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**Forgive or punish.
The impact of altruistic supervision on shirking**

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Forgive or Punish.

The Impact of Altruistic Supervision on Shirking

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Abstract: We study an efficiency-wage model where a principal hires a middle-layer of supervisors to control a group of potentially shirking workers. The assumption is that supervisors have concerns for their workers' wellbeing and vice-versa. We find that the supervisors' altruism has a negative effect on labor effort, as altruistic supervisors resent punishing shirkers. Moreover, this effect is increasing in the workers' compensation. This is at odds with the usual recommendation from the shirking-type efficiency-wage theory. However, the mechanism is mitigated by the workers' altruism, as altruistic workers resent exposing their supervisors to the risk of being fired for their forgiveness.

Keywords Altruism, shirking, control, efficiency wage, punishment, forgiveness

JEL Codes J41, M54, D64

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1. Introduction

Human beings free-ride, shirk, and disrespect the law whenever they can. This behavioral assumption is largely shared by economists and used in economic models. One would hardly find a subfield in the discipline that is not peopled by this kind of individuals. This is particularly true for the theory of the firm and for labor economics. The need to control workers, in fact, has been used to explain the existence and form of firms (Alchian and Demsetz, 1972), the optimal number of hierarchical levels (Williamson, 1976) and the optimal pay level (Mirrlees, 1976). The role of salaries as a mean to control workers has also been put forward. That an increase in wages could reduce shirking is the key result from the literature on efficiency wages and shirking in firms (Stiglitz, 1974; Calvo and Wellisz, 1979; Shapiro and Stiglitz, 1984).

Yet, both theoretically and empirically, the effect of wages on labor effort is ambiguous. Several studies have empirically shown that the effort-enhancing function of the efficiency wage may not be valid. Campbell and Kamlani (1997) and Nickell and Nicolitsas (1997), for instance, show that the one-way causation from wage to productivity is overstated, whereas Manning and Thomas (1997) and Autor (2003) conclude that the evidence on efficiency wages is inconclusive.¹ Theoretically, this has been explained in different ways. Lazear (1989) shows that when wages depend on relative performances, workers will have an incentive not only to boost their productivity, but also, to jeopardize their co-workers'. Milgrom (1988) and Perri (1994), in turn, highlight that employees may divert some of their production time to lobby their supervisors for higher wages, whereas Chang and Lai (2002: 30) show that increasing the workers' wage "opens up room for arbitrage to urge collusion between workers and

¹ It must be said that a number of studies have found support to some of the key predictions of efficiency wage theory, for instance, that the wage and the monitoring incentives can be used as substitutes to motivate work effort—see, for instance, Cappelli and Chauvin (1991); Krueger, (1991); Holzer, Katz and Krueger (1991); Rebitzer (1995). Even this evidence, however, is not uncontroversial: Groshen and Krueger (1990), for instance, find that while the wage and the supervision incentives are substitutes in the nursing occupation, they are complements in other three occupations, while Leonard (1987) finds a positive relationship between the two instruments. For a theoretical model dealing with the issue, see Chang and Lai (1999).

supervisors”, as the former may bribe the latter to avoid the punishment of losing their job. From the viewpoint of industrial psychology, the incentives that leverage on the workers’ extrinsic motivation (such as the wage) have the unintended result of crowding out their intrinsic motivation and morale (Frey, 1993a; 1993b). Hence, both theoretically and empirically, the effect of wages on labor effort is ambiguous and deserves further investigation.

One possible research avenue consists in studying the impact of social feelings on shirking. “Envy” and “resentment” bred by interpersonal comparison between the principal and his agent—as in Dur and Glazer, 2008—or among co-workers—as in Stark and Hyll, 2011—for instance, have been analyzed as factors that may explain why workers vary their efforts. In those cases, to affect labor productivity, organizations should modify the compensations of the different agents involved in the firm in a non-homogenous fashion, as it is more what others earn that affect each individual's effort.

Symmetrically, the role of “positive” feelings in organizations, such as “altruism,” has also been discussed, despite mainly by non-economists. Management scholars, for instance, have analyzed how altruism may promote corporate citizenship behavior (Valentine et al. 2011); stand as an antecedent for the development of organizational learning capabilities; and push organizations to engage in external charity or environmental-friendly acts (Kanungo and Coger, 1993).² However, the implications of altruism for the shirking-type efficiency wage theories has not been studied. This is what we do in this article.

We consider a situation where an employer wants to control a number of potentially shirking employees and hires a middle-layer of supervisors to monitor their effort. In doing so, we depart from the two-layer hierarchy that is usually studied in the efficiency/wage-

² Chiva et al. (2015: 350) define corporate citizenship behavior as “employee work behaviors of a discretionary nature that are not part of employees’ formal role requirements such as helping others or going beyond the normal expectations on their job”, while they define organizational learning capabilities as (ivi: 349) “the organizational and managerial characteristics that facilitate the organizational learning process or allow an organization to learn”.

principal/agent literature and consider a three-tier organization with one principal-multi-supervisors-multi-employees à-la Chang and Lai (2002). In our framework, workers decide whether to work or shirk and run the risk of being fired by their supervisor, whereas supervisors decide whether to punish or forgive the loafing workers and run the risk of being fired by their principal.

Our key assumption is that both workers and supervisors feel some degree of altruism towards each other. This allows us to put forward three results. First, as altruistic supervisors resent punishing caught shirkers, their concerns for others works as a sort of anti-firing insurance for the misbehaving workers. As a consequence, the supervisors' altruism has a negative effect on firm performance, as subordinates may take advantage of the "soft heart" of their superiors to get away with their misbehavior.³ Hence, there exists what we propose to call a "Samaritan effect" that depresses firm performance because of altruistic supervisors. Second, as the psychological cost of dismissing a shirker is increasing in the employment rent that workers receive on the job, the higher is the salary, the more inclined the supervisors will be to turn a blind eye upon shirkers. In this framework, raising the workers' wage may increase rather than decreases shirking, contrarily to what is usually suggested by efficiency wage theory. Third, when workers are concerned with their supervisors' well-being, the decision to shirk entails a psychological cost, as altruistic employees resent exposing their supervisors to the risk of being fired for their forgiveness. In this framework, the workers' altruism mitigates what we call the "Samaritan effect".

We believe that our contribution deepens our understanding of the mediating role of social feelings in organizations. Using an example given by Homans in his famous book *The*

³ Curiously, one of the first to acknowledge this "hidden cost of authority" was Taylor (1911: 52), who commented the success of a worker being promoted to supervisor in the following terms "for any right-minded man, however, this success is in no sense a recompense for the bitter relations which he is forced to maintain with all of those around him. Life which is one continuous struggle with other men is hardly worth living".

Human Group (1951), Akerlof and Kranton (2008: 216) claim that the “social distance between workers and supervisors can feed worker resentment of supervision”. As a support, they provide evidence that a team under the supervision of someone who remained silent about the workers’ shirking or mistakes performed better than one working with a supervisor who was “strict [...] and reported on his workers” (ivi: 215). In their example, a benevolent supervisor seems to achieve better results than less unforgiving ones. In this article, we provide mixed support to this result. Indeed, we find that the supervisors’ altruism has a direct and negative effect on labor effort, conversely to what suggested by Akerlof and Kranton (2008), but also, that this effect is mitigated by the workers’ reciprocal concern for their supervisors’ well-being. Hence, despite our results seem to suggest that altruism in hierarchies should be discouraged, they also indicate that once it flourishes, it should be improved at all steps of the hierarchical ladder.

The article is organized as follows. Section 2 presents the structure and timing of the game. In sections 3 and 4, we analyze the first and second stage of the game and outline our main results. Section 5 some implications for the firm’s optimal decision making. Section 6 concludes.

2. The model: setup, timing, and assumptions

We study a two-stage game where a unit-mass of altruistic workers (each of whom will be indicated as “he”) and a unit-mass of altruistic supervisors (each of whom will be indicated as “she”) interact through a three-layer hierarchy dominated by a principal. To focus on the supervisors’ monitoring role, we assume that they perform no work of coordination, decision-making or the likes—i.e., they are “unproductive”.

At stage 1, workers decide whether to work and incur in the cost of effort $e > 0$ (strategy

W) or shirk and run the risk of being fired by their supervisors (Strategy S).⁴ Workers are hired at a compensation $w > 0$ and receive their outside option $w_0 \geq 0$ when dismissed. To ensure that there is an effective punishment from being unemployed, we follow the common wisdom in the efficiency wage literature and assume that $w > w_0$. Hence, $w - w_0$ measures the employment rent that workers receive on the job, or alternatively, their cost of job loss. To ensure that this employment rent is non-negative for hard-workers, we impose the following restriction upon the set of parameters' value:

Assumption 1—*The workers' wage exceeds the cost of effort, so that $w - e \geq 0$.*

At stage 2, supervisors imperfectly evaluate the workers' performance. Once a supervisor detects a shirking worker—which occurs with the exogenous probability $0 \leq p \leq 1$ —she must decide whether to forgive (strategy F) or fire the shirker for his misbehavior (strategy P). Even if forgiveness seems to be an act of mercy, it is not perceived as such by the principal. When supervisors turn a blind eye on shirkers, in fact, they willingly fail their organizational duties and impose a productivity loss upon the organization. Hence, we assume that there is an exogenous probability q that the principal detects these acts of mercy and dismisses both the forgiving supervisor and the forgiven shirker, where q is such that $q \in [\underline{q}, \bar{q}]$.⁵ Supervisors are hired at compensation $s > 0$ and receive their outside option $s_0 \geq 0$ when dismissed. As before, we assume that $s > s_0$, so that $s - s_0$ measures the employment rent that supervisors receive on the job, or alternatively, their cost of job loss.

For the sake of simplicity, we assume that all workers (resp., supervisors) have the same reservation wage w_0 (resp., s_0) and that there is no probability of being reemployed once

⁴ The assumption that workers have only two effort choices is common in the efficiency wage literature—see, e.g., Shapiro and Stiglitz (1984) and Chang and Lai (2002).

⁵ For the derivation of the upper and lower bounds \bar{q} and \underline{q} see Assumptions 2 and 3 respectively.

dismissed—i.e., both type of agents joint the unemployment pool permanently.⁶ Allowing for the possibility of being reemployed, in fact, would not alter any of our results qualitatively. In addition, and without loss of generality, we normalize $w_0 = s_0 = 0$. All of our results would remain unaltered by allowing the agents' reservation wages to assume non-zero values.

The key idea behind our modelling strategy is that both workers and supervisors make decisions by internalizing the possibility of being fired as a consequence of their choice. As we shall see, the choices of both types of agents are closely related to their degree of altruism, as only sufficiently altruistic workers will work, and only sufficiently altruistic supervisors will forgive. As usual, we model altruism through utility interdependence. "The basic theory" as Levine (1998: 595) puts it "is that players care not only about their own monetary payoffs, but also about their opponent's monetary payoffs".⁷ In particular, we assume that the utility of the i th-worker, indicated as U_i , is given by the sum of his payoff, indicated as u_i , and the payoff of the supervisor he interacts with, indicated as v_j . Similarly, we assume that the utility of the j th-supervisor, indicated as V_j , is given by the sum of her payoff, indicated as v_j , and the payoff of the worker she interacts with, indicated as u_i . Finally, we assume that the utility gains that agents derive from their other-regarding preferences must be weighted for a degree of altruism $0 \leq \alpha \leq 1$ that idiosyncratically characterizes each worker i and each supervisor j .⁸ Without loss of generality, we assume that these altruism levels are drawn from a uniform distribution between 0 and 1 with probability density function $g(\alpha)$. Hence, in each of the possible states described by the probabilities p, q, γ and φ , the utility of the i th worker is given by $U_i = u_i +$

⁶ This may seem quite an unrealistic assumption. Allowing for the possibility of leaving the unemployment pool once dismissed, however, would not alter any of our results qualitatively. As in all shirking models, in fact, a higher probability of being reemployed has only the quantitative effect of softening the punishment from being dismissed, and thus, of weakening the effort-enhancing function of the efficiency wage—see for instance the discussion in Chang and Lai (1999: 303).

⁷ A huge body of experimental literature has shown that individuals are not as self-interested as the traditional economic wisdom would suggest, but rather, that interdependent preferences and concerns for the well-being of others are key to understand individual behavior. Seminal contributions in the field include, but are not limited to, Güth et al (1982); Isaac and Walker (1988); Fehr and Schmidt (1999) and Charness and Rabin (2002).

⁸ One of the first to use (and derive) a coefficient to index the altruism of different individuals is Andreoni (1990).

$\alpha_i v_j$, whereas the utility of the j th supervisor is given by $V_j = v_j + \alpha_j u_i$.

The game tree in figure 1 visualizes the structure of interactions. As anticipated, workers are first-movers, whereas supervisors play second. The probability $0 < \gamma < 1$ that a worker will work and the probability $1 < \varphi < 0$ that a supervisor will forgive will be determined endogenously as functions of the agents' altruism. Following Chang and Lai (2002), we additionally assume that workers and supervisors do not engage in regular relationships; that their encounter is random; and that the organization is large enough so that the probabilities γ and φ are given by the equilibrium densities of forgivers and shirkers in the organization. The probability $0 \leq p \leq 1$ that a supervisor will detect a loafing worker and the probability $\underline{q} \leq q \leq \bar{q}$ that the principal will detect a forgiving supervisor, as anticipated, are exogenously given.⁹ The game is solved by backward induction. Hence, we will first analyze the supervisors' decision to forgive and then, the workers' decision to shirk.

[Insert Fig. 1 about here]

3. The supervisors' decision

Given the sequence of events described in section 2 and visualized in Fig. 1, the utility of the j th-supervisor who decides to forgive is given by:

$$V_j^F = q(s_0 + \alpha_j w_0) + (1 - q)(s + \alpha_j w)$$

whereas the utility of the j th-supervisor who decides to punish is given by¹⁰:

⁹ The probabilities $0 \leq p \leq 1$ and $\underline{q} \leq q \leq \bar{q}$ could be plausibly specified as an increasing function of the density of the shirking and the forgiving groups, so that $p = p(\gamma)$ and $q = q(\varphi)$, with $p'(\gamma) > 0$ —the more shirkers there are in the organization, the easier it is to detect their misbehavior—and $q'(\varphi) > 0$ —the more forgivers there are in the organization, the easier it is to detect their misbehavior. However, even if this channel is taken into account, our main results are not altered qualitatively. For further discussion, see section 5.

¹⁰ Observe that completely self-interested supervisors—those with $\alpha_j = 0$ —have no incentive to forgive at all, as the utility they derive as punishers is always greater than the utility they derive as forgivers. Formally, this is given by the fact that $v_{\alpha_j=0}^P = s > s - q(s - s_0) = v_{\alpha_j=0}^F$.

$$V_j^P = s + \alpha_j w_0$$

To preliminary assess the effects of altruism on the supervisors' decision and thus, on firm performance, we put forward the following Proposition:

Proposition 1—*The supervisors' altruism has a negative effect on their willingness to punish.*

Indeed, the more altruistic is the supervisor, the more inclined she will be to forgive caught shirkers. This mechanism is increasing in the workers' employment rent.

Proof: $\frac{\partial(V^F - V^P)}{\partial \alpha} = (1 - q)(w - w_0) > 0$ ■

The logic behind Proposition 1 is straightforward: as altruistic supervisors resent punishing shirkers, the greater the weight of other-regarding preferences in their utility function, the greater the psychological cost of dismissing a shirker. That this harm is increasing in the workers' cost of job loss is also intuitive: as the punishment of being unemployed increases with the employment rent that workers receive on the job, the greater the latter, the greater the altruism-derived disutility suffered by punishers.

The next task is to derive the equilibrium density of forgivers in the supervisors' group. To do so, we shall look for a value $\tilde{\alpha}$ that makes the idiosyncratic supervisor with $\alpha_j = \tilde{\alpha}$ just indifferent between forgiving and punishing, that is, for a value $\tilde{\alpha}$ which satisfies $V^F - V^P = 0$, or, alternatively:

$$q(s_0 + \tilde{\alpha}w_0) + (1 - q)(s + \tilde{\alpha}w) - (s + \tilde{\alpha}w_0) = 0$$

Recalling that we have normalized $w_0 = s_0 = 0$, we can solve the above expression for $\tilde{\alpha}$ and derive the threshold level in the supervisors' altruism, which, as we shall see, divides supervisors in forgivers and punishers, which is given by:

$$\tilde{\alpha} = \frac{qs}{(1-q)w} \quad (1)$$

To ensure the existence of an interior solution, we impose the following restriction upon the set of parameters' value:

Assumption 2—*The principal's monitoring ability q is not so high as to rule out the possibility of forgiving behaviors. Parametrically, this corresponds to $q < e/(w + s) \equiv \bar{q}$, which ensures that $\tilde{\alpha} < 1$.*

Given that all supervisors with $0 < \alpha_j < \tilde{\alpha}$ will decide to punish, whereas all supervisors with $\tilde{\alpha} < \alpha_j < 1$ will decide to forgive, forgiveness and altruism are closely related in this model. Hence, we can express the equilibrium density of the forgivers' group $0 < \varphi < 1$ as a function of the threshold level derived in equation (1). Given the assumption that α is uniformly distributed over $(0,1)$, we have:

$$\varphi = \int_{\tilde{\alpha}}^1 g(\alpha) d\alpha = 1 - \tilde{\alpha} \quad (2)$$

Substituting equation (1) in relation (2), we derive the exact expression of the equilibrium density of the forgivers' group, which is given by:

$$\varphi = \varphi(w, s, q) = \frac{(1-q)w - qs}{(1-q)w} \quad (3)$$

From equation (3), it is straightforward to see that:

$$\varphi_w > 0; \varphi_q < 0; \varphi_s < 0 \quad (4)$$

Proof: $\varphi_w = \frac{qs}{(1-q)w^2} > 0$; $\varphi_q = -\frac{s}{(1-q)^2w} < 0$; $\varphi_s = -\frac{q}{(1-q)w} < 0$ ■

where, as usual, subscripts denote partial derivatives. The first comparative statics ($\varphi_w > 0$) predicts that, when workers earn high wages, the size of the forgivers' group will increase. As anticipated by Proposition 1, this occurs because the altruism-derived costs of punishing a shirker is positively correlated to the workers' wage, as the punishment that employees receive from being unemployed depends positively on their employment rent. Hence, the higher is the workers' wage, the less inclined supervisors will be to dismiss shirkers. With this, we have demonstrated the existence of what we call the "Samaritan effect". For a discussion of the implications of this effect for the shirking-type efficiency-wage theories, see Proposition 4 below.

The second comparative statics ($\varphi_q < 0$) predicts that when the principal is successful in detecting the supervisors' misbehavior, less supervisors will be inclined to put their job in jeopardy by forgiving a loafing worker. By the same logic, the better the supervisors are paid, the less inclined they will be to fail their organizational duties and run the risk of being fired. Hence, the higher the supervisory compensation, the smaller the size of the forgivers' group ($\varphi_s < 0$). The upshot is twofold. First, altruistic supervisors will demand higher wages to compensate the psychological disutility of behaving as the "big bad wolf" who command over the labor process.¹¹ Second, imposing an efficiency-wage program on supervisors acts as an effective incentive to prevent forgiveness in organizations and, as we shall see, boost the workers' effort.

With this, we have completed the analysis of the supervisors' decision. The next task is to

¹¹ Indeed, by solving the payoff difference $V_j^F - V_j^P = 0$ for the supervisors' compensation s , it is straightforward to see that the pay level $\bar{s}_j \equiv s_0 + (1 - q)\alpha_j(w - w_0)/q$ that would make the j th-supervisor just indifferent between forgiving and punishing is increasing in her level of altruism α_j , as $\partial \bar{s}_j / \partial \alpha_j > 0$. More specifically, the second term on the l.h.s. of the above equality can be referred to as the premium that an altruistic supervisor would demand to compensate the psychological disutility of punishing shirkers if she were to negotiate her wage with her employer. Quite reasonably, however, wage bargaining occurs at the group level—see section 6. Hence, it could be impossible for the firm to find a compensation rate that induces all supervisors to punish and thus fulfil their organizational duties.

inquire into that of workers and derive suggestions for the shirking-type efficiency wage theories.

4. The workers' decision

Given the sequence of events described in section 2 and visualized in Fig. 1, the utility of the i th-worker who decides to work is given by:

$$U_i^W = w - e + \alpha_i s$$

whereas the utility of the i th-worker who decides to shirk is given by:

$$U_i^S = p\{\varphi[(1 - q)(w + \alpha_i s) + q(w_0 + \alpha_i s_0)] + (1 - \varphi)(w_0 + \alpha_i s)\} + (1 - p)(w + \alpha_i s)$$

To preliminarily assess how altruism affects the workers' decision, we have to distinguish between the effects of the supervisors' other-regarding preferences and those related to the workers' concerns for their supervisors. Hence, we put forward the following Proposition:

Proposition 2—*The supervisors' altruism has a negative effect on labor effort. This negative effect, however, is mitigated by the workers' altruism.*

Proof: That the supervisors' altruism has a negative effect on labor effort can be seen from the

fact that $\frac{\partial(U^W - U^S)}{\partial\varphi} = q\alpha(s - s_0) - (1 - q)(w - w_0) < 0$. To see that $\frac{\partial(U^W - U^S)}{\partial\varphi} < 0$, recall that

we have assumed that $w_0 = s_0 = 0$. Hence, we can simplify the above expression as $\frac{\partial(U^W - U^S)}{\partial\varphi} =$

$q(w + \alpha s) - w$, from which we see that a necessary condition for $\frac{\partial(U^W - U^S)}{\partial\varphi} < 0$ is that

$q(w + \alpha s) - w < 0$, or, alternatively, that $q < \frac{w}{w + \alpha s}$. From Assumption 1, we already know that

$q < \frac{e}{w + s}$. Hence, a sufficient condition for $\frac{\partial(U^W - U^S)}{\partial\varphi} < 0$ is that $\frac{w}{w + \alpha s} > \frac{e}{w + s}$, which is always

satisfied as $0 < \alpha_i < 1$ and $w \geq e$ according to Assumption 1. In addition, we have that

$\frac{\partial(U^W - U^S)}{\partial\alpha} = \varphi q s > 0$, which indicates that the workers' altruism has a positive effect on labor

effort ■

Commenting the results from Proposition 2 is straightforward: when workers anticipate the possibility of being forgiven by a merciful supervisor, they have an incentive to leverage on her “soft heartedness” and save their cost of effort; by doing so, however, they expose the forgiving overseers to the risk of being fired by the principal. This is captured by the fact that when the supervisor forgives but the principal detects this act of mercy—which happens with probability φq —the i th-shirker incurs an altruism-derived cost of $-\alpha_i s$. To avoid such cost, workers may thus decide not to shirk.

The next task is to derive the equilibrium density of hard workers in the organization. As before, we shall look for a value $\hat{\alpha}$ which makes the idiosyncratic worker with $\alpha_i = \hat{\alpha}$ just indifferent between working and shirking, that is, for a value $\hat{\alpha}$ which satisfies $U^W - W^S = 0$, or, alternatively:

$$\begin{aligned} w - e + \hat{\alpha}s - (p\{\varphi[(1 - q)(w + \hat{\alpha}s) + q(w_0 + \hat{\alpha}s_0)] + (1 - \varphi)(w_0 + \hat{\alpha}s)\} + (1 - p)(w + \hat{\alpha}s)) \\ = (w - w_0)[1 - \varphi(1 - q)] + \hat{\alpha}(s - s_0)\varphi q - \frac{e}{p} = 0 \end{aligned} \quad (5)$$

From the payoff difference reported in equation (5), it is interesting to note that workers cannot develop sympathetic feelings towards their supervisors unless the latter show some concerns for their well-being. Formally, this is given by the fact that, when $\varphi = 0$, the effects of the workers’ altruism disappear. This suggests that altruism in hierarchies may only flourish as a top-down process: when supervisors show concerns for the subordinates’ well-being, workers may reciprocate and sympathetically avoid exposing their supervisors’ to the risk of being fired as a consequence of their misbehavior. Conversely, when supervisors are self-interested, the effect of altruism in the organization disappear, and the framework is identical to a standard shirking model where there exists an efficiency wage level—or monitoring intensity, as shown by Georgiadis (2012)—that induces all workers to provide effort.

Returning to the derivation of the equilibrium density of hard-workers—recall that we

have normalized $w_0 = s_0 = 0$ —we can solve the expression in equation (5) for $\hat{\alpha}$ and derive the threshold level in the workers' altruism which, as we shall see, separates hard-workers from shirkers, which is given by:

$$\hat{\alpha} = \frac{e - w[1 - \varphi(1 - q)]}{p\varphi qs} \quad (6)$$

To ensure the existence of an interior solution, we impose the following restriction upon the set of parameters' value:

Assumption 3—*The principal's monitoring ability q is not so low as to rule out the possibility of hard working. Parametrically, this corresponds to $q > e/[w + s(1 + p\varphi)] \equiv \underline{q}$, which ensures that $\hat{\alpha} < 1$.¹²*

Proof: To verify that $0 < \hat{\alpha} < 1$ consider the following: (i) a necessary condition for $\hat{\alpha} > 0$ is that $e > w[1 - \varphi(1 - q)]$. Inserting equation (3) in equation (6), it is straightforward to see that $w[1 - \varphi(1 - q)] = q(w + s)$, so that $\hat{\alpha} > 0$ if $e > q(w + s)$, which is always satisfied according to Assumption 2; (ii) a necessary condition for $\hat{\alpha} < 1$ is that $p\varphi qs > e - w[1 - \varphi(1 - q)]$. Rearranging, we see that $\hat{\alpha} < 1$ if $q[w + s(1 + p\varphi)] - e > 0$, or, alternatively, if $q > e/[w + s(1 + p\varphi)]$ ■

Making use of the equilibrium density the forgivers derived in equation (3), we can simplify the expression in equation (6) as:

¹² Inserting the equilibrium density of forgivers $\varphi = \varphi(w, s, q)$ derived in equation (3) in the threshold \underline{q} and rearranging, we see that the exact condition for $\hat{\alpha} < 1$ is given by $\left[(1 + p)s + w + \frac{ps^2}{w}\right]q^2 - [(1 + p)s + w + e]q + e < 0$. Hence, the exact expression of the threshold level of q that satisfies Assumption 3 is given by $\underline{q} \equiv w[(1 + p)s + w + e] + w \left\{ \left[(1 + p)s + w + e \right]^2 - 4 \left[(1 + p)s + w + \frac{ps^2}{w} \right] e \right\}^{1/2} / 2(ps + w)(s + w)$.

$$\hat{\alpha} = \frac{1}{\varphi} \left[\frac{e - q(w + s)}{pqs} \right] \quad (6')$$

The workers' decision to provide effort is closely related to their degree of altruism, as all workers with $0 < \alpha_i < \hat{\alpha}$ will decide to shirk, whereas all workers with $\tilde{\alpha} < \alpha_i < 1$ will decide to work. Hence, we can express the equilibrium density of the hard-working group $0 < \gamma < 1$ as a function of the threshold level derived in equation (6). Given the assumption that α is uniformly distributed over $(0,1)$, we have that:

$$\gamma = \int_{\hat{\alpha}}^1 g(\alpha) d\alpha = 1 - \hat{\alpha} \quad (7)$$

Substituting equation (6') in relation (7) we derive the exact expression of the equilibrium density of the forgivers' group, which is given by:

$$\gamma = \gamma(w, s, p, q, e) = 1 - \frac{1}{\varphi} \left[\frac{e - q(w + s)}{pqs} \right] \quad (8)$$

Recalling that supervisors are “unproductive” in our model—and so are shirkers, of course—the equilibrium share of hard-workers $\gamma(w, s, p, q, e)$ can be treated as an index of firm performance. Hence, it is straightforward to conclude that altruism and productivity are strictly related in our model, as sufficiently altruistic workers will work, whereas sufficiently selfish workers will shirk. With this fact in mind, we can formulate the following Proposition:

Proposition 3—*Reciprocal altruism has a positive effect on labor effort. Indeed, the density of the hard-working group increases with the share of forgivers that, in turn, is closely related to the supervisors' altruism.*

Proof: $\gamma_{\varphi} = \frac{1}{\varphi^2} \left[\frac{e - q(w + s)}{pqs} \right] > 0 \blacksquare$

The mechanism behind the result in Proposition 3 is closely related to the second effect analyzed in Proposition 2: as altruistic workers resent exposing a merciful supervisor to the risk of being fired by the principal, the higher is the probability of being forgiven—and thus, the greater the size of the forgivers' group—the less workers will be inclined to shirk.

As the equilibrium share of forgivers in the supervisors' group $\varphi(w, s, q)$ is a function of w, s and q , we can further disentangle the above mechanism by analysing how the remaining parameters of the model affect the equilibrium density of hard-workers. Making use of the comparative statics reported in (4), in fact, we can observe that:

$$\gamma_e < 0; \gamma_p > 0; \gamma_q > 0; \gamma_s > 0; \gamma_w \begin{matrix} > \\ < \end{matrix} 0 \quad (9)$$

Proof: Differentiating $\gamma(e, p, s, q, w)$ w.r.t. e, p, s, q and w , we see that: $\gamma_e = -\frac{1}{p\varphi qs} < 0$; $\gamma_p = \frac{e-q(w+s)}{p^2\varphi qs} > 0$, as we know from Assumption 2 that $e - q(w + s) > 0$; $\gamma_q = \frac{e}{p\varphi q^2 s} - \frac{1}{\varphi q} \left[\frac{e-q(w+s)}{pqs} \right] > 0$, as we already know that $\varphi_q < 0$; $\gamma_s = \frac{e-qw}{p\varphi qs^2} - \frac{1}{\varphi_s} \left[\frac{e-q(w+s)}{pqs} \right] > 0$ as we already know that $\varphi_s < 0$ and, from Assumption 2, that $e - q(w + s) > 0$, which clearly indicates that $e - qw > 0$ as well; $\gamma_w = \frac{1}{p\varphi s} - \frac{1}{\varphi_w} \left[\frac{e-q(w+s)}{pqs} \right] \begin{matrix} > \\ < \end{matrix} 0$, as we already know that $\varphi_w > 0$ ■

The first ($\gamma_e < 0$), second ($\gamma_p > 0$) and third ($\gamma_q > 0$) comparative statics are intuitive: when the cost of effort is high, workers will be more inclined to shirk; when the probability of being caught shirking is high—either by a supervisor or by the principal—workers will be more inclined to work. More interesting are the fourth ($\gamma_s > 0$) and fifth ($\gamma_w \begin{matrix} > \\ < \end{matrix} 0$) of our results.

The fourth ($\gamma_s > 0$) predicts that when the supervisory compensation is high, workers will be more inclined to put forward their labor effort. This mechanism results from the combination of two different but complementary effects. First, as anticipated by Propositions 2 and 3, altruistic workers who contemplate the possibility of shirking will feel uncomfortable in

exposing their supervisors to the risk of being fired for having forgiven their misbehavior. As the punishment that supervisor suffer from being unemployed is increasing in their wage, raising the supervisory compensation will leverage on the workers' altruism and thus increase their labor effort. This mechanism is complemented by the fact that the better supervisors are paid, the less inclined they will be to put their occupation at risk—see the third comparative statics in (4); $\varphi_s < 0$. Hence, a change in the supervisors' compensation will induce both workers and supervisors to modify their behavior.¹³

The last comparative statics ($\gamma_w \gtrless 0$) predicts that the effect of raising the wage on labor effort is ambiguous, contrarily to what is usually suggested by efficiency wage theories—see, e.g., Shapiro and Stiglitz (1984)—but in line with the results of Chang and Lai (2002). As before, the mechanism results from the combination of two different but, at this time, diverging effects. The first is the usual “disciplining” effect postulated by the shirking-type efficiency wage theories and predicts that the higher is the wage, the higher is the punishment from being unemployed and thus, the higher is the workers' effort. The second and more novel is what we call the “Samaritan effect”, which predicts that when workers earn high wages, supervisors will be less prone to dismiss shirkers—see the first comparative statics in (4); $\varphi_w > 0$. Anticipating this, workers may take advantage of their supervisor's altruism and decide to save their cost of effort, as anticipated in the first part of Proposition 2. Hence, as for the supervisory wage, a change in the workers' compensation will induce both workers and supervisors to modify their behavior.¹⁴ To summarize this result and highlight its implications for the shirking-type

¹³ The change in the workers' behavior is captured by the term $e - qw/p\varphi qs^2$ in the expression of γ_s ; the change in the supervisors' behavior is captured by the term $-1/\varphi_s [e - q(w + s)/pqs]$ in the expression of γ_s , as can be seen from the fact that φ_s indicates a change in the equilibrium density of forgivers due to a variation in the supervisory wage.

¹⁴ The change in the workers' behavior is captured by the term $1/p\varphi s$ in the expression of γ_w ; the change in the supervisors' behavior is captured by the term $-1/\varphi_w [e - q(w + s)/pqs]$ in the expression of γ_s , as can be seen from the fact that φ_w indicates a change in the equilibrium density of forgivers due to a variation in the workers' wage.

efficiency wage theory, we formulate the following Proposition:

Proposition 4—*When supervisors have other-regarding preferences, increasing the wage rate has an ambiguous effect on labor effort. In particular, when the Samaritan effect outweighs the disciplining effect, intensifying the wage incentive decreases the size of the hard-working group in the organization.*

The result put forward in Proposition 4 is similar to that advanced in Chang and Lai (2002), as they also highlight a mechanism that jeopardizes the high-wage program imposed on workers. The avenue through which they get at this conclusion, however, is quite different from ours. While they find that increasing the wage allows caught shirkers to increase the bribery amount through which they corrupt their supervisors, in our framework, the jeopardizing effect stems from the supervisors' altruism. Of course, the two explanations are not mutually excluding. Hence, we cannot but follow their remark on the importance of promoting a "work norm" in the labor community to prevent shirking in the first place—for a discussion of such norms, see Akerlof (1980). In addition, as we find that raising the supervisory compensation has an unambiguously positive effect on labor effort, we find that imposing a high-wage program on altruistic supervisors can be used as an effective tool to promote labor effort.

5. The firm's maximization

In this section, we examine the implications of the analysis developed in the above for the firm's optimal decision making. Let n , m and f denote the number of employees, the number of supervisors and the production function, respectively. Under the assumption we use here that supervisors are "unproductive", the firm's effective workforce (indicated as x) is given by the share of employees who decide to provide effort, so that $x = \gamma n$ —for the equilibrium share of

hard-workers $\gamma = \gamma(w, s, p, q, e)$ see equation (8). Following standard conventions, we assume that $f_x > 0$ and $f_{xx} < 0$ —i.e., the production function is increasing and concave in the firm’s effective workforce.

We assume that the organization maximizes its profit π by selecting the optimal numbers of employees and supervisors and the optimal pay levels subject to the effort function defined by equation (8). In doing so, it chooses a ratio $0 < m/n < 1$ that captures what Gordon (1994) defines the “intensity of supervision” and what Williamson (1976: 127) calls the supervisors’ “span of control (the number of employees a supervisor can handle effectively)”. To study this, we need to specify the supervisor’s monitoring ability p as a function of n and m , that is, we need to formalize a relationship $p = p(n, m)$ that endogenizes the monitoring probability. To keep things simple, we follow Georgiadis (2012) and assume that $p(n, m)$ takes the specific functional form:

$$p(n, m) = \frac{m}{n} \tag{10}$$

In words, this amounts to assuming that the supervisors’ monitoring ability is proportional to the “intensity of supervision” and hence, that it depends positively on the number of supervisors m and negatively on the number of workers n .¹⁵ One may think to $p(n, m)$ as measuring the probability that a supervisors will be interacting with a worker per unit of time, regardless of whether the latter is working or shirking. In this specification, when $m = n$, each worker would be constantly overseen by a single supervisor.

Putting together equation (9) and the fact that $\gamma_p > 0$ —see equation (8) and the discussion therein—it is straightforward to see that:

¹⁵ Of course, idiosyncrasies in the production process such as the kind of knowledge that workers put to use and the spatial configuration of the organization have a key role in affecting the supervisors’ monitoring ability. In the same vein, advancements in monitoring technologies or in the supervisors’ human capital may significantly ease the overseeing procedure. Even if these channels are taken into account, however, our results would not be altered qualitatively.

$$\gamma_n < 0; \gamma_m > 0 \quad (11)$$

Proof: Inserting equation (10) in equation (8), we can rewrite the equilibrium density of hard-workers as $\gamma = \gamma(e, n, m, s, q, w) = 1 - \frac{n}{\varphi} \left[\frac{e^{-q(w+s)}}{mqs} \right]$, where $\gamma_n = -\frac{1}{\varphi} \left[\frac{e^{-q(w+s)}}{mqs} \right] < 0$ and $\gamma_m = \frac{n}{\varphi} \left[\frac{e^{-q(w+s)}}{m^2qs} \right] > 0$ ■

Intuitively, as we have specified the supervisors' monitoring ability as a function of their numerosity, an increase in the intensity of supervision will increase the equilibrium density of hard workers, as the probability of being caught shirking is increasing in m and decreasing in n . With these facts in mind, we can write the firm's problem as:

$$\max_{n,m,w,s} \pi = f(x) - wn - sm$$

$$\text{s. t. } \gamma = \gamma(e, n, m, s, q, w) \text{ and } m < n$$

Where the second constraint on the supervisors/workers ratio ensures that $p(n, m) < 1$. Given the assumption that supervisors are "unproductive", in fact, it would be irrational for the organization to hire more supervisors than workers, as the former contribution to organizational performance is limited to their function, so to speak, of "effort-extraction". From the first order conditions we see that:

$$\pi_n = f_x(n\gamma_n + \gamma) - w = 0 \quad (12)$$

$$\pi_w = f_x n \gamma_w - n = 0 \quad (13)$$

$$\pi_m = f_x n \gamma_m - s = 0 \quad (14)$$

$$\pi_s = f_x n \gamma_s - m = 0 \quad (15)$$

We suppose that the second-order conditions are satisfied. From equations (8) and (10),

we already know that $\gamma_n < 0$; $\gamma_w \gtrless 0$; $\gamma_m > 0$ and $\gamma_s > 0$. Hence, we can put forward some observations. First, equation (14) states that supervisors will be employed until the marginal cost of hiring an additional overseer equals the marginal effect of the latter on the supply of labor effort. Second, equation (12) states that employees will be employed until the marginal cost of hiring an additional worker equals the marginal productivity of the latter *minus* his effect on the disciplinary environment of the firm. Due to the admittedly specific functional form chosen in equation (10), in fact, an increase in employment has an obvious and positive effect on productivity—captured by the second term in equation (12), $f_x \gamma > 0$ —that is however counterbalanced by a “control loss” phenomenon—captured by the first term in equation (10), $f_x n \gamma_n < 0$ —arising from the fact that the supervisors’ ability to keep firm discipline is assumed to decrease with the number of workers in the organization. Hence, we can formulate the following Proposition:

Proposition 5—*The firm’s employment decision is constrained by the need of monitoring workers. In particular, when the f.o.c. in equation (12) are violated— $n\gamma_n + \gamma < 0 \Leftrightarrow \pi_n < 0$ —the firm cannot find a positive employment level and avoids entering the market.*

The result from Proposition 5 is consistent with the message of both Alchian and Demsetz (1972) and Williamson (1976), as it corroborates the standard vision of firm theorists whereby the need to control workers constitutes a major determinant of organizational design. In particular, Williamson (1976) shows that the number of hierarchical layers in the organization—and thus, the size of the firm—is constrained by a control issue similar to that analyzed here. The key difference between our result and his is that he assumes that the “number of employees a supervisor can handle effectively” at each level of the hierarchy is fixed, and then, analyzes the loss of control resulting from the addition of subsequent hierarchical layers. In doing so, he derives suggestions on what is often referred to as the “depth” of the

organization—for a different perspective, see Garicano (2000). Hence, our findings expand on this line of reasoning and suggest that control-loss phenomena have constraining implications also on what is often referred to as the “breadth” of the organization, that is, on the size of each hierarchical level.

The second observation that is worth deriving from the above set of equations is more closely related to our discussion of altruism in organizations and, more specifically, to its implications for the shirking-type efficiency-wage theories. Recalling that $\gamma_w \stackrel{\geq}{<} 0$, in fact, we can advance the following Proposition:

Proposition 6—*When the Samaritan effect— $\gamma_w < 0$ —outweighs the disciplining effect— $\gamma_w > 0$ —the f.o.c. in equation (13) are violated— $\pi_w < 0$ —and the efficiency wage cannot serve as an effort-enhancing policy. In this case, organizations should pay workers their reservation wage.*

The result from Proposition 6 can be seen as an extension of the finding advanced in Proposition 4: when the perverse combination of extrinsic incentives and altruism jeopardizes the effort-enhancing function of the efficiency wage, the latter cannot be used as a tool to stimulate labor productivity. In this case, organizations should pay workers their reservation wage, as raising the wage premium would do nothing but diminish the equilibrium share of hard-workers. Conversely, given that raising the supervisors’ wage has a clear and positive effect on labor effort—see the comparative statics in equation (9), $\gamma_s > 0$ —imposing a high-wage program on supervisors can be used as an effective policy to promote firm performance.

6. Conclusion

In this article, we developed a simple game-theoretic framework to study the impact of altruism in a shirking-type efficiency wage model. In particular, we considered the situation

where a principal hires a group of supervisors to induce his employees to put forward their labor effort. Our working hypothesis is that supervisors feel some degree of concern for the well-being of workers and vice-versa. The implication of this simple assumption is twofold. First, as altruistic supervisors resent punishing loafing workers, they may decide to indulge their subordinates' misconduct to avoid the altruism-derived costs of dismissing a shirker. In doing so, however, they run the risk of being fired by the principal, who sees the supervisors' mercy as a violation of their organizational duties. Anticipating this possibility, altruistic workers will be less inclined to shirk, as to avoid exposing their supervisor to the risk of losing their job. Hence, we find that the supervisors' concerns for the workers has a negative effect on labor effort—and thus, on firm performance—but that this effect is mitigated by the workers' concerns for the supervisors. Expanding on these results, we derive implications for the shirking-type efficiency wage theories. We find that although raising the supervisor's wage can be used as an efficient tool to boost work effort, increasing the workers' compensation may actually decrease rather than increase their willingness to work. The avenue through which we get at this result is the following: as altruistic supervisors resent punishing shirkers and the cost of job loss is increasing in the workers' wage, the higher the latter, the more supervisors will decide to forgive and thus, the less workers will decide to work.

The bottom line of our analysis is that altruism in hierarchies should be discouraged. However, once it naturally flourishes, we find that it is better to have more than less concerns for others, as the negative effect of the supervisors' other regarding preferences is mitigated by the workers' altruism. Besides these recommendations, which are fairly straightforward, we think that another, perhaps more elaborated message can be retrieved from our study. Instead of trying to contain the unintended effects of altruism in hierarchies, organizations themselves could be made less "hierarchical", as to avoid forcing supervisors to bear the psychological costs of maintaining a bitter relation with those around them. To do so, less authoritarian modes of

supervision that does not require superiors to act as punishers but rather, as facilitators and enablers, should be encouraged.¹⁶ An implicit but key assumption of the shirking-type efficiency wage theories, in fact, is that supervisors are efficient in fulfilling their organizational role, as they overlook the hidden costs of behaving as the “big bad wolf” who command over the labor process. Once that social feelings are allowed into the picture, however, firm discipline ceases to operate smoothly and novel organizational solutions must be found.

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¹⁶ The follower-leader literature in human resource management is rife with partially overlapping definitions of non-authoritarian leadership styles that provide organizations with tools to motivate workers that could be more efficient than the “discipline and punish” incentives allowed for by the standard shirking model (Tannenbaum and Massarik, 1957; Bass, 1985; Yukl, 2010; Cunliffe, 2011).

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