants are the employees. You will take the role of employer (or employee) with the chance of one half. Each employer will be matched in group with one employee. The matching is anonymous, in other words, the employer (employee) will not know the identity of the employee (employer) whom he/she is matched with. Your decision can only be observed by the participant that you are matched with, and cannot be observed by all other participants.

Once the proposal is accepted, the employer pays a wage *w* to the employee. After receiving the wage *w*, the employee will choose an effort level *e* for the employer. The details are as follows.

In stage 1, **the employee makes a proposal** including the wage *w* (*w* is any integer between 0 and 100, including 0 and 100), which is required to be paid once both agrees, and the proposed effort level *e** (*e** is any integer between 1 and 10, including 1 and 10), which the employee is supposed to provide.

In stage 2, after receiving the proposal from the employee, the employer will decide whether to accept it. If the proposal is accepted, then the employer pays the wage *w* immediately and the experiment enters stage 3; if the proposal is rejected, the experiment ends.

In stage 3, (after the employer has paid the proposed wage *w*), the employee will decide the real effort level *e*. The decision of the real effort level *e* can either be the same as *e**, and or be higher or lower than the proposed *e**.

Note: the final payoffs of both parties will be decided by their real decision on wage *w* and effort *e*, and will not be decided by the proposed e*.

How to calculate payoffs

If the employer rejects the proposal, the final payoffs of both parties are their initial endowments of 35 ECU.

If the employer accepts the proposal, then the final payoffs of the employer and the employee are calculated by the following equations:

Final payoff of the employer:
Final payoff of the employer = 35 (initial endowment) + 10* effort (e) – wage (w)

Final payoff of the employee:
Final payoff of the employee =35 (initial endowment) +wage (w) –cost of real effort level e

Employees need to suffer a cost when they exert effort. The higher the real effort provided by the employee, the higher cost the employee bears. The relationship between the effort and the cost is as follows:

Effort e	1	2	3	4	5	6	7	8	9	10
Cost	0	1	3	5	8	12	16	20	25	30

Note: the final payoff of an employer cannot be negative. As a result, the employer can pay a wage of at most 10*e+35. When wage w is equal to or smaller than 10*e+35, the final payoff of the employer is 0 and the employee's final payoff is:
35(initial endowment) + all the employer has [10*e+35] – cost of real effort level e

Calculator:

To help you calculate your own payoff and the payoff of the other party in your group, we provide you a calculator on the screen. You can switch between the decision sheet and the calculator by pressing "Alt+Tab". On the calculator, choose a certain wage w and click "confirm," you will see the payoffs of the employer and the employee on various effort levels from 1 to 10.

Do you have questions on the instructions and the procedure? If you have any question, please raise your hand. One of us will then come to you.

Test of Self-conscious Affect-3 (TOSCA-3)

1. You make a mistake at work and find out a coworker is blamed for the error.

A. You would think: “Life is not fair.”

Detached: No(0)---Yes(4)

B. You would feel unhappy and eager to correct the situation.

No(0)---Yes(4)

2. You have recently moved away from your family, and everyone has been very helpful. A few times you needed to borrow money, but you paid it back as soon as you could.

A. You would be proud that you repaid your debts.

Beta Pride: No(0)---Yes(4)

B. You would return the favors as quickly as you could.

No(0)---Yes(4)

3. You are driving down the road, and you hit a small animal.

A. You would feel: “well, it was an accident.”

Detached: No(0)---Yes(4)

B. You’d feel bad you hadn’t been more alert driving down the road.

No(0)---Yes(4)

4. You and a group of coworkers worked very hard on a project. Your boss singles you out for a bonus because the project was such a success.

A. You would feel your hard work had paid off.

Beta Pride: No(0)---Yes(4)

B. You would feel you should not accept it.

Yes(0)---No(4)

5. You make a big mistake on an important project at work. People were depending on you, and your boss criticized you.

A. You would think: “ Well, nobody’s perfect.”

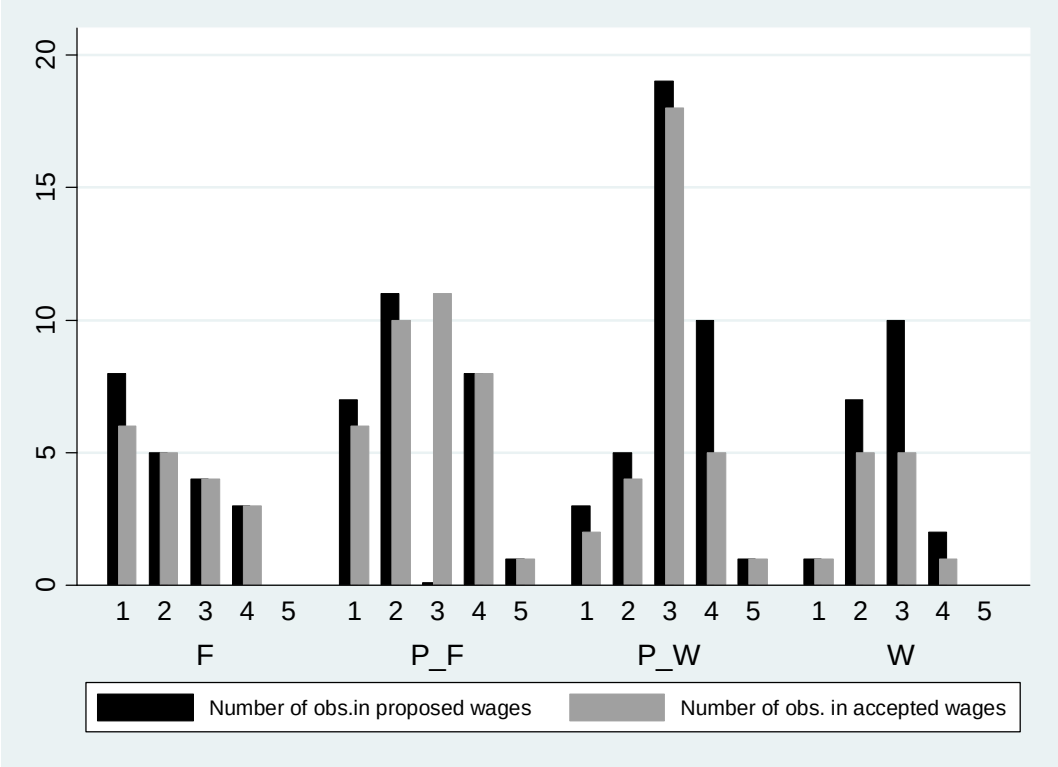
Detached: No(0)---Yes(4)

B. You would think: “I should have recognized the problem and done a better job.”

No(0)---Yes(4)

Appendix B

Figure B1: Distribution of Wages



Note: numbers 1-5 denote the wage intervals [0, 20], (20, 40], (20, 40], (40, 60], (60, 80], (80, 100] respectively.