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Employee types and endogenous organizational design: An experiment*

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Abstract

When managers are sufficiently guided by social preferences, incentive provision through an organizational mode based on informal implicit contracts may provide a cost-effective alternative to a more formal mode based on explicit contracts and monitoring. This paper reports the results from a laboratory experiment designed to test whether organizations make *full* effective use of the available preference types within their work force when drafting their organizational design. Our main finding is that they do not do so; although the importance of social preferences is recognized by those choosing the organizational mode, the significant impact managers' preferences have on the behavior of workers in the organization seems to be overlooked.

1 Introduction

A major research theme within organizational economics is how to motivate employees to exert well-directed effort. This issue is typically addressed using the principal-agent model as point of departure. In the standard version of this model the agent is assumed to solely care about his own monetary compensation and to dislike effort. Similarly so, the principal just wants to maximize her own net profit and does not care about the agent's well-being. Given these assumptions it is derived how monetary incentives should be optimally designed in order to motivate the agent to put in sufficient effort.

Many empirical studies have found, however, that people may have alternative motivations that go beyond material self-interest. Fairness, altruism, empathy and a preference to react in kind to kind or unkind actions of others (reciprocity) are among the various alternative motivations identified. The presence of such 'social preferences' may have profound implications for the provision of effort incentives. In the context of the principal-agent relationship, for instance, workers are more easily persuaded to exert

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effort when they know that their manager cares about their well-being and thus will reward higher effort with a larger (non-contractible) bonus. Effort levels will then be higher in equilibrium, thereby increasing efficiency. For this reason it may actually pay for firms to select and hire 'empathic' managers who do not solely care about profit maximization; their personality type (i.e. social preferences) helps in overcoming a difficult incentive problem with the workers (cf. Rotemberg and Saloner (1993), Rotemberg (1994), and Hermalin (2001, Section 4.2)). In the same spirit, firms may want to assign particular preference types within their work force to jobs where these social preferences are most effective.

In this paper we leave aside the question of screening and selection of employees on the basis of their social preferences. Rather, we intend to investigate whether organizations will make optimal use of the existing social preferences within their work force, by choosing an organizational design that is particular conducive to their effectiveness. Because it is notoriously difficult to gather field data on this, we make use of laboratory experiments to test the relevant theoretical predictions at hand. Compared to the existing literature, a novel and important feature of our experiment is that we explicitly study how organizational design choices and the endogenous allocation of jobs to employees vary with the observed characteristics ('track records') of these employees.

In our experiment we simplify matters by assuming that there are two types of organizational modes, each corresponding to a different role ('leadership style') for managers. In the first type managers are hired to inspire and to motivate the work force. Rather than implementing a formal system that relies on explicit incentive contracts and active monitoring, managers should instill and maintain a culture that hard work will be rewarded by the organization. This implicit contract then substitutes for a more costly explicit performance measurement and evaluation system. We represent this particular organizational mode in highly reduced form with the motivation game M depicted in Figure 1a below. This game corresponds to the trust game used by Kreps (1990) to model corporate culture. It also represents a simplified version of the game used by Rotemberg and Saloner (1993) to study the impact of leadership style on workers' incentives to innovate.[1]

[Insert Figure 1 about here]

In game M a worker first decides whether to put in (high) effort or to shirk. In case the worker shirks, it is assumed that he does not get a reward (on top of his wage). If, however, the worker exerts effort, the manager decides whether to reward him with a bonus or not. This bonus is not part of an enforceable pay-for-performance contract though. A selfish manager will therefore not pay the bonus and, anticipating this, the worker will not put in high effort. If, however, the manager could credibly commit to pay the bonus (only) when the worker exerts effort, the worker would be motivated to do so.

The second type of organizational mode relies more strongly on formal contracts and explicit monitoring. Here managers are hired to supervise and to monitor workers. Workers receive a given wage for putting in effort, but are fined or fired whenever they are caught shirking. In line with Calvo and Wellisz (1978), the role of the manager is then to supervise, i.e. to check whether the worker does not deliver substandard work. We model this particular situation with the inspection game I depicted in Figure 1b,

[1] In spirit the M-game corresponds to the 'loose supervision' regime in the model of supervision and workgroup identity studied by Akerlof and Kranton (2005). The inspection game I (to be discussed shortly) then corresponds to their 'strict supervision' regime.

for high (I_H) and low (I_L) inspection costs separately. Here the manager (as a supervisor) first decides whether to monitor or not. If she does so, the only relevant option for the worker is to put in high effort. But if the manager decides not to monitor, the worker decides whether to shirk or to exert (high) effort. Payoffs are such that selfish workers will shirk if not monitored. Realizing this, the manager commits to monitor in the first stage.[2]

Assuming selfish preferences, the worker is predicted to exert effort under organizational structure I whereas under structure M he does not. Structure I is thus more efficient, and therefore likely to be preferred by the owner of the firm (assuming that she shares in the efficiency gains). Things change when employees may have social preferences. Putting a very empathic (or reciprocal) employee in the manager's position under structure M will then yield first best. This holds because, anticipating that he will be rewarded with a bonus by the empathic manager, the worker puts in effort and does not shirk. And compared to structure I, organizational mode M saves on the costs of the monitoring technology.[3] Structure M thus becomes relatively more attractive the more empathic the employees are. Another intuitive prediction is that the less costly the inspection system under structure I is, the more it takes for the owner to prefer the M structure. Lower inspection costs can effectively be represented in Figure 1b by having payoffs of 440 (instead of 360) after the manager's decision to monitor. More generally, theory predicts that the M structure which relies on empathic managers becomes less likely the more cost-effective the formal performance measurement system under mode I is.

The experiment that we use to test the above predictions consists of two parts. In part one subjects make decisions in 9 different games that all have the same structure as those in Figure 1. That is, a first mover (player A) first decides whether to 'stay-out' or to 'enter'. Only if player A enters, player B is called on to choose between left and right. Subjects both take decisions in the player A role and conditional decisions in the player B role. In that way the first part generates an individual 'track record' (e_i,r_i), with e_i (r_i) the number of entry decisions ('right' choices) the subject made. This individual track record can be seen as a (imprecise) measure of the subject's preference type.

In part two subjects first learn their role, either owner of a firm or employee. Roles are kept fixed during all 15 periods of this part. In the first five periods the organizational mode is exogenously given, by game M say. In each period firms consisting of one owner and two employees are formed, based on a strangers design. All firm members observe the track records of the two employees (but not of the owner). Based on this information, the owner decides which employee to put in the manager's (i.e. second mover) position.[4] After that the two employees play the corresponding game, yielding payoffs to them as reflected in Figure 1a. The owner's payoffs equal those of the manager (and are private

[2] Game I reflects a simplified version of an inspection game where the manager can commit to a particular inspection strategy. In a more general setup, the manager commits to a particular inspection probability, such that the worker is just induced to exert effort with probability one; see Section 5 in Avenhaus, von Stengel, and Zamir (2002) for a full discussion and justification of this game. In their real effort experiment Dickinson and Villeval (2004) also use a inspection game in which the principal/manager can commit ex ante to a given monitoring technology. For simplicity, here we restrict the manager to just two inspection probabilities, either zero (no monitoring at all) or one (always monitor).

[3] This explains why the maximum joint payoffs for the worker and the manager under M (1100) are higher than the maximum joint payoffs under I (980). In the Appendix we provide an elaborate justification of the particular parameterization depicted in Figure 1 (and used in the experiment).

[4] Clearly, in reality the manager's and worker's position may require different capabilities and a given employee may not be suitable for both positions. In the experiment we focus on a situation where such differences in ability requirements are of lesser importance. A real world example in which this is the case is provided by the field experiment study of Bandiera et al. (2007a, 2007b). They consider a soft fruit producing firm where the main task of workers is to pick fruit, whereas managers have to monitor the quality of picking and to organize logistics. Both managers and workers are hired from the same population of Eastern European university students that are of similar age and background.

information).

The next five periods consider the other organizational mode, here game I of Figure 1b. The sequence of events is the same as in periods 1 to 5. Moreover, also in game I the owner's payoffs correspond with those of the manager, which is now the first mover in this game. In the final five periods the organizational mode is made endogenous and owners first choose between game M and game I, before they assign their workers to a particular position. Overall four sessions are conducted, that differ in the order in which the two organizational modes are played and in the version of the inspection game considered (I_L or I_H).

Our main findings can be summarized as follows. The informational value of subjects' track records lies in their r_i-values. In particular, in both games employees with the first mover role are more likely to 'enter' the higher the r_i value is of the second mover with whom they are matched. So indeed, the more 'empathic' second movers are, the higher the willingness of first movers to enter the reciprocal relationship. Firm owners seem to overlook this mechanism, however, when assigning their employees to different roles. They naively assume that employees' decisions are mostly affected by their own track record characteristics only. As a result, in the M-game they typically assign the role of manager (second mover) to the employee with the *lower* r_i-value in his track record, i.e. to the more selfish employee. These assignments appear suboptimal, because profit would have been higher if they would assign roles the other way around. Also the choice between different organizational modes is not guided by the employees' r_i values (but rather by their e_i values). Nevertheless, the loss owners bear due to their suboptimal allocation of roles is rather small and they in general do correctly realize that social preferences within their work force make the M-mode relatively more attractive. Overall we therefore conclude that owners in our experiment do recognize the importance of social preferences for organizational outcomes, but do not make use of the available preferences within their work force to the fullest extent possible.

Numerous laboratory experiments have already been conducted that relate to the above discussed issues of endogenous organizational design. In a series of important papers, for instance, Ernst Fehr and various coauthors have studied the choice of optimal incentive contracts. A main common finding is that social preferences can serve as a useful (i.e. cost-effective) contract enforcement device and contracts may therefore deliberately be left incomplete.[5] In the terminology used before, in practice firms may prefer implicit contracts over explicit incentive contracts, although under selfish preferences the latter would be optimal. Similarly so, others have explicitly studied the effect of monitoring on behavior in more detail; see e.g. Dickinson and Villeval (2004) and Schweitzer and Ho (2005). Compared to these previous experiments, we study (implicit and explicit) contracts and monitoring in highly reduced form (cf. Figure 1). The main contribution of our experiment is that we explicitly relate these (reduced form) organizational choices to the observed characteristics ('track records') of the employees that are to be affected by these instruments. Apart from that, another new feature is that we explore the endogenous allocation of roles within organizations.

This paper proceeds as follows. Assuming that employees may care about the well-being of others, we derive in the next section the formal predictions and hypotheses that are put to the test. Section 3 presents the details of our experimental design whereas Section 4 reports the results. The final section summarizes and concludes.

[5] See e.g. Fehr et al. (1997, 2007), Fehr and List (2004) and Fehr and Schmidt (2000, 2004).

2 Theoretical predictions and hypotheses

Our experiment is based on the M-game and the I-game as depicted in Figure 1.[6] Both games have the same general decision structure, which is reflected in Figure 2 below. Player A first chooses between Stay Out and Enter. If player A enters, player B subsequently chooses between Left and Right. Payoffs are such that choosing left yields B the most in monetary payoffs, whereas right corresponds to sacrificing to reward A for the 'kind' choice to enter. From $d > c > b > a$ it immediately follows that, if both players are selfish, (Out, Left) is the unique subgame perfect equilibrium.

[Insert Figure 2 about here]

Social preferences may lead players away from the inefficient (Out,Left) outcome. Various alternative motivations have been identified in the literature – like fairness, altruism, empathy and reciprocity – and a number of theoretical models have been developed to capture these types of social preferences in a formal way. Prominent examples include Fehr and Schmidt (1999)´s model of inequality-aversion, Charness and Rabin (2002)´s model of quasi-maximin preferences, and Rabin (1993)´s model of intention-based reciprocity (see also Dufwenberg and Kirchsteiger (2004)). Although these models can lead to quite different predictions in particular situations, a common theme they share is that social preferences may be efficiency enhancing. It is this common aspect that we want to emphasize here.[7]

To illustrate the impact alternative motivations may have, we capture social preferences in a very simple and stylized way. Let π_i and π_j denote player i's and j's monetary payoffs. Following Charness and Rabin (2002), we assume that player i's preferences take the following form (with $i \neq j$ and $i, j \in \{A, B\}$):

$$\begin{aligned} U_i(\pi_i, \pi_j) &= \rho_i \cdot \pi_j + (1 - \rho_i) \cdot \pi_i \quad \text{if} \quad \pi_i > \pi_j \\ &= \sigma_i \cdot \pi_j + (1 - \sigma_i) \cdot \pi_i \quad \text{if} \quad \pi_i \leq \pi_j \end{aligned} \tag{1}$$

In this specification, parameter ρ_i gives the weight player i attaches to the other player's payoffs when she herself is ahead. Parameter σ_i reflects the corresponding weight when she is behind. Without any restrictions on ρ_i and σ_i utility function (1) can capture a range of different motivations. Charness and Rabin (2002) use the results of a variety of simple games with a similar decision structure as in Figure 2, to estimate the values of ρ_i and σ_i. They find that on average players do not care about other players' payoffs when they are behind, but put a positive weight on the well-being of others when they are ahead. In line with their estimates we therefore assume that $0 < \rho_i < 1$ and that $\sigma_i \leq 0$. These assumptions incorporate the inequality-aversion model of Fehr and Schmidt (1999), which corresponds to $\sigma_i < 0 < \rho_i < 1$ and $|\sigma_i| \geq \rho_i$. They are also in line with Hermalin (2001, Section 4.2), who assumes that a player suffers from 'remorse' only if he is ahead.

[6] In the Appendix we discuss a basic reduced form model of endogenous organizational design that underlies these two specific games.

[7] Our experiment thus neither should be taken as an attempt to discriminate between various types of social preferences, nor as providing a test of a particular version of social preferences per se. Although in this section we use quasi-maximin preferences to derive and illustrate the main implications in a parsimonious way, similar predictions would have been obtained under relevant alternative specifications. For instance, incorporating Dufwenberg and Kirchsteiger (2004)'s type of intention-based reciprocity motivations leads to qualitatively the same predictions.

Assuming preferences as in (1), the game is again easily solved by backward induction. Player B will choose Right whenever $\rho_B \geq \rho^* \equiv \frac{d-c}{d-a}$.[8] Anticipating this, player A enters only when ρ_B exceeds this threshold. Hence the predicted outcome is Out when $\rho_B < \rho^*$ and (Enter, Right) in case $\rho_B \geq \rho^*$. (Outcome (Enter,Left) is never observed on the equilibrium path.) This establishes that when player B cares sufficiently about A's well-being, the inefficient outcome Out is avoided. Note that ρ_i is the key parameter here. Following Rotemberg and Saloner (1993), we say that a player is more *empathic* the higher his ρ_i is.

To capture the role of the owner of the firm, next assume there is a third player C who decides on role assignment. In particular, player C has two employees at her disposal, numbered such that $\rho_1 \leq \rho_2$. Her task is to decide which employee gets role A and who gets role B. In contrast to her two employees, for ease of exposition player C is assumed to be selfish. Her monetary payoffs equal some weighted combination $\mu_A \cdot \pi_A + (1-\mu_A) \cdot \pi_B$ of the monetary payoffs of A and B;[9] effectively, player C cares about efficiency. Then, knowing that in equilibrium the outcome either equals Out or (Enter, Right), player C prefers to assign role B to the more empathic employee ρ_2. This follows because this maximizes the probability that the more efficient outcome (Enter,Right) is obtained.[10]

Apart from role assignment, player C may possibly also choose between game M and game I. These two games share the same decision structure of Figure 2, but payoffs are different. In particular, $b_I > b_M$ and $c_I < c_M$ (cf. Figure 1).[11] Moreover, in game M player C gets the same as player B (so $\mu_A = 0$) whereas in game I her monetary payoffs equal those of player A ($\mu_A = 1$). The idea here is that the owner C gets the same as the manager, which corresponds to player B in the M-game and player A in the I-game. Given this payoff structure, player C will choose game M only when outcome (Enter,Right) is expected in that game. This yields her c_M whereas game I gives her at most c_I. If, however, outcome Out would result in game M, player C prefers to choose game I. The latter yields her at least b_I, which exceeds b_M.

The predicted outcome within each game depends on how the player B's level of empathy ρ_B compares to the critical value ρ^* for that game, viz. either ρ^*_M or ρ^*_I.[12] If $\rho_2 > \rho^*_M$ player C is best off by choosing game M (and putting employee 2 in position B). Otherwise, C is better off in the I-game. Hence we obtain that C is more likely to choose game M the more empathic her employees are.

Finally, we analyze the role of inspection costs in the I-game. Higher inspection costs correspond to lower values for b_I. If player C would be perfectly informed on her employees' empathy parameters ρ_i, variations in b_I would not affect the predicted outcomes (as long as $b_I > b_M$). However, it seems reasonable to assume that parameter ρ_i is employee i's private information. The owner may have a good idea about what the value of ρ_i is, but is not completely sure about its exact value. In particular, the owner believes that ρ_i is drawn from a particular probability distribution. If she chooses the I-game

[8] Here we assume that in the knife-edge case where player B is indifferent ($\rho_B = \rho^*$), he chooses Right for sure.

[9] In the experiment player C's payoffs are private information to her, so A and B cannot be guided by empathic feelings towards player C. This justifies that (1) does not include π_C.

[10] Note that effectively role assignment makes a difference only when $\rho_1 < \rho^* < \rho_2$. Then the outcome is (Enter, Right) when employee 2 is put in the B-role and Out when employee 1 is put in the B-role. Because $c > b$ player C prefers the former assignment. Moreover, because in each of these two outcomes all players earn the same, exactly the same predictions follow when player C is also guided by social preferences similar to those in (1).

[11] As explained in the Appendix, the first inequality $b_I > b_M$ reflects the idea that the value of the worker's effort exceeds the overall costs of a formal monitoring system. Restriction $c_I < c_M$ derives from the fact that installing a monitoring technology brings about (fixed) investment costs, even when it is not actively used in the end.

[12] For the parameters chosen in our experiment (cf. Figure 1) we have $\rho^*_M = \frac{1}{3}$ and $\rho^*_I = \frac{1}{6}$.

then, her expected payoffs equal a weighted average of b_I and c_I. If she opts for the M-game instead, she gets a weighted average of b_M and c_M. Other things equal, the expected payoffs of choosing the I-game are lower the lower b_I is. Player C is thus more likely to choose M over I_H than over I_L (cf. Figure 1).

Taken together, we obtain the following five predictions that are put to the test:

1. The more empathic player B is (i.e. the higher ρ_B is), the more likely it is that he chooses Right;
2. The more empathic player B is (i.e. the higher ρ_B is), the more likely it is that player A enters;
3. Players C will assign the role of player B to the more empathic employee within her work force (i.e. to the one with the higher ρ_i-value);
4. The more empathic the work force is (i.e. the higher ρ_2), the more likely it is that player C prefers the M-game over the I-game;
5. Ceteris paribus, player C is more likely to choose M over I_H than over I_L.

These formal predictions correspond to the intuitive predictions discussed in the Introduction. To see this, recall that in game M the worker moves first whereas the manager moves second. The first prediction then reads: the more empathic the manager is, the more likely it becomes that he will reward high effort with a bonus. As a result, the worker has a stronger incentive to put in high effort (cf. the second prediction). In contrast, in game I the manager moves first and the worker moves second. Then the more empathic the worker is, the more likely it is that he chooses high effort. Anticipating this, the manager is more likely to abstain from costly monitoring.

Turning to owner behavior, the third prediction implies that in the inspection mode, the more selfish employees within the firm are the managers. In contrast, in the motivation mode the most empathic types are assigned the role of manager. Managers in the inspection mode will therefore on average be more selfish than managers in the motivation mode. When owners can choose between organizational modes, we expect that they will opt for the motivation game M only when they have at least one rather empathic type among their employees. This employee will then be given the role of manager. Otherwise the inspection game will be chosen and the least empathic type will be given the managerial position. Finally, the more costly the formal monitoring system is (structure I_H versus I_L), the more likely it is that structure M is chosen.

Like in reality, in the experiment employees do not observe the level of empathy of their colleagues precisely, and neither do so owners C. Based on an observable track record of past choices, however, an estimate r_i of a player's empathy level ρ_i can be obtained. The formal hypotheses we want to test then correspond to predictions 1 through 5 above, where ρ_i is replaced by its estimate r_i. Exactly how individual track records are generated in the experiment is explained in the next section.

3 Experimental design

Our experiment is based on a 2 by 3 treatments design. In each session we kept the two types of games (game M and game I) fixed. Between sessions we varied the particular version of the inspection game, having either the one representing low inspection costs (I_L) or the other one with high inspection costs

Table 1: Overview of sessions and treatments (in part 2)

session	rounds $1-5$	rounds $6-10$	rounds $11-15$
1	I_L	M	I_L versus M
2	M	I_L	M versus I_L
3	I_H	M	I_H versus M
4	M	I_H	M versus I_H

(I_H). We ran four sessions in total, which differed according to (the order of) the treatments considered. Table 1 provides an overview. All sessions were run in May 2007 at the LINEEX laboratory of the University of Valencia. Overall 180 subjects participated, with 45 subjects per session. The subject pool consisted of undergraduate students at the University of Valencia. The vast majority of them (88%) were students in Economics or Business, 57% were male. They earned on average 24.5 euros in somewhat less than 2 hours, including a show up fee of 7 euros.

Each sessions consisted of two parts. At the beginning of the experiment subjects were informed about this. They were also informed that possibly some of the choices they made in part 1 would become observable to some other participants in part 2.[13] In particular, the instructions for part one explained that:

> "...It may happen that in part two some other participants get some information about the decisions you made in part one. It may also happen though that none of your part one decisions will ever become known to any other participant..."[14]

Apart from this information, subjects were kept ignorant about the actual content of part 2 until that part actually started.[15]

In the first part subjects made decisions for a series of nine extensive form games that all have the same setup as in Figure 2. We used a neutral frame for the entire experiment, with A's choosing between A1 (Stay Out) and A2 (Enter) and B's choosing between B1 (Left) and B2 (Right). Table 2 provides an overview of the games used. All subjects made choices for both roles, in all nine games.[16] Overall they thus made 18 choices in part 1. They were informed that at the end of the experiment one of these choices would be randomly selected and paid (see below for more on this).

The nine different games of part 1 have been chosen as follows. The first three games are just upscaled versions (by a factor of five) of the M-game, the I_H-game and the I_L-game, respectively. These games differ in two important ways. First, they correspond to different ratios of the amount player B has to sacrifice in order to give player A a particular reward. According to the theory discussed in the previous section, player B is only willing to give this reward if his empathy parameter ρ_i exceeds threshold ρ^*.

[13] In fact, the probability that none of a subject's part 1 choices would ever become observable to any other participant in part 2 equalled $\frac{1}{3}$ for each subject (see below).

[14] This announcement has the clear disadvantage that it may influence subjects' decisions in part 1. We considered it necessary though, in order to avoid any potential impression of deception. Moreover, if we would not make the announcement, subjects would be surprised at the start of part 2 when their choices of part 1 became known, and might think that it is quite likely that another "surprise" will follow. This might then affect their behavior in part 2.

[15] The experiment was conducted in Spanish. An English translation of the instructions can be found at the first author's website: http://www.uv.es/acunat/instructions_employee.pdf.

[16] First they made 9 decisions as player A, after that they made 9 (conditional) decisions as player B. The games were presented in the same order as in Table 2.

Table 2: Overview of the games in part one

game	A stays out	If A enters, B chooses	sacrifice	reward	ρ^*
	(b, b)	(a, d) vs. (c, c)	$d - c$	$c - a$	
I	(1400,1400)	(950,3650) vs. (2750,2750)	900	1800	0.33
II	(1800,1800)	(200,2900) vs. (2450,2450)	450	2250	0.17
III	(2200,2200)	(200,2900) vs. (2450,2450)	450	2250	0.17
IV	(1400,1400)	(200,2900) vs. (2450,2450)	450	2250	0.17
V	(1800,1800)	(950,3650) vs. (2750,2750)	900	1800	0.33
VI	(2200,2200)	(950,3650) vs. (2750,2750)	900	1800	0.33
VII	(1400,1400)	(1250,3950) vs. (2600,2600)	1350	1350	0.5
VIII	(1800,1800)	(1250,3950) vs. (2600,2600)	1350	1350	0.5
IX	(2200,2200)	(1250,3950) vs. (2600,2600)	1350	1350	0.5

Remark: It holds that $\rho^* = \frac{sacrifice}{sacrifice+reward} = \frac{(d-c)}{(d-c)+(c-a)}$.

The latter differs between the M-game and the two I-games, see the final column in Table 2. Second, the M and I games also differ in the amount player A forgoes by choosing to enter.

The remaining six games have been chosen using games I through III as starting point. Game IV combines the payoffs of the 'stay-out' option of the M-game with the sacrifice-reward values of the two I-games. Games V and VI do so vice versa. The final three games combine the stay-out payoffs of games I through III with equal sacrifice-reward values such that an ρ^* of one half results.

We used the first part to generate a 'track record' for each individual. Such a track record consisted of a two-tuple (e_i, r_i), with $e_i, r_i \in \{0, 1, ..., 9\}$ the number of enter choices subject i made as player A and the number of 'right' choices s/he made as player B, respectively. Note that this track record does not indicate to which of the nine games the e_i enter choices and the r_i 'right' choices belong. In that sense the track record only provides aggregate (or general) information.

At the start of the second part subjects first learned their roles, being either an owner ("person C") or an employee ("group member"). Subjects kept the same role throughout the entire second part. Roles were assigned as follows. In each session we ranked the 45 subjects on the basis of the number of 'right' choices r_i in their track record. Subjects with rank 16 to 30 were assigned the role of owner and the remainder the role of employee. This procedure – unknown to the subjects – secured that we had enough variation in empathy types among employees.

Once roles were assigned, subjects played 15 periods. At the beginning of each period, firms (called "groups" in the experiment) consisting of one owner and two employees were exogenously formed. We used a stranger design, in which each subject met each other subject exactly once. Subjects were thus never confronted with the same firm member again and they were explicitly informed about that.

The 15 periods were divided into three blocks of five. In the first five periods, either the I_L (I_H) game or the M game was played in isolation (see Table 1 above). In each of these periods the owner first decided, on the basis of the observed track records, which role to assign to each of her two employees. The owner thus observed (e_1, r_1) and (e_2, r_2) of her two assigned employees, and so did the two employees of each other.[17] One of the employees should be assigned the role of player A, the other one should be given the role of player B. After employees were assigned their roles, they played the game that applied, making decisions for the role assigned. This determined their period payoffs, as given in the respective

[17] In the instructions owners were explicitly informed that their two employees observed the track record of each other.

extensive form games. The owner received a period payoff equal to those of player A in the I-game and equal to those of player B in the M-game. To easily remind owners about this fact, we labelled the I-game as game "Azul" and the M-game as game "Blanco" (and we printed these games against the corresponding background color). The complete setup of the game was common knowledge, except for the payoffs of the owner, which were known to players C only. We did so to ensure that employees' decisions were not guided by empathic feelings towards player C.

In periods 6 to 10 the other game was played (cf. Table 1). Again, in each period firms were exogenously formed and the owner first decided on role assignment. After that, the two employees made their respective choices and period payoffs were obtained. In the final five periods 11 to 15, the owner first chose which game to play. Once a game had been chosen, the order of decisions was as before.

Except for the decisions made within their own firm in a given period, subjects did not get information on how the other subjects behaved in part 2. Although they may have recorded the decisions made by previous firm members in earlier periods, this information is of limited value because they would never meet with the same other subject again. The observable track records they obtained from part 1 were thus the main clue they could use to predict the behavior of other subjects within their firm. The track record of owners was never made public. Therefore, for one third of the subjects the decisions made in part one remained private information throughout the experiment.

Payoffs were determined in the following way. From the first part one game was selected at random. For this particular game subjects were then randomly coupled in pairs and were randomly assigned roles.[18] The individual payoffs that resulted from these pairings gave the earnings for the first part. To this amount we added the overall payoffs from the second part. The conversion rate was such that 500 points in the experiment corresponded with 1 euro in money. Apart from that, subjects received a show up fee of 7 euros.

The experiment was computerized using the z-tree programming package (cf. Fischbacher (2007)). Subjects started with written instructions for the first part, which were also read aloud by the experimenter. At the end of the first part subjects received new instructions for the second part. Before the second part started, subjects played one practice period. After finishing the second part subjects filled in a short questionnaire. Having completed this, the experimental points earned were exchanged for money and subjects were paid individually and discreetly.

4 Results

In this section we first describe the distribution of individual 'track records' as generated by the choices subjects made in part one. Next we look at how players A and B behave in the three games M, I_H and I_L at hand. We explicitly test our first two hypotheses that: (i) B's are more likely to reward A's entry when they have a higher r-value in their own track record and (ii) A's in turn are more likely to enter the higher this r_B-value is. The final subsection looks at the organizational design choices made by players C. It is tested whether they assign the B-role to the employee with the higher r-value in his track record and whether they are more likely to choose the M-game when the latter r-value is higher.

[18] Because we had an odd number of subjects within each session (45), we actually assigned 22 subjects the A-role and 23 subjects the B-role. The decision of one randomly selected A-subject was then used twice to determine the payoffs of two different B-roles.

Table 3: Overall distribution of individual track records

	number of e choices										
# of r's	0	1	2	3	4	5	6	7	8	9	Total
0	**10**	11	9	4	4	3				1	42
1	1	**2**	4	5	5	4		2			23
2			**2**	5	1	7	1		2		18
3		2	5	**3**	6	4	3		3	1	27
4			3	6	**13**	5	4			2	33
5		1	2	3	4	**6**	1				17
6			1		1	2		1	1		6
7					1	2	1				4
8			1			1					2
9					2	1	1		1	**3**	8
Total	11	16	27	26	37	35	11	3	7	7	180

Remark: Numbers on the diagonal where $e_i = r_i$ appear in bold.

4.1 Individual track records

In part one each subject makes nine entry decisions as player A and nine (conditional) choices between Left and Right as player B. From these 18 choices, an individual track record (e_i, r_i) results. Table 3 gives the overall distribution observed for the 180 subjects in our experiment.

On average subjects choose to enter 3.76 times as player A and as player B they choose Right on average 2.83 times. As the frequency distribution makes clear though, there is quite some heterogeneity. Most observations are scattered around the diagonal, suggesting that the number of Enter and Right choices are correlated. Indeed, for our full sample of 180 subjects the Spearman rank correlation between e and r choices equals 0.48 and is highly significant ($p = 0.000$).[19] Moreover, many entries in Table 3 are above the diagonal. This indicates that subjects typically choose Enter somewhat more often as player A than they choose Right as player B, which is corroborated by formal signrank tests.[20]

There are some minor differences in the observed track records across sessions. Comparing the number of r-choices by means of a Kruskal-Wallis test, we do not find a significant difference (at the 5% level) between the four sessions ($p = 0.0723$). For the number of enter choices there are some differences though ($p = 0.0131$). Both ranksum and Kolmogorov-Smirnov tests reveal that subjects in session 3 have a lower e-value than those in sessions 1 and 4. In the former the average equals 2.87, in the latter two 4.13 and 3.96, respectively. But even in session 3 the average e-value (2.87) exceeds the average r-value (2.44). The main observation of a substantial correlation between e and r-choices with (slightly) higher e-choices thus applies to all sessions.

As explained in the previous section, after part one we ordered the subjects on the basis of their number of r-choices. The middle third given by ranks 16 to 30 were assigned the role of player C. In sessions 1 and 4 these were subjects with $r_i = 2$ to $r_i = 4$, whereas in sessions 2 and 3 these where subjects with $r_i = 1$ to $r_i = 3$ and with $r_i = 1$ to $r_i = 4$, respectively. Recall that in every period players C were assigned one employee from the low-r group and another one from the high-r group.

[19] This also holds when we compute correlations for each of the four sessions in isolation and when we compute standard (instead of Spearman rank) correlations.

[20] Only in session 3 we do not find a significant difference (at the 5%-level) in indivivual e and r scores. But for the three other sessions we do, as well as overall.

Table 4: Number of outcomes by period for Game I_L

Outcome	Periods 1-5	Periods 6-10	Periods 11-15	Total
Out	62 (83%)	73 (97%)	70 (95%)	205 (92%)
E&L	7 (9%)	1 (1%)	2 (3%)	10 (4%)
E&R	6 (8%)	1 (1%)	2 (3%)	9 (4%)
Total	75 (100%)	75 (100%)	74 (100%)	224 (100%)

Table 5: Number of outcomes by period for Game I_H

Outcome	Periods 1-5	Periods 6-10	Periods 11-15	Total
Out	55 (73%)	61 (81%)	30 (75%)	146 (77%)
E&L	11 (15%)	5 (7%)	6 (15%)	22 (12%)
E&R	9 (12%)	9 (12%)	4 (10%)	22 (12%)
Total	75 (100%)	75 (100%)	40 (100%)	190 (100%)

4.2 Employees' choices

We next look at the decisions players A and B make in part 2 of the experiment. Recall that each of the three games M, I_H and I_L has the same decision structure as in Figure 2. Tables 4 through 6 provide an overview of the outcomes observed.

In periods 1 to 10 the game was exogenously given whereas in the last five periods it was endogenously chosen by player C. The predominant outcome in game I_L is that player A chooses Out. In the very few instances that A chooses to enter, player B is about equally likely to choose either Left or Right. The latter also applies for game I_H, but there player A is somewhat more likely to enter. Finally, in the motivation game it is (much) more likely that player A enters than in the two inspection games. But there player B also appears more likely to choose Left over Right.

The first hypothesis we want to test is whether a subject with a higher r-value in his/her track record is more likely to choose Right if assigned the role of player B. For the three games together we have overall 237 cases in which player A chooses to enter and thus B gets to make a choice. We use these observations to estimate a random effects probit model of the probability that B chooses Right.

The four specifications reported in Table 7 all include player B's r-value from his track record. Apart from that, in the first column two 0/1-dummies for respectively the I_H-game and the M-game are incorporated (so I_L serves as baseline), together with a time trend 'period'. The second column adds the remaining variables of B's and A's track record. These two specifications do not distinguish between whether the game played is the first or the second exogenous game played in a row, or whether it is endogenously chosen by player C. Specifications (3) and (4) add additional zero-one dummies to identify

Table 6: Number of outcomes by period for Game M

Outcome	Periods 1-5	Periods 6-10	Periods 11-15	Total
Out	84 (56%)	98 (65%)	130 (70%)	312 (64%)
E&L	47 (31%)	40 (27%)	47 (25%)	134 (28%)
E&R	19 (13%)	12 (8%)	9 (5%)	40 (8%)
Total	150 (100%)	150 (100%)	186 (100%)	486 (100%)

Table 7: Random effects probit estimations of B choosing Right

	(1)	(2)	(3)	(4)
r_i-own	0.111**	0.186**	0.105**	0.180*
	(0.050)	(0.095)	(0.049)	(0.095)
I_H-game	0.056	0.189	-0.113	0.068
	(0.486)	(0.515)	(0.625)	(0.687)
M-game	-0.689	-0.612	-0.635	-0.478
	(0.444)	(0.458)	(0.558)	(0.582)
period	-0.062**	-0.069**	-0.150*	-0.166*
	(0.028)	(0.029)	(0.082)	(0.086)
e_i-own		0.032		0.027
		(0.093)		(0.092)
e_i-other		-0.069		-0.088
		(0.070)		(0.072)
r_i-other		0.147*		0.152*
		(0.089)		(0.091)
second			0.712	1.007
			(1.407)	(1.457)
endo			1.179	1.487
			(1.165)	(1.207)
I_H·second			0.408	0.171
			(1.452)	(1.505)
M·second			-0.233	-0.471
			(1.397)	(1.442)
I_H·endo			-0.207	-0.410
			(1.073)	(1.115)
M·endo			-0.279	-0.538
			(0.925)	(0.959)
constant	-0.177	-0.803	0.021	-0.575
	(0.483)	(0.718)	(0.584)	(0.856)
Log L	-126.324	-124.673	-125.123	-123.324
N	237	237	237	237
rho	0.452***	0.490***	0.433***	0.472***
LR-chi2	24.607***	27.909***	27.008***	30.606***

Remark: Standard errors in parentheses. ***/**/* indicates significance at the 1/5/10% level. Rho gives the proportion of overall variance contributed by the panel-level component; its significance is based on a likelihood ratio test that rho=0. LR-chi2 reports the test statistic from testing that all coefficients (except the constant) are zero.

potential order and treatment effects in this regard.[21]

In line with our first hypothesis, player B's own r-value is always significant. Also the r-value of player A appears (marginally) significant. The latter suggests that player B's reaction to A's entry choice partially depends on how A would have behaved were he in B's position. The e-values in the track records of A and B do not have a significant impact. Although Tables 4 through 6 above suggest that B is less likely to choose Right in the motivation game, the probit estimates for the M-game dummy are insignificant (but do have the expected negative sign). The time trend 'period' is significantly negative, indicating that the propensity to choose Right decreases over time. We summarize our main finding from Table 7 in Result 1.

Result 1. B's with a higher r-value in their track record are more likely to choose Right in all three games.

We next turn to A's choice between Enter and Out. This choice is observed for every interaction in part 2, so we have 900 observations in this case. Table 8 gives the random effects probit estimates of the probability to enter.

In all specifications, the r-value in B's track record (first row) is a highly significant determinant of A's decision to enter. The higher r_B is, the larger A's entry propensity. Entry is also significant more likely in the I_H and the M-game as compared to the I_L-game. Apart from that, also player A's own r-value increases his probability of choosing enter. The e-values in the employees' track records do not play a significant role though. In particular, player A's own e-value does not provide much information about his probability of entry.[22] Overall, these results are in line with our second hypothesis.

Result 2. The higher r_B is, the more likely it is that player A enters.

Results 1 and 2 are consistent. The higher r_B is, the more likely it is that player B chooses Right. This in turn makes it more attractive for A to enter, in line with what we observe. Player B's track record thus contains valuable information about how he is going to behave, which is actually used by A to guide his entry decision. In the next subsection we investigate whether this mechanism is recognized as such by player C when deciding on organizational design.

Another important observation that follows from Tables 7 and 8 is that, given the employees' r-values, their e-values do not provide useful additional information about their likely future behavior. Put differently, the informational value of the track records lies in the r-values; the e-values are informative only to the extent that they are correlated with the r-values.

4.3 Allocation of roles and organizational design

In part two player C makes two types of choices. First, in every period she has to decide on role assignment. Observing the track records (e_i, r_i) and (e_j, r_j) of her two employees, player C decides who

[21] The dummy variable 'second' equals one if period is in between 6 and 10, and zero otherwise. Variable 'endo' equals one iff period exceeds 10. The four interaction terms multiply the game dummies with second and endo, respectively.

[22] The insignificance of e_i-own in specifications (2) and (4) of Table 8 is only partly due to the fairly substantial correlation between e_i-own and r_i-own (potentially leading to problems of multi-collinearity). If we leave r_i-own out of specification (2), we obtain a coefficient estimate of 0.056 for e_i-own with a p-value of 0.084. If we leave r_i-own out of specification (4), the coefficient for e_i-own remains insignificant ($p = 0.460$).

Table 8: Random effects probit estimations of A choosing Enter

	(1)	(2)	(3)	(4)
r_i-other	0.105***	0.176***	0.103***	0.158***
	(0.022)	(0.033)	(0.023)	(0.044)
I_H-game	0.702***	0.754***	0.548*	0.669*
	(0.197)	(0.198)	(0.281)	(0.367)
M-game	1.384***	1.364***	1.206***	0.680**
	(0.170)	(0.172)	(0.249)	(0.316)
period	-0.055***	-0.056***	-0.134***	-0.139***
	(0.012)	(0.012)	(0.036)	(0.051)
r_i-own		0.106***		0.094*
		(0.037)		(0.052)
e_i-own		0.012		-0.009
		(0.035)		(0.050)
e_i-other		-0.004		0.021
		(0.031)		(0.043)
second			-0.169	0.110
			(0.437)	(0.589)
endo			0.679	0.991
			(0.487)	(0.655)
I_H·second			0.353	0.205
			(0.488)	(0.636)
M·second			0.517	0.238
			(0.454)	(0.602)
I_H·endo			0.491	-0.004
			(0.449)	(0.578)
M·endo			0.210	-0.273
			(0.371)	(0.493)
constant	-1.559***	-2.111***	-1.165***	-2.293***
	(0.199)	(0.286)	(0.256)	(0.460)
Log L	-451.243	-445.721	-445.301	-214.979
N	900	900	900	900
rho	0.187***	0.158***	0.193***	0.202***
LR-chi2	120.354***	131.399***	132.238***	50.572***

Remark: Standard errors in parentheses. ***/**/* indicates significance at the 1/5/10% level. Rho gives the proportion of overall variance contributed by the panel-level component; its significance is based on a likelihood ratio test that rho=0. LR-chi2 reports the test statistic from testing that all coefficients (except the constant) are zero.

Table 9: Assignment of roles in I_L-game

	$r_A > r_B$	$r_A < r_B$	Total
$e_A > e_B$	72 (32%)	11 (5%)	83 (37%)
$e_A = e_B$	9 (4%)	16 (7%)	25 (11%)
$e_A < e_B$	8 (4%)	108 (48%)	116 (52%)
Total	89 (40%)	135 (60%)	224 (100%)

Table 10: Assignment of roles in I_H-game

	$r_A > r_B$	$r_A < r_B$	Total
$e_A > e_B$	52 (27%)	6 (3%)	58 (31%)
$e_A = e_B$	6 (3%)	10 (5%)	16 (8%)
$e_A < e_B$	13 (6%)	103 (54%)	116 (61%)
Total	71 (37%)	119 (63%)	190 (100%)

gets the role of player A and who becomes player B. Moreover, in periods 11 to 15 player C also chooses, before role assignment, the game that is going to be played.

4.3.1 Role assignment

Tables 9 through 11 provide an overview of the assignment decisions in the three different games. These tables reveal whether the employee who obtained role B is the one with the higher r-value in his track record ($r_A < r_B$) or whether this is the other way around ($r_A > r_B$), and similarly so for the e-values. Owing to our role assignment procedure based on the ranking of r_i-values, the two employees within a group never had the same r-value. This does not apply to the e_i-values though, explaining the additional row where $e_A = e_B$ in these tables.

From the observed assignment patterns it immediately follows that our third hypothesis is rejected; players C do not always assign the role of player B to the employee with the higher r-value in his track record. In the two inspection games it does hold that C is more likely to assign role B to the employee with the higher r-value. In the motivation game this is actually the other way around; there player C is more likely to assign role A to the higher r-value within her work force.[23] Given the fairly high correlation between subjects' r and e-values, the order of e-values among the two employees typically corresponds with the order of r-values. Assignment on the basis of relative e-values thus often (but not always) coincides with allocation on the basis of relative r-values.

[23] To account for the multiple assignment decisions per player C, we formally test this as follows. For each individual player C we compute the average values of r_B and r_A for each game separately. We then compare these individual means $\overline{r}_B$ and $\overline{r}_A$ by means of signrank tests. For the two I-games $\overline{r}_B$ is significantly larger than $\overline{r}_A$ ($p = 0.0472$ in I_L and $p = 0.0045$ in I_H), for the M-game $\overline{r}_B$ is significantly lower than $\overline{r}_A$ ($p = 0.0000$).

Table 11: Assignment of roles in M-game

	$r_A > r_B$	$r_A < r_B$	Total
$e_A > e_B$	281 (58%)	32 (7%)	313 (64%)
$e_A = e_B$	37 (8%)	15 (3%)	52 (11%)
$e_A < e_B$	11 (2%)	110 (23%)	121 (25%)
Total	329 (68%)	157 (32%)	486 (100%)

Comparing assignment patterns of r-values across games, we find that these do not differ between the two inspection games. But they are significantly different for the motivation game; the average value of r_B (per individual player C) is lower in the motivation game as compared to the average value of r_B (per individual player C) in the inspection games.[24] As a result of this, managers in the M-game (players B) have on average an r_i-value that does not differ significantly from managers in the I-game (players A).[25] This finding contrasts with the theoretical prediction that managers in the M-game will be more empathic than managers in the I-game.

Result 3. Players C quite often do not assign the role of player B to the employee with the higher r-value. In the inspection games C is more likely to assign role B to the high-r employee, in the motivation game she is more likely to give role B to the low-r employee.

Result 3 is opposite to what we expected. Especially in the M-game it is important for player C to stimulate entry, because the payoff after Out is low, and assigning the high-r type to role B appears an effective instrument to do so (cf. Results 1 and 2). Yet the majority of player C's does not do this.

A potential explanation why C's in game M tend to assign role B to the low-r employee is that they naively assume that A's and B's decisions are affected only by their own e_A and r_B values, respectively. In particular, C's may overlook that A's entry decision is mainly guided by the value of r_B (cf. Result 2). If C's indeed have such naive expectations, they would prefer to assign the high-e employee to role A and the low-r employee to role B. This follows because C gets the same as player B in game M and thus is necessarily better off when A enters instead of staying out (and she is best off when B chooses Left in reaction). This could explain the direction in the assignment patterns we observe; high (e_i, r_i) types typically get role A whereas low (e_i, r_i) types usually get role B. Moreover, one would expect naive C's to focus predominantly on relative e-values in order to stimulate entry, because stimulating Left in reaction to entry is useful only when entry can be induced.

For the two inspection games matters are less clear under naive expectations. Surely, C then prefers to give role B to the high-r employee. This maximizes the probability that B chooses Right after A enters. But given that C gets the same as A in these games, entry is now risky for player C; she may end up with the lowest payoff when B chooses Left upon A's entry. It is therefore a priori unclear whether a naive C wants to increase the probability of entry by assigning the high-e employee to role A, or whether she prefers to avoid the worst outcome (Enter, Left) in this game by giving the low-e employee role A. Under naive expectations one therefore expects that allocation decisions may be driven by both the relative r-values and the relative e-values of the two employees.

Given the substantial correlation between e_i and r_i, it is difficult to identify precisely the separate effects of e_i and r_i on the probability of obtaining role B. But the random effects probit estimates in Table 12 provide suggestive evidence. These estimates are calculated as follows. For each allocation decision of player C we focus on the employee with the lower subject id in player C's current group of employees. Because subject id's are allocated at random, this corresponds to a random selection of one of the two employees player C has in a particular period. For these employees we estimate the probability

[24] These conclusions are based on comparing the means $\overline{r}_B$ of individual player C's across games. For I_L versus M and I_H versus M signrank tests (for matched pairs) yield p-values of 0.0020 and 0.0015, respectively. For I_L versus I_H a ranksum test (unmatched data) gives $p = 0.9528$.

[25] This follows from comparing (per individual player C) $\overline{r}_B$ under game M with $\overline{r}_A$ under games I_L and I_H, respectively. Using signrank tests we obtain a p-value of 0.6288 for M versus I_L and of 0.9508 for M versus I_H.

Table 12: RE probit estimations of (lower id) employee getting role B

	I-games exo given	I-games endo chosen	M-game exo given	M-game endo chosen
r_i-own$-r_i$-other	0.049**	0.032	-0.039*	-0.006
	(0.019)	(0.034)	(0.021)	(0.027)
e_i-own$-e_i$-other	0.011	0.119**	-0.086***	-0.190***
	(0.029)	(0.054)	(0.032)	(0.043)
constant	0.001	-0.144	-0.000	0.119
	(0.078)	(0.137)	(0.098)	(0.108)
Log L	-200.506	-70.560	-189.280	-103.603
N	300	114	300	186
rho	0.022	0.039	0.153**	0.029
LR-chi2	15.009***	16.831***	34.062***	50.268***

Remark: Standard errors in parentheses. ***/**/* indicates significance at the 1/5/10% level. 'exo given' refers to periods 1 to 10 where the game at hand is exogenously given, 'endo chosen' refers to periods 11 to 15 where the game is chosen by player C as well.

that they are assigned role B, where the random effects procedure takes account of the fact that we have multiple allocation decisions per player C within our sample. We pool the data from the two inspection games, because as already discussed above allocation patterns were the same in I_L and I_H. However, we report separate estimates for the cases where the game at hand is exogenously fixed and where it is endogenously chosen. We do so because allocation patterns may be affected by the determinants that drive the choice of organizational design.

Two explanatory variables are included: (i) the difference in r-values between the lower id employee and the other employee and (ii) the difference in e-values between them. For the two inspection games findings depend on whether the game is exogenously given or whether it is endogenously chosen. In the former case only the difference in r-values appears significant; this suggests that players C particularly focus on assigning the higher r-value to role B. However, when the inspection game is endogenously chosen, only the difference in e-values is significant. Then players C prefer to assign the higher e-value to role B and thus the lower e-value to role A. A plausible explanation is that by doing so, players C hope to reduce entry. The results for the motivation game are largely independent of whether this game is exogenously given or endogenously chosen. In this game C's are mostly concerned with getting the low-e value in role B, that is, assigning the high-e value to role A.

These patterns makes sense when C's have naive expectations as described earlier. In the two inspection games C's will be mostly concerned with avoiding the very unattractive outcome (Enter,Left), and they think they can do so either by having the higher r-value in role B and/or the lower e-value in role A. The shift in focus towards the latter when the I-game is endogenously chosen is in line with the relative e-values being decisive in actual game choice (see below).[26] In the motivation game players C particularly would like to stimulate entry. Naive C's think that this is best accomplished by assigning the higher e-value to role A.

[26] Note, however, that owing to the substantial correlation between e_i and r_i, assigning the higher r-value to role B typically coincides with assigning the lower e-value to role A. Therefore, for many allocation decisions this shift in focus does not matter.

The observation that C's may have naive expectations is in line with earlier experimental findings that people tend to analyze extensive form games in a forward rather than in a backward manner. Johnson, Camerer, Sen, and Rymon (2002) consider a three-round alternating offer bargaining game in which the pie up for division shrinks over time. The actual pie sizes in each of the three rounds were hidden in boxes on the computer screen, which could be opened by moving the cursor into the box. The computer software recorded which box was opened, for how long, the order in which the boxes were opened etc.. Strikingly, most subjects focused on the first round box and did not sufficiently look ahead. In a non-negligible fraction of observations, subjects did not even open the round two and round three boxes.[27] In our setting naive C's also do not backward induct sufficiently. They simply look forward at the first (entry) decision taken by player A, overlooking the fact that this decision is affected by player A's expectation about B's likely choice (for which r_B provides relevant information).

The above discussion suggests that, due to their naive expectations, players C make suboptimal allocation decisions, especially in the motivation game. Result 2 namely indicates that entry is best stimulated by assigning the higher r-value to role B.[28] On the other hand, such an allocation also stimulates B to choose Right after Enter, and (conditional on entry) C would be better off if B chooses Left instead. To assess the overall effect we therefore investigate how player C's profits vary with her allocation decision. Table 13 presents random effects regression estimates of player C's profit for each of the three games separately. As explanatory variables we include the track record characteristics of C's two employees, together with two treatment dummies and a time trend.

First focussing on the M-game, we observe that the e-values of player A and B do not significantly affect player C's profits. The r-values, on the other hand, significantly increase profits. It also holds that the coefficient of r_B is significantly larger than the one of r_A ($p = 0.0537$). Player C would thus make more profit if she would give the employee with the higher r-value role B. Because she typically does not do so (cf. Result 3), allocation decisions in the motivation game are indeed suboptimal.

In regard to the two inspection games no significant effects are found for the employees' track record variables.[29] An explanation for this is that a higher r_B-value not only makes outcome (Enter, Right) more likely, but also the worst possible outcome (Enter, Left).[30] The regression results suggest that the payoff consequences of these two opposing effects cancel out. Profit levels are thus largely insensitive to assignment and therefore role allocation cannot be labelled suboptimal for the inspection games.

Result 4. In the motivation game Players C make more profit when they assign the high-r employee to role B. In the inspection games profit levels are largely insensitive to the assignment of the employees.

[27]In a class room experiment Rubinstein (1999) also finds that people have a natural tendency to analyze an extensive game forward rather than backwards.

[28]Result 2 is based on the probit estimates of A choosing Enter in Table 8. In this table r_i-other (e_i-other) corresponds with r_B (e_B) and r_i-own (e_i-own) with r_A (e_A). These estimates take players A as the unit of analysis, which is appropriate given the focus there on explaning A's entry decision. If we focus on assignment decisions of players C, however, the cross sectional units should correspond to different players C. We therefore re-estimated the probits using players C as the clustering variable and we basically get the same results as in Table 8; the estimated coefficient of r_B is significantly larger than the one of r_A. So entry is indeed best stimulated by assigning role B to the high r-value in the work force.

[29]Although for the I_L-game the coefficient for r_A is significantly negative, this coefficient does not differ significantly from the one of r_B ($p = 0.1849$).

[30]This follows from running separate RE probit estimates of the probability of outcome (Enter,Left) and (Enter,Right), respectively.

Table 13: Random effects regressions of player C's profit

	I_L-game	I_H-game	M-game
r_B	-4.553	-6.728	22.406***
	(3.348)	(5.769)	(5.683)
r_A	-8.558**	-0.492	13.064**
	(3.838)	(6.682)	(5.388)
e_A	0.217	-2.464	5.044
	(2.896)	(6.393)	(4.824)
e_B	-3.808	8.310	-0.113
	(2.614)	(6.361)	(5.212)
second	37.452	27.195	93.278**
	(25.307)	(39.214)	(40.983)
endo	60.620	5.393	183.310***
	(41.581)	(62.115)	(64.670)
period	-4.429	-1.211	-24.350***
	(3.862)	(5.789)	(6.128)
constant	479.387***	336.771***	408.180***
	(30.484)	(39.035)	(43.499)
Overall R^2	0.056	0.031	0.063
N	224	190	486
rho	0.085	0.145	0.150
Wald-chi2	16.521**	9.026	35.841***

Remark: Standard errors in parentheses. ***/**/* indicates significance at the 1/5/10% level. Rho gives the proportion of overall variance contributed by the panel-level component. In all three specifications a Lagrange multiplier test for random effects is insignificant. Wald-chi2 reports the test statistic from testing that all coefficients (except the constant) are zero.

Table 14: Choices between games by session

Session	Game I_L	Game I_H	Game M	Total
1	39 (52%)	-	36 (48%)	75 (100%)
2	35 (47%)	-	40 (53%)	75 (100%)
3	-	24 (32%)	51 (63%)	75 (100%)
4	-	16 (21%)	59 (79%)	75 (100%)
Total	74 (25%)	40 (13%)	186 (62%)	300 (100%)

4.3.2 Game choice

We finally look at the game choice player C makes in the final five periods of part 2. From Table 14 it can be observed that when player C chooses between I_L and M, she is about equally likely to choose either game. But when the choice is between I_H and M, she chooses the motivation game in around 73% of the cases. In line with theoretical predictions, therefore, C is more likely to choose M over I_H than M over I_L.

To explore game choice in more detail, Table 15 reports random effects probit estimates of the probability that game M is chosen. The first two columns pool the choices made between I_L and M and between I_H and M. Here r_{High} (r_{Low}) refers to the r-value of the employee with the higher (lower) r in his track record. Variables e_{High} and e_{Low} are defined similarly. Apart from the track record characteristics of player C's two employees, the first specification also includes a dummy equal to one iff I_H is the alternative, a time trend, and a variable $\pi_M - \pi_I$ measuring the difference in average realized profits player C obtained from the two games in the first ten periods (where these games were exogenously given). Intuitively, one would expect that C is more likely to choose game M when this game yielded her higher profits than game I did in the past. In the second specification we include player C's own track record as well. The final two columns consider the two subsamples M versus I_L and M versus I_H in isolation.

In all four specifications variable r_{High} is far from significant. The estimates thus do not lend support to the hypothesis that the higher the value of r_{High} within player C's work force is, the more likely it is that the M-game is chosen. The single variable from the employees' track records that appears a significant determinant (in 3 out of 4 specifications) is e_{High}. The higher e_{High} is, the more likely it becomes that player C chooses M. The only two other variables that attain significance are the profit difference $\pi_M - \pi_I$ and the M versus I_H dummy. Not surprisingly, the better (relative) experience player C has with game M in the past, the more likely she is to choose this game over the inspection game. And similar so the worse the alternative is, i.e. I_H instead of I_L.

Result 5. (i) Players C's choice between the motivation game and the inspection game is not guided by the r_i-values in her employees' track records. From these records only the highest e-value e_{High} matters; the higher e_{High}, the more likely it is that C chooses game M. (ii) player C is more likely to choose game M over game I_H than over game I_L.

Even though role assignment is suboptimal in the M-game, subjects may still make close to optimal choices between the I-game and the M-game. To explore this issue we use the random effects regressions of player C's profits reported in Table 13 to predict the profits player C in reality may obtain from either

Table 15: Random effects probit estimations of C choosing game M

	(1) M vs. I	(2) M vs. I	(3) M vs. I_L	(4) M vs. I_H
r_{High}	0.048	0.053	0.086	-0.002
	(0.054)	(0.056)	(0.073)	(0.111)
r_{Low}	0.180	0.216	0.350*	-0.089
	(0.144)	(0.153)	(0.182)	(0.293)
e_{Low}	-0.013	-0.011	-0.104	0.174
	(0.063)	(0.062)	(0.080)	(0.136)
e_{High}	0.166***	0.165***	0.201***	0.093
	(0.055)	(0.055)	(0.061)	(0.129)
order	0.100	0.046	0.211	0.285
	(0.216)	(0.226)	(0.380)	(0.518)
M versus I_H	0.719***	0.727***		
	(0.242)	(0.242)		
$\pi_M - \pi_I$	0.003***	0.003***	0.004***	0.004
	(0.001)	(0.001)	(0.001)	(0.003)
period	-0.038	-0.039	-0.112	0.057
	(0.057)	(0.057)	(0.078)	(0.092)
r_i-own		-0.075	0.044	-0.265
		(0.118)	(0.149)	(0.303)
e_i-own		0.023	0.035	0.028
		(0.060)	(0.067)	(0.132)
constant	-0.875	-0.781	-0.523	-0.432
	(0.850)	(0.930)	(1.300)	(1.710)
Log L	-174.725	-174.420	-90.189	-75.674
N	300	300	150	150
rho	0.175**	0.172**	0.009	0.439***
LR-chi2	30.153***	30.723***	23.389***	7.148

Remark: Standard errors in parentheses. ***/**/* indicates significance at the 1/5/10% level. Rho gives the proportion of overall variance contributed by the panel-level component; its significance is based on a likelihood ratio test that rho=0. LR-chi2 reports the test statistic from testing that all coefficients (except the constant) are zero.

Table 16: Average predicted profits, average actual profits and game choice

Game	I_L chosen over M ($n = 74$)	M chosen over I_L ($n = 76$)	I_H chosen over M ($n = 40$)	M chosen over I_H ($n = 110$)
I_L	431	428		
I_H			326	322
M	399	404	389	389
M_{opt}	410	423	402	413
Actual	430	384	325	422

Remark: Within columns all differences are significant according to a signrank test (1% level), except when M is chosen over I_L; then the estimated profit under I_L does not differ significantly from the estimated profit under M_{Opt} ($p = 0.3568$).

one of these two games. Table 16 provides an overview of the average predicted profits, together with the average actual profits. Apart from that, the table also lists the average estimated profit player C could have obtained under optimal role assignment in the M-game (see the row labelled M_{Opt}).

Some important observations can be made from Table 16. First, compared to the predictions under selfish preferences, the M-mode does much better than predicted (predicted profits equal 280), whereas the two I-games do slightly worse (predicted profits of 440 and 360, respectively). This finding is well in line with the many earlier experimental studies showing that social preferences may greatly enhance efficiency especially under informal implicit contracts (see the Introduction). Here the direct consequence is that the profits player C can attain under the I_H-game are in practice significantly and substantially lower than under the M-game. Subjects by and large realize this, because in 73% of the cases players C opt for the M-game when the alternative is the I_H-game. Players C thus broadly recognize that the social preferences within their work force make the M-game relatively more attractive. Second, although role assignment under the M-game is suboptimal and significantly reduces profits, the average loss in profits is relatively small in absolute magnitude (around $10 - 25$ points).

Overall the following general picture emerges. For players C the motivation game is attractive only if entry can be induced in this game. They naively think that this can be best accomplished by allocating role A to the employee with the highest e_i-value. Player Cs then choose game M when this e_{High}-value is relatively high. In case e_{High} is low Cs are more likely to choose the inspection game and will assign this player the role of B. A rationale for the latter assignment is that player C hopes to avoid the very bad outcome (Enter,Left) in this way. Allocation decisions are naive in the sense that Cs seem to overlook the significant impact of B's track record (in particular r_B) on A's entry choices, especially in game M where this relationship is of vital importance. They therefore mainly look at the employee's own track record to form expectations about how he would behave in role A. This leads to suboptimal allocation choices in game M. In turn, the choice between games is distorted as well. Nevertheless, the loss in profits due to a distorted allocation of employees is rather small under the M-game and players Cs in general do correctly realize that social preferences make mode M more attractive than mode I_H. They thus seem to recognize the general impact of social preferences, but do not make full effective use of it.

5 Conclusion

Organizations differ widely in the practices they use to motivate their employees. Some organizations heavily rely on formal contracts with explicit incentives and active monitoring. Here an important task of managers is to supervise and inspect workers in order to detect potential shirking. Other organizational modes are predominantly based on implicit informal agreements that hard work will be rewarded. In this case the main task of managers is to inspire and to motivate the work force. In these organizations employment contracts are largely incomplete and a substitute mechanism is needed to convince workers that the organization is indeed committed to reward high effort. Apart from repeated interaction and reputation (cf. Kreps (1990)), appointing managers that empathize with their employees may provide such a commitment (cf. Rotemberg and Saloner (1993)). This motivational mode where managers with social preferences are hired saves on the costs of using a formal performance measurement system.

In this paper we test several predictions concerning organizational design by means of a laboratory experiment. Theory predicts that the motivation-mode is viable only if managers are sufficiently empathic whereas for the inspection-mode this is not the case. The more empathic employees within the work force should therefore be given the managerial positions in the M-mode (but not in the I-mode). And the more empathic these managers are, the more attractive organizational mode M becomes relative to the inspection mode.

Our main findings are that owners by and large overlook the significant impact of a manager's preference type on worker behavior in the M-mode. They naively assume that the worker's effort decision is mainly guided by the preference type of the worker himself. They therefore allocate roles suboptimally in the M-mode, with workers rather than managers being the more empathic types. As a result of this, choices between organizational modes differ from theoretical predictions as well. Nevertheless, owners do correctly realize that the (potential) existence of social preferences within their work force makes the motivation mode relatively more attractive. Taken together, we conclude that owners in our experiment do recognize that social preferences matter, but do not make full effective use of the available preference types within their work force when drafting their organizational design.

Appendix: basic model of endogenous organizational design

In the experiment subjects are confronted with the simple games depicted in Figure 1. To motivate the particular parameter values we have chosen, we consider in this Appendix a bare bone (reduced form) model of endogenous organizational design. Because the main purpose here is to justify our parameter choices, in this model we abstract away from the owner's assignment decision.

A firm consists of three agents: the owner who owns the firm, a manager hired to run the firm on her behalf and a worker doing the productive work. The worker can either put in low effort ('shirk') or high effort ('work'). In the former case the value of his productivity equals v_0 whereas in the latter case it is v_1 (here all parameters are positive). The worker's disutility of putting in high (instead of low) effort equals g. Therefore, a selfish worker will shirk if no additional measures are taken.

One way to motivate the worker to put in high effort is to set up a performance monitoring system. We assume that such a system, when fully implemented, always induces the worker to work. It brings about three types of costs though. First, there are the costs k of setting up and installing the monitoring technology. Investments in technological equipment and organizational procedures are needed to allow accurate measurement of the worker's productivity.[31] Second, h denotes the firm's inspection costs. Even with the monitoring technology in place, scarce resources like the manager's time need to be devoted to monitor the worker. Third, the worker dislikes being monitored because it gives him the feeling of being controlled, leading to a disutility of d. We assume that the overall costs of the formal monitoring system fall short of the net benefits of getting the worker to work:

$$k + h + d < v_1 - v_0 - g. \tag{A1}$$

Therefore, in the absence of alternative incentive instruments, the firm would benefit from using a formal monitoring system. As in in the main text we will refer to this as the 'inspection mode', or I-mode in short. Here the main task of the manager is to check whether the worker does not deliver substandard work. In regard to compensation we assume that the worker receives a fixed wage w_I. The manager is paid on the basis of performance pay, getting a share $f_I \in (0, 1)$ of the firm's net profits (while the owner gets the remainder).

An alternative way to motivate the worker is to promise him a bonus whenever he puts in high effort. Because effort itself is non-contractable, this bonus payment cannot be made part of a formal contract though. The incentive system thus relies on an *implicit* contract that the promise will be kept. This type of organizational design is labelled as the motivation mode, or M-mode in short. Here the main task of the manager is to inspire and to motivate, by developing and maintaining a culture that high effort is indeed rewarded by the firm. In the M-mode the worker receives a wage w_M and is promised a bonus b_M on top of that if he exerts high effort. The manager gets a fraction $f_M \in (0, 1)$ of firm profits. This performance pay gives a selfish manager an incentive to renege on the promised bonus payment.

Overall the game model of Figure A1 results. First the owner chooses the organizational mode. If the M-mode is chosen, the worker moves next by deciding whether to shirk or the work. Only if the worker works, the manager decides whether to pay the promised bonus or not. (Here the implicit assumption is that the manager never wants to reward shirking with a bonus.) In the I-mode the manager moves before the worker does. The manager either commits to monitor or not to do so. In the former case the worker is assumed to work, because the disutility of working falls short of the costs of getting caught shirking. If the manager does not monitor, the worker chooses between shirking or working. The players' payoffs then follow from the assumptions made above.

[Insert Figure A1 about here]

If players are selfish, the predicted outcome is easily determined by backwards induction. A selfish manager will not pay the bonus in the M-mode (given $f_M \cdot b_M > 0$). Anticipating this, a selfish worker will shirk under this organizational design. In the inspection mode a selfish worker will shirk if not monitored by the manager, therefore the manager will monitor him.[32] The outcome is that the worker does work under this mode, at the expense of the overall costs of the monitoring technology $(k + h + d)$.

[31] These costs are equivalent to the investments in verification technology required under explicit contracts in the experiments of Fehr and Schmidt (2000) and Fehr et al. (2007).

[32] Note that $f_I \cdot (v_1 - w_I - k - h) > f_I \cdot (v_0 - w_I - k)$ follows from $(A1)$.

Given assumption $(A1)$, under selfish preferences the I-mode is more efficient than the M-mode is. Hence if the payoff parameters are such that the owner shares in these efficiency gains, she would choose the I-mode over the M-mode.[33] It would be more efficient, however, if the worker could be motivated to work in the M-mode, as this would save the overall costs of the monitoring technology.

Of course, in a fully fledged model the compensation parameters w_M, w_I, b_M, f_M and f_I would be endogenous. Here we just make the following simplifying assumptions. First, mainly for practical reasons we focus on the case in which $f_M = f_I = \frac{1}{2}$.[34] The share fraction is thus the same for the two organizational modes, such that the owner does not simply prefer one mode over the other because she can pay the manager less. Second, with respect to the wage and bonus payments w_M, w_I and b_M we assume that:

$$w_M = \frac{f_M \cdot v_0}{1+f_M};\ w_I = \frac{f_I \cdot (v_1 - k - h) + g + d}{1+f_I};\ \text{and } b_M = \frac{f_M \cdot (v_1 - v_0) + g}{1+f_M}$$

The wage level w_M $(= v_0/3)$ ensures that all firm members earn the same when the worker chooses to shirk in the M-mode. Similarly so, w_I is set such that all firm members get the same when the manager monitors in the I-mode. Finally, b_M makes that all members earn the same when the manager pays the bonus in the M-mode after the worker decided to work. Effectively, payoff differences are minimized in the three most relevant outcomes and potential efficiency gains are shared equally.

Under these assumptions, the resulting payoffs in the two modes follow directly from the (exogenous) production technology parameters appearing in inequality $(A1)$. The payoffs appearing in Figure 1 now result from making the following choices:

$$v_0 = 840;\ v_1 = 1740;\ g = 90;\ k = 180;\ h = 260\,[100] \text{ and } d = 130\,[50]$$

where for h and d the first value refers to I_H and the second to I_L.

References

Akerlof, G. and R. Kranton (2005). Indentity and the economics of organization. *Journal of Economic Perspectives 19*, 9–32.

Avenhaus, R., B. von Stengel, and S. Zamir (2002). Inspection games. In R. Aumann and S. Hart (Eds.), *Hanbook of Game Theory*, Volume 3, Chapter 51, pp. 1947–1987. North-Holland.

Bandiera, O., I. Barankay, and I. Rasul (2007a). Incentives for managers and inequality among workers: Evidence from a firm-level experiment. *Quarterly Journal of Economics 122*, 729–774.

Bandiera, O., I. Barankay, and I. Rasul (2007b). Social connections and incentives in the workplace: Evidence from personnel data. Working Paper.

Calvo, G. and S. Wellisz (1978). Supervision, loss of control, and the optimum size of the firm. *Journal of Political Economy 86*, 943–952.

[33] In particular this requires $(1 - f_M) \cdot (v_0 - w_M) < (1 - f_I) \cdot (v_1 - w_I - k - h)$.

[34] A share fraction of one half is convenient in the experiment, because the owner's (i.e. player C's) earnings then simply correspond to those of the second mover (player B) in the M-mode and the first mover (player A) in the I-mode.

Charness, G. and M. Rabin (2002). Understanding social preferences with simple tests. *Quarterly Journal of Economics 117*, 817–869.

Dickinson, D. and M.-C. Villeval (2004). Does monitoring decrease work effort? the complementarity between agency and crowding-out theories. IZA Discussion Paper, No. 1222.

Dufwenberg, M. and G. Kirchsteiger (2004). A theory of sequential reciprocity. *Games and Economic Behavior 47*, 268–298.

Fehr, E., S. Gächter, and G. Kirchsteiger (1997). Reciprocity as a contract enforcement device: experimental evidence. *Econometrica 65*, 833–860.

Fehr, E., A. Klein, and K. Schmidt (2007). Fairness and contract design. *Econometrica 75*, 121–154.

Fehr, E. and J. List (2004). The hidden costs and returns of incentives - trust and trustworthiness among ceos. *Journal of the European Economic Association 2*, 743–771.

Fehr, E. and K. Schmidt (1999). A theory of fairness, competition, and cooperation. *Quarterly Journal of Economics 114*, 817–868.

Fehr, E. and K. Schmidt (2000). Fairness, incentives and contractual choices. *European Economic Review 44*, 1057–1068.

Fehr, E. and K. M. Schmidt (2004). Fairness and incentives in a multi-task principal agent model. *Scandinavian Journal of Economics 106*, 453–474.

Fischbacher, U. (2007). z-tree: Zurich toolbox for ready-made economic experiments. *Experimental Economics 10*, 171–178.

Hermalin, B. (2001). Economics and corporate culture. In S. C. et al. (Ed.), *The International Handbook of Organizational Culture and Climate*. John Wiley and Sons Ltd.

Johnson, E., C. Camerer, S. Sen, and T. Rymon (2002). Detecting failures of backward induction: Monitoring information search in sequential bargaining. *Journal of Economic Theory 104*, 16–47.

Kreps, D. (1990). Corporate culture and economic theory. In J. Alt and K. Shepsle (Eds.), *Perspectives on Positive Political Economy*. Cambridge University Press.

Rabin, M. (1993). Incorporating fairness into game theory and economics. *American Economic Review 83*, 1280–1302.

Rotemberg, J. (1994). Human relations in the workplace. *Journal of Political Economy 102*, 684–717.

Rotemberg, J. and G. Saloner (1993). Leadership style and incentives. *Management Science 39*, 1299–1318.

Rubinstein, A. (1999). Experience from a course in game theory: pre- and postclass problem sets as a didactic device. *Games and Economic Behavior 28*, 155–170.

Schweitzer, M. and T. Ho (2005). Trust and verify: Monitoring in interdependent relationships. In J. Morgan (Ed.), *Experimental and Behavioral Economics*, Volume 13. JAI Press.

Figure 1a. Motivation game M

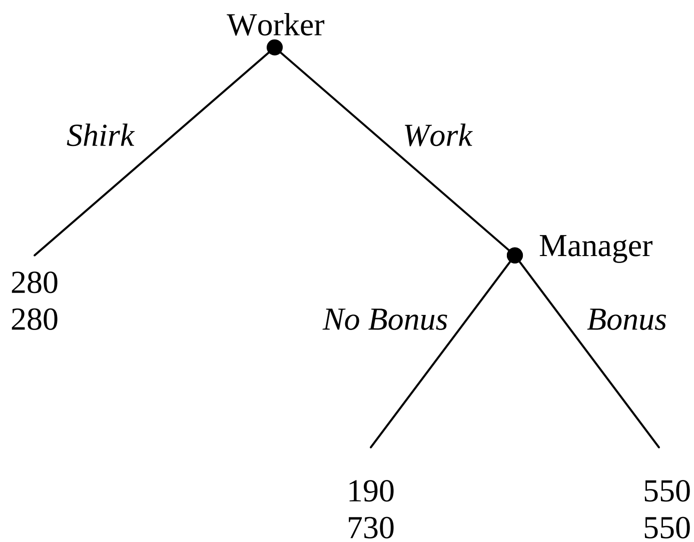


Figure 1b: Inspection game I_H [I_L]

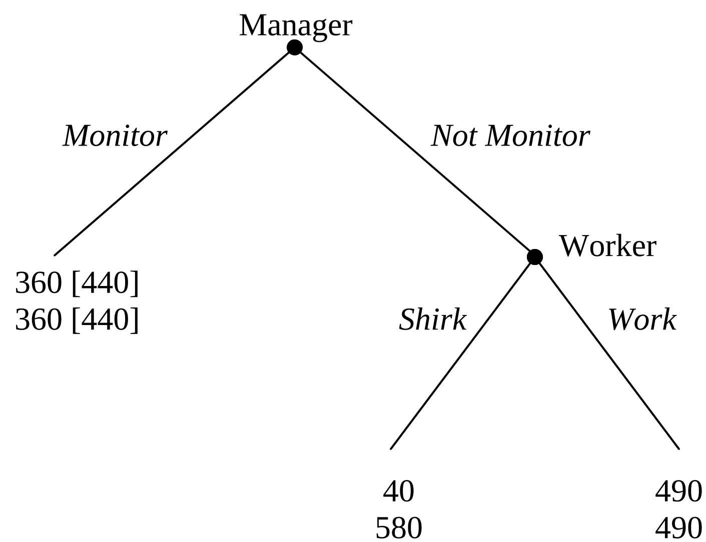


Figure 2. General decision structure
(with d > c > b > a and d+a ≤ 2c)

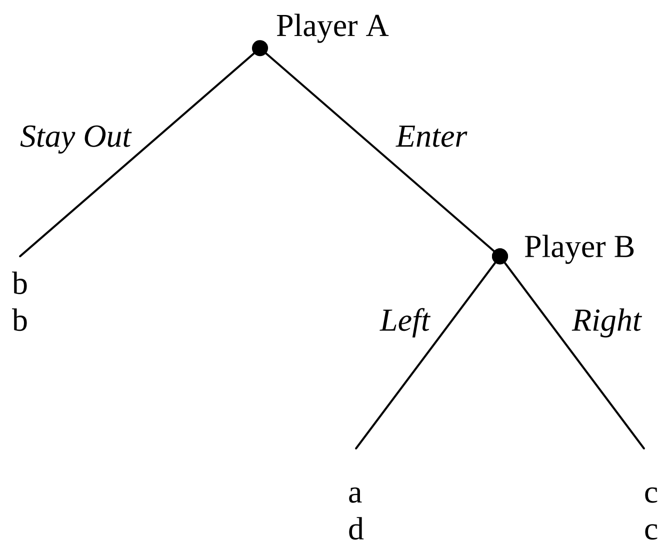
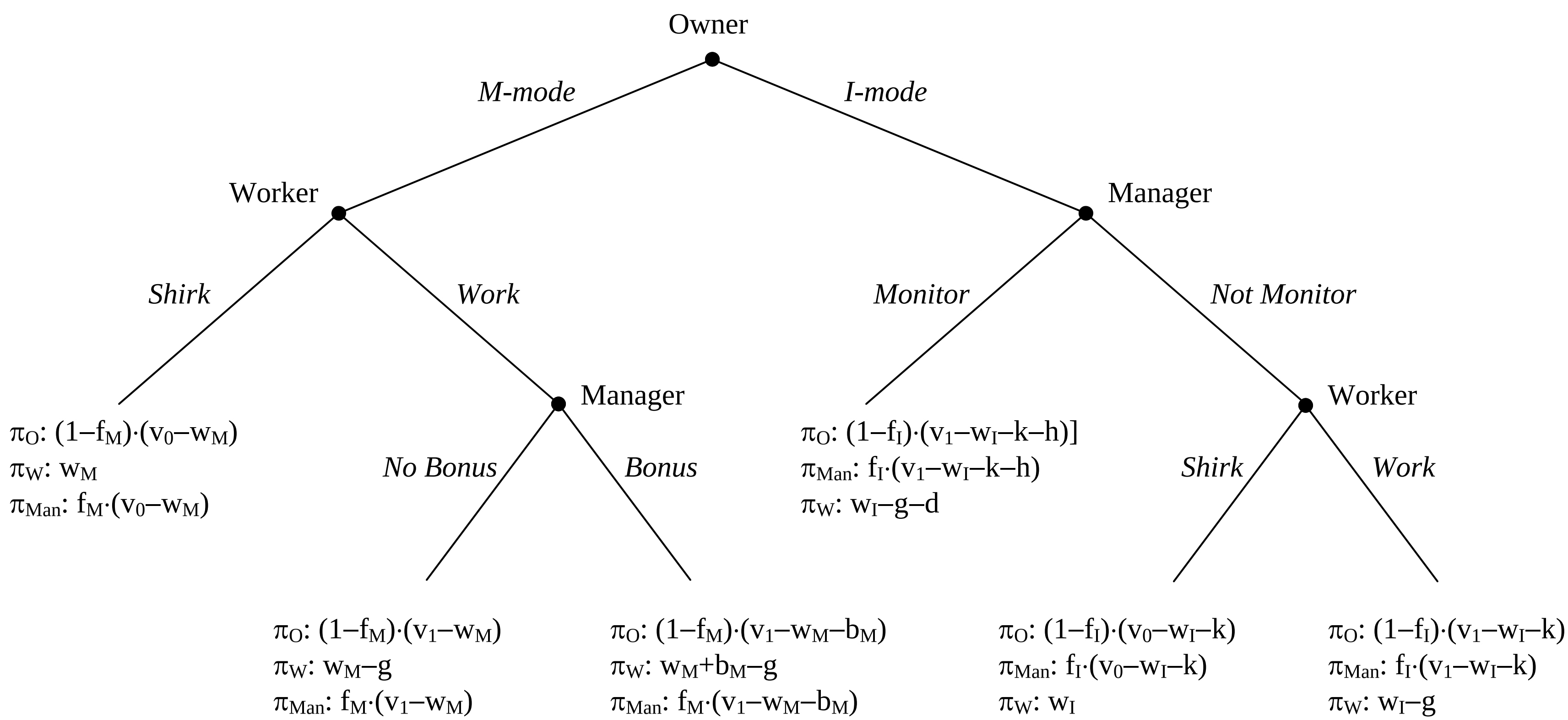


Figure A1. The basic (reduced form) game



Legend:

π_i: monetary payoffs for player $i \in \{O,Man,W\}$;
v_1 (v_0) = value productivity if worker works (shirks);
g = worker's cost of effort;
k = costs of setting up monitoring technology;
h = firm's costs of inspection;
d = worker's disutility of being monitored;
w_M (w_I) = wage worker in M (I) mode;
b_M = size of bonus payment in M-mode;
f_M (f_I) = profit sharing fraction manager in M (I) mode.