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Abstract

In this article, we propose to view the firm as a locus of socialization in which employees with heterogeneous work attitudes can be motivated and coordinated through adherence to a social ideal of effort. We develop an agency model in which employees have both a personal and a social ideal of effort. The firm does not observe the personal ideals, but can make its workforce more sensitive to the social ideal by fostering interaction in the workplace. We show that there are two reasons why the firm invests in social bonding. First, it reinforces the effectiveness of monetary incentives. Second, strengthening the social ideal reduces the adverse selection problem and the need to devise distorted payment schemes. We also show that the firm allocates more time to social interaction when personal ideals of effort are low or heterogeneous.

JEL-codes: D2, D8, J3, M5.

KEYWORDS: agency theory, social interaction, social norms, norm regulation.

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"Our offices and cafes are designed to encourage interactions between Googlers within and across teams, and to spark conversation about work as well as play."

(Google website, 2013)

"I call it the 'pronoun test', I ask frontline workers a few general questions about the company. If the answers I get back describe the company in terms like 'they' and 'them,' then I know it's one kind of company. If the answers are put in terms like 'we' or 'us,' then I know it's a different kind of company."

(Former U.S. Secretary of Labor, Robert B. Reich, on visiting a company for the first time)

1 Introduction

United Parcel Service (hereafter UPS) is known as a company that constantly strives to improve its efficiency: packages are sorted by computers to optimize the order of delivery; delivery routes are designed to avoid left turns, so that no time is wasted waiting for a gap in oncoming traffic; and drivers have to maintain a fast pace when walking. The company, which is continually looking to save seconds in the delivery chain, has a somewhat unexpected practice: several minutes are set aside for drivers and loaders to engage in a "pre-work huddle", a team gathering before the drivers leave the distribution center. According to UPS management, the objective of this practice is to engender a team spirit between loaders and drivers (Cohen and Prusak, 2001). Fostering a certain amount of social bonding among employees is not unique to UPS. Over the past few decades, many firms have introduced new practices to make it easier for employees to develop formal and informal social interaction: new physical spaces such as open-plan offices, places to relax, and meeting points are designed to promote an environment of communication and information sharing among colleagues; workshops and brainstorming sessions are held to stimulate collective creativity and mutual understanding; information technologies, such as email, intranet and chats favor exchange; and team building activities, defined as a variety of practices ranging from simple bonding exercises

to complex simulations, aim to generate a sense of cohesiveness among employees.[1,2]

Why do some firms allocate time and space to foster social interaction between their employees? Besides creating a great atmosphere and facilitating the emergence of new ideas, the literature on organizational identification, a subfield of management literature, has suggested that, by promoting interaction, a firm may be seeking to induce its workforce to identify as part of a collective (the group or the organization) and behave in ways that are normative for the collective identity (e.g., Pratt, 2000; Ellemers, De Gilder and Haslam, 2004; Van Dick, 2004; Cohen and Prusak, 2001). According to these authors, shifting the employees' identity from being personal ("I") to collective ("we") has two positive consequences. First, group-based expectations, goals, or outcomes become a source of implicit incentives for workers, that supplement or even replace more traditional monetary incentives. Second, by promoting the collective identity, the firm can keep possibly heterogeneous employees together and secure their involvement in the work environment. In this context, the rise of practices aimed at encouraging employee interaction and building shared identities could be interpreted as an attempt by firms to counter reduced loyalty (Casey, 1996) or increased diversity (Cohen and Prusak, 2001) among their workforces. The firm is viewed as a "social community" in which heterogeneous individuals can be motivated and coordinated at a smaller cost, through identification with the collective (Kogut and Zander, 1996; Foss and Lindenberg, 2012).[3]

In this article, we develop an agency model to study how a firm may foster social interaction among its employees to strengthen their shared identity and provide more efficient incentives to exert effort. An employee's identity is modeled as an ideal of effort, which is a weighted combination of a personal ideal and a social ideal. Personal ideals can differ across employees and are not observed by the firm. This gives rise to an adverse selection problem. Employees perform independent

[1]Cohen and Prusak (*ibid.*) give several examples of firms providing "space and time" to allow their employees to interact. Notably, they describe how Alcoa, the world's leading producer of aluminum, moved to new headquarters in 1998 in which glass-walled conference rooms, meeting places, kitchens, and escalators occupy the center of each floor and are designed to encourage workers to meet, mix, and chat. According to the CEO, Paul O'Neill, the ultimate goal was to promote "a sense of connection" among employees.

[2]Of course, firms may encourage a certain amount of social interaction on the workplace, but at the same time block chatting with the outside world via social-networking websites. According the consulting firm Robert Half Technology, 54 percent of U.S. companies were blocking social networks completely in 2009.

[3]The literature on organizational identification is based on insights from social identity theory (Tajfel and Turner 1979). This theory suggests that a person's identity is composed of two different facets. Personal identity corresponds to individual attributes that are not shared with other people. Social identity corresponds to attributes that result from being a member of a social group. The literature on organizational identification goes a step further by suggesting that an organization can reinforce its employees' social identity through social bonding or training in order to create implicit group incentives.

production tasks, which means that the only externalities among workers are social. We obtain four main results. First, we take the employees' sensitivity to the social work ideal as given and determine the optimal payment scheme. We show that, the more employees are sensitive to the social ideal, the higher the power of monetary incentives chosen by the firm and its profits will be. This result is a consequence of an effect known in the economic literature as the social multiplier effect, which, when applied to an agency context, means that the existence of the social ideal reinforces the effectiveness of monetary incentives (see for example Fischer and Huddart, 2008). Second, we allow the firm to alter the employees' sensitivity to the social ideal by choosing the portion of working hours allocated to social interaction. Hence, the firm plays the role of norm regulator. For the firm, there is a cost of investing in social interaction because less time is left for production. There is also a benefit: by favoring social bonding the firm makes its workforce more sensitive to the social ideal and engenders a "We" frame. The consequence is that the social multiplier effect is reinforced. We show that the firm allocates more time for social interaction when employees have low personal ideals of effort: motivating employees through the shared identity is used as a substitute for low individual work ethics. Third, we show that investing in social interaction allows the firm to alleviate the adverse selection problem. Contrary to the case of complete information in which it is optimal for the firm to set the same intensity of monetary incentives for all types of employees, the prevalence of asymmetric information leads the firm to propose a menu of contracts in which there is a downward distortion of the incentives aimed at employees with low personal work ideals. However, by promoting the shared social ideal, the firm is able to partially homogenize the heterogeneous workforce and to reduce the contractual distortions resulting from incomplete information. The consequence is that the firm gives employees more time to develop social ties when the workforce is heterogeneous. Lastly, the model predicts that firms in which it is easier to foster social interaction between employees, for example due to the nature of the business or the design of the workplace, use less differentiated payment schemes than firms in which fostering social interaction is harder. We will discuss some evidence provided by Frank (1984) suggesting that this might indeed be the case. He compares the commission schedules used by automobile dealers and real estate agencies and observes that the former use flat schedules while the latter generally use ramped schedules. He argues that the difference comes from the fact that automobile salespersons work together in the same location and interact a lot, while real estate agents spend most of the

time with clients outside the office and interact much less.

There is a burgeoning theoretical literature that suggests that social norms have important effects on workers' behavior in the workplace.[4] Kandel and Lazear (1992) assume that members of a team suffer a utility loss when their own effort level falls short of that of their co-workers. The consequence is that workers exert more effort than if peer effects were absent. In an agency context, Fischer and Huddart (2008) show that the existence of social norms fosters the effectiveness of monetary incentives. Although they do not solve for the optimal contract, they derive some implications for the organizational boundaries of firms by distinguishing between a desirable and an undesirable action, each with its own norm. Huck, Kübler and Weibull (2012) show that a particular norm can be output-increasing, neutral, or output-decreasing, depending on the incentive scheme a firm offers. They further show that low-effort equilibria (where someone exerts a low effort because others do the same) can coexist with high-effort equilibria (where someone exerts a high effort because others do the same). Rob and Zemsky (2002) study the accumulation of social capital in a firm in which a continuum of workers repeatedly perform an individual task and a cooperative task. The effort devoted to cooperation is not observable, but employees have preferences for helping that depend on the degree of past cooperation. In this context, the firm can choose to limit the incentive intensity on observable individual tasks in order to induce workers to be more helpful today and therefore more pro-social tomorrow.[5] Akerlof and Kranton (2008) consider an organization that is able to affect its workers' identity (ideal of effort) through its management style. There is a moral hazard problem regarding workers' effort and the organization can either decide to monitor its workforce closely or choose loose supervision. Monitoring workers allows easier detection of shirking, but reduces workers' ideal of effort as there is less identification with the workgroup. Akerlof and Kranton characterize the circumstances under which the organization prefers loose supervision. Kübler (2001) uses a model of social custom à la Akerlof (1980) to understand how norms can be influenced by "norm entrepreneurs" (e.g., government agencies, lawmakers, unions) through two distinct exogenous instruments: monetary incentives and changes in the meaning of following a norm. She shows that destroying an existing norm necessitates reaching a tipping point and thus

[4] We will discuss the growing empirical literature later in this article.

[5] Along these lines, Rotemberg (1994) and Dur and Sol (2010) consider models without social norms, but in which two workers are endowed with altruistic preferences they can affect by their choices. In Rotemberg, worker i decides the degree to which he internalizes the utility of worker j. In Dur and Sol, worker i is able, by engaging in social interaction with worker j, to increase j's degree of altruism. Both articles show that it is rational for workers to invest in altruistic activities to some extent.

requires a large enough change in policies.

In the present article, we rely on the work of Fischer and Huddart (2008) to introduce a social work ideal in the employees' preferences. We add two novel elements to their article and the articles mentioned above. First, we give an active role to the firm in managing the social ideal. More precisely, the firm acts as a locus of socialization in which employees internalize the social work ideal while they interact. It can regulate the process of internalization by allowing for more or less social interaction through the relevant workplace and management practices. We show that a first motive to invest in social interaction is to reinforce the effectiveness of monetary incentives. Second, we allow for heterogeneity among employees with regard to their personal work ideals and we assume that the firm does not observe these ideals. A second motive to invest in social interaction is to create a shared identity in order to mitigate the adverse selection problem. The firm can make the employees' decisions incentive compatible at a smaller cost. More broadly, from a theory of the firm perspective, our work provides a theoretical framework to explain how a firm, by acting as a locus of socialization, can better handle the problems of motivating and coordinating workers with heterogeneous work ethics.

The article is structured as follows. In section 2, we present the theoretical model. In section 3, we derive the optimal linear contract. In section 4, we analyze how the firm regulates the social ideal among its employees. Section 5 concludes.

2 Modeling personal and social ideals

We consider a moral hazard framework *à la* Holmstrom and Milgrom (1987) and extend it in three directions. First, we include a social work ideal in employees' preferences, following Fischer and Huddart (2008). Second, we allow for some heterogeneity in the workforce regarding personal ideals of effort. The characteristics of employees are unobserved by the firm, which gives rise to a problem of adverse selection. Third, we consider the case where the firm can regulate the employees' sensitivity to the social ideal.

Although the existence of social interaction between employees could also foster the exchange of information, ideas and know-how, we omit introducing technological or informational spillovers in the production process in order to focus on social spillovers and their management by the firm.

Agents. A risk-neutral firm employs a continuum of size one of risk-adverse employees to perform similar, but independent, tasks. Employees differ in a single dimension denoted by t, which is distributed over $T = \left[\underline{t}, \overline{t}\right]$ by the distribution function $F(t)$, with density $f(t)$. We refer to t as a personal ideal of effort.[6] Each employee exerts a level of effort e, not observed by the firm, and produces a publicly observable output $y = e + \nu$. The term ν is an idiosyncratic unobservable noise following a centered normal with variance σ^2. The noise terms are independent across employees. As personal ideals and efforts are not observed by the firm, the model features simultaneous adverse selection and moral hazard problems.[7]

Contracts. As employees are heterogeneous with respect to their work ideal, the firm may find it optimal to offer different contracts to different types of employee. We denote the menu of contracts by $\{w(t)\}_{t \in T}$ where $w(t)$ is the compensation paid by the firm to an employee with personal ideal t. As is common in contracting literature, we limit attention to linear contracts of the shape $w(t) = \alpha(t)y + \beta(t)$ where $\alpha(t)$ is the variable rate and $\beta(t)$ is the base salary. We will sometimes refer to $\alpha(.)$ as the power or the intensity of monetary incentives.

Payoffs. Employees have a constant absolute risk aversion. The utility function of an employee of personal ideal t choosing the contract w and effort e is given by

$$U(w, e, n(t)) = 1 - exp\left[-\eta\left(w - C(e, n(t))\right)\right] \tag{1}$$

where η represents the employee's constant absolute risk aversion, and $C(e, n(t)) = \frac{1}{2}\left(e - n(t)\right)^2$ represents the extended cost function of the employee. The cost of effort decreases up to the point where the ideal $n(t)$ is reached and increases beyond this point. The ideal reflects the work ethic of the employee of type t and corresponds to the effort that this employee exerts when the variable rate of the compensation is zero but the base salary is sufficiently high to satisfy the participation constraint, which we define below. Following Fischer and Huddart (2008), the ideal $n(t)$ is a weighted average of two elements: the personal ideal of the employee, equal to t, and a shared social ideal

[6] We will also consider the "limit" case where employees are identical. In this case $T = \left\{\hat{t}\right\}$.

[7] See Laffont and Martimort (2002) and Theilen (2003) for a general analysis of this type of models.

taken equal to the average effort across employees, $E[e]$.[8] We write

$$n(t) = (1-\lambda)t + \lambda E[e] \tag{2}$$

where $\lambda \in [0,1)$. The term λ of expression (2) reflects the employees' sensitivity to the social ideal. When $\lambda = 0$, employees do not care about the social ideal of the workgroup and only take into account their personal ideals when choosing their effort levels. The standard quadratic cost function is obtained by taking $\lambda = 0$ and $t = 0$. Later, we will assume that the firm is able to alter the sensitivity to the social ideal by allowing for more or less social interaction at the workplace. We also assume that employees have the same reservation utility level $U(w_0) = 1 - exp(-\eta w_0)$ where $w_0 \leq \underline{t}$. We will verify that this last inequality guarantees that the firm is interested in hiring all types of employees.

The risk-neutral firm's expected profit is equal to the part of the expected production accruing to the firm net of the fixed salaries paid to the employees:

$$\int_{\underline{t}}^{\bar{t}} [(1-\alpha(t))e(t) - \beta(t)] f(t)dt \tag{3}$$

Timing of the game

1. The firm chooses the portion of working hours available for employees to interact. This choice alters the employees' sensitivity to the social ideal, λ, in a way that we will describe in section 4.

2. The firm proposes a menu of contracts $\{w(t)\}_{t\in T}$.

3. Each employee chooses one contract or exercises his outside option.

4. Employees exert effort. Outputs and payoffs are realized.

[8] Hence, the social ideal is associated with a unique reference group, which is the entire workforce. Each employee is atomistic and therefore takes this social ideal as given.

3 The optimal linear contract

In this section, we take the sensitivity of employees to the social ideal as given. First, we derive the optimal level of effort for employees. Second, we solve the problem of the firm and derive the optimal menu of linear contracts.

3.1 Problem of an employee

Suppose for now that any employee selects the contract designed for him. An employee of personal ideal t chooses his effort level to maximize his certainty equivalent payoff, $\alpha(t)e+\beta(t)-\frac{1}{2}\left(e-n(t)\right)^2-\frac{1}{2}\eta\sigma^2\alpha^2(t)$. Solving for the optimal effort gives

$$e(t) = \alpha(t) + n(t) \tag{4}$$

where $n(t)$ is given by (2). Expression (4) characterizes the effort exerted by the employee of type t *given* the work ideal, $n(t)$. If the firm does not provide any monetary incentive at all (that is, if $\alpha(t) = 0$), the employee chooses a level of effort equal to his work ideal. By taking the partial derivative of expression (4) with respect to $\alpha(t)$, one can study how increasing the monetary incentive at the margin affects effort for a given ideal. We have

$$\frac{\partial e(t)}{\partial \alpha(t)} = 1 \tag{5}$$

Effort increases as the firm provides more monetary incentives. We now endogenize the social ideal by solving for the rational expectation equilibrium. At equilibrium, the effort exerted by any type of employee is a best reply to $E[e]$. By plugging expression (4) into $E[e] = \int_{\underline{t}}^{\bar{t}} e(t)f(t)dt$, we obtain the equilibrium average effort:[9]

$$E[e^*] = E[t] + \frac{E[\alpha]}{1-\lambda} \tag{6}$$

where $E[\alpha] = \int_{\underline{t}}^{\bar{t}} \alpha(t)f(t)dt$ is the average power of monetary incentives and $E[t] = \int_{\underline{t}}^{\bar{t}} tf(t)dt$ is the average personal ideal. Expression (6) shows that there are three sources fueling employees' average effort: their average personal work ideals, their social orientation, and the average power of

[9]The fact that $\partial e(t)/\partial E[e] = \lambda < 1$ implies that there is only one equilibrium in effort levels (see Cooper and John (1988)), as opposed to the framework of Huck, Kübler and Weibull (2012).

monetary incentives. Interestingly, the relationship between average effort and the average personal work ethic *is not* affected by the employees' sensitivity to the social ideal: for the firm, having a pro-social workforce does not reduce the positive influence of personal ideals on effort. However, the relationship between average effort and the average power of monetary incentives *is* affected by the sensitivity to the social ideal: a higher sensitivity makes monetary incentives more effective. The two previous results are driven by similar social multiplier effects. We first describe the multiplier effect on monetary incentives. Analytically, it takes the following shape, with a slight abuse of notation:

$$\frac{dE\left[e^{*}\right]}{dE\left[\alpha\right]}=\frac{1}{1-\lambda}=\frac{1}{1-\lambda}\times\frac{\partial E\left[e\right]}{\partial E\left[\alpha\right]} \tag{7}$$

with $1/(1-\lambda)\geq 1$. To explore the functioning of the multiplier, let us sum expression (4) over types, weighted by the density f. We obtain

$$E\left[e\right]=E\left[\alpha\right]+(1-\lambda)E\left[t\right]+\lambda E\left[e\right] \tag{8}$$

Let us suppose that the average power of monetary incentives $E\left[\alpha\right]$ increases by an amount equal to $\triangle E\left[\alpha\right]$. In a first round, this has a direct effect on average effort: the right-hand side in expression (8) increases by $\triangle E\left[\alpha\right]$, which causes the left-hand side $E\left[e\right]$ to increase by the same amount. In the second round, the change in monetary incentives has an indirect effect on effort through the social ideal: the higher social work ideal that emerged in the first round induces employees to exert even more effort. Formally, the right-hand side increases by $\lambda\triangle E\left[\alpha\right]$. This causes again an equivalent rise in the left-hand side. Summing the successive increases, we obtain:

$$\triangle E\left[e^{*}\right]=\left[1+\lambda+\lambda^{2}+...\right]\triangle E\left[\alpha\right]=\left[1+\frac{\lambda}{1-\lambda}\right]\triangle E\left[\alpha\right]=\frac{1}{1-\lambda}\triangle E\left[\alpha\right] \tag{9}$$

The multiplier $1/(1-\lambda)$ can therefore be understood as the sum of the direct monetary effect, 1, and the indirect social effect, $\lambda/(1-\lambda)$.

The same type of social multiplier effect also explains why the relationship between the average effort and the average work ideal is not affected by employees' sensitivity to the social ideal: $dE\left[e^{*}\right]/dE\left[t\right]=1$. To understand why, let us suppose that the average personal ideal $E\left[t\right]$ increases by $\triangle E\left[t\right]$ in expression (8). At first, this has a direct effect on effort: $\triangle E\left[e\right]=(1-\lambda)\triangle E\left[t\right]$. There-

after, there is an infinite sequence of indirect effects, through increases of the social ideal. Summing the successive effects, we obtain $\triangle E[e^*] = \left[(1-\lambda) + (1-\lambda)\lambda + (1-\lambda)\lambda^2 + ...\right] \triangle E[t] = \triangle E[t]$.

Using equations (4) and (6), we can express the effort of an employee of personal ideal t as

$$e^*(t) = (1-\lambda)t + \lambda E[t] + \frac{1}{1-\lambda}\left((1-\lambda)\alpha(t) + \lambda E[\alpha]\right) \tag{10}$$

Expression (10) states that the effort level $e^*(t)$ is increasing in the power of incentives, $\alpha(t)$, and in the average power of incentives, $E[\alpha]$. When employees become more sensitive to the collective (that is, when λ increases), an employee with below average personal ideal (that is, $t < E[t]$) increases his effort level. Indeed, the employee becomes more influenced by the average work ethic of the group, $E[t]$, while at the same time the effectiveness of monetary incentives is reinforced.[10] However, an employee with an above average personal ideal (that is, $t > E[t]$) may choose a higher or a lower effort level under the same circumstances: while the employee is attracted by the lower average work ethic of the group, monetary incentives become more effective so that the total effect is ambiguous. We summarize the main results in the following proposition.

Proposition 1. *(1) Consider a given menu of linear contracts* $\{w(t)\}_{t\in T}$.

(a) The relationship between the average level of effort $E[e^*]$ *and the average personal ideal* $E[t]$ *is not affected by the employees' sensitivity to the social ideal.*

(b) The average level of effort $E[e^*]$ *is higher when employees are more sensitive to the social ideal. In fact, employees with a below average personal ideal exert a higher level of effort, whereas employees with an above average personal ideal may exert a lower or a higher effort.*

(2) *The fact that employees' preferences incorporate a social ideal creates a social multiplier effect, defined in (7), which makes effort more responsive to a change in monetary incentives. The multiplier effect is stronger when employees are more pro-social.*

In their 2008 article, Fischer and Huddart introduce a social norm in an agency context and derive the existence of a social multiplier effect: social incentives reinforce the effectiveness of monetary incentives. Point 2 in Proposition 1 echoes their result. We, however, extend it to the case of a heterogeneous workforce. Point 1(a) expresses a second social multiplier effect that is largely overlooked in the literature: having a more pro-social workforce does not weaken the positive

[10] Note that $\frac{1}{1-\lambda}\left((1-\lambda)\alpha(t) + \lambda E[\alpha]\right) = \alpha(t) + \frac{\lambda}{1-\lambda}E[\alpha]$ is increasing in λ.

relationship between the average personal work ideal and the average effort. Together with point 2, this implies 1(b): the average effort is higher when employees are more sensitive to the social ideal.[11] Interestingly, while the effort exerted by below average workers necessarily increases when influenced by peers, the effort exerted by above average workers may decrease or increase. These theoretical results are in line with recent empirical findings. Mas and Moretti (2009) study how the productivity of cashiers in a supermarket chain is affected by the productivity of their peers. They show that workers increase their effort levels by 1% when a worker with above average productivity joins their shift. They obtain two complementary results. First, while low-productivity workers benefit from the presence of more productive workers, the productivity of high-skill workers *is not* affected by the presence of low-skill co-workers. Second, the magnitude of the spillover depends positively on the frequency of interaction in the workplace. Bandiera, Barankay, and Rasul (2010) study whether the productivity of fruit pickers is affected by the presence of co-workers with whom they share social ties. They consider a situation in which there are no externalities among workers in production, or compensation. They find that, compared to a situation without social ties, a given worker's productivity is significantly higher when working with more able friends, but significantly lower when working with less able friends.

To conclude this section, we calculate the certainty equivalent payoff for an employee with personal ideal t when he exerts the optimal effort level (10). We have

$$u(t, \alpha(t), \beta(t)) = \beta(t) + \frac{\lambda}{1-\lambda}\alpha(t)E[\alpha] + ((1-\lambda)t + \lambda E[t])\alpha(t) + \frac{1}{2}(1-\eta\sigma^2)\alpha^2(t) \qquad (11)$$

Note that $\partial^2 u/\partial t \partial \alpha(t) = 1 - \lambda > 0$: Employees with a high personal ideal are more sensitive to an increase in the power of incentives than employees with a low personal ideal. This single-crossing condition will help the firm to screen different types of employees under incomplete information.

[11] In the model, the level of personal ideals is not affected by the power of incentives proposed by the firm. Accordingly, there is no crowding-out effect of intrinsic motivation by monetary incentives. The model could be extended to include a reduced form of the crowding-out mechanisms modeled in the literature (see, for example, Francois (2000) in the context of public sector motivation, Canton (2005) in a multitask environment, Bénabou and Tirole (2003) in an informed principal setting, and Bénabou and Tirole (2006) in the case of pro-social behaviors). We omit, however, introducing such mechanisms and concentrate on the analysis of social norms and adverse selection.

3.2 Problem of the firm

We now turn to the problem of the firm for a given level of employee sensitivity to the social ideal. As a benchmark, we first consider the situation in which the firm knows the employees' personal ideals. We then consider the situation in which the firm cannot observe personal ideals.

3.2.1 The case of complete information about personal ideals

The firm determines the menu of contracts by maximizing its expected profit

$$\max_{\{\alpha(t),\beta(t)\}} \int_{\underline{t}}^{\bar{t}} \left((1-\alpha(t))e^*(t) - \beta(t)\right) f(t)dt \tag{12}$$

under the participation constraints

$$\forall t \in T, u(t,\alpha(t),\beta(t)) \geq w_0 \tag{13}$$

where $e^*(t)$ is defined in (10) and $u(t,\alpha(t),\beta(t))$ in (11). At the optimum, the participation constraints must be binding. We show in Appendix 1 that the firm's program can be written

$$\max_{\{\alpha(t)\}} \int_{\underline{t}}^{\bar{t}} \left(\frac{\alpha(t)}{1-\lambda} + t - w_0 - \frac{1}{2}(1+\eta\sigma^2)\alpha^2(t) \right) f(t)dt \tag{14}$$

Maximizing pointwise, we obtain the optimal power of incentives for each type of employee:

$$\forall t \in T, \alpha^*_{CI}(t) = \frac{1}{(1-\lambda)(1+\eta\sigma^2)} \tag{15}$$

where CI stands for complete information.[12] Expression (15) extends the expression of the optimal power of incentives derived in Holmstrom and Milgrom (1987) to the case in which workers have a social work ideal. As in their framework, the firm chooses low-powered incentives when the perceived risk level, $\eta\sigma^2$, is high. Three other points are worth noting. First, the firm chooses the same variable rate for all employees, regardless of their personal ideals. This is due to the fact that the personal ideal of an employee does not affect the way his effort responds to monetary

[12]Note that the assumption $\underline{t} \geq w_0$ guarantees that $\frac{\alpha^*_{CI}(\underline{t})}{1-\lambda} + \underline{t} - w_0 - \frac{1}{2}(1+\eta\sigma^2)\alpha^{*2}_{CI}(\underline{t}) = \frac{1}{2(1-\lambda)^2(1+\eta\sigma^2)} + \underline{t} - w_0 > 0$: the firm is willing to hire all types of employee (see Appendix 1 for details).

incentives: Expression (10) implies that $\partial^2 e^*(t)/\partial t \partial \alpha(t) = 0$. Second, the firm chooses a higher power of incentives when employees are more sensitive to the social ideal. In this situation, the social multiplier effect (7) is strengthened, so that effort becomes more reactive to an increase in the variable rate of the compensation scheme. Third, at equilibrium, the firm has to offer a higher base salary to employees with a low personal ideal. This is because, for a menu of contracts with equal variable rates, the certainty equivalent (11) is increasing in the employees' personal ideal. This explains why, under incomplete information, the firm will have to propose a different menu of contracts in order to prevent employees with high personal ideals from switching to contracts aimed at employees with low personal ideals.

3.2.2 The case of incomplete information about personal ideals

We now assume that the firm does not observe the employees' personal ideals. The firm has to make sure that each type of employee chooses the contract designed for him. The profit maximizing program becomes

$$\underset{\{\alpha(t),\beta(t)\}}{max} \int_{\underline{t}}^{\bar{t}} \left((1-\alpha(t))e^*(t) - \beta(t)\right) f(t) dt \tag{16}$$

under the participation constraints

$$\forall t \in T, u(t, \alpha(t), \beta(t)) \geq w_0 \tag{17}$$

and the incentive constraints

$$\forall t, t' \in T, u(t, \alpha(t), \beta(t)) \geq u(t, \alpha(t'), \beta(t')) \tag{18}$$

Let us consider two employees whose personal ideals t and t' satisfy $t' > t$. Summing the two incentive constraints $u(t, \alpha(t), \beta(t)) \geq u(t, \alpha(t'), \beta(t'))$ and $u(t', \alpha(t'), \beta(t')) \geq u(t', \alpha(t), \beta(t))$ gives $\alpha(t') \geq \alpha(t)$: Incentive compatibility implies that the power of incentives $\alpha(.)$ has to be non-decreasing. Using standard arguments, we show in Appendix 2 that the optimization problem of

the firm can be simplified to

$$\max_{\{\alpha(t)\}} \int_{\underline{t}}^{\bar{t}} \left(\frac{\alpha(t)}{1-\lambda} + t - w_0 - \frac{(1-\lambda)\alpha(t)\,(1-F(t))}{f(t)} - \frac{1}{2}(1+\eta\sigma^2)\alpha^2(t) \right) f(t)dt \tag{19}$$

under the constraints

$$\forall t \in T, \frac{d\alpha(t)}{dt} \geq 0 \tag{20}$$

Expressions (14) and (19) differ because of the term $\int_{\underline{t}}^{t} \frac{(1-\lambda)\alpha(t)(1-F(t))}{f(t)} f(t)dt$ reflecting the informational rent the firm has to give to types $t > \underline{t}$ for them not to deviate from their specified contracts. This rent is decreasing in λ: The adverse selection problem is less severe when employees are more concerned with the collective identity. By adhering to the social ideal, employees are less affected by their personal work ideals and they behave more homogeneously. To solve the maximization problem, we ignore momentarily the constraints (20) and maximize expression (19) pointwise. We obtain

$$\forall t \in T, \alpha^*_{II}(t) = \frac{1}{(1-\lambda)(1+\eta\sigma^2)} - (1-\lambda)\frac{1-F(t)}{f(t)}\frac{1}{1+\eta\sigma^2} \tag{21}$$

where II stands for incomplete information. To guarantee that the neglected constraints (20) are verified, we make the following assumption, which is common in an agency context, regarding the hazard rate:

Assumption 1. The hazard rate $\frac{f(t)}{1-F(t)}$ is increasing in t.[13]

Under Assumption 1, the firm is able to screen employees according to their personal ideals. The properties of $\alpha^*_{II}(t)$ are described in the following proposition.[14]

Proposition 2.

1. *The power of incentives $\alpha^*_{II}(t)$ is increasing in t. There is no distortion in the contract designed for the highest personal ideal: $\alpha^*_{II}(\bar{t}) = \alpha^*_{CI}(\bar{t})$ and there is a downward distortion for the other personal ideals: $\alpha^*_{CI}(t) - \alpha^*_{II}(t) = (1-\lambda)\frac{1-F(t)}{f(t)}\frac{1}{1+\eta\sigma^2}$ increases as t approaches $\underline{t}$.*

2. *The firm provides stronger monetary incentives when employees are more sensitive to the*

[13] This assumption is verified for distributions such as the uniform, the normal, the logistic and the Laplace, among others.

[14] Again, the assumption $\underline{t} \geq w_0$ guarantees that the firm is willing to hire all types of employee (see Appendix 2 for details).

social ideal: $\alpha^*_{II}(t)$ *increases when* λ *increases. Furthermore, the distortion measured by* $\alpha^*_{CI}(t) - \alpha^*_{II}(t)$ *decreases when employees are more sensitive to the social ideal.*

3. *The power of incentives* $\alpha^*_{II}(t)$ *is decreasing in the perceived risk level,* $\eta\sigma^2$.

Point 1 of Proposition 2 is a result typical of adverse selection problems, adapted to our context. To prevent employees with a high personal ideal from deviating, the firm has to give employees with smaller personal ideals a contract in which the power of incentives is lower than under complete information, but in which the fixed part of the compensation is larger (to satisfy the participation constraint). As a consequence, there is a downward distortion compared with the case of complete information. Point 2 conveys two important new results. First, the firm chooses a higher power of monetary incentives when employees are more sensitive to the social ideal. As employees become more oriented toward the collective, the social multiplier stated in Proposition 1 has a stronger effect on the average effort: $dE[e]/dE[\alpha] = 1/(1-\lambda)$ increases as λ increases. Second, the distortion between the complete information case and the incomplete information case, $\alpha^*_{CI}(t) - \alpha^*_{II}(t)$, is reduced when employees are more sensitive to the social ideal. In fact, the influence of heterogeneous personal ideals on individual behaviors diminishes when employees become more concerned with the group environment. In this case the firm proposes less differentiated monetary incentives.[15] In point 3, we retrieve a standard result of moral hazard models stating that the firm chooses a lower power of monetary incentives when employees are more risk adverse (higher η) or when output is less linked to effort (higher σ). At equilibrium the profit of the firm is

$$\pi^*(\lambda) = E[t] - w_0 + \frac{1}{2(1+\eta\sigma^2)} \int_{\underline{t}}^{\bar{t}} \frac{1}{(1-\lambda)^2} \left(1 - \frac{(1-\lambda)^2 (1-F(t))}{f(t)}\right)^2 f(t)dt \tag{22}$$

Not surprisingly, the profit increases in the average personal ideal, $E[t]$, and increasing when employees become more sensitive to the social ideal.

[15] If all employees have the same personal ideal $\hat{t}$ (that is, $T = \{\hat{t}\}$), then $\frac{1-F(\hat{t})}{f(\hat{t})} = 0$ and we have:

$$\alpha^*(\hat{t}) = \frac{1}{(1-\lambda)(1+\eta\sigma^2)}.$$

We retrieve the result of section 3.2.1 concerning the case of complete information about personal ideals.

4 Regulating employees' ideals through social interaction

We now assume that the firm is able to influence the social orientation of its workforce by choosing the amount of time during which employees can interact. Social interaction can, for example, be fostered and to some extent controlled by the firm through the design of the workplace, through the holding of workshops and team-building activities, or by facilitating recreational breaks. There is a large amount of empirical evidence in sociology, management science, political science, and economics suggesting that individuals are more sensitive to a group norm when they have frequent interaction with the other individuals belonging to the group (e.g., Cialdini and Trost, 2008, for sociology; Van Dick, 2004, and Cohen and Prusak, 2001, for management science; Putnam, 1995, for political science; Mas and Moretti, 2009, and Bandieri, Barankay, and Rasul, 2008 and 2010, for economics). Sociologists emphasize the fact that people learn and internalize the values, beliefs, and norms of a group through repeated interaction with its members (Bicchieri and Muldoon, 2011). The act of matching behaviors and beliefs to a group norm is referred to as conformity and is seen as the result of unconscious influences or social pressures exerted by the group. Individuals are more affected by these stimuli when they interact frequently, and they are more willing to bear the emotional investment required to conform: their sensitivity to the group norm increases. The researchers in management science who have developed the concept of organizational identification also argue that fostering social interaction within an organization causes employees to identify with the workgroup. Cohen and Prusak note, for example, that "if you want people to connect, to talk, to begin to understand and depend on one another, give them places and occasions for meeting, and enough time to develop networks and communities. Social capital needs breathing room - social space and time - within work and surrounding work". Friedley and Manchester (2005) make a similar point to explain what determines team cohesion in debate teams in high schools and colleges: "It is communication in the human moment that most powerfully creates team cohesion - *a strong sense of loyalty and commitment to the team vision as one's own* ... Whether a room or lounge where team members can congregate between classes and the end of the day, practice space for formal and informal coaching sessions, travel time in cars and vans, or social time to enjoy pizza and a movie, both quantity and quality of communication are necessary to build a cohesive team climate

of openness and trust" (italics added).[16]

We normalize the length of employees' working time to 1. The firm divides the time between a productive period of length p where the instantaneous production problem is described in the two previous sections, and a period of length $b = 1 - p$ during which social bonding takes place. There is no physical production during social bonding. The firm is able to announce and commit to the allocation of working hours before proposing the menu of contracts. As explained above, we assume that the employees' sensitivity to the social ideal is influenced by the firm's choice. The more time is allocated to social interaction, the more employees become sensitive to the social ideal. Formally, $\lambda(b)$ is increasing in b. We assume that during the period in which social bonding takes place, the employees receive their reservation wage, w_0, at each instant of time. The firm solves

$$\max_{b} \ (1-b)\pi^*\left(\lambda(b)\right) + b(-w_0)$$

where $\pi^*(\lambda)$ is given by expression (22). The first-order condition of the profit maximization reads

$$\phi(b) \equiv -E[t] + \frac{1}{(1+\eta\sigma^2)(1-\lambda(b))^2}\left(\psi(b) - \frac{1}{2}\right)\int_{\underline{t}}^{\bar{t}}\big(1-\chi(t,b)\big)^2 f(t)dt + \frac{2\psi(b)}{(1+\eta\sigma^2)}\int_{\underline{t}}^{\bar{t}}\big(1-\chi(t,b)\big)\frac{1-F(t)}{f(t)}f(t)dt = 0 \quad (23)$$

where $\psi(b) = \frac{(1-b)\lambda'(b)}{1-\lambda(b)}$ and $\chi(t,b) = \frac{(1-\lambda(b))^2(1-F(t))}{f(t)}$. The function $\psi(.)$ measures the ability of the firm to make its employees more sensitive to the social ideal, starting from any length of interaction. Note that $\psi(0) > 0 = \psi(1)$. We make the following assumption:

Assumption 2. *(i)* $\phi(0) > 0$. *(ii)* $\psi(b)$ *is decreasing in* b *over* $[0,1]$. *(iii) There is a level* $\hat{b} \in (0,1)$ *satisfying* $\psi(\hat{b}) = 1/2$.

Assumption 2 guarantees that the firm's ability to increase the employees' sensitivity to the group is sufficiently high to ensure that the firm will find it profitable to invest in social interaction. We describe the properties of the optimal length of social interaction in the following proposition.

[16]Interestingly, both the sociological and the management literatures mentioned above state that face-to-face interaction is more effective than mediated interaction in creating a shared identity.

Proposition 3. *Suppose that assumption 2 holds and let the average personal ideal of employees be* $E(t) = \hat{t}$, then

1. *When employees are homogeneous with regard to their personal ideals* ($T = \{\hat{t}\}$), *the firm chooses to devote a proportion* $b^* > 0$ *of working time to social interaction. We have* $b^* = \hat{b}$ *if* $\hat{t} = 0$, *where* $\hat{b}$ *is defined in Assumption 2. Furthermore,* b^* *is decreasing in* $\hat{t}$.

2. *When employees are heterogeneous with regard to their personal ideals, the firm chooses to devote a share* $b^{**} > b^*$ *of working time to social interaction. Furthermore* b^{**} *is decreasing in* $\hat{t}$.[17]

Proof. Suppose that employees are identical. Expression (23) reduces to

$$-\hat{t} + \frac{1}{(1+\eta\sigma^2)(1-\lambda(b))^2}\left(\psi(b) - \frac{1}{2}\right) = 0 \tag{24}$$

If $\hat{t} = 0$ then the solution of (24) is $b^* = \hat{b}$ with $\psi(\hat{b}) = 1/2$. If $\hat{t} > 0$ then the solution of (24) is $b^* < \hat{b}$. It is easily verified that b^* is decreasing in $\hat{t}$. Suppose employees are not identical (and hence necessarily $\hat{t} > 0$) then $\int_{\underline{t}}^{\bar{t}}(1-\chi(t,b))^2 f(t)dt < 1$. Furthermore, the last term of equation (23) is positive. The solution of (23) is therefore $b^{**} > b^*$. ■

Proposition 3 expresses two results. First, it is less profitable for the firm to devote time to developing the employees' social ideal when their average personal ideal is high. In this case, effort is fueled by personal work ethics and it is therefore more costly for the firm to replace productive activities with bonding activities. Second, for a given average personal ideal, the firm devotes more time to developing social interaction for heterogeneous employees than for homogeneous employees. When employees are heterogeneous, the firm faces an adverse selection problem when designing the contracts, and it has to give a rent to the employees with a high personal ideal of effort to make them choose the right contract. By fostering the social orientation of the workforce, the firm is able to reduce the effect of heterogeneity on individual behaviors and to alleviate the adverse selection problem. Its profit therefore increases.

The past few decades have seen a surge in the number of firms using bonding activities. What has driven such a change? Some researchers suggest that, in times when job security and employees' attachment to firms are diminishing, firms could use soft management policies to shift employees' identity from being personal to being collective (Casey, 1996 or Pratt, 2000). Casey (1996) notes,

[17] To make $\hat{t}$ vary, we "shift" the entire distribution $F(t)$ and its support to the right.

for example, that "the devices of workplace family and team manifest a corporate effort to provide emotional gratifications at work to counter the attractions of rampant individualism".[18] Other researchers highlight the dramatic changes that have occurred in the demographics of the workforce in developed countries in recent decades. These changes include increases in gender, age, ethnic and cultural diversity.[19] This shift in workforce demographics suggests that work ethos have become more diverse and contrasting among employees. Cohen and Prusak (2001) explain that nurturing professional and personal connections among workers is a way for firms to deal with their growing diversity: The shared identity that emerges from social interaction serves as glue for a heterogeneous group of people. Our model is consistent with these two types of explanations: Proposition 3 establishes that a decrease in the average personal work ideal of employees or a greater heterogeneity leads the firm to allocate more time to bonding activities.

Proposition 3 describes the firm's investment in social interaction for workforces with different characteristics. We now describe how the firm's choices change when its ability to engender social contacts changes. To do so, it is convenient to consider two firms, denoted by 1 and 2, who differ in a single dimension, their ability to foster social interaction. Their respective workforces have the same characteristics. The difference between firm 1 and 2 can be explained by the characteristics of their workplaces or by the nature of their activities, as in the example we describe below. To capture the difference in abilities to foster social interaction, we assume that $\lambda_1(b)$ and $\lambda_2(b)$ are different as soon as the firm invests in some social capital. More specifically,

Definition 1. *Given the workforce characteristics, the environment of firm 1 is said to be conducive to social interaction while the environment of firm 2 is not if*

- $\lambda_1(0) = \lambda_2(0) = \hat{\lambda}$.
- *For any* $b \in (0,1]$ *we have* $\lambda_1(b) > \lambda_2(b)$.
- $\psi_1(0) > \hat{\psi}$ *and* $\psi_2(0) \leq \hat{\psi}$ *where* $\hat{\psi} = \frac{1}{2}\frac{\int_{\underline{t}}^{\bar{t}}(1-\hat{\chi}(t))^2 f(t)dt + 2(1+\eta\sigma^2)(1-\hat{\lambda})^2 E[t]}{\int_{\underline{t}}^{\bar{t}}(1-\hat{\chi}(t))^2 f(t)dt + 2(1-\hat{\lambda})^2 \int_{\underline{t}}^{\bar{t}}(1-\hat{\chi}(t))(1-F(t))dt}$ *and* $\hat{\chi}(t) = (1-\hat{\lambda})^2\frac{1-F(t)}{f(t)}$.

[18] Nevertheless there is still a lively debate about the real trend in work ethics in recent decades, with some authors suggesting a declining trend and others suggesting stability or even an increasing trend (Twenge, 2010).

[19] For example, according to the U.S. Bureau of Labor Statistics, the median age of the American workforce was about 41 years in 2008, compared to about 36 twenty years earlier. For the first time in American history, there are four generations in the workplace. As regards the participation of women in the workforce, women hold 51.4 percent of managerial and professional jobs in 2010, up from 26.1 percent in 1980.

The first point of the definition states that the employees' sensitivity to the social ideal is the same for the two firms for $b = 0$, that is, when there is no investment in social bonding. The second and third points guarantee that it is less efficient for firm 2 to invest in social interaction because it has a smaller effect on the employees' sensitivity to the social ideal than for firm 1. In fact $\hat{\psi}$ is constructed to guarantee that $\phi_1(0) \geq 0 > \phi_2(0)$, meaning that firm 1 invests in a positive amount of social interaction ($b_1^* > 0$) while firm 2 does not invest at all ($b_2^* = 0$).

The differences in investment levels and in investment efficiencies explain that, at equilibrium, firm 1's employees will be more sensitive to the social ideal than firm 2's employees: $\lambda_1^* = \lambda_1(b_1^*) > \lambda_2^* = \lambda_2(0)$. This has the following consequence on the remuneration schemes $\alpha_{II,i}^*(t) = \frac{1}{(1-\lambda_i^*)(1+\eta\sigma^2)} - (1-\lambda_i^*)\frac{1-F(t)}{f(t)}\frac{1}{1+\eta\sigma^2},\ t \in T,\ i = 1, 2$ proposed by the two firms:

Proposition 4. *Consider two firms whose workforces have identical characteristics and suppose that the environment of firm 1 is conducive to social interaction while the environment of firm 2 is not, in the sense of definition 1. Then we have* $\alpha_{II,1}^*(t) > \alpha_{II,2}^*(t)$ *and* $\frac{\partial \alpha_{II,1}^*(t)}{\partial t} < \frac{\partial \alpha_{II,2}^*(t)}{\partial t}$ *for any* t *in* T*: firm 1 devises a remuneration scheme with stronger monetary incentives than firm 2, but less differentiated with respect to personal work ideals.*

Proposition 4 notably states that a firm having greater ability to create social interaction devises a menu of contracts that is less differentiated with respect to personal ideals than a firm having less ability. The reason is that the former firm is able to make its employees more sensitive to the social ideal, which attenuates the need to differentiate the payment contracts to separate the different types of employees. Frank (1984) provides evidence in which firms where employees can easily interact use less differentiated commission schedules than firms where employees cannot. He compares commission schemes used in the automobile dealership industry with those used in real estate firms. His data concerns thirteen auto dealerships located in upstate New York (see Table A.1 in Appendix 3). In this industry, salespersons typically receive a share α of the gross margin realized with the sale (the selling price of the vehicle minus its wholesale cost). He notes that the thirteen dealerships use schemes with a constant θ. Regarding the real estate business, Frank studies the commission schemes used in four large agencies located in Ithaca, New York (see Table A.1). He observes that three of the four agencies use a tiered commission rate.[20] The national association

[20]Frank (*ibid.*) considers the commission schemes associated with co-brokered sales. These sales involve two real

of realtors also indicates that tiered commission rates are very common in the real estate business. What is the reason explaining the different shapes of pricing schemes used in the two industries? According to Frank (1984), it is the firms' ability to engender or not social contact among the workforce. He notes that there is much more social contact among automobile salespersons than among real estate persons because "the former spend most of their time working in close physical proximity of one another, while many of the latter work primarily out of their own homes; and most spend the bulk of their working hours visiting houses with prospective buyers. Both the psychologist's models of attention and the sociologist's description of the reference group stress the roles of exposure and proximity as determinants of what we focus most closely". Note finally that the average commission rate set by the automobile dealerships is below the average commission rate set by the real estate agencies, which seems to contradict the result of Proposition 4. However, the levels are hardly comparable because they are not calculated over the same measure of the output. In fact, a crude calculation using the figures of Table A.1 and footnote 20 gives (average) commission rates of $0.55 \times 0.07/2 \simeq 2\%$ for real estate selling agents, well below the commission rates for automobile sellers.

5 Concluding remarks

The literature on economics and management theory has recently emphasized that workers are not driven solely by personal considerations but are also concerned with the goals and beliefs of the group or organization in which they work. This observation has led some authors to suggest that to foster performance, firms could try to influence the way their employees perceive and internalize these goals. In their textbook *Economics, Organizations and Management*, Milgrom and Roberts (1992) note, for example, that "important features of many organizations can best be understood in terms of deliberate attempts to change preferences of individual participants".

In this article, we emphasize that firms have two specific characteristics that make it easier for them to change preferences of their employees. First, the firm creates an environment well

estate agencies interacting through a multiple listing service (MLS). The listing agency represents the seller and is responsible for marketing the property and overseeing the transaction. It shares the information about the property with other agencies in the MLS. The selling agency actually sells the property by finding the buyer. When the transaction is realized, a commission representing 6 to 7 % of the price of the house is paid by the seller and shared (usually equally) between the listing agency and the selling agency. The selling agency then pays a part of the money received to the agent who has found the client (the "selling agent") and concluded the sale.

identified (e.g., the workplace) in which workers can interact. The consequence is that a process of socialization can take place in this environment, during which employees internalize the social ideal of the workgroup. Second, the firm can regulate the intensity of socialization by allowing for more or less social interaction through the relevant workplace and management practices.

We show that the firm, by acting as a locus of socialization, is able to motivate and coordinate a heterogeneous workforce more efficiently. Motivation is higher because the social ideal engenders positive social complementarities that foster effort and improve the effectiveness of monetary incentives. Coordination is easier because as the social ideal attenuates the adverse selection problem, the actions of heterogeneous employees can be made incentive compatible at a smaller cost. Therefore, the firm can devise less distorted payment schemes. In fact, our analysis complements the work of researchers who view the firm as being the organization the most able to derive benefits from complementary but heterogeneous resources. Lazear (2013) summarizes this view by arguing that "perhaps the greatest value of the firm is that it provides a mechanism for people to work together and take advantage of complementarities in their skills and interests". Nevertheless, we consider the case in which the complementarities between workers are not technological but rather social. In this context, the main value of the firm is to provide a mechanism enabling the creation and regulation of a "We" frame among employees, through social contacts in the workplace. Over the last few decades, higher turnover rates and the increased diversity of the workforce have probably strengthened the need for firms to act as locuses of socialization. This may explain the development of workplace designs and management practices aimed at fostering social contact among employees. The new workplace engenders both social incentives substituting for low individual work ethics and shared representations of actions among the heterogeneous workforce.

Several extensions of the model could be of interest. First, in line with the preceding discussion, it could be interesting to modify the model so that, in addition to their effects on work ideals, social interactions have also a direct positive effect on employees' productivity. For example, employees could learn and exchange knowledge when interacting. This should reinforce the incentives of the firm to invest in social interaction. Second, there is only one reference group in our framework, namely the entire workforce, relative to which the social ideal of effort is defined. It could be interesting to make the number of reference groups endogenous and assume that employees choose the group they wish to conform to. Third, we assume that employees have the same sensitivity

to the social ideal. Another possible extension could therefore be to allow for different degrees of sensitivity among workers.[21]

To conclude, let us listen to the British anthropologist and evolutionary psychologist Robin Dunbar (1998) who explains why a TV production team experienced reduced productivity after being moved to a new workplace. "It turned out that when the architects were designing the new building, they decided that the coffee room where everyone ate their sandwiches at lunch time was an unnecessary luxury and so dispensed with it ... If people were encouraged to eat their sandwiches at their desks, then they were more likely to get on with their work and less likely to idle time away. And with that, *they inadvertently destroyed the intimate social networks that empowered the whole organization*" (italics added).

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Appendices

Appendix 1. Derivation of the optimal contract under complete information

Using expressions (4) and (10) and setting $\alpha(t)e^*(t) + \beta(t) - \frac{1}{2}\left(e^*(t) - n(t)\right)^2 - \frac{1}{2}\eta\sigma^2\alpha^2(t) = w_0$, we can write

$$\begin{aligned}
\int_{\underline{t}}^{\bar{t}} \left((1-\alpha(t))e^*(t) - \beta(t)\right) f(t)dt &= \int_{\underline{t}}^{\bar{t}} \left(e^*(t) - w_0 - \frac{1}{2}(1+\eta\sigma^2)\alpha^2(t)\right) f(t)dt \\
&= \int_{\underline{t}}^{\bar{t}} \left((1-\lambda)t + \lambda E\left[t\right] + \frac{(1-\lambda)\alpha(t) + \lambda E\left[\alpha\right]}{1-\lambda} - ...\right) f(t)dt \\
&= \lambda E\left[t\right] + \frac{\lambda E\left[\alpha\right]}{1-\lambda} + \int_{\underline{t}}^{\bar{t}} \left((1-\lambda)t + \alpha(t) - ...\right) f(t)dt \\
&= \int_{\underline{t}}^{\bar{t}} \left(\lambda t + \frac{\lambda\alpha(t)}{1-\lambda}\right) f(t)dt + \int_{\underline{t}}^{\bar{t}} \left((1-\lambda)t + \alpha(t) - ...\right) f(t)dt \\
&= \int_{\underline{t}}^{\bar{t}} \left(\frac{\alpha(t)}{1-\lambda} + t - w_0 - \frac{1}{2}(1+\eta\sigma^2)\alpha^2(t)\right) f(t)dt
\end{aligned}$$

We could allow for some shutdown of types. Shutdown (if any) occurs on an interval $[\underline{t}, t^*]$ for some $t^* > \underline{t}$. t^* is obtained as a solution to

$$\underset{\{t^*\}}{max} \int_{t^*}^{\bar{t}} \left((1-\lambda)t + \lambda E\left[t/t > t^*\right] + \frac{(1-\lambda)\alpha^*_{CI}(t) + \lambda E\left[\alpha^*_{CI}/t > t^*\right]}{1-\lambda} - \frac{1}{2}(1+\eta\sigma^2)\alpha^{*2}_{CI}(t)\right) f(t)dt$$

which can be rewritten as

$$\underset{\{t^*\}}{max} \int_{t^*}^{\bar{t}} \left(\frac{\alpha^*_{CI}(t)}{1-\lambda} + t - w_0 - \frac{1}{2}(1+\eta\sigma^2)\alpha^{*2}_{CI}(t)\right) f(t)dt$$

If the solution is interior, we have

$$\frac{\alpha^*_{CI}(t^*)}{1-\lambda} - \frac{1}{2}(1+\eta\sigma^2)\alpha^{*2}_{CI}(t^*) = w_0 - t^*$$

so that $w_0 - t^* > 0$. As $\underline{t} > w_0$ we have $t^* < \underline{t}$: A contradiction. ■

Appendix 2. Derivation of the optimal contract under incomplete information

We want to show that the program

$$\max_{\{\alpha(t),\beta(t)\}} \int_{\underline{t}}^{\bar{t}} \left((1-\alpha(t))e^*(t)) - \beta(t)\right) f(t)dt \tag{25}$$

subject to

$$\forall t \in T, u(t,\alpha(t),\beta(t)) \geq w_0 \tag{26}$$

and

$$\forall t,t' \in T, u(t,\alpha(t),\beta(t)) \geq u(t,\alpha(t'),\beta(t')) \tag{27}$$

can be simplified to

$$\max_{\{\alpha(t)\}} \int_{\underline{t}}^{\bar{t}} \left(\frac{\alpha(t)}{1-\lambda} + t - w_0 - \frac{(1-\lambda)\alpha(t)\left(1-F(t)\right)}{f(t)} - \frac{1}{2}(1+\eta\sigma^2)\alpha^2(t) \right) f(t)dt \tag{28}$$

subject to

$$\forall t \in T, \frac{d\alpha(t)}{dt} \geqq 0 \tag{29}$$

We roughly follow the method of Laffont and Martimort (2002). For convenience, let us define $u(t,\tilde{t}) = u(t,\alpha(\tilde{t}),\beta(\tilde{t}))$ where

$$u(t,\alpha(\tilde{t}),\beta(\tilde{t})) = \beta(\tilde{t}) + \frac{\lambda}{1-\lambda}\alpha(\tilde{t})E\left[\alpha\right] + \left((1-\lambda)t + \lambda E\left[t\right]\right)\alpha(\tilde{t}) + \frac{1}{2}(1-\eta\sigma^2)\alpha^2(\tilde{t}) \tag{30}$$

is the certainty equivalent payoff for an employee with personal ideal t when he has chosen the contract $\left\{\alpha(\tilde{t}),\beta(\tilde{t})\right\}$ (see equation (11)). Let $u(t) = u(t,t)$. Condition (27) implies the following local first-order condition for type t: $\left.\frac{\partial u(t,\tilde{t})}{\partial \tilde{t}}\right|_{\tilde{t}=t} = 0$ or

$$\frac{d\beta(t)}{dt} + \frac{\lambda}{1-\lambda}\frac{d\alpha(t)}{dt}E\left[\alpha\right] + \left((1-\lambda)t + \lambda E\left[t\right]\right)\frac{d\alpha(t)}{dt} + (1-\eta\sigma^2)\alpha(t)\frac{d\alpha(t)}{dt} = 0 \tag{31}$$

The local second-order condition for t is $\left.\frac{\partial^2 u(t,\tilde{t})}{\partial \tilde{t}^2}\right|_{\tilde{t}=t} \leq 0$ or

$$\frac{d^2\beta(t)}{dt^2}+\frac{\lambda}{1-\lambda}\frac{d^2\alpha(t)}{dt^2}E\left[\alpha\right]+((1-\lambda)t+\lambda E\left[t\right])\frac{d^2\alpha(t)}{dt^2}+(1-\eta\sigma^2)\left(\left(\frac{d\alpha(t)}{dt}\right)^2+\alpha(t)\frac{d^2\alpha(t)}{dt^2}\right)\leq 0 \tag{32}$$

By differentiating (31) with respect to t, we find

$$\frac{d^2\beta(t)}{dt^2}+\frac{\lambda}{1-\lambda}\frac{d^2\alpha(t)}{dt^2}E\left[\alpha\right]+(1-\lambda)\frac{d\alpha(t)}{dt}+((1-\lambda)t+\lambda E\left[t\right])\frac{d^2\alpha(t)}{dt^2}+(1-\eta\sigma^2)\left(\left(\frac{d\alpha(t)}{dt}\right)^2+\alpha(t)\frac{d^2\alpha(t)}{dt^2}\right)=0 \tag{33}$$

By using (32), (33) can be written as $\frac{d\alpha(t)}{dt}\geq 0$. Note that the local incentive constraint for the employee of type t (expression (31)) implies the global incentive constraint (expression (27)). To prove it, let us consider $t'\neq t$. Using (31), we can write

$$\begin{aligned}
\beta(t)-\beta(t') &= \int_{t'}^{t}\dot{\beta}(\tau)d\tau \qquad (34)\\
&= -\int_{t'}^{t}\left(\frac{\lambda}{1-\lambda}\dot{\alpha}(\tau)E\left[\alpha\right]+((1-\lambda)\tau+\lambda E\left[t\right])\dot{\alpha}(\tau)+(1-\eta\sigma^2)\alpha(\tau)\dot{\alpha}(\tau)\right)d\tau\\
&= -\int_{t'}^{t}\frac{\partial}{\partial\tau}\left(\frac{\lambda}{1-\lambda}\alpha(\tau)E\left[\alpha\right]+((1-\lambda)\tau+\lambda E\left[t\right])\alpha(\tau)+\frac{1}{2}(1-\eta\sigma^2)\alpha^2(\tau)-(1-\lambda)A(\tau)\right)d\tau
\end{aligned}$$

where $A(\tau)$ is a primitive of $\alpha(\tau)$. We have

$$\begin{aligned}
\beta(t)-\beta(t') &= -\left[\frac{\lambda}{1-\lambda}\alpha(\tau)E\left[\alpha\right]+((1-\lambda)\tau+\lambda E\left[t\right])\alpha(\tau)+\frac{1}{2}(1-\eta\sigma^2)\alpha^2(\tau)\right]_{t'}^{t}+\int_{t'}^{t}(1-\lambda)\alpha(\tau)d\tau\\
&= -\frac{\lambda}{1-\lambda}\alpha(t)E\left[\alpha\right]-((1-\lambda)t+\lambda E\left[t\right])\alpha(t)-\frac{1}{2}(1-\eta\sigma^2)\alpha^2(t)+\frac{\lambda}{1-\lambda}\alpha(t')E\left[\alpha\right]\\
&\quad+((1-\lambda)t'+\lambda E\left[t\right])\alpha(t')+\frac{1}{2}(1-\eta\sigma^2)\alpha^2(t')+\int_{t'}^{t}(1-\lambda)\alpha(\tau)d\tau \qquad (35)
\end{aligned}$$

Hence

$$\begin{aligned}
&\beta(t)+\frac{\lambda}{1-\lambda}\alpha(t)E\left[\alpha\right]+((1-\lambda)t+\lambda E\left[t\right])\alpha(t)+\frac{1}{2}(1-\eta\sigma^2)\alpha^2(t)\\
&\quad=\beta(t')+\frac{\lambda}{1-\lambda}\alpha(t')E\left[\alpha\right]+((1-\lambda)t'+\lambda E\left[t\right])\alpha(t')+\frac{1}{2}(1-\eta\sigma^2)\alpha^2(t')+\int_{t'}^{t}(1-\lambda)\alpha(\tau)d\tau\\
&=\beta(t')+\frac{\lambda}{1-\lambda}\alpha(t')E\left[\alpha\right]+((1-\lambda)t+\lambda E\left[t\right])\alpha(t')+\frac{1}{2}(1-\eta\sigma^2)\alpha^2(t')-(1-\lambda)(t-t')\alpha(t')+\int_{t'}^{t}(1-\lambda)\alpha(\tau)d\tau
\end{aligned} \tag{36}$$

Therefore $u(t,t) = u(t,t') - (1-\lambda)(t-t')\alpha(t') + \int_{t'}^{t}(1-\lambda)\alpha(\tau)d\tau$. However $-(1-\lambda)(t-t')\alpha(t') + \int_{t'}^{t}(1-\lambda)\alpha(\tau)d\tau$ is positive because we know from above that $\alpha(t)$ is non-decreasing. Hence, for any $t' \neq t$, $u(t,t) \geq u(t,t')$: the global incentive constraint is satisfied for type t.

We now rewrite the maximization problem of the firm as a function of $\alpha(t)$ and $u(t)$ instead of $\alpha(t)$ and $\beta(t)$. We know that $u(t) = \beta(t) + \frac{\lambda}{1-\lambda}\alpha(t)E[\alpha] + ((1-\lambda)t + \lambda E[t])\alpha(t) + \frac{1}{2}(1-\eta\sigma^2)\alpha^2(t)$. The incentive constraints (31) are replaced by the constraints $\frac{du(t)}{dt} = (1-\lambda)\alpha(t)$ and $\frac{d\alpha(t)}{dt} \geq 0$.[22] Using the fact that $\frac{du(t)}{dt} > 0$ allows the participation constraints (26) to be simplified to $u(\underline{t}) = w_0$. The problem of the firm becomes

$$\underset{\{\alpha(t),u(t)\}}{max} \int_{\underline{t}}^{\bar{t}} \left(\frac{(1-\lambda)\alpha(t) + \lambda E[\alpha]}{1-\lambda} + (1-\lambda)t + \lambda E[t] - u(t) - \frac{1}{2}(1+\eta\sigma^2)\alpha^2(t) \right) f(t)dt \tag{37}$$

under the constraints:

$$\forall t \in T, \frac{du(t)}{dt} = (1-\lambda)\alpha(t) \tag{38}$$

$$\forall t \in T, \frac{d\alpha(t)}{dt} \geqq 0 \tag{39}$$

$$u(\underline{t}) = w_0 \tag{40}$$

Using (38) and (40), we have $u(t) = u(\underline{t}) + \int_{\underline{t}}^{t}(1-\lambda)\alpha(\tau)d\tau = w_0 + \int_{\underline{t}}^{t}(1-\lambda)\alpha(\tau)d\tau$. Therefore, we can rewrite (37) as

$$\underset{\{\alpha(t)\}}{max} \int_{\underline{t}}^{\bar{t}} \left(\frac{(1-\lambda)\alpha(t) + \lambda E[\alpha]}{1-\lambda} + (1-\lambda)t + \lambda E[t] - \int_{\underline{t}}^{t}(1-\lambda)\alpha(\tau)d\tau - w_0 - \frac{1}{2}(1+\eta\sigma^2)\alpha^2(t) \right) f(t)dt \tag{41}$$

However

[22] Indeed $\frac{du(t)}{dt} = (1-\lambda)\alpha(t) + \left(\frac{d\beta(t)}{dt} + \frac{\lambda}{1-\lambda}\frac{d\alpha(t)}{dt}E[\alpha] + ((1-\lambda)t + \lambda E[t])\frac{d\alpha(t)}{dt} + (1-\eta\sigma^2)\alpha(t)\frac{d\alpha(t)}{dt} \right)$, but the term in parentheses is zero from the first-order condition (31).

$$\begin{aligned}\int_{\underline{t}}^{\bar{t}}\left(\int_{\underline{t}}^{t}(1-\lambda)\alpha(\tau)d\tau\right)f(t)dt &= \left[F(t)\int_{\underline{t}}^{t}(1-\lambda)\alpha(\tau)d\tau\right]_{\underline{t}}^{\bar{t}}-\int_{\underline{t}}^{\bar{t}}((1-\lambda)\alpha(t))F(t)dt \\ &= \int_{\underline{t}}^{\bar{t}}(1-\lambda)\alpha(t)dt-\int_{\underline{t}}^{\bar{t}}(1-\lambda)\alpha(t)F(t)dt=\int_{\underline{t}}^{\bar{t}}(1-\lambda)\alpha(t)\left(1-F(t)\right)dt\end{aligned}$$

Hence the problem of the firm becomes

$$\underset{\{\alpha(t)\}}{max}\int_{\underline{t}}^{\bar{t}}\left(\frac{(1-\lambda)\alpha(t)+\lambda E\left[\alpha\right]}{1-\lambda}+(1-\lambda)t+\lambda E\left[t\right]-w_0-\frac{(1-\lambda)\alpha(t)\left(1-F(t)\right)}{f(t)}-\frac{1}{2}(1+\eta\sigma^2)\alpha^2(t)\right)f(t)dt \tag{42}$$

subject to (39), or

$$\underset{\{\alpha(t)\}}{max}\int_{\underline{t}}^{\bar{t}}\left(\frac{\alpha(t)}{1-\lambda}+t-w_0-\frac{(1-\lambda)\alpha(t)\left(1-F(t)\right)}{f(t)}-\frac{1}{2}(1+\eta\sigma^2)\alpha^2(t)\right)f(t)dt \tag{43}$$

subject to (39). ■

We can use a similar argument as in Appendix 1 to allow for a possible shutdown of types. Shutdown (if any) occurs on an interval $[\underline{t},t^*]$ for some $t^*>\underline{t}$, obtained as a solution of

$$\frac{\alpha_{II}^*(t^*)}{1-\lambda}-\frac{(1-\lambda)\alpha_{II}^*(t^*)\left(1-F(t^*)\right)}{f(t^*)}-\frac{1}{2}(1+\eta\sigma^2)\alpha_{II}^{*2}(t^*)=w_0-t^*$$

Therefore we have $w_0-t^*>0$. As $\underline{t}>w_0$ we have $t^*<\underline{t}$: A contradiction. ■

Appendix 3. Differences in commission schemes in Automobile Dealerships and Real Estate Firms

Table A.1: Differences in commission schemes (from Frank, 1984)

Auto Dealership		Real Estate Firms	
Dealership	Slope of the earnings function, α	Firm	Selling Agent's Commission Rate, α
1	0.165	1	0.50
2	0.20	2	0.50 if $E < \$30,000$
3	0.20		0.55 if $\$30,000 \leq E < \$41,111$
4	0.20		0.575 if $\$41,111 \leq E$
5	0.20	3	0.50 if $E < \$26,000$
6	0.25		0.60 if $\$26,000 \leq E < \$38,000$
7	0.25		0.575 if $\$38,000 \leq E$
8	0.25	4	0.50 if $E < \$12,000$
9	0.25		0.55 if $\$12,000 \leq E < \$18,000$
10	0.25		0.60 if $\$18,000 \leq E$
11	0.25		
12	0.30		
13	0.30		