# Social Norms and Economic Incentives in Firms

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Abstract. This paper studies the interplay between economic incentives and social norms in firms. We introduce a general framework to model social norms arguing that norms stem from agents' desire for, or peer pressure towards, social efficiency. In a simple model of team production we examine the interplay of three different types of contracts with social norms. We show that one and the same norm can be output-increasing, neutral, or output-decreasing depending on the incentive scheme. We also show how social norms can induce multiplicity of equilibria and crowding out.

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## 1. Introduction

In a world without externalities, there would be no need for society or any kind of social rules. If one agent's actions never harmed or kindled another, there would be no need for rules of conduct, law, or social norms. There would be no relevant interaction and, thus, no reason for governing it. But the moment there is interaction, the moment agents can inflict externalities on each other, norms (of any sort) become relevant and, typically, desirable. That is, norms are rooted in the presence of externalities. In this paper, we focus on social norms, i.e., norms that are shared by many or most individuals and that are not formally enforced. We conceptualize such norms as resulting from players having social preferences that discourage actions causing negative and encourage actions causing positive externalities on others. A "social

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ideal" is an action profile that results in Pareto efficiency. Thus, the social norm is to behave according to a social ideal. However, in contrast to most recent models of social preferences, the strength of social incentives in our framework is endogenous, depending on the actions of others, how well others act, or are expected to act, in accordance with the social ideal. This reflects the peculiar nature of social norms that, although everyone might agree with their desirability, nobody might stick to them.

After laying down our general approach to modeling social norms, we proceed by specifically applying our framework to production in firms. The main conclusion from this analysis is that the impact of one and the same social norm may crucially depend on the economic incentives that are in place. In fact, one and the same social norm may be output enhancing, neutral, or output decreasing, depending on the type of contract chosen by the firm's owner. This points to a new and important role of contract design: By choosing appropriate contracts one can "manage" social norms, i.e., determine the way norms impact on behavior. As we prove, this offers a new rationale for team incentives even in the absence of complementaries of efforts. Once we have laid down our analytical framework, the logic of this result is astonishingly simple. Consider a firm where total output is just the sum of all workers' efforts. (This will be the lead example throughout our paper.) Under individual piece rates there is no meaningful interaction between workers, in particular, there are no externalities. This is crucially different under team incentives where agents' efforts cause positive externalities on each other. The presence of such externalities triggers the social norm which, by definition, encourages actions that induce positive externalities. As a consequence, social norms will (weakly) enhance a firm's productivity under team incentives.

The opposite is true for incentives based on relative performance such as tournament incentives. Holding everything else constant—the firm's technology and workers' preferences—we can show that the introduction of relative pay renders the same social norm, that increased output under team pay, detrimental to the firm's performance. Remarkably, this is exactly what is found in a field experiment by Bandiera, Barankay, and Rasul (2005). They study fruit pickers working under two different incentive schemes, a piece rate solely based on own productivity and a relative-performance scheme. Consistent with our model, they find that, as long as fruit pickers can observe each other's effort, efforts are much lower under the relative-performance scheme than under piece rates. They attribute this to workers "internaliz[ing] the negative externality they impose on others under the relative incentive scheme".

There are other important consequences of social norms that can be studied for a given type of incentive scheme. Most importantly, we show that social norms can naturally give rise to multiplicity of equilibria. Equilibria with low efforts (where nobody cares much about others because others don't care much) can coexist with high-effort equilibria (where everybody cares a lot about others precisely because everybody else cares a lot). These high-effort equilibria can even induce over-zealous behavior—as apparently common in many "city firms" where employees often report they have to work very long hours (with very little output) simply because everybody else does.

Multiplicity of equilibria makes it harder to determine optimal incentives. Consider a one-parameter model where the firm owner simply varies a bonus rate. (This is the model that we shall consider in our section on team pay.) The highest possible profit may result from a bonus that induces multiple equilibria which may entail a high strategic risk. If workers coordinate on the low-effort equilibrium, the firm may be better off to choose a "second-best" bonus rate where efforts are unique. This also suggests the importance of leadership, that is, of a manager's ability to motivate workers to coordinate on a "good" equilibrium, in the presence of multiple equilibria (under the same pay scheme).

Finally, we show that the presence of social norms may explain one of the bigger puzzles in economics: why steeper incentives can reduce efforts. These so-called "crowding effects" of economic incentives, as discussed, for example, in Frey (1997) or Frey and Jegen (2003)[1] have recently attracted wide attention and, by now, there is a large body of literature documenting such "perverse" incentive effects. In our framework such effects arise naturally. Suppose team incentives get steeper but agents still exert the same effort. As a consequence, everybody is now doing less for the common good, relative to what they could do. This reduces the pressure from the social norm and agents may, after adjustment to the new equilibrium, exert less effort.

There are several papers in the economics literature where social norms have been included in microeconomic analyses.[2] However, not many attempts have been made to study how social norms affect the incentive structure within firms. The most prominent paper in this literature is perhaps Kandel and Lazear (1992), who develop a model of norms in teams. In contrast to our paper, they exclusively focus on partnerships and profit-sharing schemes and make strong assumptions about the

[1]Drawing on the sociology and psychology literature Frey argues that economic incentives can crowd out *intrinsic motivation*. An early example for this effect goes back to Titmuss (1970) who argues that monetary incentives for blood donations undermine people's intrinsic willingness to give blood. In contrast, the argument here is that economic incentives can weaken the effect of a *social norm*. Empirically, the two mechanisms might sometimes be hard to distinguish. However, our simple model offers diverse comparative static predictions that are testable.

[2]See e.g. Akerlof (1980), Moffitt (1983), Besley and Coate (1992), Bernheim (1994), Lindbeck, Nyberg and Weibull (1999, 2003), Hart (2001), Kübler (2001), and Vendrick (2003) and the literature cited in these studies.

curvature properties of agents' social payoff functions ruling out some of the more intriguing findings of our study. Bacharach (1999) proposes a theory of agents who "team reason", leading to an ideal profile of actions for the team, which is related to our notion of a social ideal. However, Bacharach does not consider different incentive schemes, nor does he follow up on the consequences of multiplicity. More recently, and closest to our approach, Fischer and Huddart (2008) consider norms that are determined by the incentive structure within the firm, just as in our model. There are some major differences between their and our approach, however. Our model draws upon a general principle of a group or team efficiency ideal that depends on the incentive structure and affects individual choices. By contrast, Fischer and Huddart distinguish between personal norms and social norms, and between a desirable and an undesirable action, each with its own norm. Thus, the social norm in their setup is independent of team efficiency; it is instead a conformity norm that only depends on the actions of others. Another important difference is that they rule out equilibrium multiplicity by assuming peer pressure to take a certain form. By contrast, we allow for multiplicity of equilibria, and we believe that multiplicity may be useful for the explanation of a number of empirical findings.[3]

In the presence of externalities, agents can, of course, internalize efficiency gains through side contracting. Such contracts between workers can be beneficial for the principal in team settings and detrimental under relative performance pay, as shown by Holmström and Milgrom (1990) and Itoh (1992). The logic of those results is closely related to our findings. From the viewpoint of this literature, our analysis shows that social norms may achieve similar results for workers even if side contracting is impossible, for example, because of enforcement problems. In terms of "realism" this strikes us important. For example, the data of Bandiera, Barankay and Rasul (2005) suggest that the performance effects we discuss arise because of social ties rather than as purely monetary consequences. Moreover, some of our findings, such as the possibility of crowding out, are specific to our approach.

Regarding the empirical evidence, in addition to Bandiera, Barankey and Rasul (2005), who study an intriguing field experiment, Encinosa, Gaynor, and Rebitzer

[3]Other papers on social norms in firms are Barron and Gjerde (1997). Hart (2001) also focuses on norms and firms, but rather deals with the question whether the degree of trust between agents influences the optimal ownership structure. Also related is recent work by Rey Biel (2008) who studies how inequity aversion of agents affects optimal contracts. In the literature on the effect of social preferences on the optimality of certain contractual arrangements, the work by Bartling (2010) is most relevant. He compares relative-performance pay with team pay, in a model with inequality averse agents. Interestingly, in his model the pure incentive effect of other-regarding preferences compared to standard preferences is negative for team pay and positive for relative performance evaluation. In contrast, social norms in our setup have the opposite effect on incentives under these two incentive schemes, which appears to be more in line with empirical evidence.

(2000) find that group norms matter in medical partnerships. Knez and Simester (2001) provide evidence for the airline industry, and Ichino and Maggi (2000) for the banking industry.[4] The latter study is of particular interest. Ichino and Maggi report substantial shirking differentials between branches of a large Italian bank, despite identical monetary incentives governing the employees' efforts in these branches. They identify group-interaction effects as a key explanatory variable that allows for multiple equilibria. This evidence is supplemented by experimental data consistent with multiplicity. In a laboratory study, Falk, Fischbacher, and Gächter (forthcoming) find that the same individual contributes more to a public good in a group with high average contributions than in a group with low contribution levels. Falk and Ichino (2006) report similar evidence on the effects of peer pressure in a recent non-laboratory experiment.

The rest of the paper is organized as follows. In the next section we develop an approach to modelling social norms that is intended to be generally applicable, extending beyond the examples of how norms form and operate in firms - the topic of Section 3. Section 4 concludes with a discussion.

## 2. Modeling social norms

Suppose there is a group or team of $n$ *agents*, where each agent $i$ chooses an *effort* $x_i \geq 0$. An *effort profile* thus is a vector $\vec{x} = (x_1, ..., x_n) \in \mathbb{R}^n_+$. We write $(x'_i, x_{-i})$ when others act according to the profile $\vec{x}$ while agent $i$ deviates to effort $x'_i$. Each effort profile results in both *material* and *social* utility to each agent. We take the *total utility* to an agent to be the sum of the two:

$$U_i(\vec{x}) = u_i(\vec{x}) + v_i(\vec{x}, \hat{x}^i), \tag{1}$$

where both functions are twice differentiable. The material utility, $u_i(\vec{x})$, is meant to represent agent $i$'s preferences concerning consumption and effort. Let $\hat{X} \subset \mathbb{R}^n_+$ be the set of effort profiles $\vec{x} \in \mathbb{R}^n_+$ that result in *Pareto efficient* material utility profiles.[5] By a *social ideal* we mean an element of $\hat{X}$.

As for the social utility, we assume that each agent has a particular social ideal, $\hat{x}^i \in \hat{X}$, an action profile that $i$ deems is "in the best joint interest" of the group or team. This is the second argument in the social-utility term above. To follow the social norm then means to act according to the social ideal, by choosing $\hat{x}^i$.

[4] While Encinosa *et al.* focus on the interplay of group norms, multitasking and risk aversion, Knez and Simester show that firm-wide performance goals do have an effect on employees if these work in small groups, which allows them to monitor each other's work effort closely.

[5] That is, effort profiles that are not dominated by any other effort profile, in terms of agents' material payoffs.

We proceed to specify properties of the social-utility functions $v_i$. First, for each action $x_i \in \mathbb{R}_+$, we define the *externality that $i$ imposes on the others* as the sum of the material utility effects caused them by her action $x_i$, had the others stuck to their social ideal:

$$\psi_i\left(x_i, \hat{x}_{-i}^i\right) = \sum_{j \neq i} \left[u_j(x_i, \hat{x}_{-i}^i) - u_j(\hat{x}^i)\right], \tag{2}$$

This externality may be negative or positive. For instance, it is negative if $i$ shirks from the production of some public good while it is positive if $i$ is over-zealous and exerts more effort than the social ideal calls for. Clearly $\psi_i\left(\hat{x}^i\right) = 0$. Secondly, for any action profile of the others, $x_{-i} \in \mathbb{R}_+^{n-1}$, we define the *externality that they impose on $i$* as the material utility effect they cause her by their actions, had she stuck to her social ideal:

$$\psi_{-i}\left(\hat{x}_i, x_{-i}^i\right) = u_i\left(\hat{x}_i^i, x_{-i}\right) - u_i(\hat{x}^i). \tag{3}$$

Also this externality may be negative or positive and vanishes at the social ideal, $\psi_{-i}\left(\hat{x}^i\right) = 0$.

We define the social utility $v_i(\vec{x}, \hat{x}^i)$, associated with any action profile $\vec{x} \in \mathbb{R}_+^n$ and social ideal $\hat{x}^i \in \hat{X}$, as a function of the two externalities, the one that agent $i$ imposes upon the others and the one that they impose upon her:

$$v_i(\vec{x}, \hat{x}^i) = g^i\left[\psi_i\left(x_i, \hat{x}_{-i}^i\right), \psi_{-i}\left(\hat{x}_i^i, x_{-i}\right)\right]. \tag{4}$$

where $g^i : \mathbb{R}^2 \to \mathbb{R}$ is twice differentiable and non-decreasing in its first argument, the externality that agent $i$ imposes on the others. The social utility term, $v_i(\vec{x}, \hat{x}^i)$, is meant to represent agent $i$'s social preferences, her "moral" preferences concerning her own effort, in relation to other group members' efforts and to their common social ideal. The monotonicity means that an agent obtains a higher level of social utility, or "moral satisfaction," the more effort she exerts, *ceteris paribus* (thereby benefitting the others in the group or team). This social utility of own effort may also depend on the efforts made by the others, reflected by the second argument of $g^i$. For example, the closer the others adhere to the social ideal, the stronger may be the social utility gain from increased own effort. Indeed, in the subsequent applications we will take this to be the typical case.[6] The social utility may be internalized or take the form of social disapproval from others — external "peer pressure." The latter evidently requires that agents can observe or infer each other's efforts.[7] The function $g^i$ can

[6] The same assumption is made for a binary choice in Lindbeck, Nyberg and Weibull (1999).

[7] In our model, both interpretations are equivalent as the output from agents' efforts will be deterministic. With stochastic production, the two interpretations give different results.

then represent the well-known phenomenon of increased peer pressure when others' efforts are closer to the social ideal.

The first-order effect of an agent's unilateral change of effort on her *total utility* (1) can be divided into two parts. First, there is a direct effect on her material utility, and, secondly, there is an indirect effect on her social utility, transmitted through her action's effect on others' material utility:

$$\frac{\partial U_i(\vec{x})}{\partial x_i} = \frac{\partial u_i(\vec{x})}{\partial x_i} + w_i(\vec{x}, \hat{x}^i) \cdot \sum_{j \neq i} \frac{\partial u_j(x_i, \hat{x}^i_{-i})}{\partial x_i}, \tag{5}$$

The second term is the product of a weight factor and the sum of the effect on all other's material utilities, evaluated at their ideal effort levels. The weight factor depends on everyone's effort and on the social ideal:

$$w_i(x, \hat{x}^i) = g^i_1 \left[\psi_i \left(x_i, \hat{x}^i_{-i}\right), \psi_{-i} \left(\hat{x}^i_i, x_{-i}\right)\right].$$

Here $g^i_1$ denotes the partial derivative of $g^i$ with respect to its first argument. By hypothesis, this partial derivative is non-negative. The size of the weight factor thus depends on (a) how sensitive the agent is to the externality he causes others, (b) on the externality he causes the others by her action, and (c) the externality they cause him by their actions.

By hypothesis, other's material utilities are non-negatively affected by an increase in $i$'s effort. Hence, if $i$'s effort is positive and optimal from his personal viewpoint, that is, in terms of his total utility and given the others' efforts, then $i$'s marginal material utility is non-positive. It is zero if $i$ is indifferent to the externality he causes others — as in standard economics models — and it is negative if he cares (somewhat) about this externality. In the latter case, $i$ exerts more effort than if he was selfish. In the case of a team, this may be viewed as an expression of "team spirit," a concern for the other workers. It is arguably natural to assume that the weight factor is larger the closer others adhere to the social ideal, that is, that we care more about others' material well-being if these others contribute more to the common good.

We will apply this general set-up to a variety of commonly used contract forms within firms. We will assume that after the contract has been selected by the owner, each worker chooses his or her effort, without knowing the others' effort choices, but with a possible concern for the team. This defines a two-stage game in which each worker's strategy is a rule that specifies the worker's effort as a function of the contract selected. The payoff to the owner is taken to be the firm's profit and the payoffs to the workers is taken to be their total utilities. We will consider a few stylized situations of the simplest form.

## 3. Team pay

The firm has one owner (or principal) and $n$ identical workers (or agents). The owner observes the firm's output $y$ but not individual efforts. Output is a linear function of the sum of worker efforts, $y = x_1 + ... + x_n$, and each worker is paid $w = by/n$, where $b \geq 0$ is a *bonus rate* chosen at the outset by the owner.[8] Such a team payment scheme evidently induces externalities among the workers; each worker will benefit if a colleague works harder and lose income if a colleague shirks. Workers' material utilities are linear-quadratic in income and effort. With a slight abuse of notation,

$$u_i(b, \vec{x}) = b \cdot \bar{x} - \frac{1}{2}x_i^2 \tag{6}$$

where $\bar{x}$ denotes average effort. It is easily verified that the effort profile that maximizes the sum of all workers expected material utilities is $\hat{x} = (b, b, ..., b)$. Hence, we take this as the ideal effort profile of each and every worker $i$. According to this ideal, all workers should exert the same effort $\hat{x}_i = b$, for any bonus rate $b \geq 0$ chosen by the owner/principal.[9] By contrast, a selfish worker $i$ will exert the lower effort $x_i^o = b/n$.

From (2) and (3) we obtain, again with a slight abuse of notation, that

$$\psi_i(b, x_i, \hat{x}_{-i}) = \frac{b}{n}(n-1)(x_i - b) \tag{7}$$

and

$$\psi_{-i}(b, \hat{x}_i, x_{-i}) = \frac{b}{n}\left[\sum_{j \neq i} x_j - (n-1)b\right]. \tag{8}$$

The social utility to each worker $i$, from any effort profile $\vec{x}$ under any bonus rate $b$, is thus

$$v_i(b, \vec{x}) = g\left[\frac{b}{n}(n-1)(x_i - b), \frac{b}{n}(n-1)(\bar{x}_{-i} - b)\right], \tag{9a}$$

where $\bar{x}_{-i} = \sum_{j \neq i} x_j / (n-1)$ is the average effort of the other workers.[10] The social utility to each worker $i$ is thus a function of the bonus rate, $b$, the number of workers, $n$, the worker's own effort, $x_i$, and others' average effort, $\bar{x}_{-i}$.

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[8] We assume limited liability of the agents. This implies that the first-best cannot be attained in our framework with purely selfish agents by paying (negative) fixed wages.

[9] For an analysis of how effort levels stipulated by a social norm may depend on individuals' "talents", treated as private information, see Dufwenberg and Lundholm (2001).

[10] Workers being identical, their social payoffs are defined by the same function $G$.

By equation (1), we have now defined each worker's total utility:

$$U_i(b,\vec{x}) = \frac{b}{n}\sum_{j=1}^{n} x_j - \frac{1}{2}x_i^2 + g\left[\frac{b}{n}(n-1)(x_i - b), \frac{b}{n}(n-1)\left(\bar{x}_{-i} - b\right)\right] \tag{10}$$

The firm's profit — the residual left to the owner — is simply

$$\pi(b,\vec{x}) = F\left(\sum_{j=1}^{n} x_j\right) - b\sum_{j=1}^{n} x_j. \tag{11}$$

We take the owner to be a risk neutral profit-maximizer.

The interaction takes the form of a two-stage game, where the owner first chooses a bonus rate $b \geq 0$, and then all workers observe this rate — the contract offered to them — and simultaneously choose their individual efforts $x_i$.[11] Hence, a pure strategy for the owner is a real number $b \in \mathbb{R}_+$, and a pure strategy for a worker $i$ is a function $\xi_i : \mathbb{R}_+ \to \mathbb{R}_+$ that assigns an effort level, $x_i = \xi_i(b)$, to every bonus rate $b$. We solve this game for symmetric subgame perfect equilibrium, that is, subgame perfect equilibria in which all workers use the same strategy.

For any bonus rate $b \in [0,1]$, let $X^{NE}(b)$ be the set of effort levels $x$ such that $\vec{x} = (x, x, ..., x)$ is a Nash equilibrium under that bonus rate. A strategy pair $(b^*, \xi^*)$, where $b^*$ is the owner's strategy and $\xi^*$ the common strategy for the workers, constitutes a symmetric subgame-perfect equilibrium if and only if $\xi^*$ selects a common Nash equilibrium effort level for each bonus rate, and $b^*$ maximizes the owner's profit, given $\xi^*$:

[E1] $\xi^*(b) \in X^{NE}(b)\ \forall b \geq 0$

[E2] $b^* \in \arg\max_{b\in[0,1]} F[n\xi^*(b)] - nb\xi^*(b)$

**3.1. Selfish workers.** As a benchmark, let us first consider the standard case of workers motivated solely by their material utility, $g \equiv 0$. From (6) it is immediate that workers' decisions concerning effort are strategically independent. Hence, regardless of other workers' efforts, each worker $i$ solves the same maximization problem

$$\max_{x_i \geq 0}\left(\frac{b}{n}x_i - \frac{1}{2}x_i^2\right). \tag{12}$$

[11] In the section below we will also analyse the case where workers can reject the contract and take an outside option in its stead. For now, we shall assume that workers are stuck with their firm. This can be seen as a short-run analysis (where the labor market is sticky) but it mainly simplifies the exposition of the general mechanics induced by a social norm in a firm.

Consequently, the unique Nash equilibrium effort level, under any bonus rate $b \geq 0$, is $x^o(b) = b/n$ for all workers $i$ — one $n^{th}$ of the socially ideal effort level. Inserting this equilibrium response to any bonus rate offered into the expression for the firm's profit, we obtain

$$\pi = F(b) - b^2. \tag{13}$$

Hence, the owner's optimal choice of bonus rate is uniquely characterized by the first-order condition $F'(b) = 2b$. In particular, for $F$ linear, the solution is $b^o = 1/2$.

In sum: in the case of selfish workers and linear production, there exists a unique subgame-perfect equilibrium. In this equilibrium, the owner offers a 50/50 split of the firms' revenue with the team of workers. Workers' common effort level on the equilibrium path is $x^o(b^o) = 1/(2n)$, they each earn income $1/(4n^2)$ and obtain (material) utility $1/(8n^2)$. The owner makes profit $1/4$. Clearly, there is free-riding among workers in this unique equilibrium: their common equilibrium effort is only one $n^{th}$ of their socially ideal effort level, $\hat{x}(b) \equiv b$. Hence, if they could, they would like to collectively commit to this higher effort level. Under the equilibrium bonus rate $b^o = 1/2$, each worker's income would rise to $1/4$ and their material utility would rise to $1/8$. Even the owner's profit would increase, to $n/4$.

**3.2. Workers with team spirit.** Having studied the benchmark case of selfish workers, we now return to the general case. For any bonus rate $b \geq 0$ chosen by the owner, an effort profile $(x_1^*, ..., x_n^*)$ constitutes a subsequent Nash equilibrium if and only if

$$x_i^* \in \arg\max_{x_i \geq 0} \quad b\sum_{j=1}^{n} x_j/n - \frac{1}{2}x_i^2 + g\left[\frac{b}{n}(n-1)(x_i - b), \frac{b}{n}(n-1)(\bar{x}_{-i} - b)\right] \tag{14}$$

for each worker $i$. We henceforth assume that $g$ is twice differentiable and that it is increasing and concave in its first argument: $g_1 \geq 0$ and $g_{11} < 0$.[12] In this case, a necessary and sufficient condition for (14) to hold, for any given *positive* bonus rate $b$, is that each $x_i$ is positive and satisfies[13]

$$x_i = \frac{b}{n} + (n-1)\frac{b}{n}g_1\left[\frac{b}{n}(n-1)(x_i - b), \frac{b}{n}(n-1)(\bar{x}_{-i} - b)\right]. \tag{15}$$

[12] Both the material and social utilities are then concave functions of the worker's own effort, and the sum of two concave functions is concave, so also total utility is concave.

[13] To see that each worker's effort necessarily is positive in equilibrium, note that the maximand in (14) is differentiable with respect to $x_i$, with positive derivative at $x_i = 0$, whenever $b > 0$.

Focusing on symmetric equilibria, we note that the set of such equilibrium effort levels, $X^{NE}(b)$, is identical with the set of fixed points under the function $\phi : \mathbb{R}_+ \to \mathbb{R}$, defined by

$$\phi(x) = \frac{b}{n} + b(1 - \frac{1}{n})g_1 \left[(1 - \frac{1}{n})(bx - b^2), (1 - \frac{1}{n})(bx - b^2)\right]. \tag{16}$$

It follows immediately from this observation that no symmetric equilibrium effort is lower than the unique equilibrium effort of selfish workers:

**Proposition 1.** *If $b > 0$ and $x^* \in X^{NE}(b)$, then $x^* \geq x^o(b)$.*

What about existence of symmetric equilibria, for arbitrary bonus rates $b \geq 0$? We will show below that a sufficient condition for existence is $g_1(0,0) \leq 1$. This is a natural condition in many situations. Some technical regularity conditions aside, the condition is met, with a margin, if an agent's social utility is maximal when all workers exert the socially ideal effort.[14] To see this, consider the effect of changes in $i$'s effort on his or her own social utility, when all others exert the socially efficient effort:

$$\begin{aligned} \frac{\partial v_i(\vec{x}, \hat{x})}{\partial x_i} \quad | \quad_{\vec{x}=(\hat{x},\ldots,\hat{x})} &= g_1\left[\psi_i(\hat{x}), \psi_{-i}(\hat{x})\right] \cdot \sum_{j \neq i} \frac{\partial u_j(x_i, \hat{x}_{-i})}{\partial x_i} |_{x_i=\hat{x}} \\ &= g_1(0,0) \cdot \sum_{j \neq i} \frac{\partial u_j(\hat{x})}{\partial x_i} \end{aligned}$$

In "typical" applications, such as the present one, the sum is positive. Hence, a necessary condition for $i$'s social utility to be maximal when all workers exert the socially ideal effort is $g_1(0,0) = 0$, and hence $g_1(0,0) \leq 1$.

**Proposition 2.** *If $g_1(0,0) \leq 1$, then there exists at least one symmetric Nash equilibrium with common effort level $b/n \leq x^* \leq b$.*

**Proof** Suppose $b \geq 0$. By definition, $g_1 \geq 0$. Hence, $\phi(x) \geq b/n$ for all $x \geq 0$, so $x^* \geq b/n$ is necessary for symmetric Nash equilibrium. Moreover, $g_1(0,0) \leq 1$ implies $\phi(b) \leq b$. Since $\phi$ is continuous, $\phi(x^*) = x^*$ for some $x^* \in [b/n, b]$. □

[14] The condition fails if some individual maximizes his or her social payoff by being "over zealous," that is, by exceeding the socially ideal effort when all others stick to the social ideal. We believe this case to be an exception rather than the rule.

In general, it is not an easy task to find and characterize the set of SSPE, the main reason being the non-linearity of the model and the possibility of multiple Nash equilibrium effort levels for a given bonus rate $b$. Rather than embarking on a general and abstract analysis, we move on to a diagrammatic exposition of a special case, showing what *can* happen within the present model framework.

**Example.** Suppose the social utility to worker $i$ is linear in the externality he imposes on the others, and logistic in the externality they impose on him. It is thus as if each worker cares logistically more about the material externality he imposes on the others in the team, the more the other team members contribute themselves. Formally, let

$$g(z_i, z_{-i}) \equiv \frac{\lambda e^{\sigma z_{-i}}}{1 + e^{\sigma z_{-i}}} \cdot z_i$$

for parameters $\lambda, \sigma > 0$. Clearly, $g$ is twice differentiable, has a positive partial derivative with respect to its first argument, and $g_1(0,0) = \lambda/2$. From equation (16) we obtain

$$\phi(x) = \frac{b}{n}\left(1 + \lambda(n-1)\frac{\exp\left(\frac{\sigma}{n}(n-1)(x-b)b\right)}{1 + \exp\left(\frac{\sigma}{n}(n-1)(x-b)b\right)}\right).$$

Figure 1 shows the graph of this function, for $b = 0.25$, $0.5$ and $0.75$ (for $n = 5$, $\lambda = 1.5$ and $\sigma = 20$).

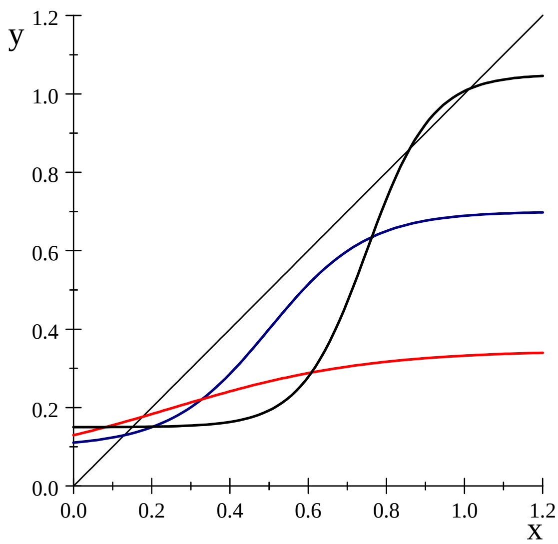


Figure 1: The fixed-point equation for effort, given the bonus rate.

The higher the bonus rate, the higher is the corresponding graph's initial value, $\phi(0)$ (and this is also true for the asymptotic values, but not for all intermediate values). For each of the two lower bonus rates there is a unique equilibrium, and we see that the equilibrium effort is somewhat higher when the bonus rate is 0.5 (the optimal bonus rate for selfish workers) than when it is 0.25. But is also the profit higher? We will return to this question in the next diagram, but first we note that for the highest bonus rate, $b = 0.75$, there are thee equilibrium effort levels.

The possibility of multiple equilibria raises the question whether there is a systematic way to select among them. We find it reasonable to disregard the intermediate equilibrium as is unstable under adaptive expectations; the slightest perturbation of workers' expectations will lead their efforts away from that level. By contrast, each of the other two equilibria is stable under adaptive expectations. Given the bonus rate, $b = 0.75$, the collective decision problem that the team faces is essentially that of a $n$-player coordination game, and it can be argued that, in a practical situation of this sort, the team members will talk with each other before they individually decide whether to take the high or low equilibrium effort. It is plausible that this will lead the team-members to coordinate on the Pareto dominant equilibrium. Indeed, there is experimental evidence in favor of this hypothesis, for example in Van Huyck, Battalio, and Beil (1990). Moreover, for the case of two players facing a symmetric and finite coordination game, there is some theoretical basis for this selection too. Demichelis and Weibull (2008) generalize the cheap-talk model of pre-play communication by allowing messages to have a pre-existing meaning and players to have a lexicographic preference against lying. They show that, in generic coordination games with such pre-play communication, the Pareto efficient Nash equilibrium component is the only one that is evolutionarily stable. Which of the two equilibria in this example, for $b = 0.75$, Pareto dominates the other? Again, we postpone the answer until after we have considered the next diagram, which shows (for the same parameter values as in Figure 1) the graph of the equilibrium correspondence from bonus rates $b \in (0, 1)$ to equilibrium effort levels, $x > 0$, along with iso-profit curves for the case of linear production. The dashed straight line is the graph of the equilibrium correspondence for the case of selfish workers, $x = b/n$.

A number of remarks can be made. First, we note that the lowest iso-profit curve ($\pi = 0.25$) just touches the equilibrium line $x = b/n$ for selfish workers from above at the profit-maximizing bonus rate, $b = 0.5$, for such workers. Hence, higher profits can be obtained under team pay with team-spirited workers than with selfish workers. For instance, the bonus rate $b = 0.3$ results in profits $\pi \approx 0.7$ and is a locally profit-maximizing bonus rate. Is it also globally profit-maximizing in this example, if we use the suggested equilibrium selection principle? The other candidate bonus rate for profit maximization in this example is $b \approx 0.71$, which results in profit $\pi \approx 1.25$, in the subgame perfect equilibrium with the high-effort equilibrium. If the high-effort equilibrium Pareto-dominates the low-effort equilibrium, for the team of workers, then this will be the globally profit-maximizing bonus rate under the suggested equilibrium selection principle.

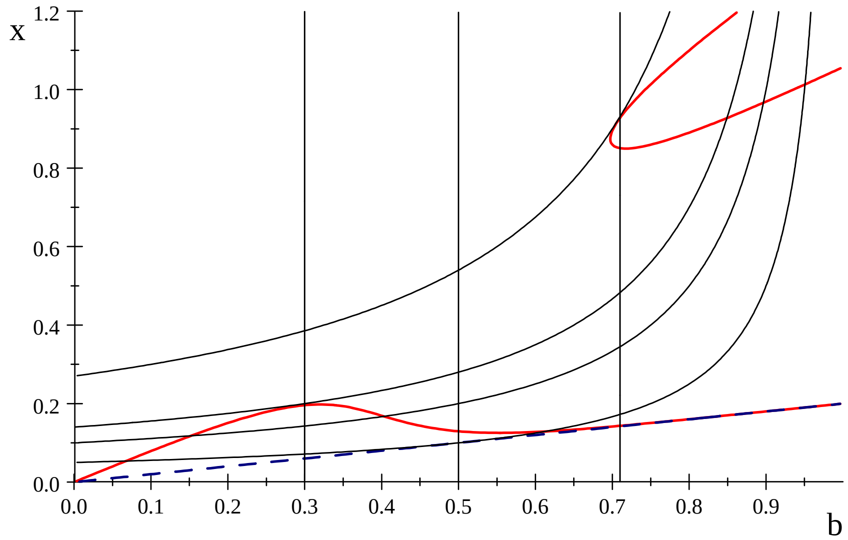


Figure 2: The correspondence from bonus rates to equilibrium effort levels.

In the present numerical example (with $n = 5$ and $\lambda = 1.5$), the total utility to a worker, when all workers exert the same effort $x$ and the bonus rate is $b$, is

$$U = bx - \frac{1}{2}x^2 + \frac{\exp(16(x-b)b)}{1+\exp(16(x-b)b)} \cdot \frac{6b}{5}(x-b)$$

For $b = 0.71$ and $x \approx 0.16$ (the low equilibrium effort), we obtain $U \approx 0.10$ while for $b = 0.71$ and $x \approx 0.90$ (the high equilibrium effort), we obtain $U \approx 0.38$. Hence, the high-effort equilibrium does Pareto dominate the low-effort equilibrium, and the optimal contract for the owner is thus to offer the high bonus $b = 0.71$. Under this bonus rate, workers will be over-zealous and contribute above the social ideal ($x = 0.71$). We note that the profit is much higher than had the workers been selfish. The high bonus brings forth a very strong team spirit, resulting in a high profit to the owner — and high total utility to each worker. Thus, in this example, market selection in favor of more profitable firms also favors the high-effort equilibrium.

Note that inequity aversion in team production, e.g. captured by Fehr-Schmidt (1999) preferences, can also generate multiple equilibria and over-zealousness. However, the inefficient standard equilibrium always persists under inequity aversion, which is not always the case in our model.

A phenomenon illustrated by Figure 2 is that an increase in the bonus rate can lead to reduced efforts. This is the case, for example, if the bonus rate is raised from $b = 0.35$ to, say, $b = 0.45$. It is thus as if economic incentives can crowd out social incentives. This phenomenon can be understood by studying equation (15), which shows that an increase in the bonus rate $b$ has three effects on a worker's effort (holding other workers' efforts constant). First, it increases $i$'s economic incentive to exert effort, by way of the monetary reward to the team. It also increases the worker's social incentive to exert effort, since an increase in the bonus, if not accompanied by an increase in own effort, decreases the (positive) externality imposed on other team members. However, an increase in the bonus rate also *reduces* the worker's incentive to exert effort, since other team members' (positive) externality upon him decreases as the bonus rate goes up (recall that their efforts are fixed in this thought experiment) — which diminishes the peer pressure felt by the worker. If this third, peer pressure, effect outweighs the first two, then the worker will reduce his effort if the bonus rate is increased and the others efforts would be fixed. But the same reasoning applies to them, so they will also reduce their efforts, resulting in a downward spiral in efforts until a lower-effort equilibrium, associated with the new and higher bonus rate, has been reached.

Such crowding out can be studied more generally, by way of implicitly differentiating the fixed-point equation, $\phi(x) = x$ for symmetric equilibrium, where $\phi$ is defined in (16), with respect to the bonus rate, $b$. For a dynamically stable such equilibrium (that is, satisfying $\phi'(x) < 1$), the marginal effect of a marginal increase of $b$ on the equilibrium effort, $x$, is negative ("crowding out") if and only if

$$g_1 + \frac{1}{n-1} < \left(1 - \frac{1}{n}\right) b\,(2b - x)\,(g_{11} + g_{12})$$

(With partial derivatives denoted by suffixes.) In the parametric example above, $g_{11} = 0$ and $g_{12} > 0$, and typically the equilibrium effort is less than double the social ideal level. In such cases, the term on the right-hand side, the peer effect, is positive. If this third term is large enough (it has to "overcome" the direct monetary effect, $g_1$ by the margin $1/(n-1)$), there will be crowding out. We note that this happens more easily the larger the team, ceteris paribus.

Another phenomenon illustrated by Figure 2 is that a slight change in the bonus rate can result in a discontinuous jump in work effort. For instance, a gradual shift downwards of the bonus rate, from its optimal value $b = 0.71$, will lead to a sudden and drastic decrease in workers' effort when the bonus rate is about 0.69, from $x \approx 0.87$ to $x \approx 0.11$. As the bonus rate continues to shift downward, we would observe first a very slight decrease, then a continuous increase and finally a continuous decrease in effort. All of this, the discontinuity and non-monotonicity, is due to the endogenous social incentive. It appears that the non-monotonicity is a fundamental and robust phenomenon, while discontinuities arise only in case workers are quite sensitive to others' efforts in their consideration of these others' welfare. For instance, if instead of $\lambda = 1.5$ in our numerical example (but otherwise the same parameters) we would have $\lambda = 1$ (or lower), the subgame equilibrium is unique for all bonus rates, see Figure 3 below.

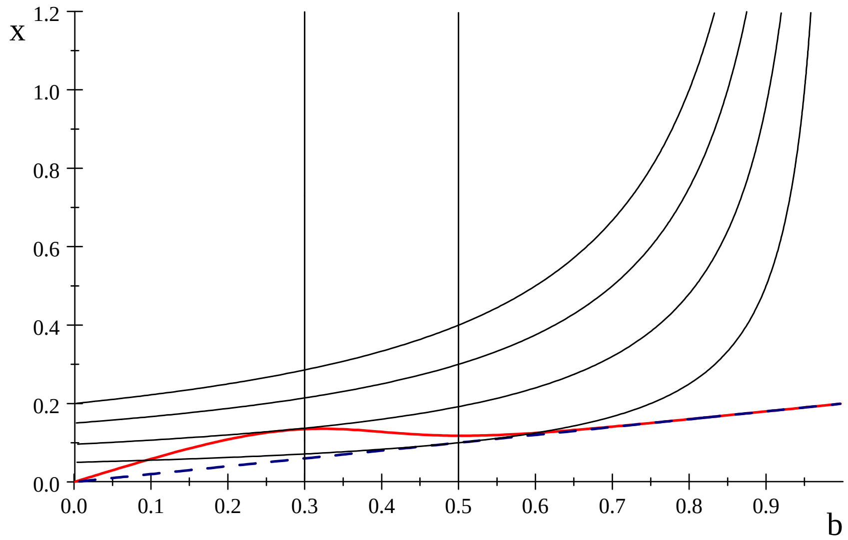


Figure 3: The correspondence from bonus rates to equilibrium effort levels, when $\lambda = 1$.

The crowding-out of the social incentive still occurs, and the profit-maximizing bonus rate is approximately 0.28, still far below that for selfish workers ($b = 0.5$). Evidently the owner earns a higher profit than had the workers been selfish. What about the workers' material utility. Is it higher or lower when they have social preferences than when they are selfish, under the profit-maximizing contract for each case? Their material equilibrium utility under any bonus rate $b$ and common effort level $x$ is $u^* = (b/n - x/2)\, x$. Hence, if they would be selfish and the bonus rate accordingly were $b = 0.5$, their material utility would be $u^* = 0.005$, while if they would have the social preferences of this example, and the bonus rate accordingly were $b \approx 0.28$, their material utility would be $u^* \approx -0.007$. Hence, their concern for each others' welfare in the end benefits the owner but is detrimental to their material well-being.[15]

Before we move on, let us briefly summarize the key effects of social norms that we have seen here:

- Social norms always increase efforts in this team-pay framework and, consequently, a firm owner will be better off when her workers are sensitive to social work norms.
- Social norms can induce over-zealousness. In equilibrium, workers might work harder than their social ideal.
- More high-powered monetary incentives can crowd out social-norm incentives and actually *reduce* equilibrium efforts.

## 4. Relative-performance pay

Under team pay, a worker's effort is a positive externality for other workers—an increase in $i$'s effort increases $j$'s income and hence material utility, *ceteris paribus.* We saw that a social norm derived from externalities then works in favor of the firm owner. In other environments, such as when there is an element of competition between the workers, one worker's effort may cause a negative externality on others—an increase in $i$'s effort may decrease $j$'s income. Can a social norm then work against the owner's interest? If social utilities (induced, perhaps, through peer pressure) make workers compete less hard with each other, then social preferences of the form modelled here may restrain their efforts and cause profits to be lower than if workers had only material utilities. Under such contracts, will social preferences among workers reduce profits? Enhance workers' material utility?

In order to analyze this in a simple and clear setting, suppose now that the owner observes each worker's effort (or individual output) with some noise and pays the worker with the highest observed effort (or individual output) a lump-sum bonus, or award, $a > 0$. With otherwise the same model specification, let $x_i \geq 0$ be worker $i$'s effort and let $\tilde{x}_i = x_i + \varepsilon_i$ be the effort observed by the owner. In the spirit of the tournament model by Lazear and Rosen (1981), for any effort profile $\vec{x}$ the material utility to worker $i$ is a random variable:

$$\tilde{u}_i = \begin{cases} a - x_i^2/2 \text{ if } \tilde{x}_i > \tilde{x}_j \ \forall j \neq i \\ -x_i^2/2 \text{ if } \tilde{x}_i < \tilde{x}_j \text{ for some } j \neq i \end{cases}$$

[15] For this example, we neglect participation constraints, which might be violated with social norms but satisfied without social norms.

Assuming the noise terms $\varepsilon_i$ to contain one common component, $\eta$, a productivity shock to all workers, and one idiosyncratic component, $\nu_i$, specific to worker $i$, we write $\varepsilon_i = \eta + \nu_i$ and assume that the $\nu_i$ terms are i.i.d. Gumbel-distributed. In this case, the expected utility for each worker is a logistic function of his/her own effort, given those of the other workers:

$$u_i(a, \vec{x}) = \mathbb{E}[\tilde{u}_i] = \frac{ae^{\theta x_i}}{ae^{\theta x_i} + \sum_{j \neq i} e^{\theta x_j}} - x_i^2/2$$

for some $\theta > 0$ (a parameter inversely related to the standard deviation of the noise term). The unique effort profile that maximizes the sum of all worker's expected material utility, given any award $a \geq 0$ is $\vec{x} = (0, 0..., 0)$, that is, no-one exerts any effort. This is no surprise, since exactly one member of the team will receive the award (lump-sum bonus), irrespective of individual efforts, and therefore efforts are wasteful from the team's point of view. Let thus the social ideal for all workers be $\hat{x} = 0$.

In the case of selfish workers, the unique symmetric Nash equilibrium effort profile, given the award $a > 0$, is again proportional to the reward (though now it is a lump-sum while before it was a rate):

$$x^o(a) = \theta \cdot \left(1 - \frac{1}{n}\right) \frac{a}{n}$$

We note that the more precise the owner's effort observations, the more effort each worker exerts, and the more workers there are in the team, the less will each of them work. The profit to the owner is total output, which we take to be increasing in the sum of efforts, net of the award paid to the winning team member,

$$\pi = F\left(\sum_j x_j\right) - a,$$

for some twice differentiable production function $F$ meeting the usual Inada conditions. The profit-maximizing bonus thus solves

$$\max_{a \geq 0} F\left(\theta \frac{n-1}{n} a\right) - a$$

This maximization program has a unique solution, $a^o > 0$, characterized by the first-order condition

$$\theta \cdot F'\left(\theta \frac{n-1}{n} a^o\right) = \frac{n}{n-1}$$

We now introduce social preferences in the same manner as before, where

$$\psi_i\left(x_i, \hat{x}_{-i}\right) = (n-1) \cdot \frac{e^{\theta x_i} - 1}{n + e^{\theta x_i} - 1} \cdot \frac{a}{n}$$

$$\psi_{-i}\left(\hat{x}_i, x_{-i}\right) = \frac{n - 1 + \sum_{j \neq i} e^{\theta x_j}}{1 + \sum_{j \neq i} e^{\theta x_j}} \cdot \frac{a}{n}$$

and hence

$$U_i(a, \vec{x}) = \frac{a e^{\theta x_i}}{\sum_{j=1}^{n} e^{\theta x_j}} - \frac{1}{2} x_i^2 + g \left[ (n-1) \cdot \frac{e^{\theta x_i} - 1}{n + e^{\theta x_i} - 1} \cdot \frac{a}{n}, \frac{n - 1 + \sum_{j \neq i} e^{\theta x_j}}{1 + \sum_{j \neq i} e^{\theta x_j}} \cdot \frac{a}{n} \right].$$

The fixed-point equation for symmetric Nash equilibrium becomes

$$x = \theta (n-1) \frac{1}{n^2} - \frac{\theta (n-1) a e^{\theta x}}{\left(n + e^{\theta x} - 1\right)^2} \cdot g_1 \left[ (n-1) \cdot \frac{e^{\theta x} - 1}{n + e^{\theta x} - 1} \cdot \frac{a}{n}, \frac{(n-1)\left(1 + e^{\theta x}\right)}{1 + (n-1) e^{\theta x}} \cdot \frac{a}{n} \right]$$

Since $g_1 > 0$, any equilibrium effort (there may be multiple symmetric equilibria) will be lower in the presence of social preferences. This is not surprising, since the incentive scheme is such that one workers' effort is a negative externality for the others. Hence, in the case of relative-performance pay, a social norm among team members is detrimental for the owner.

**Example.** Using the same $g$-function as in the case of team-pay, and parameter values $n = 5$, $\lambda = \theta = 1$ and $\sigma = 20$, the fixed point equation can be written as

$$x = \frac{4a}{25} - \frac{4a}{5} \frac{5e^x}{\left(4 + e^x\right)^2} \cdot \frac{\exp\left(\frac{80a}{5} \cdot \frac{1-e^x}{1+4e^x}\right)}{1 + \exp\left(\frac{80a}{5} \cdot \frac{1-e^x}{1+4e^x}\right)}.$$

Taylor expansion in $x$ gives the following approximation:

$$x \approx \frac{4a}{5} \left[ \frac{1}{10} + \left( \frac{4}{25} a - \frac{3}{50} \right) x - \left( \frac{1}{500} - \frac{6}{125} a \right) x^2 \right],$$

which shows that the equilibrium effort is approximately linear in the award rate. The diagram below shows the graph of the (exact) equilibrium correspondence from the award, $a$, to the equilibrium effort level, $x$. This is the lower full curve in the diagram, indeed looking much like a straight line to the eye. The more steeply sloped dashed curve is this correspondence in the case of selfish workers; they react stronger to the monetary incentive. The two thin curves are iso-profit curves, drawn for the production function $F(x_1 + ... + x_n) \equiv \sqrt{x_1 + ... + x_n}$. The two thin vertical lines indicate the associated optimal awards, $a^0 = 0.2$ in the case of selfish workers, and $a^* \approx 0.1$ in the case of workers with social preferences. The two thin horizontal lines indicate the corresponding equilibrium effort levels.[16]

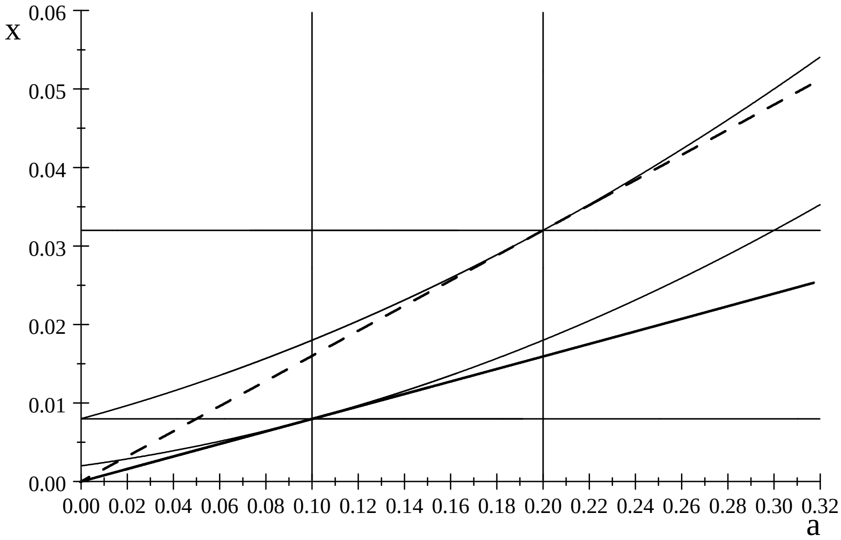


Figure 4: The correspondence from awards to equilibrium efforts, under relative-performance pay.

We note that the social norm harms the firm's profit. More exactly, the profit-maximizing award in the presence of the norm, $a^* \approx 0.1$ is smaller than the optimal award in the case of selfish workers, $a^o \approx 0.2$. In the first case, worker's effort level is $x^* \approx 0.008$ while in the second case it is $x^0 = 0.032$. Hence, the associated profits are

$$\pi^* \approx \sqrt{5 \cdot 0.008} - 0.1 \approx 0.1$$

$$\pi^0 \approx \sqrt{5 \cdot 0.032} - 0.2 \approx 0.2$$

The levels of expected material utility to each worker, in these two equilibrium situations, are

$$u^* \approx \frac{1}{5} \cdot 0.1 - \frac{1}{2}(0.008)^2 \approx 0.002$$

[16]We obtain $x^0 = 0.032$ when $a = 0.2$, for selfish workers. Solving the fixed-point equation under the Taylor approximation, we obtain $x^* \approx 0.007972$ when $a = 0.1$ for workers with social preferences. These are the two thin horizontal lines.

and

$$u^0 \approx \frac{1}{5} \cdot 0.2 - \frac{1}{2} (0.032)^2 \approx 0.004.$$

Hence, selfish workers not only make the employer better off, but also obtain higher expected material utility themselves than workers with social preferences. The employer gives more high-powered incentives to selfish workers and they respond by working harder. Nevertheless, they are better off than workers with social preferences in material terms as the higher award overcompensates them for the higher effort level.

## 5. Discussion

Social norms root in externalities. They encourage actions that induce positive and discourage actions that induce negative externalities. The strength of the social norm may depend on how well others adhere to it. These are the basic premises of our paper that develops a general framework for studying social norms in economic contexts. This framework is fully flexible and can be applied to any economic context where externalities are important.

The fundamental observation we make is that in a very simple model of a firm, economic incentives can determine the sign of the effect that social norms have on actions. One and the same social norm can be efficiency enhancing, neutral, or efficiency decreasing depending on the type of contract used. More specifically, we show that with team pay social norms enhance efficiency while relative-performance incentives render norms detrimental. This suggests the importance of "norm management" when a principal designs a contract.[17] In particular, team pay emerges as an incentive scheme that can generate effort-enhancing social pressure.[18] Moreover, we demonstrate that social norms make the optimal design of economic incentives tricky as there can be multiplicity of equilibria, jumps, and crowding out.

The paper raises many new questions. First of all, one can explore the robustness of our results in a variety of settings. (In an older version of this paper, we examined sequential production, franchises, binding outside options, etc.) But there are also other types of questions. An obvious one concerns the issue of equilibrium selection on which we have only touched upon. One possible avenue for future research is to apply tools from evolutionary game theory to investigate this in more detail.

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[17] See Kübler (2001) on the similar notion of "norm regulation".

[18] A related argument in favor of team work is provided by Che and Yoo (2001). They show that team pay can be optimal in a dynamic setting even if individual contributions are verifiable. Implicit contracts, i.e. sanctions against free riders by other team members, increase effort levels beyond those achieved by contracts based on individual performance.

Another question concerns the endogeneity of the social norm. In our model we have assumed that workers have social preferences and we have not studied where these preferences originate from. Intuitively, one might suspect that agents who have such preferences have an evolutionary disadvantage since others (with standard preferences) can always free ride on them. However, a key observation for understanding the *evolution* of work norms is that the matching between workers and firms is typically not random (as normally assumed in evolutionary models and implicit in the above argument for why free-riders should survive). Rather workers apply to selected firms and firms select applicants after careful interviewing. Firms care a lot about dimensions that can be summarized under "personality".[19] A version of our team production model can explain why this is the case. As the equilibria in the effort game are Pareto-ranked, our firm would try to select workers who are sensitive to peer pressure. Firms that do not care for the "personality" of their workers would consistently earn less than others, and might therefore ultimately disappear.

For workers, similar dynamics may apply. Those who are insensitive to peer pressure would only be selected by firms with a lower "work morale," that is, by firms that in equilibrium pay less and that face a bigger risk of being shut down. This implies a double disadvantage for workers who are insensitive to social norms and who would free-ride. They earn lower wages and they are more likely to lose their jobs. Hence, evolutionary selection may operate in favor of workers who are sensitive to peer pressure in such settings. Interestingly, the opposite holds true for tournaments. A firm using relative performance schemes would like to select workers who are insensitive to social pressure. Thus, different incentive schemes can lead to sorting of worker types, a phenomenon which may be related to certain personality differences observed between the private and the public sector.[20]

[19]See, for example, the recent article by Highhouse (2002) who discusses the advantages of the "holistic approach" to personnel selection over standardized tests.

[20]See, for example, Francois (2000), who deals with public sector motivation from the vantage point of economics, or the recent survey on public sector motivation in the literature on public administration by Wright (2001).

## References


[1] Akerlof G. (1980). A Theory of Social Custom, of Which Unemployment May Be One Consequence, *Quarterly Journal of Economics* 84: 749-775.

[2] Bacharach, M. (1999). Interactive team reasoning: A contribution to the theory of co-operation. *Research in Economics* 53: 117-147.

[3] Bandiera, O., I. Barankay, and I. Rasul (2005). Preferences and the Response to Incentives: Evidence from Personnel Data. *Quarterly Journal of Economics* 120: 917-962.

[4] Barron, J.M. and K.P. Gjerde (1997). Peer Pressure in an Agency Relationship. *Journal of Labour Economics* 15: 234-254.

[5] Bartling, B. (2010). Relative Performance or Team Evaluation? Optimal Contracts for Other-Regarding Agents. Mimeo.

[6] Bernheim D. (1994). A Theory of Conformity. *Journal of Political Economy* 102(5): 841-877.

[7] Besley T. and S. Coate (1992). Understanding Welfare Stigma: Taxpayer Resentment and Statistical Discrimination. *Journal of Public Economics* 48: 165-183.

[8] Che, Y.-K., and S.-W. Yoo (2001). Incentives for Teams. *American Economic Review* 91: 525-541.

[9] Demichelis, S. and J. Weibull (2008). Language, meaning and games: a model ofcommunication, coordination and evolution. *American Economic Review* 98: 1292-1311.

[10] Dufwenberg, M. and M. Lundholm (2001). Social norms and moral hazard. *Economic Journal* 111, 506-525.

[11] Encinosa, W.E., M. Gaynor and J.B. Rebitzer (2000). The Sociology of Groups and the Economics of Incentives: Theory and Evidence on Compensation Systems. Mimeo.

[12] Falk, A., U. Fischbacher and S. Gächter (2012). Living in Two Neighborhoods - Social Interaction Effects in the Lab. *Economic Inquiry* (forthcoming).

[13] Falk, A., and A. Ichino (2006). Clean evidence on peer pressure. *Journal of Labor Economics* 24 (1): 39-57.

[14] Fehr, E. and K. M. Schmidt (1999). A Theory of Fairness, Competition, and Cooperation. *Quarterly Journal of Economics* 114: 817-868.

[15] Fischer, P. and S. Huddart (2008). Optimal Contracting with Endogenous Social Norms. *American Economic Review* 98: 1459-1475.

[16] Francois, P. (2000). 'Public Service Motivation' as an Argument for Government Provision. *Journal of Public Economics* 78, 275-299.

[17] Frey, B.S. (1997). *Not Just for the Money: An Economic Theory of Personal Motivation*, Cheltenham: Edward Elgar.

[18] Frey, B.S. and R. Jegen (2003). Motivation Crowding Theory: A Survey of Empirical Evidence. *Journal of Economic Surveys* 15: 589-611.

[19] Hart, O. (2001). Norms and the Theory of the Firm. Harvard University. SSRN Electronic Paper Collection.

[20] Highhouse, S. (2002). Assessing the Candidate as a Whole: A Historical and Critical Analysis of Individual Psychological Assessment for Personnel Decision Making. *Personnel Psychology* 55, 363-396.

[21] Holmström, B. and P. Milgrom (1990). Regulating Trade Among Agents. *Journal of Institutional and Theoretical Economics* (JITE) 146: 85-105.

[22] Ichino, A. and G. Maggi (2000). Work Environment and Individual Background: Explaining Regional Shirking Differentials in a Large Italian Firm. *Quarterly Journal of Economics* 115: 1057-1090.

[23] Itoh, H. (1992). Cooperation in Hierarchical Organizations: An Incentive Perspective. *Journal of Law, Economics and Organization* 8: 321-345.

[24] Kandel, E. and E.P. Lazear (1992). Peer Pressure and Partnerships. *Journal of Political Economy* 100: 801-817.

[25] Knez, M. and D. Simester (2001). Firm-wide Incentives and Mutual Monitoring at Continental Airlines. *Jounal of Labor Economics* 19: 743-772.

[26] Kübler, D. (2001). On the Regulation of Social Norms. *Journal of Law, Economics, and Organization* 17: 449-476.

[27] Lazear, E.P. and S. Rosen (1981). Rank-Order Tournaments as Optimum Labor Contracts. *Journal of Political Economy* 89: 841-864.

[28] Lindbeck, A., S. Nyberg and J. Weibull (1999). Social Norms and Economic Incentives in the Welfare State. *Quarterly Journal of Economics* CXIV: 1-35.

[29] Lindbeck, A., S. Nyberg and J. Weibull (2003): Social Norms and Welfare State Dynamics. *Journal of the European Economic Association, Papers and Proceedings* 1(2-3): 533-542.

[30] Moffitt R. (1983). An Economic Model of Welfare Stigma. *American Economic Review* 73: 1023-35.

[31] Rey Biel, P. (2008): Inequity Aversion and Team Incentives. *Scandinavian Journal of Economics* 110: 297–320.

[32] Titmuss, R.M. (1970). *The Gift Relationship*, London: Allen and Unwin.

[33] Van Huyck, J., R. Battalio and R. Beil (1990). Tacit Coordination Games, Strategic Uncertainty, and Coordination Failure. *American Economic Review* 80: 234-248.

[34] Vendrick, M.C.M. (2003). Dynamics of a Household Norm in Female Labour Supply. *Journal of Economic Dynamics & Control* 27: 823-841.

[35] Wright, B.E. (2001). Public Sector Motivation: A Review of the Current Literature and a Revised Conceptual Model. *Journal of Public Administration Research and Theory* 11: 559-586.