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Contract Design with Socially-Attentive Preferences

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The standard agency model assumes that the agent does not care how his decisions influence others. This is a strong assumption, which we relax. We find that, although monetary incentives are effective also with socially-attentive agents, the principal may optimally set none. This could explain the puzzle that empirically only a fraction of employees experiences monetary incentives. We also show that the principal benefits from having a socially-attentive agent and how she optimally influences her agent's preferences. Furthermore, contractibility of effort does not generally cause the implementation of the efficient effort and may harm the generated surplus. This provides an efficiency argument for regulatory boundaries on employers' control over employees and the content of employment contracts.

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1 Introduction

The question of how people should behave is probably one of the oldest questions of humanity. The common feature of the advice given by most philosophers and clerics is that people should take into account how their decisions influence the well-being of others. There is indeed rich empirical evidence that many people do take the well-being of others into account.¹ In standard agency models, it is nonetheless assumed that agents do not care how their decisions influence others. This is a strong assumption, which we relax in this paper. The objective of this paper is to provide a detailed and comprehensive analysis of the agency model when agents factor in the consequences of their decisions for others.

We study a model where an agent acts on behalf of a principal and the agent's non-contractible effort choice influences the probability distribution over outcomes. The outcome affects the principal, the agent, and possibly a third party.² We augment the agent's preferences by allowing him³ to put weight on others' utilities. We say that the agent is egoistic if he puts zero weight on others' utilities, while the agent is socially attentive if he puts a positive weight.⁴

We first obtain the result that monetary incentives are not only effective when the agent is egoistic, but also if he is socially attentive. That is, a contract that specifies a higher remuneration for a successful outcome motivates the agent to exert more effort.⁵ We also examine the structure of the optimally designed contract. We first show that in the benchmark where the agent is egoistic, the optimal contract includes monetary incentives, i.e., rewards the agent for a successful outcome. This is in contrast to the case with socially-attentive preferences: if the agent is sufficiently socially attentive, the principal optimally refuses to provide monetary incentives. The intuition for this result is that providing monetary incentives is costly for the principal. Since a socially attentive agent reacts less strongly to monetary incentives than an egoistic one, the principal's costs of providing monetary incentives may – in

¹For instance, experiments on the dictator game – where one person determines how to share a certain endowment between herself and a second person – show that a majority of persons do not behave selfishly. Andreoni and Miller (2002), for example, document that only a quarter of persons are selfish money-maximizers.

²Depending on the specific context, the third party could, for example, be interpreted as customers, other employees (co-workers, subordinates, or bosses), or the ecological environment.

³We follow the standard convention and talk about a male agent and a female principal.

⁴The literature, cf. Andreoni, Harbaugh, and Vesterlund (2007), puts forward two reasons for social attentiveness: altruism and warm-glow. For our model and its analysis, it does not matter whether the agent is socially attentive due to altruism or warm-glow.

⁵While monetary incentives are also effective in standard agency models, e.g., Holmström (1979), there are models where monetary incentives are ineffective. In such models, monetary incentives crowded out the agents' intrinsic motivations; see, for example, Bénabou and Tirole (2006).

comparison to the benefits of monetary incentives, in the form of a more motivated agent – be too high to justify monetary incentives. Under a regularity condition, the principal’s problem is concave, which allows us to show that the monetary incentives provided by the principal are monotonically decreasing in the agent’s social attentiveness. The optimal incentives are hence always lower with socially-attentive preferences than with egoistic preferences. In summary, with a socially-attentive agent, the principal optimally sets either no incentives or incentives that are rather weak. These results are also empirically relevant, since they could explain the puzzle that – contrary to the predictions of the standard theory – many employees experience no financial incentives or rather weak incentives.⁶

Socially-attentive preferences have consequences that go beyond the structure of the optimally designed contract. First, we can show that the principal is better off if her agent is socially attentive rather than egoistic. Intuitively, despite the fact that monetary incentives are less effective in case the agent is socially attentive, this negative effect is overcompensated by the positive effect that for all potentially optimal contracts a socially-attentive agent is more motivated to exert effort. Second, the principal implements an inefficiently low effort level irrespectively of whether the agent is egoistic or socially attentive. But the implemented effort level approaches the efficient (i.e., surplus-maximizing) level as the agent’s social attentiveness approaches its maximum.

The model also yields new and interesting insights in case the agent’s effort is contractible. For the benchmark of an egoistic agent and the absence of a third party – a scenario which is extensively studied by the existing literature – we obtain the standard result that contractibility of effort leads to the implementation of the efficient effort level. Remarkably, this is, in general, no longer true if the agent is socially attentive or a third party is present. Two noteworthy results emerge.

First, we show that the principal implements a higher effort level when effort is contractible than when it is non-contractible. But contractibility is not necessarily beneficial: The generated surplus could actually be lower when effort is contractible rather than non-contractible. The reason is that, while the principal implements an inefficiently low effort level when effort is non-contractible, she may implement an

⁶In the representative US sample of Lemieux, MacLeod, and Parent (2009), only 37% of workers are in performance-pay jobs. Bryson, Freeman, Lucifora, Pellizzari, and Perotin (2012) confirm this finding for the US and document that incentive payments are even less common in Europe. In most EU-15 countries, only 10%-25% of the employees receive incentive payments. Gittleman and Pierce (2013) use a different definition of performance-related pay and a more recent sample of the same data as Bryson et al. (2012), and show that in the US, 20% of employees work in jobs with performance-related pay. Bell and Van Reenen (2013) use a different representative data set and find that 40% of all workers in the UK receive part of their annual wage in form of a bonus. Holmström and Milgrom (1990, p. 93) summarize that it is a “mystery to organizational observers, why there is so much less reliance on high-powered incentives than basic agency theory would suggest”.

inefficiently high effort level when it is contractible. If the agent is sufficiently socially attentive, the over-implementation problem caused by contractibility is more severe than the under-implementation problem caused by non-contractibility. An important implication of this result is that regulatory boundaries on the methods employers can use to control their employees and legal restrictions on what can be specified in employment contracts could not only help employees, but also enhance efficiency.

Second, while one expects social attentiveness to affect the generated surplus positively – since parties should then interact and cooperate in a more social way – we show that it could in fact harm the surplus in case effort is contractible. To be precise, when taking into account the endogeneity of the optimal contract, the generated surplus could be lower when the agent is socially attentive instead of egoistic. This holds true because the principal exploits the agent's social attentiveness in a way that harms the surplus.

In practice, agents' preferences towards their work are not necessarily fixed, but can be influenced, for example, via emphasizing the importance of the firms' mission, by underlining the value of each agent's work, or by team-building measures. To capture this, we consider an extension where we allow the agent's preferences to be endogenous.⁷ We formalize this by letting the principal undertake investments that influence the agent's preferences, i.e., the agent's level of social attentiveness. While it is not always optimal for the principal to motivate her agent via monetary incentives, we show that it is always optimal for the principal to motivate her agent via investments into his social attentiveness. We further find that the principal's investment is, in general, not efficient and determine the factors that cause the inefficiency.

Relation to the literature. Our paper is related and contributes to two strands of the literature. First, to the literature that incorporates different forms of social preferences into agency models. Itoh (2004), Englmaier and Wambach (2010), and Bartling (2011) examine the effects of inequity-averse agents. Itoh (2004) and Bartling (2011) also consider agents that are status-seeking. Itoh (2004) shows that the principal is in general worse off if her agent cares more about the inequity between the principal and the agent. In the presence of multiple agents, the principal could benefit from the agents' inequity aversion that concerns other agents by designing an appropriate interdependent contract that specifies wage payments as a function of all agents' performances. Englmaier and Wambach (2010) show that the compensation scheme converges to a linear sharing scheme as the concern for equity

⁷It is well known – see, for example, Tversky and Kahneman (1981) or the modern salience theory introduced by Bordalo, Gennaioli, and Shleifer (2013) – that preferences are not something fixed, but something that can be influenced by framing or reference points effects. For an overview of the literature on salience theories in markets, see Herweg, Müller, and Weinschenk (2018).

among agents becomes sufficiently important. Furthermore, the optimal contract may be team-based and overdetermined (i.e., it may include performance measures that are not informative) or incomplete (i.e., it may neglect informative measures). Bartling (2011) shows that, with the inequity aversion or the status-seeking behavior of agents, team contracts can be optimal even when there is a positive correlation between the agents' performance measures, and relative performance evaluation would provide additional incentives to the agents. The paper thus offers an explanation for the empirically observed lack of relative performance evaluation. Kräkel (2016) analyzes peer effects in a multi-agent setting, where the comparisons with other agents influence each agent's motivation. He shows that, depending on the interplay of the peer effects, agents' efforts are either strategic complements or strategic substitutes. The seminal paper of Besley and Ghatak (2005) examines motivated agents, i.e., agents who care about the mission of the organization for which they work. The authors formally capture this by assuming that the agents' payoffs depend on their own type as well as on the type of principal for whom they work. The authors *inter alia* show that the matching of the mission preferences of principals and agents is important for organizational efficiency. Cassar (2016) models a situation where the principal's and the agent's project preferences are misaligned and analyzes what mission the principal optimally chooses in different contractual environments. Cassar and Meier (2018) provide an extensive overview over non-monetary components of job satisfaction and their influence on recompensation schemes. Bandiera, Barankay, and Rasul (2005) present evidence that social preferences influence workers' productivity. They compare the productivities under piece rates with that under relative incentives (where individual effort imposes a negative externality on others). Bandiera, Barankay, and Rasul (2009) show that the social connections in firms influences the behavior of workers and managers. We contribute to this literature by showing that a particularly simple form of social preferences – namely, social attentiveness – can (i) easily be incorporated into agency models and (ii) yields an array of new and interesting results.

Second, to the literature that explores the relationship between organizational missions and organizational performance. Most firms nowadays publish their missions and these often include commitments to social issues, such as protecting the environment, encouraging diversity, and supporting the community (Bartkus and Glassman, 2008). Bart and Baetz (1998) examine the relationship between mission statements and organizational performance, using a sample of Canadian organizations, and show that specific characteristics of mission statements are selectively associated with higher levels of organizational performance. Building on a sample of US and Canadian organizations, Bart, Bontis, and Taggar (2001) show that mission statements are positively associated with financial performance and make a positive contribution to it. They also emphasize that, in order to be successful, mission

statements must be rational, contain sound content, have organizational alignment, and bring sufficient behavioral change in the desired direction. Their research thus shows that effective mission statements must be accompanied by an array of (possibly costly) measures by the organization. These findings are confirmed by Bartkus and Glassman (2008), who show that mission statements that are merely the result of institutional pressures cause symbolic statements that are not related to the actual behaviors of organizations. Williams (2008) uses textual and content analysis methods to investigate the mission statements of Fortune 1000 firms. She shows that higher-performing firms include aspects of philosophies, targeted markets, strategies for survival, public image, team work, safety, and concern for employees significantly more often than lower-performing firms. Our paper theoretically contributes to this literature by showing that an agent's effort and performance is positively related to the weight the agent assigns to the well-being of others. Moreover, it is always optimal for principals (i) to invest into measures that increase the agent's social attentiveness and (ii) given that the agent is socially attentive, to invest into measures that improve the organization's corporate social responsibility, i.e., the alignment of the society's and the principal's interests.

2 Model

We first describe the standard principal-agent model and then incorporate social attentiveness into it.

Primitives. A principal (she) needs to hire an agent (he) to run a business. Both are risk-neutral and have zero reservation utilities. When working for the principal, the agent exerts effort $e \in [0, e^{\max}]$, where e^{\max} is positive and could be finite or infinite, causing costs $c(e)$. The agent's effort choice determines the probability distribution over outcomes. With probability $p(e)$ the agent yields a successful outcome that is associated with a high return for the principal, while with probability $1 - p(e)$ he yields an unsuccessful outcome that generates a low return.⁸ We denote the high return by R , where R is positive, and normalize the low return to zero. The outcome may also affect a third party, which experiences a payoff $V \geq 0$ if the agent succeeds and 0 otherwise. The case $V = 0$ captures the situation where a third party is absent or unaffected. While the outcome is contractible, the agent's effort is non-contractible, i.e., there is moral hazard. A contract is hence a pair $(w_0, w_R) \in \mathbb{R}^2$, where w_0 is the wage payment to the agent if he yields the unsuccessful outcome and thereby generates the return 0, while w_R is the payment if he yields the successful outcome and generates return R . The agent's wealth is normalized to zero,

⁸In Appendix A, we allow for an arbitrarily high number of possible outcomes and show that the multi-outcome case effectively reduces to the two-outcome case.

such that wage payments cannot be negative: $w_0, w_R \geq 0$. The agent's liability is thus limited.

Preferences. We deviate from the textbook moral-hazard model (see, for example, Laffont and Martimort (2001)), by supposing that the agent might have socially-attentive preferences. Formally, the agent puts a weight $\beta \in [0, 1]$ on the utilities of others.⁹ We henceforth say that the agent is egoistic if he puts zero weight on others' utilities, $\beta = 0$, while the agent is socially attentive if he puts positive weight on others' utilities, $\beta > 0$. We denote an agent that puts a higher weight on others' utilities, i.e., has a higher β , as more socially attentive. Unless explicitly stated differently, we suppose that the agent puts at least slightly more weight on his own utility than on that of others, $\beta < 1$. While we initially take β as given, we later consider the possibility that the principal can take measures to influence β . The agent's expected utility is thus

$$E[u_A] = p(e)w_R + (1 - p(e))w_0 - c(e) + \beta E[u_{\neg A}], \quad (1)$$

where $p(e)w_R + (1 - p(e))w_0$ is the expected wage payment, $c(e)$ are the agent's effort costs, and $\beta E[u_{\neg A}] = \beta(E[U_P] + E[U_T])$ is the weighted sum of the other parties' utilities. The principal's expected utility is¹⁰

$$E[u_P] = p(e)(R - w_R) + (1 - p(e))(0 - w_0), \quad (2)$$

while the third party's expected utility is

$$E[u_T] = p(e)V. \quad (3)$$

By including (2) and (3) into (1), we can rewrite the agent's expected utility as

$$E[u_A] = p(e)w_R + (1 - p(e))w_0 - c(e) + \beta(p(e)(R - w_R + V) - (1 - p(e))w_0). \quad (4)$$

Assumptions. We impose the standard assumptions on the effort cost function c and the success function p : c and p are twice continuously differentiable, $c'(e), c''(e) > 0$ for $e > 0$, $c(0) = c'(0) = 0$, $\lim_{e \rightarrow e^{\max}} c'(e) = \infty$, $p(0) = 0$, $p'(e) > 0$, and $p''(e) \leq 0$. Thus, the effort cost function is increasing and convex and the success function is increasing and weakly concave.

Timing. First, the principal offers a contract to the agent, who then decides whether to accept the offer. If the agent rejects the offer, all parties receive zero reservation utilities and the game ends. In case of acceptance, the agent exerts effort. Finally, the outcome is realized and the agent receives the contracted payment.

⁹As we discuss in Appendix B, allowing the agent to put different weights on the principal's and the third party's utilities complicates notation without providing new significant insights.

¹⁰In section 6.2, we briefly discuss the case where the principal is also socially attentive. In the main part of the paper, we maintain the assumption that the principal maximizes her expected profit, i.e., the difference between the expected return and the expected wage payment.

3 Analysis

3.1 Optimal contract

We first examine the agent's effort choice for any given contract and then analyze the principal's problem of designing an optimal contract. Differentiating the agent's expected utility with respect to effort yields

$$\frac{\partial E[u_A]}{\partial e} = p'(e) \left((w_R - w_0)(1 - \beta) + \beta(R + V) \right) - c'(e). \quad (5)$$

We have to distinguish between two cases. First, if $(w_R - w_0)(1 - \beta) + \beta(R + V) \leq 0$, the derivative $\partial E[u_A]/\partial e$ is non-positive for effort $e = 0$ and negative for all efforts $e > 0$. Accordingly, the agent optimally chooses to invest zero effort, $e^* = 0$. Second, if $(w_R - w_0)(1 - \beta) + \beta(R + V) > 0$, the derivative $\partial E[u_A]/\partial e$ is positive for $e = 0$ or e sufficiently small, such that the agent optimally chooses a positive effort level $e^* > 0$, where e^* solves the first-order condition $\partial E[u_A]/\partial e = 0$.¹¹

The principal's problem is to maximize her expected utility subject to the agent's incentive constraint, the agent's participation constraint, and the limited liability constraints:

$$\max_{w_0, w_R, \hat{e}} E[u_P] \text{ subject to } \hat{e} \in \operatorname{argmax}_e E[u_A], E[u_A] \geq 0, w_0 \geq 0, \text{ and } w_R \geq 0, \quad (P1)$$

where \hat{e} denotes the effort level the principal seeks to implement. We first show that the agent's participation constraint $E[u_A] \geq 0$ is automatically fulfilled for every contract (w_0, w_R) that satisfies the limited liability constraints. To see this, note that the agent's expected utility is non-negative if $w_0, w_R \geq 0$ and he chooses to exert zero effort, see equation (4). Since the agent chooses the effort level to maximize his expected utility, his equilibrium expected utility must be non-negative as well. It is therefore optimal for the agent to accept every contract offered by the principal that satisfies the limited liability constraints, so that – as usual in such agency models – we can neglect the participation constraint in the principal's problem.

We next prove the existence of an optimal contract, i.e. a contract which solves problem P1.

Proposition 1: *There always exists an optimal contract (w_0^*, w_R^*) . It satisfies $w_0^* = 0$ and $w_R^* \in [0, R)$.*

PROOF: Suppose, contrary to our claim, that $w_R^* \geq R$. Then the principal's expected utility is

$$E[u_P] = p(e^*)(R - w_R^*) + (1 - p(e^*))(0 - w_0^*), \quad (6)$$

¹¹Note that, due to $p'' \leq 0$ and $c'' > 0$, the second-order condition is satisfied, $\partial^2 E[u_A]/\partial e^2 < 0$. Furthermore, because $\lim_{e \rightarrow e^{\max}} c'(e) = \infty$, the optimal effort e^* is lower than the maximal effort e^{\max} , such that we have an interior solution.

which is non-positive due to $w_0^* \geq 0$. This is not optimal for the principal, since she can guarantee herself a positive expected utility by setting a contract where $w_0 = 0$ and w_R between 0 and R . For example, when setting $w_0 = 0$ and $w_R = R/2$,

$$E[u_P] = p(e^*)R/2, \quad (7)$$

which is positive due to $e^* > 0$. Moreover, w_R^* cannot be negative due to the agent's limited liability. Hence, if an optimal contract exists, it must satisfy $w_R^* \in [0, R)$.

Suppose next, contrary to our claim, that $w_0^* > 0$. Consider first the case where the agent exerts zero effort, $e^* = 0$. Then $E[u_P] = -w_0^* < 0$, which is lower than the positive expected utility with the contract $(w_0^* = 0, w_R^* = R/2)$. For the case where the agent exerts a positive effort level, $e^* > 0$, it holds that

$$\frac{\partial E[u_P]}{\partial w_0} = -(1 - p(e^*)) + p'(e^*)(R - w_R^* + w_0^*) \frac{\partial e^*}{\partial w_0} < 0, \quad (8)$$

where we used that $w_R^* \in [0, R)$, such that $(R - w_R^* + w_0^*) > 0$ and that $\partial e^* / \partial w_0 \leq 0$ by the first-order condition $\partial E[u_A] / \partial e = 0$. The principal can hence improve her expected utility by lowering w_0 to the lowest possible level of zero.

Finally, if an optimal contract exists, we already know that $w_0^* = 0$ and $w_R^* \in [0, R)$ must hold. It thus remains to be shown that there exists some w_R that maximizes the principal's objective function $E[u_P]$. Since the principal's expected utility is continuous in w_R and we can restrict the search for an optimal value of w_R to some arbitrarily closed and bounded interval $[a, b] \supset [0, R)$, the Bolzano-Weierstrass Extreme Value Theorem applies, such that an optimal w_R and thus an optimal contract must exist. \square

Proposition 1 shows that an optimal contract always exists, whether the agent is egoistic or socially attentive. The intuition for the properties of the optimal contract are as follows. First, in case the agent does not succeed, it is optimal to make only the minimal possible wage payment, so $w_0^* = 0$.¹² Second, it is never optimal for the principal to provide a wage payment that equals or exceeds her return R and it is not possible to offer a negative wage payment, so $w_R^* \in [0, R)$.

A useful implication of Proposition 1 is that, for all potentially optimal contracts, the agent's effort choice e^* is determined by the first-order condition¹³

$$\frac{\partial E[u_A]}{\partial e} = p'(e) (w_R(1 - \beta) + \beta(R + V)) - c'(e) = 0. \quad (9)$$

We can now determine how the agent reacts when he is provided with stronger monetary incentives and when he is more socially attentive. Implicitly differentiating (9)

¹²Having a wage payment of zero should be interpreted as the principal offering a wage payment that does not exceed the minimal possible wage payment.

¹³To derive (9), we used that the first-order condition not only applies if $(w_R - w_0)(1 - \beta) + \beta(R + V) > 0$, but also if $(w_R - w_0)(1 - \beta) + \beta(R + V) = 0$.

yields that

$$\frac{\partial e^*}{\partial w_R} = -\frac{p'(e^*)(1-\beta)}{p''(e^*)(w_R(1-\beta) + \beta(R+V)) - c''(e^*)}, \quad (10)$$

which is positive, and

$$\frac{\partial e^*}{\partial \beta} = -\frac{p'(e^*)(-w_R + R + V)}{p''(e^*)(w_R(1-\beta) + \beta(R+V)) - c''(e^*)}, \quad (11)$$

which is positive as well for all $w_R \in [0, R)$. Furthermore, the effect of a higher payoff V experienced by the third party on the agent's effort choice is

$$\frac{\partial e^*}{\partial V} = -\frac{p'(e^*)\beta}{p''(e^*)(w_R(1-\beta) + \beta(R+V)) - c''(e^*)}, \quad (12)$$

which is positive if the agent is socially attentive and zero if he is egoistic. The same holds true for the relation between effort e^* and the principals return R , since $\partial e^* / \partial R = \partial e^* / \partial V$.

Proposition 2: *For all potentially optimal contracts, i.e., all contracts (w_0, w_R) satisfying $w_0 = 0$ and $w_R \in [0, R)$, the following holds:*

- *With an egoistic agent ($\beta = 0$), as well as with a socially-attentive agent ($\beta > 0$), monetary incentives are effective, in the sense that the agent exerts more effort, the higher the monetary incentives provided by the principal are, $\partial e^* / \partial w_R > 0$.*
- *The agent exerts more effort, the more socially attentive he is, $\partial e^* / \partial \beta > 0$.*
- *While a socially-attentive agent reacts positively towards a higher payoff of the third party, $\partial e^* / \partial V > 0$, an egoistic agent does not react, $\partial e^* / \partial V = 0$. The same holds true with respect to the principal's return R .*

Because the agent's effort choice depends on the monetary incentives and his social attentiveness, it is convenient to write the agent's effort choice as a function of w_R and β : $e^* = e(w_R, \beta)$. Using Proposition 1, the principal's problem simplifies to

$$\max_{w_R} E[u_P] = p(e(w_R, \beta))(R - w_R) \quad \text{subject to } w_R \geq 0. \quad (P2)$$

The principal hence optimally sets the contract $(w_0^* = 0, w_R^*)$, where w_R^* solves (P2).

We can now analyze the structure of optimal contracts. We first examine whether the principal optimally provides monetary incentives by setting $w_R^* > 0$ or optimally refuses to set monetary incentives by setting $w_R^* = 0$. In the former case, the agent's remuneration is variable, i.e., dependent on the outcome, while in the latter case the remuneration is fixed, i.e., independent of the outcome.

Differentiating the principal's expected utility yields that

$$\frac{\partial E[u_P]}{\partial w_R} = p'(e(w_R, \beta)) \frac{\partial e(w_R, \beta)}{\partial w_R} (R - w_R) - p(e(w_R, \beta)). \quad (13)$$

Consider first an egoistic agent, $\beta = 0$. Such an agent invests zero effort if $w_R = 0$. By (10) and (13) it hence holds that

$$\left. \frac{\partial E[u_P]}{\partial w_R} \right|_{\beta=0, w_R=0} = \frac{(p'(e(0,0)))^2}{c''(e(0,0))} R > 0. \quad (14)$$

If the principal set $w_R = 0$, she could hence improve her expected utility by increasing w_R . It is therefore optimal for the principal to provide monetary incentives: $w_R^* > 0$. Interestingly, this does no longer hold if the agent is socially attentive. That is, with an attentive agent, the principal may optimally set no monetary incentive, i.e., pay the agent a fixed, outcome-independent wage. Formally, here $w_R = w_0$ and the principal pays the agent only the minimal possible wage (which we normalized to zero).

Proposition 3: *The optimal contract is $(w_0^* = 0, w_R^*)$, where w_R^* solves (P2). If the agent is egoistic ($\beta = 0$) or his social attentiveness is sufficiently low (β is small), the principal optimally sets monetary incentives, $w_R^* > 0$. In contrast, the principal sets no monetary incentives, $w_R^* = 0$, if the agent's social attentiveness β is sufficiently high.*

PROOF: We first show that the principal optimally sets monetary incentives, $w_R^* > 0$, if the agent's social attentiveness β is low. Suppose, contrary to our claim, that the principal sets no monetary incentive, $w_R = 0$. If β is sufficiently low, then we see from (13) that

$$\left. \frac{\partial E[u_P]}{\partial w_R} \right|_{w_R=0} = p'(e(0, \beta)) \frac{\partial e(0, \beta)}{\partial w_R} R - p(e(0, \beta)) > 0, \quad (15)$$

because the effort $e(0, \beta)$ and thus the success probability $p(e(0, \beta))$ are small, i.e., approach zero as $\beta \rightarrow 0$, whereas $p'(e(0, \beta))$, $\frac{\partial e(0, \beta)}{\partial w_R}$, and R are positive and do not approach zero. Accordingly, the principal can improve her expected utility by increasing w_R . It is thus optimal for the principal to set monetary incentives, $w_R^* > 0$.

It remains to be shown that the principal optimally sets no monetary incentives, $w_R^* = 0$, if the agent's social attentiveness β is high. By the principal's problem (P2) and (10)

$$\frac{\partial E[u_P]}{\partial w_R} = \frac{(p'(e(w_R, \beta)))^2 (R - w_R)}{c''(e(w_R, \beta)) - p''(e(w_R, \beta)) (w_R(1 - \beta) + \beta(R + V))} (1 - \beta) - p(e(w_R, \beta)). \quad (16)$$

Select some $\hat{\beta} \in (0, 1)$ and let the agent's attentiveness be such that $\beta \in [\hat{\beta}, 1)$. By (16),

$$\frac{\partial E[u_P]}{\partial w_R} \leq \frac{\left(\sup_{\beta \in [\hat{\beta}, 1), w_R \in [0, R]} \{p'(e(\cdot))\} \right)^2 R}{\inf_{\beta \in [\hat{\beta}, 1), w_R \in [0, R]} \{c''(e(\cdot))\} - \sup_{\beta \in [\hat{\beta}, 1), w_R \in [0, R]} \{p''(e(\cdot))\} (\hat{\beta}(R + V))} (1 - \beta) - \inf_{\beta \in [\hat{\beta}, 1), w_R \in [0, R]} \{p(e(\cdot))\} \quad (17)$$

holds for all $\beta \in [\hat{\beta}, 1)$ and $w_R \in [0, R)$. Note that by continuity, all suprema and infima exist. Furthermore, the fraction on the right-hand side of (17) is positive due to $p'(e) > 0$, $c''(e) > 0$, and $p''(e) \leq 0$, but finite and independent of β . Therefore, and because $\inf_{\beta \in [\hat{\beta}, 1), w_R \in [0, R)} \{p(e(\cdot))\} = p(e(0, \hat{\beta})) > 0$, the right-hand side of (17) is negative if β is sufficiently large. To be precise, it is negative if and only if β belongs to the nonempty interval $(\max\{\hat{\beta}, \hat{\beta}\}, 1)$, where $\hat{\beta}$ is such that the right-hand side of (17) is zero. For all $\beta \in (\max\{\hat{\beta}, \hat{\beta}\}, 1)$ and $w_R \in [0, R)$, the derivative $\partial E[u_P]/\partial w_R$ is hence negative, implying that the principal optimally sets $w_R^* = 0$. \square

The intuition why the optimally designed contract may include no monetary incentives is as follows. First, socially-attentive preferences limit the effectiveness of monetary incentives, in the sense that a socially-attentive agent reacts less strongly to monetary incentives than an egoistic agent does, cf. (10). Second, providing monetary incentives is costly for the principal, cf. (2). Accordingly, if the agent is sufficiently socially attentive, the principal's costs of providing monetary incentives are too high, in comparison to their benefits (in the form of a more motivated agent), to justify monetary incentives. The principal then optimally refuses to provide monetary incentives and prefers to pay the agent a constant, outcome-independent wage.

It is worth emphasizing that this is no limit result. That is, as can be seen in the proof of Proposition 3, the principal may optimally set no monetary incentives even if the agent puts a non-trivially higher weight on his own utility than on that of others. In the quadratic cost example considered in Section 3.5, the principal optimally sets no monetary incentives if the agent's social attentiveness β is at least as large as a threshold, which is – depending on the parameter constellation – at most $1/2$.

3.2 Equilibrium utilities

After having characterized the structure of the optimal contract, we are now able to determine the parties' utilities for the optimal contract. We first show that the agent as well as the principal experience a positive rent, i.e., expected utilities that exceed their reservation utilities. This result holds independently of whether the agent is egoistic or socially attentive.

Proposition 4: *Under the optimal contract (w_0^*, w_R^*) , the agent as well as the principal experience a positive rent: $E[u_A | (w_0^*, w_R^*)] > 0$, $E[u_P | (w_0^*, w_R^*)] > 0$.*

PROOF: Consider first the agent's expected utility. We know from before that $w_0^* = 0$, cf. Proposition 1, and that the agent optimally chooses the effort e^* that solves the first-order condition, cf. (9),

$$p'(e) (w_R^*(1 - \beta) + \beta(R + V)) - c'(e) = 0. \quad (18)$$

By Proposition 3, either $w_R^* > 0$ or $\beta > 0$ or both inequalities hold, such that e^* is positive. If the agent alternatively chose effort $e = 0$, his expected utility would be zero. Because e^* is the unique maximizer of the agent's expected utility and positive, the agent's expected utility must be positive when exerting the optimal effort e^* :

$$E[u_A|(w_0^*, w_R^*)] > 0. \quad (19)$$

Consider next the principal's expected utility. For the contract $(w_0 = 0, w_R = 0)$, the principal's expected utility is, by (2),

$$E[u_P|(w_0 = 0, w_R = 0)] = p(e(0, \beta))R. \quad (20)$$

First, if the agent is socially attentive, $\beta > 0$, he chooses a positive effort level when faced with the contract $(w_0 = 0, w_R = 0)$, such that the probability of a successful outcome is positive, $p(e(\cdot)) > 0$, and the principal experiences a positive expected utility

$$E[u_P|(w_0 = 0, w_R = 0), \beta > 0] > 0. \quad (21)$$

Thus, the principal's expected utility under the optimal contract (w_0^*, w_R^*) must be positive as well:

$$E[u_P|(w_0^*, w_R^*), \beta > 0] > 0. \quad (22)$$

Second, if the agent is egoistic, $\beta = 0$, he chooses zero effort when faced with the contract $(w_0 = 0, w_R = 0)$, such that the principal experiences an expected utility of zero. However, in case $\beta = 0$, we know from Proposition 3 that it is strictly optimal for the principal to set monetary incentives, i.e., $w_R^* > 0$. Accordingly, the principal's expected utility under the optimal contract (w_0^*, w_R^*) must be positive in this case also:

$$E[u_P|(w_0^*, w_R^*), \beta = 0] > 0. \quad \square$$

Intuitively, due to the non-contractibility of the agent's effort choice, the agent experiences an information rent which the principal cannot fully extract. However, the principal is still able to construct a contract that yields her a positive expected utility.

The next proposition shows that the principal benefits from a socially-attentive agent.

Proposition 5: *The principal's expected utility is increasing in the social attentiveness of her agent, $dE[u_P|(w_0^*, w_R^*)]/d\beta > 0$. In particular, the principal's expected utility is higher if her agent is socially attentive rather than egoistic, $E[u_P|(w_0^*, w_R^*), \beta > 0] > E[u_P|(w_0^*, w_R^*), \beta = 0]$.*

PROOF: By the Envelope Theorem and because for the optimal contract $w_0^* = 0$ and $w_R^* \in [0, R)$,

$$\frac{dE[u_P|(w_0^*, w_R^*)]}{d\beta} = p'(e(\cdot))(R - w_R^*) \times \frac{\partial e(\cdot)}{\partial \beta} > 0. \quad (23)$$

This particularly implies that

$$E[u_P|(w_0^*, w_R^*), \beta > 0] > E[u_P|(w_0^*, w_R^*), \beta = 0]. \quad \square$$

This is intuitive: Despite the fact that monetary incentives are less effective for a socially more attentive agent, this negative effect is overcompensated by the positive effect that for all potentially optimal contracts a socially more attentive agent is more motivated to exert effort. The result is also practically relevant: if the principal has the choice between two agents that differ with respect to their social attentiveness, but are otherwise identical, the principal should seek to hire the more socially attentive agent.

3.3 Efficiency

It is worthwhile to compare the effort implemented by the principal and the resulting surplus to the efficient levels. For this purpose, consider a social planner, who seeks to maximize the expected surplus

$$E[s] = p(e)(R + V) - c(e). \quad (24)$$

We directly see that, while the effort is important for the surplus, the wage payments per se do not matter – they are simply transfers between the parties and cancel out. Maximizing over effort yields the first-order condition

$$\frac{\partial E[s]}{\partial e} = p'(e)(R + V) - c'(e) = 0. \quad (25)$$

Because the expected surplus is concave in effort, the effort level the planner seeks to implement solves (25). We refer to this effort level as the efficient effort level $e^{\text{efficient}}$. By formula (5), the planner has to set $w_R - w_0 = R + V$ to implement $e^{\text{efficient}}$. Because the principal optimally sets $w_R^* - w_0^* \in [0, R)$, cf. Proposition 1, and $\partial e^* / \partial w_R > 0$, cf. Proposition 2, we obtain the following result.

Proposition 6: *The principal implements an inefficiently low effort level: $e^* < e^{\text{efficient}}$.*

Proposition 6 shows that the classical result, that a principal underprovides incentives to a wealth-constrained agent and thereby implements an inefficiently low effort level (cf. Laffont and Martimort 2001), also holds when the agent has socially-attentive preferences. In our model, this result is due to two effects. First, there is the classical rent-extraction efficiency trade-off. Formally, the principal optimally provides incentives $w_R < R$ instead of $w_R = R$ in order to reduce the information rent she has to pay to her agent. Second, if $V > 0$, the principal also underprovides incentives because she ignores the positive effect of stronger incentives on the third party.

The following proposition shows, however, that the under-implementation of effort is a negligible issue if the agent's social attentiveness is large.

Proposition 7: *The effort level implemented by the principal approaches the efficient effort level as the agent's social attentiveness goes to 1: $\lim_{\beta \rightarrow 1} e^* = e^{\text{efficient}}$.*

PROOF: By Propositions 1 and 3, the principal sets $w_0^* = w_R^* = 0$ if β is close to 1. For this contract, the agent chooses the effort level e^* that solves

$$p'(e)\beta(R+V) - c'(e) = 0, \quad (26)$$

where we used the first-order condition (9). Comparing this equation to (25) directly yields that e^* approaches $e^{\text{efficient}}$ as β goes to 1. \square

Since the expected surplus is concave in the implemented effort, Propositions 6 and 7 directly imply the following results.

Corollary 1: *The principal implements an effort level that causes an inefficiently low expected surplus: $E[s|e^*] < E[s|e^{\text{efficient}}]$. As the agent's social attentiveness goes to 1, $\lim_{\beta \rightarrow 1} E[s|e^*] = E[s|e^{\text{efficient}}]$.*

3.4 Additional results with concavity

We can derive additional results if $c''' \geq 0$ and $p''' \leq 0$, such that the principal's problem is concave, $\partial^2 E[u_P] / \partial w_R^2 < 0$.¹⁴ The first part of Proposition 8 shows that there is a monotone negative relationship between the optimal monetary incentives w_R^* and the agent's social attentiveness β . The second part of Proposition 8 shows that in the presence of a third party, $V > 0$, the equilibrium effort e^* is strictly increasing in the agent's social attentiveness β , but that the relationship is only weak in the absence of a third party, $V = 0$.

Proposition 8: *Let $c''' \geq 0$ and $p''' \leq 0$ such that the principal's problem is concave. If the monetary incentives are positive, $w_R^* > 0$, they are decreasing in the agent's social attentiveness β : $\partial w_R^* / \partial \beta < 0$. The effort level e^* is increasing in β if $V > 0$, $de^* / d\beta > 0$. If $V = 0$, e^* is constant in β , as long as β is sufficiently small, such that $w_R^* > 0$ and increasing in β otherwise.*

PROOF: Using (16), we directly see that when $c''' \geq 0$ and $p''' \leq 0$,

$$\frac{\partial E[u_P]}{\partial w_R} = \frac{(p'(\cdot))^2 (1-\beta)(R-w_R)}{c''(\cdot) - p''(\cdot)(w_R(1-\beta) + \beta(R+V))} - p(\cdot) \quad (27)$$

is decreasing in w_R and β . Suppose that $w_R^* > 0$. Then w_R^* solves the first-order condition $\partial E[u_P] / \partial w_R = 0$. If β increases, w_R^* must thus be lowered to restore the first-order condition. Hence, $\partial w_R^* / \partial \beta < 0$, which proves the first part of Proposition 8.

¹⁴Note that irrespectively of whether the agent is egoistic or socially attentive, $c''' \geq 0$ and $p''' \leq 0$ are sufficient conditions for concavity. But as we have shown above, concavity is non-essential for many results in our setting.

Regarding the relationship between e^* and β , we have to distinguish between two cases. First, consider the case where β is sufficiently large such that

$$\left. \frac{\partial E[u_P]}{\partial w_R} \right|_{w_R=0} \leq 0. \quad (28)$$

Because the principal's problem is concave – i.e., $\partial E[u_P]/\partial w_R$ is decreasing in w_R – the principal then optimally sets $w_R^* = 0$. If we increase β further, inequality (28) remains valid, so that the principal optimally keeps $w_R^* = 0$. This implies that

$$\frac{de^*}{d\beta} = \frac{\partial e^*}{\partial \beta} + \frac{\partial e^*}{\partial w_R^*} \times \frac{\partial w_R^*}{\partial \beta} = \frac{\partial e^*}{\partial \beta}, \quad (29)$$

which is positive by (11).

Second, consider the case where β is sufficiently small, such that

$$\left. \frac{\partial E[u_P]}{\partial w_R} \right|_{w_R=0} > 0. \quad (30)$$

The principal then optimally sets $w_R^* > 0$, where w_R^* solves the first-order condition $\partial E[u_P]/\partial w_R = 0$. Implicit differentiation of $\partial E[u_P]/\partial w_R = 0$, cf. (27), yields

$$\frac{\partial w_R^*}{\partial \beta} = -\frac{R - w_R}{1 - \beta} + \frac{p(\cdot)p''(\cdot)V}{(p'(\cdot))^2(1 - \beta) - p(\cdot)p''(\cdot)(1 - \beta)}. \quad (31)$$

Together with (10) and (11) we get that

$$\frac{de^*}{d\beta} = \frac{\partial e^*}{\partial \beta} + \frac{\partial e^*}{\partial w_R^*} \times \frac{\partial w_R^*}{\partial \beta} \stackrel{\text{sign}}{=} V. \quad \square$$

The intuition regarding the relationship between the equilibrium effort and the agent's level of social attentiveness is the following. First, in the presence of a third party, $V > 0$, the (positive) direct effect of a higher level of social attentiveness on the equilibrium effort $\partial e^*/\partial \beta$ dominates the (non-positive) indirect effect $\frac{\partial e^*}{\partial w_R^*} \times \frac{\partial w_R^*}{\partial \beta}$, such that the equilibrium effort is strictly increasing in the agent's level of social attentiveness. Second, in the absence of a third party, $V = 0$, the principal reacts towards a higher β by cutting back w_R^* (if possible) to an extent that keeps the implemented effort fixed, so that the direct and the indirect effect are equally strong. However, a cut of the monetary incentives w_R^* is only possible if w_R^* is positive, which holds true if the agent's social attentiveness is sufficiently small. If $w_R^* = 0$, the principal cannot reduce w_R^* further, so that the equilibrium effort is increasing in the agent's level of social attentiveness.

Propositions 3 and 8 show that with a socially-attentive agent, the principal optimally either provides no monetary incentives or incentives that are rather weak. The first result provides a possible explanation for the puzzle that empirically only a fraction of employees experience monetary incentives.¹⁵ The second result provides an

¹⁵See, for example, Lemieux et al. (2009), Bryson et al. (2012), Gittleman and Pierce (2013), and Bell and Van Reenen (2013).

explanation why monetary incentives are, if they exist, often weaker than predicted by standard agency models.¹⁶

Propositions 6 and 8 directly imply the following result.

Corollary 2: *Let $c''' \geq 0$ and $p''' \leq 0$, such that the principal's problem is concave. The expected surplus $E[s|e^*]$ is increasing in the agent's social attentiveness β if $V > 0$, while it is weakly increasing in β if $V = 0$.*

Social attentiveness, or a higher level of social attentiveness, is thus (at least weakly) beneficial for the surplus the principal and the agent generate. This holds true because social attentiveness increases the implemented effort level and thus mitigates the problem that an inefficiently low effort level is implemented.

3.5 Example

Suppose effort costs are quadratic, $c(e) = \alpha e^2$, where $\alpha > 0$, and effort is measured in units of success probability, such that $p(e) = e$ for all $e \leq 1$ and $p(e) = 1$, otherwise. Let $R + V < 2\alpha$ to guarantee an interior solution of e^* .

The principal optimally sets $w_0^* = 0$ and

$$w_R^* = \begin{cases} \frac{R}{2} - \frac{\beta}{1-\beta} \times \frac{R+V}{2} & \text{for } \beta < \frac{R}{2R+V}, \\ 0 & \text{otherwise.} \end{cases} \quad (32)$$

Thus, if the agent is sufficiently socially attentive, $\beta \geq \frac{R}{2R+V}$, the principal sets no monetary incentives. If, for example, the principal and the third party benefit from success to the same extent, such that $R = V$, the threshold is $1/3$. In general, the threshold is increasing in R , decreasing in V , and between 0 and $1/2$.

While the efficient effort is $e^{\text{efficient}} = \frac{R+V}{2\alpha}$, the implemented effort is only

$$e^* = \begin{cases} \frac{R+\beta V}{4\alpha} & \text{for } \beta < \frac{R}{2R+V}, \\ \frac{\beta(R+V)}{2\alpha} & \text{otherwise.} \end{cases} \quad (33)$$

The principal's expected utility is

$$E[u_P | (w_0^*, w_R^*)] = \begin{cases} \frac{R+\beta V}{4\alpha} \left(\frac{R}{2} + \frac{\beta}{1-\beta} \times \frac{R+V}{2} \right) & \text{for } \beta < \frac{R}{2R+V}, \\ \frac{\beta(R+V)}{2\alpha} R & \text{otherwise.} \end{cases} \quad (34)$$

The agent's expected utility is

$$E[u_A | (w_0^*, w_R^*)] = \begin{cases} \frac{(R+\beta V)^2}{16\alpha} & \text{for } \beta < \frac{R}{2R+V}, \\ \frac{(\beta(R+V))^2}{4\alpha} & \text{otherwise.} \end{cases} \quad (35)$$

¹⁶See, for example, Williamson (1985) or Holmström and Milgrom (1990).

The expected surplus generated is

$$E[s|e^*] = \begin{cases} \frac{R+\beta V}{4\alpha}(R+V) - \alpha\left(\frac{R+\beta V}{4\alpha}\right)^2 & \text{for } \beta < \frac{R}{2R+V}, \\ \frac{\beta(R+V)}{2\alpha}(R+V) - \alpha\left(\frac{\beta(R+V)}{2\alpha}\right)^2 & \text{otherwise.} \end{cases} \quad (36)$$

Figures 1-3 illustrate the example for the values $R = V = 1$ and $\alpha = 2$.

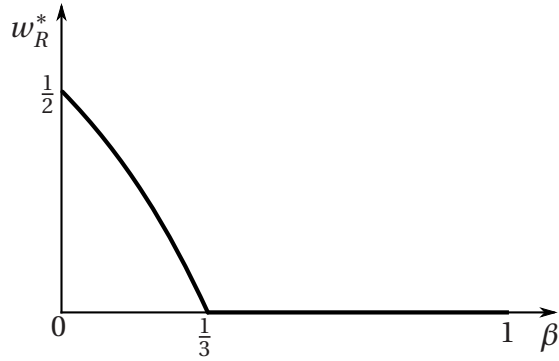


Figure 1: The wage w_R^* .

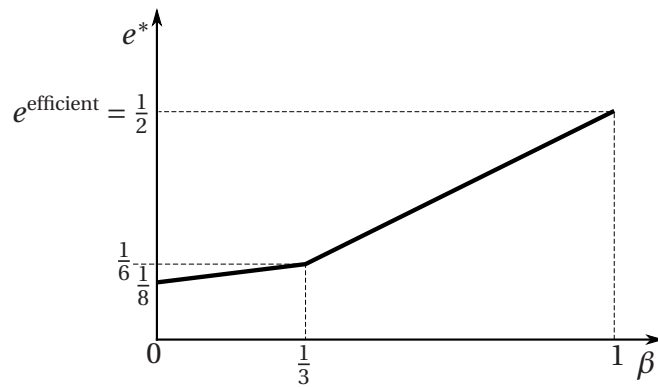


Figure 2: The effort e^* .

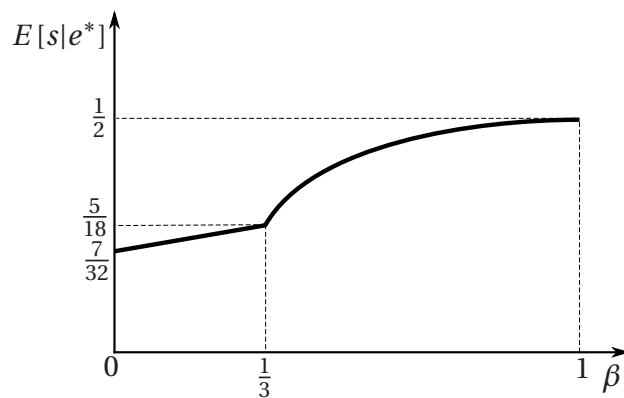


Figure 3: The surplus $E[s|e^*]$.

3.6 Further interesting parameter constellations

Up until now, we assumed that the agent puts a non-negative weight on others' utilities and that the third party experiences a non-negative utility if the agent succeeds. We next describe the consequences when this is no longer true.

The case $\beta < 0$. An agent with this characteristic puts a negative weight on others' utilities, i.e., is unsocial. It is interesting to observe that the agent is then unwilling to exert any positive effort level if w_R is positive, but small, see (5). In general, for all potentially optimal contracts, the agent is less willing to exert effort than in case her preferences are characterized by $\beta \geq 0$. For the principal, it is nonetheless optimal to incentivize the agent, i.e., set $w_R^* > 0$, if $R + \beta V > 0$. As we can see from (5), the agent can then be motivated to exert positive effort for some sufficiently high monetary incentives satisfying $w_R < R$. However, if $R + \beta V \leq 0$, the agent would only exert positive effort if the principal provided monetary incentives that at least weakly exceed her return R , such that the principal cannot do better than providing no monetary incentives $w_R^* = 0$.

The case $V < 0$. A successful outcome for the principal is then negative for the third party. This is, for example, a plausible scenario for a criminal organization, which has a negative impact on the community, or a heavily polluting industry harming the environment. It is useful to rewrite (5) as

$$\frac{\partial E[u_A]}{\partial e} = p'(e) (w_R + \beta(R + V - w_R)) - c'(e), \quad (37)$$

where we used that $w_0^* = 0$, i.e., that the principal does not reward failure. We directly see from (37) that, in case $R + V - w_R < 0$, a constellation which has to be satisfied if $R + V < 0$, a more socially-attentive agent (i.e., an agent with a higher β) is willing to exert less effort. Accordingly, the principal is worse off, the more socially attentive her agent is. This is a plausible result: A criminal organization, for example, may want to hire an agent who is unscrupulous and does not care about the negative impact the organization's actions have on the society.

4 Contractible effort

The model also yields new and interesting insights in case the agent's effort is contractible, i.e., there is no moral hazard. With contractible effort, a contract consists of a wage payment w and an effort level e the agent has to exert. The following proposition characterizes the properties of the optimal contract; see Appendix C for the formal derivation.

Proposition 9: *Suppose effort is contractible. The principal optimally implements the effort level*

$$e^{\text{contractible}} = \max\{e^{\text{uncon}}, \underline{e}\},$$

where $e^{\text{uncon}} := \operatorname{argmax}_e p(e)R - c(e) + \beta p(e)V$ and $\underline{e} := \max\{e | c(e) - \beta p(e)(R+V) = 0\}$, and sets the wage

$$w^{\text{contractible}} = \frac{c(e^{\text{contractible}}) - \beta p(e^{\text{contractible}})(R+V)}{1 - \beta}.$$

Define the threshold $\bar{\beta} := \frac{c(e^{\text{efficient}})}{p(e^{\text{efficient}})(R+V)}$, where the threshold satisfies $\bar{\beta} \in (0, 1)$.

1. Case $V > 0$. The implemented effort is increasing in the agent's social attentiveness, $\partial e^{\text{contractible}} / \partial \beta > 0$. The principal implements an inefficiently low effort $e^{\text{contractible}} < e^{\text{efficient}}$ if $\beta < \bar{\beta}$, the efficient effort $e^{\text{contractible}} = e^{\text{efficient}}$ if $\beta = \bar{\beta}$, and an inefficiently high effort $e^{\text{contractible}} > e^{\text{efficient}}$ if $\beta > \bar{\beta}$.
2. Case $V = 0$. The implemented effort is weakly increasing in the agent's social attentiveness, $\partial e^{\text{contractible}} / \partial \beta \geq 0$. The principal implements the efficient effort $e^{\text{contractible}} = e^{\text{efficient}}$ if $\beta \leq \bar{\beta}$, while she implements an inefficiently high effort $e^{\text{contractible}} > e^{\text{efficient}}$ if $\beta > \bar{\beta}$.

For the benchmark of an egoistic agent and the absence of a third party, $\beta = V = 0$, a scenario which is extensively studied by the existing literature, we obtain the standard result that contractibility of effort leads to the implementation of the efficient effort. Interestingly, as shown in Proposition 9, this is generally no longer true if the agent is socially attentive, $\beta > 0$, or a third party is present, $V > 0$.

First, if the agent's social attentiveness is rather low, $\beta < \bar{\beta}$, and a third party is present, $V > 0$, the principal and the agent bargain to a contract that maximizes the sum of their expected utilities, but they do not, or not fully, take into account how their contract affects the third party. Accordingly, an inefficiently low effort level is implemented.

Second, if the agent's social attentiveness is rather high, $\beta > \bar{\beta}$, the principal can – and optimally does – exploit the agent by requiring an excessive effort level without having to compensate him with more than the minimal possible wage payment. Thus, while with non-contractibility there is the problem of under-implementation of effort, the opposite problem could arise with contractibility.

The above results have consequences for the generated surplus.

Proposition 10: *Suppose effort is contractible.*

1. Case $V > 0$. The expected surplus is increasing in the agent's social attentiveness when $\beta < \bar{\beta}$, $\partial E[s | e^{\text{contractible}}] / \partial \beta > 0$, but decreasing in it when $\beta > \bar{\beta}$, $\partial E[s | e^{\text{contractible}}] / \partial \beta < 0$. In particular, $E[s | e^{\text{contractible}}, \beta \neq \bar{\beta}] < E[s | e^{\text{contractible}}, \bar{\beta}] = E[s | e^{\text{efficient}}]$.
2. Case $V = 0$. The expected surplus is weakly decreasing in the agent's social attentiveness, $\partial E[s | e^{\text{contractible}}] / \partial \beta \leq 0$. In particular, $E[s | e^{\text{contractible}}, \beta \leq \bar{\beta}] = E[s | e^{\text{efficient}}] > E[s | e^{\text{contractible}}, \beta > \bar{\beta}]$.

For both cases, $E[s|e^{\text{contractible}}, \beta = 0] > \lim_{\beta \rightarrow 1} E[s|e^{\text{contractible}}] = 0$.

PROOF: The results stated in the enumeration of Proposition 10 directly follow from Proposition 9 and the concavity of the expected surplus in the implemented effort level. The remaining results are readily obtained when plugging in the effort level the principal implements $e^{\text{contractible}}$ into the formula for the expected surplus (24). \square

Proposition 10 reveals that social attentiveness (or a higher level of social attentiveness) could actually harm the surplus the principal and the agent generate. This result is possibly surprising, since one usually expects that socially-attentive preferences have positive effects: social attentiveness should cause parties to interact and cooperate in a more social and better way, thus generating together a higher surplus, rather than a lower one. While this presumption is right with non-contractible effort, it is wrong with contractible effort. The reason is that, with contractible effort, social attentiveness – if sufficiently high – causes the principal to implement an excessive effort level, which harms the surplus.

The following proposition shows that the principal benefits from the agent's social attentiveness with contractible effort also. However, only the principal experiences a rent in case effort is contractible.

Proposition 11: *Suppose effort is contractible. The principal's expected utility is positive,*

$$E[u_P|(w^{\text{contractible}}, e^{\text{contractible}})] > 0,$$

while the agent's expected utility is zero,

$$E[u_A|(w^{\text{contractible}}, e^{\text{contractible}})] = 0.$$

The principal's expected utility is increasing in the agent's social attentiveness,

$$dE[u_P|(w^{\text{contractible}}, e^{\text{contractible}})] / d\beta > 0.$$

In particular, her expected utility is higher if the agent is socially attentive rather than egoistic, $E[u_P|(w^{\text{contractible}}, e^{\text{contractible}}), \beta > 0] > E[u_P|(w^{\text{contractible}}, e^{\text{contractible}}), \beta = 0]$.

PROOF: If effort is contractible, the principal could implement the same effort level and offer the same wage payment as the expected wage payment when effort is non-contractible. Since this would yield the principal a positive rent, cf. Proposition 4, the principal's rent under the optimal contract must be positive as well:

$$E[u_P|(w^{\text{contractible}}, e^{\text{contractible}})] > 0. \quad (38)$$

By construction of the optimal contract, it is never optimal for the principal to leave any rent to the agent, such that the agent's expected utility is zero:

$$E[u_A|(w^{\text{contractible}}, e^{\text{contractible}})] = 0. \quad (39)$$

It remains to be shown that the principal's expected utility is increasing in the agent's social attentiveness. To see this, consider the optimal contract the principal sets when her agent's social attentiveness is $\underline{\beta}$. If her agent's social attentiveness is higher, namely $\bar{\beta} > \underline{\beta}$, the principal could offer the same wage payment, but demand a higher effort, which results in a higher expected utility for her. Therefore, the principal's expected utility must be increasing in the agent's social attentiveness,

$$\frac{E[u_p(w^{\text{contractible}}, e^{\text{contractible}})]}{d\beta} > 0. \quad \square$$

In order to identify the effects of contractibility, we next compare the case with contractible effort to the case with non-contractible effort.

4.1 Contractibility vs. non-contractibility

The following proposition shows that the contractibility of effort has a positive effect on the effort level implemented by the principal.

Proposition 12: *The principal implements a higher effort level if effort is contractible than when it is non-contractible: $e^{\text{contractible}} > e^*$.*

PROOF: If effort is contractible, we know from Proposition 9 that the principal implements the effort level $e^{\text{contractible}} = \max\{e^{\text{uncon}}, \underline{e}\}$. Thus, $e^{\text{contractible}} \geq e^{\text{uncon}}$. Recognize that $e^{\text{uncon}} := \operatorname{argmax}_e p(e)R - c(e) + \beta p(e)V$ or equivalently that e^{uncon} is the solution of the following condition:

$$p'(e)(R + \beta V) - c'(e) = 0. \quad (40)$$

Recall that in case effort is non-contractible, the equilibrium effort e^* solves (9), i.e., the following condition

$$p'(e)((1 - \beta)w_R^* + \beta(R + V)) - c'(e) = 0. \quad (41)$$

Comparing (40) and (41), we directly see – using $w_R^* < R$, by Proposition 1 – that

$$R + \beta V > (1 - \beta)w_R^* + \beta(R + V). \quad (42)$$

Due to the concavity of the success function, $p'' \leq 0$, and the convexity of the effort cost function, $c'' > 0$, this implies that $e^{\text{contractible}} \geq e^{\text{uncon}} > e^*$. \square

The ensuing proposition reveals that, although the contractibility of effort causes a higher effort level to be implemented by the principal, this is not necessarily beneficial for the surplus.

Proposition 13: *If the agent's social attentiveness β is sufficiently low, the expected surplus the principal and the agent generate is higher when effort is contractible than when it is non-contractible: $E[s|e^{\text{contractible}}] > E[s|e^*]$. It is vice versa if the agent's social attentiveness β is sufficiently high: $E[s|e^{\text{contractible}}] < E[s|e^*]$.*

PROOF: Suppose first that the agent's social attentiveness β is sufficiently low, $\beta \leq \bar{\beta}$. Propositions 9 and 12 show that

$$e^* < e^{\text{contractible}} \leq e^{\text{efficient}}. \quad (43)$$

By the concavity of the expected surplus and since the effort $e^{\text{efficient}}$ maximizes the expected surplus, it thus holds that

$$E[s|e^{\text{contractible}}] > E[s|e^*]. \quad (44)$$

Suppose next that the agent's social attentiveness β is sufficiently high. When effort is contractible and $\beta > \bar{\beta}$, we know from Proposition 9 that $e^{\text{contractible}} > e^{\text{efficient}}$ and from equations (93)-(97) that then $e^{\text{contractible}} = \underline{e}$ and that \underline{e} is increasing in β . Accordingly, for all $\beta > \bar{\beta}$,

$$E[s|e^{\text{contractible}}] < E[s|e^{\text{efficient}}] \quad (45)$$

and the difference between $E[s|e^{\text{efficient}}]$ and $E[s|e^{\text{contractible}}]$ is increasing in β ,

$$\frac{\partial (E[s|e^{\text{efficient}}] - E[s|e^{\text{contractible}}])}{\partial \beta} > 0. \quad (46)$$

When effort is non-contractible, we know from Corollary 1 that $E[s|e^*] < E[s|e^{\text{efficient}}]$ and that $\lim_{\beta \rightarrow 1} E[s|e^*] = E[s|e^{\text{efficient}}]$. Together with (45) and (46), this implies that

$$E[s|e^{\text{contractible}}] < E[s|e^*] \quad (47)$$

if the agent's social attentiveness β is sufficiently high. \square

This result is interesting, because in the benchmark of an egoistic agent, the non-contractibility of effort leads to a loss of generated surplus, i.e., to a forfeiture of efficiency. Our results show, however, that this result is not robust in the sense that it need not hold if we allow the agent to put positive weight on others' utilities: With socially-attentive preferences, the generated surplus could actually be higher when effort is non-contractible than when it is contractible. Intuitively, while with non-contractible effort an inefficiently low effort level is implemented, an excessively high effort level may be implemented when effort is contractible. In case the agent is sufficiently socially attentive, under-implementation is a lesser problem than over-implementation, such that non-contractibility is beneficial for the surplus.

It is only consequent to ask how contractibility affects the parties' utilities.

Proposition 14: *The principal's expected utility is higher when effort is contractible than when it is non-contractible:*

$$E[u_P(w^{\text{contractible}}, e^{\text{contractible}})] > E[u_P(w_0^*, w_R^*), e^*].$$

In contrast, the agent's expected utility is lower when effort is contractible than when it is non-contractible:

$$E[u_A(w^{\text{contractible}}, e^{\text{contractible}})] < E[u_A(w_0^*, w_R^*), e^*].$$

PROOF: When effort is non-contractible, we know from Proposition 4 that the agent experiences a rent: $E[u_A|w_0^*, w_R^*, e^*] > 0$. When effort is contractible, the principal could offer the agent the same wage payment as the expected wage payment the agent experiences when effort is non-contractible. That is, the wage $\tilde{w} = p(e^*)w_R^*$. With effort being contractible and $E[u_A|w_0^*, w_R^*, e^*] > 0$, however, the principal can require an effort level $e^{\text{contractible}}$ that exceeds e^* , which improves her expected utility. Under the optimal contract, the principal must thus experience a higher expected utility when effort is contractible than when it is non-contractible:

$$E[u_P|w^{\text{contractible}}, e^{\text{contractible}}] > E[u_P|w_0^*, w_R^*, e^*]. \quad (48)$$

From Propositions 4 and 11 it directly follows that

$$E[u_A|w_0^*, w_R^*, e^*] > E[u_A|w^{\text{contractible}}, e^{\text{contractible}}] = 0. \quad \square$$

Intuitively, the principal always benefits from effort being contractible, since this allows her to perfectly control the agent's effort without having to care about incentive compatibility. The agent's expected utility suffers from the contractibility of effort, since the principal then does not leave the agent any rent.

The results stated in Propositions 13 and 14 have important practical implications: If technically possible and legally permissible, a principal would always use methods that make her agent's effort observable and contractible. Such methods are controversially debated, since they often interfere with the agent's privacy. Our results contribute to this debate by showing that regulatory boundaries on the methods principals can use to control their agents, as well as legal restrictions on what can be specified in contracts, could protect the agents from being exploited by their principals. Additionally, such regulatory boundaries and legal restrictions need not only help agents, but could also improve efficiency, i.e., raise the generated surplus.

4.2 Example

As in Section 3.5, suppose $c(e) = \alpha e^2$, with $\alpha > 0$, $p(e) = e$ for all $e \leq 1$ and $p(e) = 1$, otherwise. Furthermore, let $R + V \leq \alpha$.

The principal optimally sets

$$w^{\text{contractible}} = \begin{cases} \frac{(R+\beta V)^2 - 2\beta(R+\beta V)(R+V)}{4\alpha(1-\beta)} & \text{for } \beta < \frac{R}{2R+V}, \\ 0 & \text{otherwise.} \end{cases} \quad (49)$$

The optimally implemented effort level is

$$e^{\text{contractible}} = \begin{cases} \frac{R+\beta V}{2\alpha} & \text{for } \beta < \frac{R}{2R+V}, \\ \frac{\beta(R+V)}{\alpha} & \text{otherwise.} \end{cases} \quad (50)$$

The agent's expected utility is $E[u_A | (w^{\text{contractible}}, e^{\text{contractible}})] = 0$. The principal's expected utility is $E[u_P | (w^{\text{contractible}}, e^{\text{contractible}})] = e^{\text{contractible}} R - w^{\text{contractible}}$. The expected surplus is

$$E[s | e^{\text{contractible}}] = \begin{cases} \frac{R+\beta V}{2\alpha}(R+V) - \alpha \left(\frac{R+\beta V}{2\alpha}\right)^2 & \text{for } \beta < \frac{R}{2R+V}, \\ \frac{\beta(R+V)}{\alpha}(R+V) - \alpha \left(\frac{\beta(R+V)}{\alpha}\right)^2 & \text{otherwise.} \end{cases} \quad (51)$$

Observe that the expected surplus is higher with contractible effort than with non-contractible effort, $E[s | e^{\text{contractible}}] > E[s | e^*]$, if $\beta < 2/3$, the same for $\beta = 2/3$, but lower if $\beta > 2/3$. Figures 4-6 illustrate the example for the values $R = V = 1$ and $\alpha = 2$.

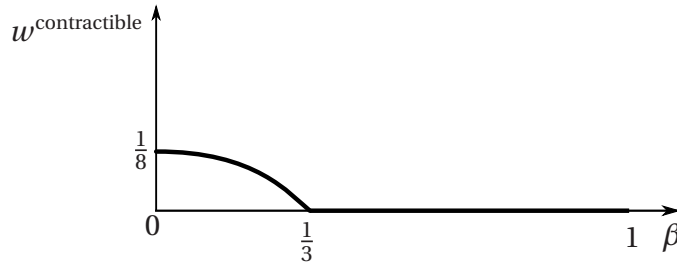


Figure 4: The wage $w^{\text{contractible}}$.

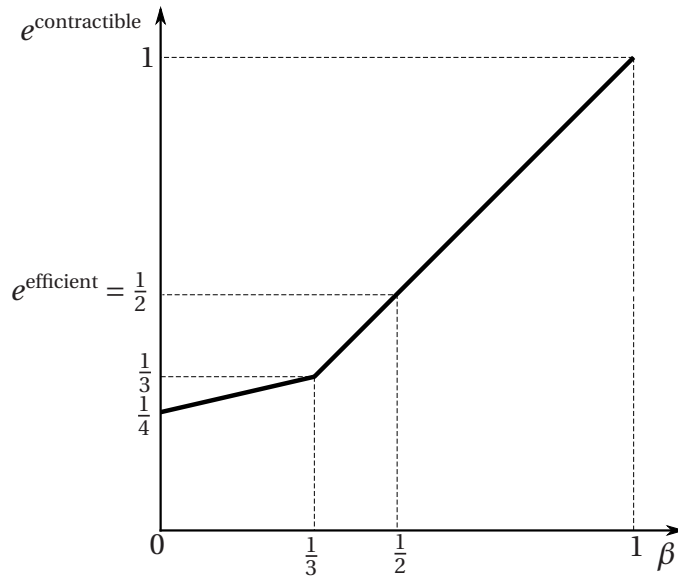


Figure 5: The effort $e^{\text{contractible}}$.

5 Endogenous preferences

We next suppose that the principal can influence the strength of the agent's social attentiveness β . In practice, this could be achieved by increasing an agent's identification with the company he is working for or by emphasizing the importance of the company's mission, i.e., the relevance of the agent's task. We capture this formally

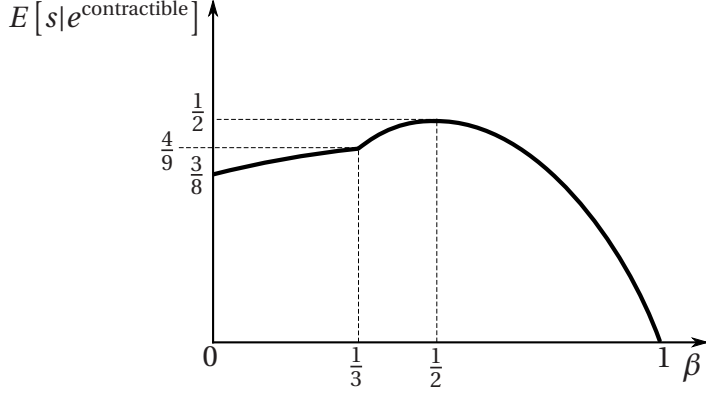


Figure 6: The surplus $E[s|e^{\text{contractible}}]$.

by supposing that the principal can elevate the agent's social attentiveness by investing into it. Denoting the initial level of social attentiveness by β_0 , the principal's problem is to select a $\beta \in [\beta_0, 1]$, which causes costs $\chi(\beta)$. By investing the amount $\chi(\beta)$, the principal thus achieves that her agent has social attentiveness β . We henceforth concentrate on the case with non-contractible effort and let $\beta_0 < 1$, such that there is scope for strengthening the agent's social attentiveness. We assume that χ is twice continuously differentiable, $\chi'(\beta), \chi''(\beta) > 0$ for $\beta > \beta_0$, $\chi(\beta_0) = \chi'(\beta_0) = 0$, and $\lim_{\beta \rightarrow 1} \chi'(\beta) = \infty$.¹⁷

The principal's problem is to find the optimal investment $\chi(\beta)$, or equivalently the optimal β . Using that under the optimal contract $w_0 = 0$, her problem is

$$\max_{\beta} E[u_P] = p(e(w_R, \beta))(R - w_R) - \chi(\beta). \quad (52)$$

The level of β the principal optimally sets is denoted by β^* , where β^* solves the first-order condition

$$\frac{\partial E[u_P]}{\partial \beta} = p'(e(w_R, \beta))(R - w_R) \frac{\partial e(w_R, \beta)}{\partial \beta} - \chi'(\beta) = 0. \quad (53)$$

We directly see that for all potentially optimal contracts $\beta^* > \beta_0$ due to $w_R \in [0, R)$.

Proposition 15: *The principal always makes a positive investment $\chi(\beta^*)$ to increase the agent's social attentiveness, where β^* solves the first-order condition (53). The principal's investment is lower [equal, higher] than that of a planner if and only if $V > [=, <] \bar{V}$, where $\bar{V} := \frac{\beta^*}{1-\beta^*}(R - w_R)$.*

PROOF: The planner maximizes

$$\max_{\beta} E[s] = p(e(w_R, \beta))(R + V) - c(e(w_R, \beta)) - \chi(\beta). \quad (54)$$

¹⁷Observe that the assumptions we impose on the function χ are essentially the same as the ones we imposed before on the effort-costs function c .

The planner's optimal β , denoted by $\beta^{\text{efficient}}$, solves the first-order condition

$$\frac{\partial E[s]}{\partial \beta} = (p'(e(\cdot))(R + V) - c'(e(\cdot))) \frac{\partial e(\cdot)}{\partial \beta} - \chi'(\beta) = 0. \quad (55)$$

Using (9) solved for $c'(e(\cdot))$, we can rewrite this as

$$\frac{\partial E[s]}{\partial \beta} = p'(e(\cdot))((1 - \beta)(R + V - w_R)) \frac{\partial e(\cdot)}{\partial \beta} - \chi'(\beta) = 0. \quad (56)$$

By the concavity of the expected surplus $E[s]$, $\beta^{\text{efficient}} > [=, <] \beta^*$ if and only if

$$\left. \frac{\partial E[s]}{\partial \beta} \right|_{\beta^*} = p'(e(\cdot))((1 - \beta^*)(R + V - w_R)) \frac{\partial e(\cdot)}{\partial \beta} - \chi'(\beta^*) > [=, <] 0. \quad (57)$$

Subtracting (53) from (57) yields, that $\beta^{\text{efficient}} > [=, <] \beta^*$, if and only if

$$\begin{aligned} (1 - \beta^*)(R + V - w_R) &> [=, <] R - w_R \\ \iff V &> [=, <] \frac{\beta^*}{1 - \beta^*} (R - w_R). \quad \square \end{aligned} \quad (58)$$

It is interesting to realize that while it is not always optimal for the principal to motivate the agent via monetary incentives (cf. Proposition 3), it is always optimal to motivate him via investments into his social attentiveness (cf. Proposition 15).

There are two reasons why the principal chooses a different β and thus a different investment $\chi(\beta)$ than the planner. First, the principal ignores the negative effect on the agent's effort costs caused by stronger social attentiveness and the associated higher effort level. Second, the principal does not take into account the positive effect a higher level of social attentiveness has on the third party. If V is large, the second effect dominates the first effect and the principal consequently underinvests, $\chi(\beta^*) < \chi(\beta^{\text{efficient}})$. In contrast, if V is small, the first effect dominates and the principal overinvests, $\chi(\beta^*) > \chi(\beta^{\text{efficient}})$.

Remark 1. If the principal's problem is concave (i.e., $c''' \geq 0$ and $p''' \leq 0$), Proposition 8 implies that the more the principal invests into the agent's social attentiveness and the higher the agent's social attentiveness therefore is, the less monetary incentives she optimally provides. Monetary incentives and the investments in the agent's attentiveness are thus substitutes.

Remark 2. The principal might also be able to take measures that ensure that a successful outcome is not only valuable for herself, but also for the society as a whole. In practice, firms could take an array of measures to improve their corporate social responsibility, for example by ensuring fair working conditions in supplying firms or investments in projects that reduce the environmental damages caused by their operations. This could formally be captured by assuming that the principal can increase the payoff V experienced by the third party for costs $\rho(V)$, where we let the function ρ satisfy the same assumptions as the function χ specified before. It is

straightforward to show that the principal always optimally invests to increase V – i.e., invests into measures to improve her firms’ corporate social responsibility – if her agent is socially attentive, while she optimally does not invest if her agent is egoistic. Intuitively, investments to increase the corporate social responsibility are beneficial for the principal if and only if they motivate her agent to exert more effort, which is (as we know from Proposition 2) the case whenever the agent is socially attentive.

Remark 3. It is also possible that the design of the contract itself influences the agent’s social attentiveness. Formally, β is then a function of the contract (w_0, w_R) . Supposing that the contract influences the agent’s attentiveness via the expected wage payment, two results emerge. Qualitatively, it is still optimal to make only the minimal possible wage payment in case the agent does not succeed, i.e., $w_0^* = 0$. Quantitatively, since increasing w_R has now not only a direct effect on the agent’s equilibrium effort choice, but also an indirect effect, the principal optimally provides weakly higher incentives.

6 Discussion and extensions

6.1 Multiple outcomes

In Appendix A, we extend the model to allow for an arbitrarily high number of possible outcomes. We show that the multi-outcome case effectively reduces to the two-outcome case. Intuitively, this holds true, because it is optimal for the principal not to reward all outcomes that do not possess the maximal likelihood ratio. That is, optimal monetary incentives are designed in such a way that, if any outcome, only the outcome with the maximal likelihood ratio is rewarded. This holds not only for egoistic agents (as already shown by Demougin and Fluet 1998), but also for agents with socially-attentive preferences and all levels of social attentiveness.

6.2 Socially-attentive principal

We now consider the case where the principal and the agent both have socially-attentive preferences for the net utility of the other and the third party, respectively.¹⁸ We denote the strength of the principal’s social attentiveness by $\lambda \in [0, 1)$. The prin-

¹⁸If we instead suppose that the principal and the agent both have socially-attentive preferences regarding the gross expected utility of each other and the third party, then amplifications effects arise. While this feature is unappealing, the qualitative effects stay unchanged.

principal's expected utility is

$$\begin{aligned} E[u_P] &= p(e)(R - w_R) + (1 - p(e))(-w_0) + \lambda(p(e)w_R + (1 - p(e))w_0 - c(e) + p(e)V) \\ &= p(e)(R + \lambda V - (1 - \lambda)w_R) - (1 - p(e))(1 - \lambda)w_0 - \lambda c(e). \end{aligned} \quad (59)$$

It is straightforward to verify that (for essentially the same arguments) the previously derived results stay valid. In particular, it is optimal not to reward an unsuccessful outcome, such that $w_0^* = 0$, and the principal optimally sets no monetary incentive, $w_R^* = 0$, if the agent's social attentiveness β is sufficiently high. There is one noteworthy exception: a socially-attentive principal optimally sets monetary incentives $w_R^* \in [0, R + V)$, i.e., incentives w_R that are possibly larger than her return R . It is further interesting to realize that the principal provides weakly stronger incentives the more socially attentive she is.

Proposition 16: *Suppose the principal's problem is concave. For all $\underline{\lambda}$ and $\bar{\lambda}$, with $\underline{\lambda} < \bar{\lambda}$, the principal sets monetary incentives such that $w_R^*|_{\underline{\lambda}} \leq w_R^*|_{\bar{\lambda}}$. Moreover, if $w_R^*|_{\underline{\lambda}} > 0$, then $w_R^*|_{\underline{\lambda}} < w_R^*|_{\bar{\lambda}}$.*

PROOF: Using that $w_0^* = 0$ and taking into account that the agent chooses effort $e^* = e(w_R, \beta)$, we can write (59) as

$$E[u_P|\lambda] = p(e(w_R, \beta))(R + \lambda V - (1 - \lambda)w_R) - \lambda c(e(w_R, \beta)). \quad (60)$$

Suppose now that, contrary to our claim, $w_R^*|_{\underline{\lambda}} > w_R^*|_{\bar{\lambda}}$. Then $w_R^*|_{\underline{\lambda}} > 0$ must hold true. Due to the concavity of the principal's problem, $w_R^*|_{\underline{\lambda}}$ must hence solve the first-order condition

$$\frac{\partial E[u_P|\underline{\lambda}]}{\partial w_R} = p'(e(\cdot)) \frac{\partial e(\cdot)}{\partial w_R} (R + \underline{\lambda} V - (1 - \underline{\lambda})w_R) - (1 - \underline{\lambda})p(e(\cdot)) - \underline{\lambda} c'(e(\cdot)) \frac{\partial e(\cdot)}{\partial w_R} = 0. \quad (61)$$

Solving the first-order condition of the agent's maximization problem (9) for $c'(e(\cdot))$ yields

$$c'(e(\cdot)) = p'(e(\cdot))((1 - \beta)w_R + \beta(R + V)). \quad (62)$$

Plugging (62) into (61), we obtain

$$\begin{aligned} \frac{\partial E[u_P|\underline{\lambda}]}{\partial w_R} &= p'(e(\cdot)) \frac{\partial e(\cdot)}{\partial w_R} (R + \underline{\lambda} V - (1 - \underline{\lambda})w_R) - (1 - \underline{\lambda})p(e(\cdot)) \\ &\quad - \underline{\lambda} \frac{\partial e(\cdot)}{\partial w_R} p'(e(\cdot)) ((1 - \beta)w_R + \beta(R + V)) = 0, \end{aligned} \quad (63)$$

which can be rewritten as

$$R = \frac{\frac{(1 - \underline{\lambda})p(e(\cdot))}{p'(e(\cdot)) \frac{\partial e(\cdot)}{\partial w_R}} - (1 - \beta)\underline{\lambda} V}{1 - \beta\underline{\lambda}} + w_R. \quad (64)$$

Now consider the case with the higher level of social attentiveness $\bar{\lambda}$. Differentiating the principal's expected utility with respect to w_R and plugging (62) and (64) in yields

$$\left. \frac{\partial E[u_P|\bar{\lambda}]}{\partial w_R} \right|_{w_R^*|\bar{\lambda}} = p'(e(\cdot)) \frac{\partial e(\cdot)}{\partial w_R} (1-\beta) \underbrace{\left(\bar{\lambda} - \lambda \frac{1-\beta\bar{\lambda}}{1-\beta\lambda} \right)}_{>0} V - p(e(\cdot)) \underbrace{\left((1-\bar{\lambda}) - (1-\lambda) \frac{1-\beta\bar{\lambda}}{1-\beta\lambda} \right)}_{<0}, \quad (65)$$

which is positive. Hence, $w_R^*|\bar{\lambda} > w_R^*|\lambda$, as supposed before, could never be optimal for a principal with a social attentiveness of $\bar{\lambda}$. Accordingly, $w_R^*|\lambda \leq w_R^*|\bar{\lambda}$ must be true.

It remains to show that if $w_R^*|\lambda > 0$, then $w_R^*|\lambda < w_R^*|\bar{\lambda}$. Note that if $w_R^*|\lambda > 0$, we must also have that $w_R^*|\bar{\lambda} > 0$, because of $w_R^*|\lambda \leq w_R^*|\bar{\lambda}$. Then $w_R^*|\lambda$ solves the first-order condition $\frac{\partial E[u_P|\lambda]}{\partial w_R} = 0$, while $w_R^*|\bar{\lambda}$ solves $\frac{\partial E[u_P|\bar{\lambda}]}{\partial w_R} = 0$. Equation (65), which we derived using that $w_R^*|\lambda$ solves $\frac{\partial E[u_P|\lambda]}{\partial w_R} = 0$, implies that $w_R^*|\lambda < w_R^*|\bar{\lambda}$. \square

These results are intuitive. If the principal's social attentiveness is relatively high, payments to the agent are relatively little painful for her, which is why she is willing to provide relatively high monetary incentives, if she provides any incentives.

6.3 The problem with unlimited liability

We next briefly examine the scenario where the agent is not wealth constrained and his liability is unlimited. The principal is then free to set arbitrary wage payments. The principal's problem is to maximize her expected utility subject to the agent's participation and incentive constraints. In the optimum, the agent's participation constraint has to bind,¹⁹ such that the agent's expected utility equals his reservation utility $E[u_A] = 0$. Substituting the binding participation constraint into the principal's objective function allows us to write the problem as

$$\max_e p(e)R - c(e) + \beta p(e)V. \quad (66)$$

The principal thus optimally implements the effort level e^{uncon} , which solves

$$p'(e)(R + \beta V) - c'(e) = 0. \quad (67)$$

We directly see that, in the presence of a third party, $V > 0$, e^{uncon} falls short of $e^{\text{efficient}}$. In contrast, in the absence of a third party, $V = 0$, we have $e^{\text{uncon}} = e^{\text{efficient}}$. Thus, the principal either implements an inefficiently low effort level or the efficient effort level.

¹⁹Otherwise, i.e., if $E[u_A] > 0$, the principal can lower w_0 and w_R by some $\varepsilon > 0$, which lowers her wage costs, while leaving the implemented effort level unchanged.

7 Conclusions

In standard agency models, the agent does not care how his decisions affect the well-being of others. This is a rather strong assumption, which we relax in this paper. Considering socially-attentive preferences in agency models is not only important due to normative and positive reasons, but also yields a rich set of new and interesting insights. We want to highlight three of them, which we think are theoretically especially interesting as well as empirically or practically important.

First, with socially-attentive preferences, the principal may optimally refuse to provide monetary incentives. This finding is empirically relevant, since it provides a potential explanation for the puzzle that, in practice, only a fraction of employees work under compensation schemes that include monetary incentives.

Second, while it is not always optimal for the principal to motivate the agent via monetary incentives, it is always optimal to motivate him via investments that raise his social attentiveness. This underlines the practical relevance of measures which improve employees' identification with their employers' mission and the sense of purpose employees experience about their work.

Third, for the benchmark of an egoistic agent and the absence of a third party, contractibility of effort leads to the implementation of the efficient effort. But this is, in general, no longer true if the agent is socially attentive or a third party is present. We show that contractibility may in fact harm the generated surplus, which provides an efficiency argument for regulatory boundaries on the methods principals can use to control their agents and legal restrictions on what can be specified in contracts.

Appendix A: Multiple outcomes

For the case with standard (egoistic) preferences, Demougin and Fluet (1998) have shown that the multi-outcome model effectively reduces to the two-outcome model, since due to limited liability and risk neutrality, it is optimal for the principal to reward only the outcome with the highest likelihood ratio. We next explore whether this result is also valid for the case with socially-attentive preferences. We thus concentrate on the case where $\beta > 0$ and suppose that there are $n > 2$ possible outcomes.

The probability that outcome i realizes is denoted by $p_i(e)$. The set of possible returns is $\{R_1, \dots, R_n\}$, where R_i is the principal's return when outcome i realizes. The set of possible wage payments is $\{w_1, \dots, w_n\}$, where w_i is the wage payment the agent receives when outcome i realizes and $w_i \geq 0$ has to hold due to the agent's limited liability. The set of possible payoffs for the third party is $\{V_1, \dots, V_n\}$. The expected return $E[R_i|e] = \sum_{i=1}^n p_i(e)R_i$ and the third party's expected payoff $E[V_i|e] = \sum_{i=1}^n p_i(e)V_i$ are non-negative, increasing, and concave in effort. Furthermore, we can order the outcomes such that the monotone likelihood ratio property is satisfied: $p'_i(e)/p_i(e)$ is increasing in i . In order for the likelihood ratios to be well-defined, we need that $p_i(e) > 0$ for all $e > 0$ and $i \in \{1, \dots, n\}$. For the agent's utility maximization problem to be concave under the optimal contract, we need $p''_n(e) \leq 0$.

The parties expected payoffs are

$$E[u_A] = \sum_{i=1}^n p_i(e)w_i - c(e) + \beta E[u_{\neg A}], \quad (68)$$

$$E[u_P] = \sum_{i=1}^n p_i(e)(R_i - w_i), \quad (69)$$

$$E[u_T] = \sum_{i=1}^n p_i(e)V_i. \quad (70)$$

Plugging (69) and (70) into (68) yields

$$E[u_A] = \sum_{i=1}^n p_i(e) \left((1 - \beta)w_i + \beta(R_i + V_i) \right) - c(e). \quad (71)$$

The first-order condition is

$$\frac{\partial E[u_A]}{\partial e} = \sum_{i=1}^n p'_i(e) \left((1 - \beta)w_i + \beta(R_i + V_i) \right) - c'(e) = 0. \quad (72)$$

The principal's problem is to maximize her expected payoff $E[u_P]$ subject to:

- (i) the agent's participation constraint $E[u_A] \geq 0$,
- (ii) the agent's incentive constraint, respectively, the first-order condition $\frac{\partial E[u_A]}{\partial e} = 0$,

(iii) the limited liability constraints $w_i \geq 0 \forall i \in \{1, \dots, n\}$.

Since the agent chooses his effort optimally and his liability is limited, it holds that

$$E[u_A|e^*] \geq E[u_A|e=0] \geq 0. \quad (73)$$

The agent's participation constraint is thus automatically satisfied, which is standard in agency models with limited liability. Formulated as a Lagrangian, the principal's problem is hence:

$$\mathcal{L} = \sum_{i=1}^n p_i(e)(R_i - w_i) + \phi \left(\sum_{i=1}^n p'_i(e) \left((1 - \beta)w_i + \beta(R_i + V_i) \right) - c'(e) \right) + \sum_{i=1}^n \mu_i w_i. \quad (74)$$

In the optimum, the following Karush-Kuhn-Tucker conditions have to hold:

$$\frac{\partial \mathcal{L}}{\partial w_i} = -p_i(e) + \phi p'_i(e)(1 - \beta) + \mu_i = 0 \quad \forall i \in \{1, \dots, n\}, \quad (75)$$

$$\frac{\partial \mathcal{L}}{\partial e} = \sum_{i=1}^n p'_i(e)(R_i - w_i) + \phi \left(\sum_{i=1}^n p''_i(e) \left((1 - \beta)w_i + \beta(R_i + V_i) \right) - c''(e) \right) = 0, \quad (76)$$

$$\sum_{i=1}^n p'_i(e) \left((1 - \beta)w_i + \beta(R_i + V_i) \right) - c'(e) = 0, \quad (77)$$

$$w_i \geq 0, \mu_i \geq 0, \text{ and } \mu_i w_i = 0 \quad \forall i \in \{1, \dots, n\}. \quad (78)$$

The following proposition shows two results. First, the principal implements a positive effort level. Second, the optimal contract is such that, if any outcome, only the outcome with the maximal likelihood ratio is rewarded. The multi-outcome case thus effectively reduces to the two-outcome case.

Proposition 17: *The principal optimally implements a positive effort, $e^* > 0$, and sets a contract (w_1^*, \dots, w_n^*) which satisfies $w_i^* = 0$ for all $i \in \{1, \dots, n-1\}$ and $w_n^* \geq 0$.*

PROOF: We can write the principal's expected utility as the difference between the expected return and the expected wage payment:

$$E[u_P] = \sum_{i=1}^n p_i(e)R_i - \sum_{i=1}^n p_i(e)w_i = E[R_i|e] - E[w_i|e]. \quad (79)$$

Under the contract where all wage payments are zero, $w_i = 0$ for all $i \in \{1, \dots, n\}$, we see from (72) that the agent chooses the effort level \hat{e} that solves

$$\sum_{i=1}^n p'_i(\hat{e})\beta(R_i + V_i) - c'(\hat{e}) = 0 \quad (80)$$

and that $\hat{e} > 0$ for all $\beta > 0$. Further note that this contract causes an expected wage payment of zero. Because the limited liability constraints require the wage payments to be non-negative, all other contracts cause an at least weakly higher expected wage payment. Since the expected return is increasing in effort, the principal's expected

utility is therefore lower if she implements an effort $e < \hat{e}$ with some other contract. Under the optimal contract (w_1^*, \dots, w_n^*) , it must hence hold that the implemented effort is $e^* \geq \hat{e} > 0$.

We next prove the second part of Proposition 17. Suppose that – contrary to the claim – there exists some $j \in \{1, \dots, n-1\}$ for which $w_j^* > 0$. Then by the complementary slackness condition captured in (78), we must have $\mu_j^* = 0$. We need to distinguish between three cases.

Case 1: $p'_j(e) < 0$. According to (75), since $\mu_j^* = 0$, the Lagrange multiplier ϕ^* must then be negative, $\phi^* < 0$. This implies together with (75) and (78) that:

- $w_i^* = 0$ for all outcomes $i \in \{1, \dots, n\}$ for which $p'_i(e) \geq 0$,
- $w_i^* \geq 0$ for all outcomes $i \in \{1, \dots, n\}$ for which $p'_i(e) < 0$.

But a contract with such a structure implements a lower effort level and is more costly for the principal than the contract where all wage payments are zero. To be precise, with such a contract, the expected wage payment is $E[w_i|e^*] > 0$ and, by (77), the implemented effort level is $e^* < \hat{e}$, where \hat{e} solves (80) and is positive, so $E[R_i|e^*] < E[R_i|\hat{e}]$. As we can see from (79), such a contract is hence worse for the principal than the contract where all wage payments are zero and can thus not be optimal.

Case 2: $p'_j(e) = 0$. Then the optimality condition (75) cannot be satisfied for the outcome j , since $p_j(e^*) > 0$ and $\mu_j^* = 0$.

Case 3: $p'_j(e) > 0$. Since $\mu_j^* = 0$, we must have $\phi^* > 0$ such that (75) is satisfied. Dividing (75) by $p_i(e)$ we get

$$-1 + \phi \frac{p'_i(e)}{p_i(e)}(1 - \beta) + \frac{\mu_i}{p_i(e)} = 0. \quad (81)$$

We next show that equation (81) cannot hold for both outcomes j and n . For outcome j , we have $\mu_j^* = 0$ and thus (81) writes as

$$-1 + \phi \frac{p'_j(e)}{p_j(e)}(1 - \beta) = 0. \quad (82)$$

For outcome n , (81) is

$$-1 + \phi \frac{p'_n(e)}{p_n(e)}(1 - \beta) + \frac{\mu_n}{p_n(e)} = 0. \quad (83)$$

Given that (82) holds, (83) cannot hold due to $\phi^* > 0$, $p'_n(e)/p_n(e) > p'_j(e)/p_j(e)$, and $\mu_n \geq 0$. Thus, there cannot exist some $j \in \{1, \dots, n-1\}$ for which $w_j^* > 0$. \square

Appendix B: Different weights on utilities

We assumed that the agent puts the same weight β on the principal's and the third party's utilities. The model is readily generalized to different weights. Denoting the weight on the principal's utility by β_P and the weight on the third party's utility by β_T , we can write the agent's expected utility as

$$E[u_A] = p(e)w_R + (1 - p(e))w_0 - c(e) + \beta_P(p(e)(R - w_R) - (1 - p(e))w_0) + \beta_T p(e)V. \quad (4')$$

Rescaling the third party's payoff to $\tilde{V} := \frac{\beta_T}{\beta_P} \times V$ and writing β for β_P allows us to reformulate (4') as

$$E[u_A] = p(e)w_R + (1 - p(e))w_0 - c(e) + \beta(p(e)(R - w_R + \tilde{V}) - (1 - p(e))w_0). \quad (4'')$$

Observe that – except for having \tilde{V} instead of V , which is qualitatively inconsiderable – equation (4'') is identical to the agent's objective function with equal weights, which we already know from the main text, see equation (4). Allowing the agent to put different weights on the principal's and the third party's utilities therefore has the same effect as variations of the third party's payoff V have. Due to this insight, and to keep the notation as compact as possible, we do not allow for different weights in the main text of the paper.

Appendix C: Contractible effort

Given the contract (w, e) , the principal's expected utility writes

$$E[u_p] = p(e)R - w \quad (84)$$

and the agent's expected utility is

$$E[u_A] = w - c(e) + \beta(p(e)(R + V) - w). \quad (85)$$

The principal's problem is to maximize her expected utility subject to (i) the limited liability constraint $w \geq 0$ and (ii) the agent's participation constraint $E[u_A] \geq 0$.

Because, all else equal, the principal's expected utility is increasing in effort, it could never be optimal for the principal to require an effort level such that the agent's expected utility is positive. Accordingly, we can restrict our attention to the case where $E[u_A] = 0$. Solving $E[u_A] = 0$ for the wage payment w yields

$$w = \frac{c(e) - \beta p(e)(R + V)}{1 - \beta}. \quad (86)$$

We are hence able to rewrite the constraint $w \geq 0$ as

$$c(e) - \beta p(e)(R + V) \geq 0. \quad (87)$$

The principal's problem can thus be reformulated. She maximizes her expected utility subject to (86) and (87).

We now take a closer look at constraint (87). Consider first the case where $\beta > 0$. Then (87) holds with equality for $e = 0$ as well as for exactly one positive effort level, namely

$$\underline{e} := \max\{e \mid c(e) - \beta p(e)(R + V) = 0\}. \quad (88)$$

See Figure 7.

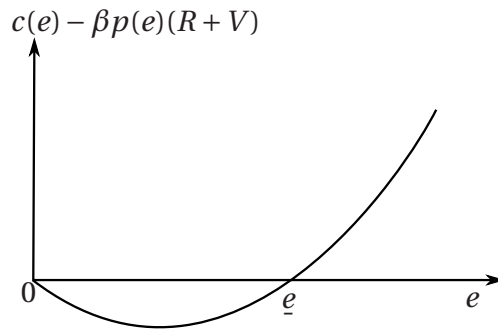


Figure 7: The constraint (87) and the construction of \underline{e} .

Because $c(e) - \beta p(e)(R + V)$ is convex in e , constraint (87) holds if either $e = 0$ or

$e \geq \underline{e}$. Since implementing $e = 0$ is never optimal for the principal,²⁰ we can replace constraint (87) by the simpler constraint $e \geq \underline{e}$.

Consider next the remaining case $\beta = 0$. Then (87) holds if and only if $e \geq \underline{e} = 0$. We can thus again replace the constraint (87) by the constraint $e \geq \underline{e}$. This allows us to write the principal's problem as

$$\max_{w,e} E[u_P] \text{ subject to (86) and } e \geq \underline{e}. \quad (\text{P3})$$

Plugging (86) into the principal's objective function yields

$$E[u_P] = p(e)R - \frac{c(e) - \beta p(e)(R + V)}{1 - \beta}. \quad (\text{89})$$

After multiplying by $(1 - \beta)$,²¹ we can rewrite the problem (P3) as

$$\max_e p(e)R - c(e) + \beta p(e)V \text{ subject to } e \geq \underline{e}. \quad (\text{P4})$$

Because the objective function is concave, the principal optimally either implements the unconstrained maximizer of her objective function

$$\begin{aligned} e^{\text{uncon}} &:= \operatorname{argmax}_e p(e)R - c(e) + \beta p(e)V \\ \iff e^{\text{uncon}} &\text{ solves } p'(e)(R + \beta V) - c'(e) = 0, \end{aligned} \quad (\text{90})$$

or, if this is not possible due to $e^{\text{uncon}} < \underline{e}$, the effort level \underline{e} . Denoting the effort level the principal optimally implements in case of contractible effort by $e^{\text{contractible}}$, we thus have

$$e^{\text{contractible}} = \max\{e^{\text{uncon}}, \underline{e}\}. \quad (\text{91})$$

The optimal wage payment provided by the principal is, by (86),

$$w^{\text{contractible}} = \frac{c(e^{\text{contractible}}) - \beta p(e^{\text{contractible}})(R + V)}{1 - \beta}. \quad (\text{92})$$

This proves the first part of Proposition 9.

To compare the effort level the principal implements, $e^{\text{contractible}}$, to the efficient effort $e^{\text{efficient}}$, the following properties are useful and straightforward to derive. First, recall that $e^{\text{efficient}}$ solves (25), i.e., the first-order condition $\partial E[s]/\partial e = p'(e)(R + V) - c'(e) = 0$. We directly see that $e^{\text{efficient}}$ is positive and independent of β . Second, for effort \underline{e} , the following holds:

$$\underline{e}|_{\beta=0} = 0, \quad \frac{\partial \underline{e}}{\partial \beta} > 0, \quad \underline{e}|_{\beta=1} > e^{\text{efficient}}. \quad (\text{93})$$

²⁰When implementing effort zero, the principal would yield $E[u_P] \leq 0$, while she could obtain $E[u_P] > 0$ if she implements effort $e = \varepsilon$, where ε is small and positive. Formally, the contract $w = c(\varepsilon)$ and $e = \varepsilon$ guarantees the agent's participation and yields the principal an expected utility $E[u_P] = p(\varepsilon)R - c(\varepsilon)$, which is positive since ε is small.

²¹This multiplication is unproblematic, since it constitutes a positive monotone transformation of the principal's objective function.

Third, for effort e^{uncon} , the following holds:

$$\text{if } V = 0, \text{ then } e^{\text{uncon}} > 0, e^{\text{uncon}} = e^{\text{efficient}}, \frac{\partial e^{\text{uncon}}}{\partial \beta} = 0; \quad (94)$$

$$\text{if } V > 0, \text{ then } e^{\text{uncon}} > 0, e^{\text{uncon}} < e^{\text{efficient}}, \frac{\partial e^{\text{uncon}}}{\partial \beta} > 0. \quad (95)$$

From the formulas (93)-(95) it directly follows that the effort level the principal optimally implements $e^{\text{contractible}} = \max\{e^{\text{uncon}}, e\}$ is weakly increasing in β if $V = 0$, $\partial e^{\text{contractible}}/\partial \beta \geq 0$, and strictly increasing in β if $V > 0$, $\partial e^{\text{contractible}}/\partial \beta > 0$.

The threshold $\bar{\beta}$ is such that $e = e^{\text{efficient}}$. Solving

$$c(e^{\text{efficient}}) - \bar{\beta}p(e^{\text{efficient}})(R + V) = 0 \quad (96)$$

for $\bar{\beta}$ yields

$$\bar{\beta} = \frac{c(e^{\text{efficient}})}{p(e^{\text{efficient}})(R + V)}. \quad (97)$$

Note that, because at least for the effort level $e^{\text{efficient}}$ the expected surplus is positive, so that $p(e^{\text{efficient}})(R + V) - c(e^{\text{efficient}}) > 0$, we have $\bar{\beta} \in (0, 1)$. Figures 8 and 9 illustrate these properties and the second part of Proposition 9 summarizes them.

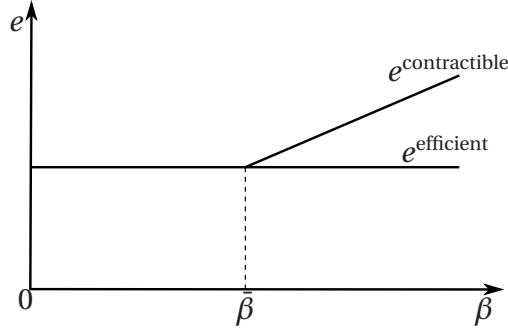


Figure 8: Comparison of $e^{\text{contractible}}$ and $e^{\text{efficient}}$ for the case $V = 0$.

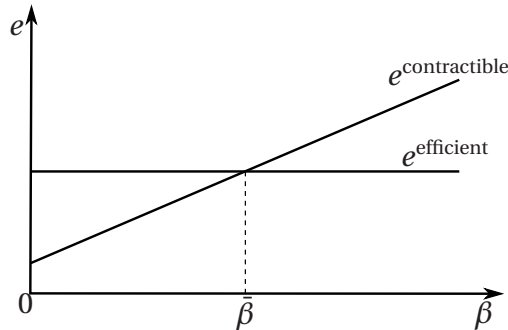


Figure 9: Comparison of $e^{\text{contractible}}$ and $e^{\text{efficient}}$ for the case $V > 0$.

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