Performance Pay and Multiple Tasks; Inner Motivations and Participation Constraints

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In principal-agent relationships, agents are often engaged in several tasks. Contracts are studied under different participation constraints for an agent that receives non-pecuniary rewards. The optimal contracts vary according to the degree of dependency between the efforts, the strength and distribution of inner motivations, and, the type of constraint. If the inner motivation for the incentivized task is relatively high (low), the inner motivation for non-incentivized tasks is relatively low (high) and/or the degree of substitutability between the efforts is relatively low (high), the bonus where a utility constraint holds, is higher (lower) than when a net-income constraint holds.

Keywords: intrinsic motivations, non-pecuniary motivations, participation constraints, job satisfaction, incentive schemes

INTRODUCTION

Experiments and field evidence show that many people are motivated by non-pecuniary motivations that affect job performance positively in the sense that effort is above the maximum contractually enforceable level (see for instance Deci and Ryan, 1985 and Ryan and Deci, 2000). The element of voluntarism in job performance may arise if work is perceived as being a purpose of life, because it is meaningful or because it is joyful and interesting. A job (or a position) typically consists of several tasks and the motivations for doing them are likely to differ since some tasks are more personally rewarding than others. For example, an academic has to divide her time between teaching and research, and, depending on preferences, she may prefer to spend relatively more time and energy in one of them. A health care worker divides his time between routine practices (administrative activities) and patient care. One would expect that the motivation for undertaking bedside care, if being driven by a desire to help other people, is stronger than the motivation for doing administrative work.

Non-pecuniary motivations appear to be advantageous for a principal, but such preferences may also result in an ineffective allocation across tasks. Does it play a role for the optimal contract how the degree of inner motivation is distributed across verifiable and non-verifiable tasks? Consider a nurse that is strongly motivated to deliver care but less motivated to do administrative work and where administrative work can be more easily verified than caring activities. On the other hand, consider a professor that is strongly motivated to do research but is less motivated for teaching, where the research activities are more easily verifiable than teaching activities. The principal's contract problem seems to differ across the two professions. For the professor (nurse), the principal can incentivize the task that is associated with a high (low) degree of inner motivation.

In order to address the above questions, we extend the multitasking model presented by Holmstrom and Milgrom (1991) by introducing inner motivations for both tasks (verifiable and non-verifiable) and by allowing for such motivations to vary across tasks. We assume risk neutral actors, focus on tasks that are substitutes and restrict our attention to optimal linear contracts. Furthermore, the standard multitasking model is extended by considering the role the participation constraint may play. We primarily focus on the cases where (i) the agent's total utility (including inner motivations) has to exceed a certain level (the utility constraint), and, (ii) the agent's material net payoff (excluding the utility generated by inner motivations) has to be sufficiently high (the net-income constraint). The first case represents a situation where the agent considers outside work options that do not produce any utility from inner motivations. This means that the agent, in addition to the disutility of effort, considers pecuniary and non-pecuniary rewards when deciding on participation and production. As a consequence, the agent is willing to forego financial gains in exchange for utility that derives from inner motivations. In the second case, the agent considers outside work options that produce utility from inner motivations. This is likely to be the case for individuals that possess particular skills and knowledge or when the alternative work option provides the agent with the same type of mission (contribution to a social cause) or work meaning (autonomy and competence) as is the case for the principal in question. Such considerations seem likely for agents that have particular skills or belong to particular professions (e.g. health care workers and academics). For these groups of agents, non-pecuniary rewards will not be important for the participation decision since the (perceived) alternative employment possibilities are restricted to a particular sector or type of work that produces non-pecuniary utility. Consequently, there is a separation between the participation decision and production decision, in the sense that the second depends on non-pecuniary motivations while the first one does not.

In our analyses we find that the optimal contract is sensitive to the degree and the distribution of the inner motivations across tasks, the degree of substitutability between the efforts and the type of participation constraint considered (the best outside option). For instance, in contrast to former studies, we find that the demand for incentive pay might increase in response to a higher inner motivation, independent of the participation constraint considered. This finding matters for the motivation that is associated with the non-incentivized task. Another interesting finding is that the size of the optimal bonus is dependent on the agent's best outside option. In cases where the inner motivation for the incentivized task is relatively high (low), the inner motivation for non-incentivized tasks is relatively low (high) and/or the degree of substitutability between the efforts is relatively low (high), the optimal bonus in the case where the utility constraint holds, is higher (lower) than in the case where the net-income constraint holds. Hence, an important finding from our model analyses is that whether it is preferable for the principal to offer a wage contract characterized by mostly variable or fixed payments is critically dependent on the agent's best outside option. For instance, turning to our examples above, this means that an academic, having considerable inner motivation for research (being verifiable) and low inner motivation for teaching (being non-verifiable), the principal finds it advantageous to offer a high-powered contract (variable payments) if the utility constraint is relevant, and a low-powered contract (fixed payment) if the net-income constraint is relevant. A health care worker, however, having low inner motivation for administration (being verifiable) and considerable inner motivation for patients' care (being non-verifiable) should face a high-powered contract (variable payments) when the net-utility constraint is relevant, and a low-powered contract (fixed payment) when the utility constraint is relevant. Finally, when considering welfare implications from practicing the different wage contracts, we find that non-incentivized effort is too low, relatively to the first best level, under both participation constraints. By using an example, we observe that incentivized effort equals the first-best level for the utility constraint, while the efforts can be too high or too low for the net-income constraint.

The remainder of the paper is structured as follows. First, as an inspiration for the forthcoming analyses, we refer to former literature being concerned with non-pecuniary motivations and multitasking. Second, a model where the agent derives both pecuniary and non-pecuniary benefits (inner motivations) from doing multiple tasks is introduced. Third, we deduce the optimal contracts belonging to each participation constraint and compare these across contracts. Fourth, the social outcome is compared with the optimal contracts. And finally, we summarize our main results together with some concluding remarks.

LITERATURE

Our work relates to the literature on non-pecuniary motivations (intrinsic motivation, public service motivation and pro-social concerns). This literature typically distinguishes between intrinsic and extrinsic motivations (see for example Deci and Ryan, 1985 and Staw, 1989). Intrinsic motivations (inner motivation) are behavioral motives that arise from inner feelings because people care about what they do or because of idealistic or ethical purposes. Extrinsic motivations represent motives that arise from the outside and include material rewards, recognition and esteem.[1] Francois and Vlassopoulus (2008) observe two alternative conceptual views when modelling pro-sociality where pro-sociality is defined as being motivated by making a contribution to a social cause.[2] In the first group, agents care about the overall value of the good to which they contribute (outcome-oriented motivations). Here they derive a benefit when a socially worthwhile service is provided and this benefit is independent of whether or not the agent herself is productive [see e.g. Francois (2000), Glazer (2004), Besley and Ghatak (2005) and Prendergast (2007)].[3] Francois (2000) considers agents that provide effort out of the concerns for the impact of that effort on a valued social service (care about the total service level), while Glazer (2004) studies agents that care about the achievements (output) of own organization. In Besley and Ghatak (2005), agents with pro-social preferences receive utility benefits when working for the right principal (the preferred mission), while Prendergast (2007) is concerned with client-specific benefits (perfect and imperfect altruism). In the second group, agents obtain a direct benefit from the effort expended into an activity (activity-oriented motivations). Such studies are concerned with agents that experience an increase in utility just by being personally involved in performing certain tasks or through their personal contributions to output [see e.g. Andreoni (1990), Benabou and Tirole (2003 and 2006) and Delfgauuw and Dur (2007 and 2008)]. However, activity-orientated motivations need not follow from pro-social concerns. Cassar and Meier (2018), drawing on economic studies using survey and experimental design, argue that work represents a source of meaning. Their reasoning also builds upon self-determination theory (Deci and Ryan 1985; Ryan and Deci 2000) where "work meaningfulness" depends on three psychological needs: autonomy, competence (the use of own talent and skills) and relatedness (connection with colleagues). This perspective implies that intrinsic benefits may follow from doing particular tasks that are perceived as joyful, interesting and challenging.

The majority of economic studies on pro-social motivations is multiagent analysis concerned with issues related to signaling, screening and the sorting and self-selection among agents, where agent effort is one-dimensional (single task).[4] In these studies, intrinsically motivated workers are provided with a premium on top of their monetary compensation. This means that employers are able to attract more motivated workers by setting a wage lower than the reservation wage of the non-motivated workers. Murdock (2002) studies the role of inner motivations on the firm's investment decision. He finds that inner motivations influence firms to invest in projects with a higher intrinsic pay-off. Glazer (2004) considers a productive principal and a worker that care about firm output and shows how increased effort can cause the principal to reduce his own contribution into production. Besley and Ghatak (2005) are concerned with the matching of mission-oriented managers and workers. It follows that the endogenous matching of principals and agents with similar altruistic preferences raises productivity and affects the structure of the financial compensation.

Multitasking in the presence of non-pecuniary motivation is typically analyzed by extending the multitask model presented by Holmstrom and Milgrom (1991).[5] Corneo and Rob (2003) study a worker engaged in an individual task and a cooperative task in which the cooperative task produces non-pecuniary benefits. The analysis compares the optimal incentive for a welfare-maximizing firm (public) with those of a profit-maximizing (private) firm. They find that the optimal incentive for private firms is the strongest one, and, that more cooperative effort will be provided in public firms. Schnedler (2009) studies an agent that performs two tasks, both creating benefits for the principal, where one task is considered twice as important as the other task. Two aggregate performance measures are compared where one reflects the preferences of the principal rather well, while the other does not. In Jones et al., (2018), an experiment is designed to examine effects from performance pay on incentivized- and non-incentivized efforts. As part of this analysis they present a theoretical framework, however, their analysis does not consider optimal contracts. Benabou and Tirole (2016) develop a model to examine how the extent of labor market competition affects incentive structures, effort, profits and efficiency. In their baseline model, agents differ in their productivity for the observable activity and in their intrinsic motivation for the unobservable activity.[6] An analysis performed by Helm and Wirl (2021) is close to the one of Benabou and Tirole (2016), but here agents differ with respect to work ethics rather than productivity.

Typically, the literature on multitasking assumes non-pecuniary motivations that are associated with the non-incentivized task, while such motivations are absent for the incentivized task.[7] Besley and Ghatak (2018), however, study an agent that is intrinsically motivated for doing both tasks and where the principal has perfect information related to the agent's performance in producing one of the tasks and an informative signal of the agent's performance related to the other task. The analysis shows that multitasking with an intrinsically motivated agent having private information leads the principal to offer less high-powered contracts compared to the case where inner motivations are absent. In this perspective, it becomes interesting to analyze optimal contract design in situations where agents are intrinsically motivated (activity-orientated) for doing the verifiable task as well.[8]

Our analysis is extended in yet another direction since considering alterative participation constraints. Typical participation constraints of the agency literature refer to agents that accept a proposed wage contract if her utility is higher or equal to a minimum utility level, where the minimum level reflects what she otherwise could have obtained in alternative contractual relationships (see MacLeod and Malcomson, 1989; Holmstrom and Milgrom, 1991; Baker et al., 1994 and Jørgensen and Hanssen, 2018).[9] However, the literature also contains examples of alternative approaches, often denoted limited-liability constraints. One example is Sappington (1983) that imposes limits on the maximum loss that an agent can be forced to bear from contracting with a principal.[10] A second approach introduces a minimum income level irrespective of performance (income-constraint). For example, Besley and Ghatak (2005) consider agents that are intrinsically motivated and suggest a constraint where agents are ensured a minimum consumption (income) level. A third approach introduces minimum net-income constraints. Makris (2009), in a model that consider activity-oriented motivations, introduces a constraint that ensures that the budget cannot fall short of the production costs of the agent. This condition implies that the agent's production costs are born fully by the principal, thus the agent is not allowed to use own wealth in the provision of services. Related constraints are applied by Chone and Ma (2010) and Makris and Siciliani (2013) when studying altruistic agents. According to Chone and Ma (2010), the agent, when choosing effort, is guided by altruistic preferences but participation itself will depend on the profit (net-income) being higher or equal to a minimum level. Makris and Siciliani (2013) characterize the minimum net-profit constraint as being an institutional one since arising from formal or informal requirements (e.g. law, norms and political pressure). According to the authors, this type of limited liability effectively protects altruistic agents from being exploited by principals.

From the above discussions, it follows that three different participation constraint are applied in the literature; utility, income and net-income participation constraints. Assuming a net-income or an income constraint, rather than a utility constraint, means that the principal does not experience any payoff benefits from the agent's inner motivations. Additionally, given the net-income constraint, the agent's participation decision becomes dependent on the payment from the principal, subtracted the agent's disutility. Hence, in this case, the principal has to compensate the agent with respect to such efforts. Given the income constraint, in contrast, the agent does not consider the disutility of efforts as being relevant for the participation decision, consequently, the principal needs not to compensate the agent with respect to the disutility of efforts. In the following we primarily focus at the utility participation constraint and the net-income constraint, however, the analysis of the income constraint is available from the appendices (see App. 1, 2 and 3).

THE PRINCIPAL – AGENT MODEL

The principal's problem is to supply a wage contract at stage 1. At stage 2, given the contract, the agent chooses the effort levels, e and E, where $x = x(E)$ is the production function for activity *x*, and $y = y(e)$ is the production function for activity y. Activity y is supposed to be contractible (verifiable) while activity *x* is non-contractible (non-verifiable). The wage contract is linear and given by;

$$w = by(e) + A \tag{1}$$

where *w* is the agent's total financial compensation, A is the fixed payment, $by(e)$ is variable payments where *b* is the unit payment for the incentivized activity, in the following denoted as "the bonus". In order to simplify the analyses, we restrict ourself to situations where $0 \leq b \leq 1$ and $A \geq 0$, i.e. the wage is a combination between a variable and a fixed non-negative payment.[11]

The multitasking agent can be intrinsically motivated both for *x* and *y* and experiences disutility in inserting efforts into both activities. The agent's utility function is given by;

$$G(e, E) = \alpha y(e) + \beta x(E) + w - v(e, E) \tag{2}$$

α is the agent's utility gain (non-pecuniary benefits) for an extra unit of y where $0 \leq \alpha \leq 1$. The agent's utility gain for an extra unit of *x* is β where $0 < \beta \leq 1$. In the following it is assumed that the principal value *x* and *y* equal to 1, it now follows from the restrictions on α and β that the agent does not value *x* and *y* more than the principal. $v = v(e, E)$ in (2) is the agent's disutility.[12] According to what is commonly presumed in principal-agent models, we assume that;

$$x_E > 0, y_e > 0, X_{EE} \leq 0, y_{ee} \leq 0, v_E > 0, v_e > 0, v_{EE} > 0, v_{ee} > 0 \; and \; v_{eE} \geq 0 \tag{A1}$$

The first four inequalities in (A1) say that the marginal productivities are concavely increasing in efforts. The next four expressions imply that the disutility is strictly convexly increasing in efforts. The final one says that the marginal disutility of a higher E is unchanged or increases as the level of *e* is stepped up, meaning that the agent's efforts are independent or substitutes in the disutility function.[13]

In order to solve the model we use backward induction. We start out by describing the agent's optimal behavior at stage 2. Maximizing the agent's utility with regard to *E* and *e*, for a given wage contract, gives us the following conditions;

$$G_e = (b + \alpha)y_e - v_e = 0 \tag{3a}$$

$$G_E = \beta x_E - v_E = 0 \tag{3b}$$

The second order conditions become;

$$G_{EE} = \beta x_{EE} - v_{EE} < 0, G_{ee} = \alpha y_{ee} + by_{ee} - v_{ee} < 0, G_{eE} = -v_{eE} \leq 0 \tag{4a}$$

$$D = G_{EE}G_{ee} - (G_{eE})^2 > 0 \tag{4b}$$

From (3ab) we observe that optimal agent behavior is characterized by balancing the marginal gain from supplying more effort into activities *y* and *x*, respectively, with the marginal disutility that arises from more effort use.[14] Notice that for (A1), the inequalities in (4a) is satisfied, while (4b) gives an additional restriction on the agent's utility function, i.e. $-G_{EE} > -G_{eE}$ and $-G_{ee} > -G_{eE}$. It is now of interest to see how the efforts are affected by changes in b, β and α. Let $e = e(b; \alpha, \beta)$ and $E = E(b; \alpha, \beta)$ be functions that define how the agent's optimal behavior is dependent on b, α and β (the response functions). Differentiation of (3ab), using (4ab), gives us:

$$e_b = \frac{1}{D} y_e (v_{EE} - \beta x_{EE}) > 0 \quad \text{and} \quad E_b = -\frac{1}{D} y_e v_{eE} \leq 0 \tag{5a}$$

$$e_\alpha = \frac{1}{D} y_e (v_{EE} - \beta x_{EE}) > 0 \quad \text{and} \quad E_\alpha = -\frac{1}{D} y_e v_{eE} \leq 0 \tag{5b}$$

$$e_\beta = -\frac{1}{D} (x_E v_{eE}) \leq 0 \quad \text{and} \quad E_\beta = \frac{1}{D} x_E (v_{ee} - (\alpha + b) y_{ee}) > 0 \tag{5c}$$

As expected, the higher the bonus, *b*, the higher the effort that determines the incentivized activity, *e* ("the direct bonus effect") (see 5a). The effect from a higher b on the effort that determines the non-incentivized activity, E, (the "indirect bonus effect") is given much attention in the multitasking literature (see the second equation in 5a). We observe that this effect is zero for $v_{eE} = 0$ (independent efforts), while being negative for $v_{eE} > 0$ (substitutes) meaning that the non-incentivized activity is reduced in response to a higher bonus. The impacts from the two types of motivations are available from (5b) and (5c). From (5b) it follows that a higher degree of motivation for the incentivized activity, i.e. the higher α, the more effort, e, is allocated to activity, y, and this effect is dependent on the motivation for the non-incentivized activity.[15] The effort allocated to the non-incentivized activity, E, remains constant for $v_{eE} = 0$ and is reduced for $v_{eE} > 0$. From (5c), we identify the effects from higher motivation on the non-incentivized activity (higher β). It follows that the effort that produces the non-incentivized activity, *E*, increases and this effect is dependent on the motivation for the incentivized activity. The effort that produces the incentivized activity, e, is constant ($v_{eE} = 0$) or lower ($v_{eE} > 0$). Moreover, we notice from (5a) and (5b) that the marginal effects on the agent's efforts are the same for small changes in b and α, i.e. $e_b = e_\alpha$ and $E_b = E_\alpha$. Finally, it follows from (4ab) and (5abc) that $-G_{EE} = v_{EE} - \beta x_{EE} > -G_{eE} = v_{eE}$ and $-G_{ee} = v_{ee} - (b + \alpha) y_{ee} > -G_{eE} = v_{eE}$, meaning that $e_b = e_\alpha > -E_b = -E_\alpha$ and $E_\beta > -e_\beta$. Hence, an increase in the motivation for a particular activity generates an increase in the effort that produces the same activity that always dominates the (possible) reduction in the effort producing the other activity. It also follows that an increase in the bonus implies an increase in the incentivized effort that will dominate the (possible) reduction in effort that produces the non-incentivized task.

The principal's valuation of both activities, *M*, is given by

$$M = x + y \tag{6}$$

The principal's profit, π, is then defined as follows;[16]

$$\pi = y(e) + x(E) - w = y(e) + x(E) - by(e) - A \tag{7}$$

In the following, we derive the expression for the profit of the principal for each of the two constraints where we interpret the restrictions as the agent's possible outside options. The utility constraint, *U*, is as follows;

$$G(e, E) \geq \bar{G} \tag{8a}$$

where $\bar{G}$ is the minimum utility level, reflecting what the agent otherwise could have obtained in an alternative contractual relationship where there are no inner rewards for fulfilling the contract. This means that for the agent, being a nurse, a professor or any other particular profession, $\bar{G}$ measures what she could obtain in utility by working when the motivations for doing the particular task are absent. Using (1) and (2), the fixed payment, *A*, has to fulfill the following condition;

$$A \geq \bar{G} + v(e, E) - (\alpha + b)y(e) - \beta x(E) \tag{8b}$$

If this constraint is binding, the principal will not pay higher wages than necessary, therefore (8b) holds as an equality.[17] Inserting (8b), interpreted as an equality, into (7), the profit of the principal, given *U*, now becomes;

$$\pi^U = (1 + \alpha)y(e(b; \alpha, \beta)) + (1 + \beta)x(E(b; \alpha, \beta)) - v(e(b; \alpha, \beta), E(b; \alpha, \beta)) - \bar{G} \tag{9}$$

When the net-income participation constraint, *N*, is relevant, the agent ignores motivations in her participation decision. For this reason she accepts the contract if the total compensation, subtracted the disutility of efforts, $H = w - v(e, E)$, is equal to or above a certain minimum level $\bar{H}$; $\bar{H} \leq H$.[18] $\bar{H}$ refers to what the agent could have obtained in an alternative contractual relationship where she is able to achieve the same non-pecuniary rewards (work meaning) as will be the case when working for the principal in question. This seem reasonable for a professor (nurse) who is considering the possibility to work for another university (hospital) where her (his) net income will be $\bar{H}$. Working for another university (hospital) means that he (she) is driven by the same motivations, giving her (him) the same kind of pleasure, no matter the actual chosen institution, i.e. the same motivations appear regardless which university (hospital) she (he) is working for. Now, using (1), the restriction in this case yields;

$$H = A + by(e) - v(e, E) \geq \bar{H} \tag{10a}$$

By reformulating (10a) we get;

$$A \geq \bar{H} + v(e, E) - by(e) \geq 0 \tag{10b}$$

By using (10b) in (7), assuming that (10b) holds as an equality, the profit of the principal becomes;

$$\pi^N = y(e(b; \alpha, \beta)) + x(E(b; \alpha, \beta)) - v(e(b; \alpha, \beta), E(b; \alpha, \beta)) - \bar{H} \tag{11}$$

A comparison between (9) and (11) reveals that the expressions are structurally different. The effects on the principal's profit from the motivations, α and β, arise directly in the first and second term, and indirectly via the agent's response functions, $e = e(b; \alpha, \beta)$ and $E = E(b; \alpha, \beta)$, for participation constraint *U* (see 9). For participation constraint *N*, the motivations impact the valuation of the activities only in an indirect way (via the response functions) (see 11). The deviation between the profits in (9) and (11) is given by:

$$\pi^U - \pi^N = \alpha y\big(e(b; \alpha, \beta)\big) + \beta x\big(E(b; \alpha, \beta)\big) - (\bar{G} - \bar{H}) > (<) 0 \tag{12}$$

THE OPTIMAL CONTRACTS

We now deduce the necessary conditions for the optimal contract, i.e. we move to stage 1 of the model where the principal maximizes profit with regard to *b*. It is supposed that the principal knows which kind of participation condition the agent considers. We start out with the case where the principal knows that the agent's participation decision depends on both pecuniary and non-pecuniary rewards (the utility case; *U*), thereafter we consider the alternative (the net-income case; *N*). (In App. 1, we also consider a third participation constraint).[19]

The Utility Case (Case *U*)

From (9), it follows that the first order condition becomes[20];

$$\pi_b^U = ((1+\alpha)y_e - v_e)e_b + ((1+\beta)x_E - v_E)E_b = 0 \tag{13}$$

Now, by using (3ab), (13) can be rewritten as (where the optimal value of b is denoted b^U);

$$b^U = \frac{\beta v_e e_b + \alpha v_E E_b}{\beta v_e e_b - v_E E_b} = \frac{y_e e_b + x_E E_b}{y_e e_b} = 1 + \frac{x_E v_{eE}}{y_e(\beta x_{EE} - v_{EE})} = 1 + \frac{x_E E_b}{y_e e_b} \tag{14}$$

From (14) we see that the size of the optimal bonus is determined by a direct effect and a spill-over term (an indirect effect). The spill-over term, $\frac{x_E E_b}{y_e e_b}$, is zero or negative and its significance depends on the first derivative of the production functions, on the direct bonus effect, e_b, and on the indirect bonus effect, E_b. The denominator, $y_e e_b$, measures the effect on activity y from a marginal change in b and is positive (see 5a). The numerator, $x_E E_b$, measures the effect on activity x from a marginal change in b. From (5a) we know that this effect is zero (independent efforts) or negative (substitutes). For independent efforts; $v_{eE} = 0 \Longrightarrow E_b = 0$, we find, not surprisingly, that $b^U = 1$ meaning that the variable payment correlates perfectly with the agent's incentivized performance. For non-independent effort levels (substitutes); $v_{eE} > 0 \Longrightarrow E_b < 0$ and $\frac{x_E E_b}{y_e e_b} < 0$, we find, as expected, that $b^U < 1$,[21] thus variable payments only partly correlate with the agent's incentivized performance. The expression in (14) confirms the conclusion of the multitasking literature that ignores intrinsic motivations, since what matters for the optimal size of the bonus is the marginal benefits of the efforts in combination with the balancing of the agent's effort allocation.[22]

Next, we study the effects on the optimal bonus from higher motivations. To simplify, we assume that all third derivatives are equal to zero, i.e.

$$y_{eee} = x_{EEE} = v_{eee} = v_{eeE} = v_{eEE} = v_{EEE} = 0 \tag{A2}$$

Differentiation of (14) with regard to α and β, using (5ac) and (A2), yields the following expressions;

$$\frac{\partial b^U}{\partial \alpha} = b_\alpha^U = \frac{1}{T} v_{eE}[y_{ee}x_E e_\alpha - x_{EE}y_e E_\alpha] \leq 0 \tag{15}$$

$$\frac{\partial b^U}{\partial \beta} = b_\beta^U = \frac{1}{S} v_{eE}\left[(\beta x_{EE} - v_{EE})\left[y_e x_{EE} E_\beta - y_{ee} x_E e_\beta\right] - x_E y_e x_{EE}\right] \geq 0 \tag{16}$$

where

$$T = v_{eE}(y_e x_{EE} E_b - y_{ee} x_E e_b) + (y_e)^2 (v_{EE} - \beta x_{EE}) > 0$$
$$S = [y_e(v_{EE} - \beta x_{EE})]^2 + v_{eE}(v_{EE} - \beta X_{EE})[y_e x_{EE} E_b - x_E y_{ee} e_b] > 0$$

For independent efforts, $v_{eE} = 0$, the two expressions (15) and (16) become zero while for non-independent efforts, $v_{eE} > 0$, (15) is negative and (16) is positive, thus both motivations impact the optimal bonus. Moreover, since the denominator is always higher than the absolute value of the numerator in (15), i.e. $v_{eE}[x_{EE}y_e E_\alpha - y_{ee}x_E e_\alpha] < v_{eE}(y_e x_{EE} E_b - y_{ee} x_E e_b) - (y_e)^2(\beta x_{EE} - v_{EE})$, it follows that $-1 < b_\alpha^U \leq 0$. Consequently, the principal's reaction to a marginal increase in α is to reduce b. The absolute value of this reduction is always less than the initial marginal increase in α as $-1 < b_\alpha^U \leq 0$. Finally, we observe that both (15) and (16) are zero for linear production functions; $y_{ee} = 0$ and $x_{EE} = 0$. The above discussion confirm that for more motivated agents, the demand for incentive pay is lower. However, this conclusion is only relevant for the incentivized activity since a higher motivation for the non-incentivized activity, implies a higher demand for incentive pay. Moreover, in App. B we show that incentivized effort and profit are increasing with α, while non-incentivized effort is decreasing (or constant for independent efforts) as the motivation for incentivized effort is increasing. The fixed wage is decreasing when α becomes higher, while both the size of the variable payment and the total payment can be both increasing and decreasing as

α becomes higher. Furthermore, a marginal increase in the motivation for *x* has intermediate influences on all these variables with one exception; the fixed payment, *A*, will be reduced (see equations b1-b5 in App. B for further details).

The Net-Income Case (Case *N*)

By maximizing (11) with regard to *b*, we get the following optimality condition;[23];

$$\pi_b^N = (y_e - v_e)e_b + (x_E - v_E)E_b = 0 \tag{17}$$

Now, by using (3ab), (17) can be expressed as (the optimal value of *b* for *N* is denoted b^N);

$$b^N = \frac{(1-\alpha)\beta v_e e_b + (1-\beta)\alpha v_E E_b}{\beta v_e e_b - (1-\beta)v_E E_b} = 1 - \alpha + (1-\beta)\frac{x_E E_b}{y_e e_b} \tag{18}$$

The expression in (18) deviates from the same expression for case *U* (see 14) since now both α and β enters in a direct way (not only indirectly via the response function). The explicit presence of α and β in (18) confirms that neither of the two motivations induces a motivational rent for the principal. Given independent efforts; $v_{eE} = 0 \implies E_b = 0$, the optimal bonus becomes $b^N = 1 - \alpha,$ thus the optimal bonus depends on the motivation for the incentivized activity, α, while it is independent of the motivation for the non-incentivized activity, β. To the extent the agent and the principal value the incentivized activity similarly, i.e. α = 1, the optimal contract becomes a fixed wage contract. Given non-independent efforts (substitutes); $v_{eE} > 0 \implies E_b < 0$, a spill-over term is introduced and this term differs from the one identified for case *U* since being multiplied with $(1-\beta)$. The presence of this term means that the spill-over term is given less weight compared with case *U*. The reduced weighting occurs because the closer the agent's valuation of activity *x*, relatively to the valuation of the principal, the less weight is given to this effect.[24]

By using the equations in (5abc) and (A2), the differentiation of (18) with regard to α and β, yields the following expressions;

$$\frac{\partial b^N}{\partial \alpha} = b_\alpha^N = -1 < 0 \tag{19}$$

$$\frac{\partial b^N}{\partial \beta} = b_\beta^N = \frac{1}{\psi} v_{eE}\left[(1-\beta)(\beta x_{EE} - v_{EE})\left(y_e x_{EE} E_\beta - y_{ee} x_E e_\beta\right) - x_E y_e (x_{EE} - v_{EE})\right] \geq 0 \tag{20}$$

where $\psi = [y_e(\beta x_{EE} - v_{EE})]^2 + (1-\beta)v_{eE}(\beta X_{EE} - v_{EE})[x_E y_{ee} e_b - y_e x_{EE} E_b] > 0$

From (19) we observe that the effect on the optimal bonus from a higher motivation for the incentivized activity, α, is negative both for independent and non-independent efforts and that an increase in such a motivation is offset by an equivalent reduction in the optimal bonus. From (20) we see that a higher motivation for the non-incentivized activity, β, does not impact the optimal bonus, b^N, if $v_{eE} = 0$ while for substitutes, $v_{eE} > 0$, the optimal bonus increases with β. This last finding follows because a higher motivation for activity *x*, implies a higher effort of the type that produces this activity. This effect again makes it more costly for the agent to supply the effort that produce activity *y*, thus the agent becomes compensated by the principal for this increase in "costs" via the optimal bonus. Finally, we observe, in contrast to case *U*, that both motivations impact the optimal bonus for linear production functions. For $y_{ee} = x_{EE} = 0$, it is seen that $b_\beta^N = \frac{x_E v_{eE}}{y_e (v_{EE})^2} \geq 0$ where the equality holds when $v_{eE} = 0$. Furthermore, in App. 2 we show that a marginal increase in the inner motivation for *y* has no effects on efforts, profit or the total payment. The only change is now that an increase in α will reduce variable payments with an (absolute) amount that equals the increase in the fixed payment. When it comes to a change in the inner motivation for doing the non-incentivized task, however, there are indeterminate effects on all variables, and no certain conclusions regarding the signs can be drawn (see equations b6-b10 in App. 2 for further details).

A Comparison: The Utility Case and The Net-Income Case

In this section we compare the findings arrived at for case U and case N. Let us first discuss which of the bonuses that are highest. It follows that if the marginal profit with regard to b for case U is higher (lower) than the marginal profit with regard to b for case N, then b^U (b^N) is highest. From (12), (14) and (18), it is seen that the sign of difference in the marginal profit with regard to b between case U and case N is defining which of the bonuses that are highest; i.e.:

$$\pi_b^U - \pi_b^N = \alpha y_e e_b + \beta x_E E_b \geq (<) 0 \text{ implies } b^U \geq (<) b^N \tag{21a}$$

The difference stems from the potential advantage (disadvantage) the principal obtains from the presence of motivations when the utility constraint, instead of the net-income constraint, holds as a restriction. The first term, $\alpha y_e e_b$, measures the direct positive effect in terms of additional marginal utility for case U, relatively to case N, from increasing b since leading to higher values of e and y, while the second term, $\beta x_E E_b$, measures the possible negative spillover-effect that arises because E and x might be reduced. In situations where the motivation for the incentivized task, α, is relatively high (low), the motivation for the non-incentivized task, β, is relatively low (high) and/or the value of $y_e e_b$ is relatively high (low) compared to the value of $x_E E_b$, the bonus for case U becomes higher (lower) than the one for case N because the direct (indirect) effect dominates the indirect (direct) effect. Using the conditions in (5a) means that the inequality in (21a) can be reformulated as

$$\alpha \geq (<) \frac{\beta x_E v_{eE}}{y_e(v_{EE} - \beta x_{EE})} \text{ implies } b^U \geq (<) b^N \tag{21b}$$

Moreover, it follows from (16) and (20) that the optimal b's are independent of the motivation for the non-incentivized activity, i.e. the value of β when the efforts are independent, i.e. $v_{eE} = 0$. From (21b) it is seen that for independent effort the b is always higher for case U relatively to case N except when $\alpha = 0$ which gives $b^N = b^U = 1$, see (14) and (18). This means that for independent efforts, in combination with an agent being without any motivation for doing the incentivized task, the principal should set the maximum bonus, independent of the (binding) participation constraint considered. Moreover, by comparing (14) and (18), in the case of independence in efforts it follows that as the motivation for the incentivized task becomes positive, the bonus is reduced for case N while it is unchanged for case U. When the agent has a motivation for the incentivized task that is the highest possible one (equal to one), the difference between the two cases is significant. For case N, the principal should apply a fixed wage (i.e. the optimal bonus equals zero), while for case U the optimal bonus remains equal to one.

In the case of non-independent efforts (substitutes), we already know that a higher value of α reduces the size of the optimal bonus both for case U and case N (see 15 and 19). For case N, the partial effect from α is constant and equal to minus one (see 19), while for case U it is higher than minus one and depends on the degree of substitution (see 19), i.e. $-1 = b_\alpha^N < b_\alpha^U \leq 0$. A higher value of β increases the size of the optimal bonus for both cases (see 16 and 20). As seen from (14) and (18), the influence from a change in β is different. For case N, a higher motivation for the non-incentivized task directly reduces the spillover-effect, in addition to have an indirect effect, as for case U. However, the indirect effect in case N is lower than in case U, implying that it is generally ambiguous whether the increase in the bonus is highest in the N or the U case.[25] Moreover, it is seen from comparing (14) and (18) that an increase in the degree of substitutability between the efforts in the disutility function (i.e. v_{eE} becomes higher) means that both b^U and b^N decrease. It is also seen that the bonus in case N is less sensitive to changes in v_{eE} relatively to the bonus in case U since $(1-\beta) < 1$.

The ranking of the optimal bonuses for four agent archetypes, given non-independent efforts, are summarized in Table 1. We first notice that "Homo economicus", characterized by the absence of motivations for both tasks, ($\alpha = 0$ and $\beta = 0$) implies that case U and case N both yield a positive optimal bonus being below 1 (a standard finding from the multitasking literature). For "the research-driven professor", being perfectly motivated for doing the incentivized task (research), combined with the absence of motivation for the non-incentivized task (teaching) ($\alpha = 1$ and $\beta = 0$), leads, due to the balancing of the incentives directed at the two tasks, to a positive bonus being less than 1 for case *U*. For case *N*, the optimal bonus becomes negative, but since we have restricted ourselves to consider non-negative bonuses, *b* is in this case set equal zero (fixed payment) in Table 1. The negative bonus for case *N* follows, despite studying agent being perfectly motivated for the incentivized task, due to a negative spill-over effect (non-incentivized tasks). The above discussion makes clear that the optimal bonus for "the research driven professor" is critically dependent on the participation constraint considered.

TABLE 1
A COMPARISON OF THE OPTIMAL CONTRACTS FOR CASE U AND CASE N FOR PARTICULAR VALUES OF THE INNER MOTIVATIONS (AGENT ARCHETYPES): NON-INDEPENDENT EFFORTS (SUBSTITUTES, $E_b < 0$)

	$\boldsymbol{\beta \to 0}$	$\boldsymbol{\beta = 1}$
$\boldsymbol{\alpha = 0}$	$0 < b^N = b^U < 1$ **Homo economicus**	$0 < b^U < b^N = 1$ **The care-driven nurse**
$\boldsymbol{\alpha = 1}$	$0 = b^N < b^U < 1$ **The research-driven professor**	$0 = b^N < b^U < 1$ **The perfectly motivated agent**

Our results as concerning "the care-driven nurse,"($\alpha = 0$ and $\beta = 1$), are almost the opposite of those arrived at for "the research- driven professor." Again, the optimal bonus for case *U* is less than 1 (balancing the incentives directed at the two tasks) but now this level is lower than the optimal level for case *N*. Given case *N*, the agent is perfectly incentivized as concerning the non-incentivized task meaning that a bonus equal to 1 will ensure the optimal amount of the incentivized task. For "the perfectly motivated agent", ($\alpha = 1$ and $\beta = 1$) we arrive at results very similar to the ones arrived at for "the research-driven professor." The only difference occurs for case *N*, since now the optimal bonus defined by (18), is exactly equal to zero (and not because of restricting ourselves to non-negative bonuses, as is the case for "the research-driven professor").

THE FIRST BEST VERSUS THE OPTIMAL CONTRACTS

We expect that the optimal contracts will not realize the first best since one activity is non-contractible. However, it is clearly of interest to study deviations in efforts from the first-best solution across cases. The choice of welfare criteria, however, is not obvious due to the presence of intrinsic motivations. One possibility would be to apply a strictly utilitarian approach implying the summation of the profit of the principal and the utility of the agent. Implicitly, since adding the utilities (benefits) related to producing the activities *x* and *y*, this means that the utilitarian welfare function becomes analogous to treating the benefits for the principal and the agent as public goods and subtracting the disutility in inserting efforts in the production, i.e.

$$W = (1 + \alpha)y(e) + (1 + \beta)x(E) - v(e, E) \tag{22}$$

Given the utilitarian welfare function (see 22), the first best solution is defined by; [26]

$$W_e = (1 + \alpha)y_e - v_e = 0 \tag{23}$$

$$W_E = (1 + \beta)x_E - v_E = 0 \tag{24}$$

The optimality conditions in (23) and (24) are analogous to the conditions that follow from maximizing the profit of the principal given case *U* with regard to *e* and *E*, see equation (9). In the following, the first best effort values defined by the utilitarian welfare function are denoted e^W and E^W.[27] In order to explicitly compare the welfare solution in (23) and (24) with the outcomes from case *U* and case *N*, let us simplify by assuming that the disutility function is quadratic in *e* and *E* combined with linear production functions, i.e. $y_{ee} = x_{EE} = 0$. In our further discussion, we have chosen the following specifications;

$$(i)\ y = y(e) = e,\ (ii)\ x = x(E) = E,\ (iii)\ v = v(e, E) = \frac{1}{2}e^2 + \frac{1}{2}E^2 + \gamma eE,\ 0 \leq \gamma < 1 \quad \text{(A3)}$$

Then it follows from (3a), (3b), (14), (18), (23) and (24) that $b^U = 1 - \gamma$, $b^N = 1 - \alpha - \gamma(1 - \beta)$, $e^U = \frac{1+\alpha-\gamma(1+\beta)}{1-\gamma^2}$, $E^U = \frac{\beta-\gamma(1+\alpha-\gamma)}{1-\gamma^2}$, $e^N = \frac{1}{1+\gamma}$, $E^N = \frac{\beta(1+\gamma)-\gamma}{1+\gamma}$, $e^W = \frac{1+\alpha-\gamma(1+\beta)}{1-\gamma^2}$ and $E^W = \frac{1+\beta-\gamma(1+\alpha)}{1-\gamma^2}$. In Table 2 we have compared case *U* and case *N* with the welfare optimal values. First we notice that the condition in (21), defining which of the *b*'s that are highest, simplifies to $\alpha \geq (<) \beta\gamma$. In the columns of Table 2 we have specified the four cases where $\gamma = 0, \gamma < \frac{\alpha}{\beta}, \gamma = \frac{\alpha}{\beta}$ and $\gamma > \frac{\alpha}{\beta}$, while the rows rank the values of *b*, *e* and *E*. Given independent efforts (see the first column), it follows that the effort for the incentivized task is lower than the welfare optimal level for case *N* while they are equal for case *U*. The efforts that belong to the non-incentivized task are the same for case *N* and case *U* and lower than the welfare optimal level. Hence, case *N* gives less welfare than case *U* for independent efforts. In situation where the direct effect dominates the indirect effect ($\gamma < \frac{\alpha}{\beta}$; see the second column), the same conclusion matters for the efforts that belong to the incentivized task, while the efforts that belong to the non-incentivized task (case *N* and case *U*) are lower than the welfare optimal level, and lowest for the case *U*. Generally, this means that we cannot determine whether case *U* or case *N* represents the most significant deviation from welfare optimality. When the direct effect is equal to the indirect effect (the third column), the efforts that belongs to the incentivized activity and the non-incentivized are the same for the two cases, thus producing similar welfare outcomes. Finally, when the indirect effect dominates ($\gamma > \frac{\alpha}{\beta}$), case *U* produces the welfare optimal level for the effort that belong to the incentivized task while the other effort level is lower than the welfare optimal level. Case *N* yields a higher level of the effort that belongs to the incentivized task, relatively to the welfare optimal level, and a lower level of the effort that belongs to the non-incentivized task. Additionally, the value of non-incentivized effort is lower for case *N*, relatively to case *U*, implying that the deviation from the welfare optimality is more significant for case *N* relatively to case *U*. Generally, the comparison exemplifies that there might be considerable welfare losses practicing optimal contracts when having inner motivations in multitasking principal-agent relationships.

TABLE 2
THE RANKING OF EFFORTS (CASE *U*, CASE *N* AND THE FIRST-BEST LEVELS): A QUADRATIC DISUTILITY FUNCTION AND LINEAR PRODUCTION FUNCTIONS WHEN $0 < \alpha < 1$ AND $0 < \beta < 1$

	$\gamma = 0$ The efforts are independent	$0 < \gamma < \frac{\alpha}{\beta}, \gamma < 1$ Direct effect dominates indirect effect	$0 < \gamma = \frac{\alpha}{\beta} < 1$ Direct effect equals indirect effect	$0 < \frac{\alpha}{\beta} < \gamma < 1$ Indirect effect dominates direct effect
b	$b^N < b^U = 1$	$b^N < b^U < 1$	$b^N = b^U < 1$	$b^U < b^N < 1$
e	$e^N < e^U = e^W$	$e^N < e^U = e^W$	$e^U = e^N = e^W$	$e^W = e^U < e^N$
E	$E^N = E^U < E^W$	$E^U < E^N < E^W$	$E^U = E^N < E^W$	$E^N < E^U < E^W$

CONCLUDING REMARKS

We study agents that are intrinsically motivated for performing both tasks where only one of the tasks is contractible for the principal. The best outside option for the agent could either be to work for another principal that does not produce any non-pecuniary benefits (implying a utility participation constraint) or for a principal where non-pecuniary benefits are expected (implying a net-income participation constraint). The two optimal wage contracts analyzed are both conditional on the degree of inner motivation for both tasks (the incentivized and the non-incentivized task) and the degree of substitution (between the efforts in the agent's disutility function). Furthermore, the optimal contract will generally differ, depending on the relevant outside option for the agent in question; a binding utility participation constraint (utility case) or a binding net-income participation constraint (net-income case). The optimal wage contract is only independent of the type of outside option in the special case where efforts are independent (in the agent's disutility function) in combination with the agent not being intrinsically motivated for doing the incentivized task.

The following effects are valid for the utility case and the net-income case; (i) the higher the inner motivation for the incentivized task, the lower the optimal bonus (i.e. more low-powered contracts), (ii) the lower the inner motivation for the non-incentivized task, the higher the optimal bonus (i.e. more low-powered contracts), and, (iii) the higher the degree of substitution, the lower the optimal bonus (i.e. more low-powered contracts). The significance of the above effects, however, will depend on the relevant outside option. The optimal bonus for the utility case, relatively to the net-income case, is less sensitive to changes in the inner motivations for the incentivized task, while for changes in the degree of substitution the opposite conclusion matters. However, for changes in the inner motivation for the non-incentivized task, the marginal increase in the bonus for the net-income case could be both higher and lower than for the utility case.

Whether or not the optimal bonus is higher or lower for the utility case, relatively to the net-income case, will depend on the impact on the principals' marginal profit from a higher bonus. This impact consists of two effects; (i) a positive direct effect reflecting the increase in agent utility from investing more effort into the incentivized task, and, (ii) a negative indirect effect reflecting the decrease in agent utility from investing less effort into the non-incentivized task. The positive direct effect becomes higher (lower), the higher (lower) the degree of inner motivation for the incentivized task. The negative indirect effect becomes lower (higher), the lower (higher) the degree of inner motivation for the non-incentivized task and the lower (higher) the degree of substitution. When the direct effect dominates (is dominated by) the indirect effect, the optimal bonus will be highest (lowest) for the utility case. This means that a relatively high (low) inner motivation for the incentivized task, a relatively low (high) inner motivation for the non-incentivized task and a relatively low (high) degree of substitution yield a more (less) high powered contract for the utility case relatively to the net-income case.

The above reasoning may represent possible new theoretical explanations for why low-powered contracts are frequent in higher education and in the caring industry. To exemplify, consider the situation with a given degree of substitution between the two efforts in the disutility function. If professors have a high degree of inner motivation from doing an incentivized task (research) and a relatively low degree of inner motivation from doing a non-incentivized task (teaching), and their preferred outside option is to seek employment in another university providing similar non-pecuniary benefits (the net-income case), the optimal contract will be a low-powered one. However, the same conclusion may follow for agents that have the opposite distribution of non-pecuniary benefits. One possible example is health care workers characterized by a relatively low degree of inner motivation for the incentivized task (administration) and a relatively high degree of inner motivation for the non-incentivized task (nursing), and where their best outside option is associated with leaving the care industry for a sector characterized by the absence of inner motivations (the utility case). The two examples show that opposite distributions of inner motivations across tasks might produce similar optimal contracts (low-powered contract) for agents that have different binding participation constraints. These results follow directly from the difference in agent's participation decision in the two cases. If the utility constraint is relevant, the inner motivations for the tasks directly counts in the principal’s utility, while it does not when the agent’s participation is decided by comparing possible net-incomes.

When it comes to welfare consequences, we find that in cases where the inner motivation for the incentivized task is relatively high and/or the inner motivation for the non-incentivized effort is relatively low, under-investments in both tasks (efforts) will occur independent of the relevant outside option. In this particular case, the incentivized effort level is lowest for the net-income case while non-incentivized effort is lowest for the utility case. Hence, generally it is not possible to conclude as to the deviation from the welfare optimal solution being highest or lowest for the utility case relatively to the net-income case. Turning to the situation where the inner motivation for the incentivized task is relatively low and/or the inner motivation for the non-incentivized is relatively high, incentivized effort is welfare optimal while non-incentivized effort is lower than the welfare optimal level for the utility case. For the net-income case, incentivized effort is higher and non-incentivized effort lower than the welfare optimal levels. Moreover, the deviation in non-incentivized effort level is highest for the net-income case, hence, we can conclude, for this particular case, that the utility case yields higher welfare than net-income case.

Our findings opens for a discussion of optimal contracts and their economic efficiency in the interplay between multitasking, inner motivations for several tasks and variations in outside options (participation constraints). Evidence confirms that workers’ incentives through pay-for-performance contracts are weak in the public sector. According to our findings, such observations might be explained by inner motivations being significant for incentivized tasks while being weak for non-incentivized tasks in combination with agents that ignore non-pecuniary rewards in their participation decisions. Moderate and low bonuses might also be the result of agents having weak motivations for verifiable tasks while having strong motivations for non-verifiable tasks in combination with agents that include non-pecuniary rewards when making their participation decision.

However, if the principal and agent are aware of the inability of the optimal contracts to realize the first best solution, an additional explanation for why performance-pay-contracts are rare in the public sector becomes apparent. Suppose that the non-verifiable activity is observable but non-contractible for the principal, and there are considerable gains from reaching the first best relatively to the optimal contracts. If so, there is a strong incentive for the parties to reach implicit agreements, possibly characterized by a (temporary) fixed wage contract to the agent. For instance, local wage negotiations for academic staffs, frequently observed at universities, might be perceived as institutional responses to such incentive problems.

Future theoretical works should consider less restrictive assumptions. In particular, an interesting avenue would be to study principals that are imperfectly informed about the relevant participation constraints of the agent in question. It would also be possible to confront our results with different empirical contexts, and collect data to provide information about the agent’s perceptions as concerning outside options. However, despite simplifying assumptions, we believe that our analysis complements existing literature.

ENDNOTES

1. Heath (1999), on the basis of laboratory and field studies, finds that people perceive own motivations like learning new things, developing skills, accomplishing something worthwhile, and feeling good about oneself as being more important than own extrinsic motivations (pay, benefits, security, and praise from managers). The same studies confirm the presence of beliefs where others are more motivated than themselves by extrinsic incentives and less motivated by intrinsic ones.
2. Pro-sociality is often discussed in association with public service motivation and mission-oriented agents. For a survey on such motivations, see Perry et al. (2010). Tonin and Vlassopoulus (2015) find that a social cause, in addition to the public sector and care-related sectors, also arises in connection with corporate philanthropy and corporate social responsibility.
3. Murdock (2002), when referring to Galbraith (1977) and Staw (1977 and 1989), distinguishes between the following two types of intrinsic motivations; task involvement and goal identification. Task involvement

denotes the degree to which an agent derives utility from the actual performance of a task. Under goal identification, agents have objectives for accomplishment that are independent of any financial reward.

4. There is also a literature being concerned with how monetary incentives may crowd-out intrinsic motivation (see for example Frey, 1997; Deci et al., 1999; Grepperud and Pedersen, 2006). For a more general discussion of this topic see Gneezy et al., (2011). Benabou and Tirole (2003), study a conflict between extrinsic and intrinsic motivation that arises from the fact that providing high-powered incentives may send a negative signal about the task or agent ability. Benabou and Tirole (2006) study individuals that value extrinsic rewards, enjoy doing an activity, and care about their self-image where the self-image depends on how individuals care for their reputation.
5. Holmstrom and Milgrom (1991) do not explicitly consider agents that derive intrinsic utility from particular tasks, however, such a possibility is discussed; "We are assuming that teachers are motivated to teach some higher-thinking skill even without explicit financial incentives to do so" (Holmstrom and Milgrom, 1991, footnote 9, page 33).
6. Benabou and Tirole (2016) also consider the case with both tasks being observable (incentivized) and where one is measured with more noise than the other.
7. An exception is Schnedler (2009) since both tasks (efforts) are assumed to be non-observable while aggregate performance is observable with noise.
8. Given action-oriented motivations, the standard neoclassical preferences of agents (income and effort disutility) are extended by introducing a term that is a positive function of effort [see for example the discussions in Francois (2007), Francois and Vlassopoulus (2008), Carpenter and Gong (2016) and Cassar and Meier (2018)].
9. Here we denote such a participation constraint as the utility constraint.
10. Sappington (1983) uses the term "limited liability" about contracts that incorporate limits on the ex post liability of the agent. Examples of such contracts are when; (i) information about risk is incomplete, (ii) social concerns that warrant subsidies for the participation in certain activities, and, (iii) paternalism and/or equity considerations that mandate risk-spreading or the guarantee of a subsistence level of "well-being".
11. Since our focus primary is on wage contracts, we rule out the possibilities of having a negative A. Hence, the franchise contract, defined by the situation where the principal is selling the job to the agent, obviously being an optimal solution, is not discussed.
12. To simplify we assume separable production functions. This means that interrelationships between the two efforts are only present via the disutility function.
13. Here we focus on the case in which the efforts are substitutes (or independent) since limiting the number of cases to consider. Furthermore, this case is the most relevant one since we consider time-consuming activities in which the increase of one type of effort will increase the marginal disutility of inserting the other type of effort. An extension is to consider the case where an increase in one type of effort will reduce the marginal disutility of inserting the other type of effort (complements).
14. For the case where $\alpha = 0$, (3ab) does not define an optimal value of e when b is zero. In this case, it seems likely that the agent inserts a minimum value of e to prevent the principal from firing the agent. Since y is contractible and verifiable, the principal may define contractual requirements so that the agent will be fired if these are broken.
15. In the following when referring to "motivation" we mean inner motivation or intrinsic motivation.
16. Holmstrom and Milgrom (1991) discuss several model versions. In their general set-up, the different activities can be measured with varying precision where the agent is risk-averse and the principal is risk-neutral. Furthermore, the utility function of the agent is exponential while general functions describe the gross benefit function of the principal and the cost function of the agent. In their "teacher example" (see section 2.3), they consider two activities described by linear production functions where one activity (basic skills) is observable and the other (higher-order thinking skills) is unobservable. In our set-up, we introduce inner motivation for both activities (one being perfectly observable and the other being unobservable) while assuming linear production functions and an additive gross benefit function (see 6). Holmstrom and Milgrom (1991) have already shown that the optimal linear contract is independent of the cross-partials of the gross benefit function.
17. In the reminder of this work, all participation constraints considered are assumed to be binding,
18. For constraint N, the agent can be perceived as having lexicographical preferences. First, H must exceed a certain level if the agent is to accept the contract. The utility determines the effort into production and is relevant only when H is equal or above the certain level of H. In the work of Chone and Ma (2010), the agent,

when choosing the activity level, is guided by an inner motivation preference-ordering but he is willing to participate when profits at least are equal to a given level.

19. The third participation constraint (the income constraint) implies that the agent claims an income that has to be equal or above some certain amount. In this case, the agent will not experience any disutility in supplying efforts and the personal gains (α for each *y* and β for each *x)* are eliminated. For the order of completeness, this case is discussed in App. 1, App. 2 (b11-b16) and App. 3.

20. The second order condition is $\pi_{bb}^{U} = (1+\alpha)(y_e - v_e)e_{bb} + (1+\beta)(x_E - v_E)E_{bb} + (1+\alpha)(y_{ee} - v_{ee})(e_b)^2 + (1+\beta)(x_{EE} - v_{EE})(E_b)^2 - (2+\alpha+\beta)v_{eE}e_bE_b < 0$ that is supposed to be satisfied.

21. When $\frac{x_E E_b}{y_e e_b} = -1$, $b^U = 0$, and when $\frac{x_E E_b}{y_e e_b} < -1$, the optimal bonus is negative. Despite negative bonuses being possible from a theoretical point of view, we will not here pursuit such discussions.

22. If the principal values each unit of *y* by *c* and each unit of *x* by *n* instead of *1* as presumed in (6), the formula in (15) becomes $b^U = c + \frac{n x_E v_{eE}}{y_e(\beta x_{EE} - v_{EE})}$ which is analogous to the condition arrived at by Holmstrom and Milgrom (1991).

23. The second order condition is $\pi_{bb}^{N} = (y_e - v_e)e_{bb} + (x_E - v_E)E_{bb} + (y_{ee} - v_{ee})(e_b)^2 + (x_{EE} - v_{EE})(E_b)^2 - v_{eE}e_bE_b < 0$ that is supposed to be satisfied.

24. From (18) it follows that $b^N < 0$ if $(1-\alpha)y_e e_b + (1-\beta)x_E E_b < 0$, however, we restrict ourselves to non-negative bonuses, and in such a case we set $b^N = 0$.

25. If we define the spillover term as $\mu(\alpha,\beta) = \frac{x_E E_b}{y_e e_b} < 0$ in the case of substitutes, it follows that $b_\beta^U = \frac{\partial\mu}{\partial\beta}$ and $b_\beta^N = -\mu + (1-\beta)\frac{\partial\mu}{\partial\beta} \geq (<) b_\beta^U$. Hence, $b_\beta^N \geq (<) b_\beta^U$ when $-\frac{\partial\mu}{\partial\beta}\frac{\beta}{\mu} \leq (>) 1$, i.e. implying that when the indirect effect (the spillover term μ) increases less (more) than 1 % when β increases with 1 %, the marginal effect on the bonus is highest (lowest) in case *N* compared to case *U*. In the case of independent efforts, as already commented on above, $b_\beta^N = b_\beta^U = 0$.

26. Given our prior assumptions the second order conditions are satisfied, i.e. $W_{ee} = (1+\alpha)y_{ee} - v_{ee} < 0, W_{EE} = (1+\beta)x_{EE} - v_{EE} < 0, W_{eE} = -v_{eE} \leq 0$ and $F = W_{ee}W - (W_{eE})^2 > 0$.

27. The strictly utilitarian approach means a “double” counting of the non-pecuniary utilities stemming from producing *y* and *x*. For example, the value of production will increase with the number of motivated agents being involved in the production process (see for instance Chalkley and Malcomson,1998). App. 3. discusses the welfare function that applies when non-pecuniary benefits are not considered as legitime parts of the social preferences (non-utilitarian welfare function).

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APPENDIX 1: THE INCOME PARTICIPATION CONSTRAINT (CASE *I*)

The income constraint, *I*, implies that the agent claims an income that has to be equal or above some certain amount, $\bar{J}$;

$$J = w = A + by(e) \geq \bar{J} \tag{a1}$$

Following the outside options interpretation, $\bar{J}$ here symbolizes what the unproductive agent could obtain in an alternative state, (or alternatively, when the non-pecuniary benefits are so important that she does not have any work disutility,) but receives a monetary transfer. By reformulating (a1) we get;

$$A \geq \bar{J} - by(e) \geq 0 \tag{a2}$$

By using (a1) in (7), assuming that (a2) holds as an equality, the profit of the principal becomes;

$$\pi^I = y(e(b;\alpha,\beta)) + x(E(b;\alpha,\beta)) - \bar{J} \tag{a3}$$

A minimum income constraint ($\bar{J}$), (a3) implies that the principal, when designing the optimal contract, solely maximizes the revenue that follows from producing the tasks. This problem is analogous to maximizing profit when the costs are independent of efforts (fixed costs).

The principal now maximizes (a3), when the reaction functions of the agent is taken into account, with regard to *b*, which, for an interior solution, yields:

$$\pi_b^I = y_e e_b + x_E E_b = 0 \tag{a4}$$

(where the second order condition is $\pi_{bb}^I = y_e e_{bb} + x_E E_{bb} + y_{ee}(e_b)^2 + x_{EE}(E_b)^2 < 0$).

Unlike the maximum problems related to case U and case N, the second order condition for the maximization problem of the principal in this case, given our prior assumptions, is not always satisfied. This is for example the situation when $x_{EE} = y_{ee} = v_{eee} = v_{eeE} = v_{eEE} = v_{EEE} = 0$. First, we notice that an interior solution does not exist for independent efforts i.e. $E_b = 0$, thus $\pi_b^I > 0$ because $y_e e_b > 0$. Hence, the highest possible b, given independent efforts, becomes the maximum value for b that is equal to 1 ($b^I = 1$) (we restrict ourselves to cases where the fixed component of the wage contract is non-negative, i.e. $A \geq 0$). Secondly, in the case of substitutability, since $e_b > -E_b$, an interior solution implies that the marginal productivity of E in equilibrium has to be higher than the marginal productivity of e; i.e. $x_E > y_e$. This again means that e has to be relatively high and E relatively low, implying the principal has to set a relatively high bonus, b, to stimulate e. Thirdly, by using equation (13) and the left hand side of (a4) together with (17), it follows that we can rewrite (13) and obtain $\pi_b^U = \pi_b^I - by_e e_b = 0$ and express (17) as $\pi_b^N = \pi_b^I - (\alpha + b)y_e e_b - \beta x_b E_b = 0$. The first rewriting implies that $\pi_b^I > 0$, when (13) holds, as long as

$by_e e_b > 0$, while the second expression means that $\pi_b^I > 0$, when (17) holds, as long as $(\alpha + b)y_e e_b + \beta x_E E_b > 0$. The first condition, $by_e e_b > 0$, is obvious for positive b's. The second condition, $(\alpha + b)y_e e_b > -\beta x_E E_b$ is less obvious. However, recalling that $e_b > -E_b$, this condition holds if βx_E is not too high relative to $(\alpha + b)y_e$. Moreover, it is seen from (14) and (18) that if (a4) should hold, $b^U = 0$ and $b^N = \beta - \alpha$. It now follows that the optimal bonus for case I must be higher the same bonuses for case U and case N. Moreover, it is likely that, if an internal solution exists for case I (i.e. equation a4 holds), that the optimal bonus will be higher than 1. In the following we have we limited our attention to the case where the optimal bonus cannot exceed one, i.e. $b^I = 1$, as a consequence the optimal bonus does not change for marginal changes in the inner motivations.

APPENDIX 2: THE EFFECTS ON EFFORTS, FIXED PAYMENTS, VARIABLE PAYMENTS AND THE TOTAL COMPENSATION FROM CHANGES IN EACH OF THE TWO INNER MOTIVATIONS (CASE *U*, *N* AND *I*)

The Utility Case (Case *U)*

First we consider the impacts from changes in the two motivations on efforts and profit, where e^U, E^U, π^U, A^U, z^U and w^U denote the optimal values for case *U*. From former assumptions and equation (15) and (16), we arrive at the following effects;

$$\frac{\partial e^U}{\partial \alpha} = e_\alpha + e_b b_\alpha^U = (1 + b_\alpha^U)e_\alpha > 0, \quad \frac{\partial E^U}{\partial \alpha} = E_\alpha + E_b b_\alpha^U = (1 + b_\alpha^U)E_\alpha \leq 0 \tag{b1}$$

$$\frac{\partial e^U}{\partial \beta} = e_\beta + e_b b_\beta^U \leq (>)0, \qquad \frac{\partial E^U}{\partial \beta} = E_\beta + E_b b_\beta^U \geq (<)0 \tag{b2}$$

$$\frac{\partial \pi^U}{\partial \alpha} = y > 0, \qquad \frac{\partial \pi^U}{\partial \beta} = x + (1 - b^U)y_e \frac{\partial e^U}{\partial \beta} + x_E \frac{\partial E^U}{\partial \beta} \geq (<)0 \tag{b3}$$

We observe that an increase in the motivation for the incentivized activity, α, always increases the effort that produces the incentivized activity while the effort that produces the non-incentivized activity is unchanged (independent) or decreases (substitutes) (see b1). For independent efforts, an increase in the motivation for the non-incentivized activity, β, has no effect on the effort that produces the incentivized activity while the effort that produces the non-incentivized activity increases (see b2). For non-independent efforts (substitutes), the same two effects are ambiguous (see b2*)*. In both cases, the direct effect from a higher β implies a higher *E* and a lower *e*, however there are indirect effects because the principal increases the bonus in response to a higher β that again reduces *E* and increases *e*. If the direct (indirect) effect dominates, *E* becomes higher (lower) and *e* becomes lower (higher). For profit (see b3), we see that an increase in α implies a change in profit being equal to *y*. A somewhat unexpected finding, however, is that an increase in β has an indeterminate effect on profit. First, a higher β, implying a less restrictive participation constraint, produces a higher *E* that again increases *x* and profit. Second, a higher β causes a reduction in *e* that reduces *y* and profit. Given independent efforts, however, a higher β means higher profits since $v_{eE} = 0 \Rightarrow b^U = 1$ and $\frac{\partial E^U}{\partial \beta} > 0$. It also follows that a higher motivation for the incentivized activity and a higher motivation for the non-incentivized activity reduces the fixed payment while the effects on variable payments and the total compensation are indeterminate.

The impacts on A^U, z^U and w^U from a change in each of the two inner motivations are;

$$\frac{\partial A^U}{\partial \alpha} = -(1 + b_\alpha^U)y < 0, \frac{\partial z^U}{\partial \alpha} = (1 + b_\alpha^U)b^U y_e e_b + b_\alpha^U y \leq (>)0$$
$$\frac{\partial w^U}{\partial \alpha} = (1 + b_\alpha^U)b^U y_e e_b - y \leq (>)0 \tag{b4}$$

$$\frac{\partial A^U}{\partial \beta} = -x - b_\beta^U y < 0, \qquad \frac{\partial z^U}{\partial \beta} = (y + b^U y_e e_b) b_\beta^U + b^U y_e e_\beta \leq (>) 0,$$
$$\frac{\partial w^U}{\partial \beta} = -x + b^U y_e (e_b b_\beta^U + e_\beta) \leq (>)\, 0 \tag{b5}$$

From (b4-b5) we observe that the fixed payment, A, is lower for higher inner motivations (α and β). These effects confirm that non-pecuniary rewards, ceteris paribus, substitute for pecuniary payments in the sense that agents with such motivations accept a lower financial compensation (the compensating differential). The effects from the inner motivations on variable payments and the total compensation, *z* and *w*, are indeterminate (see b4-5).

The Net-Income Case (Case *N*)

Next, we consider the impacts from changes in the two inner motivations on efforts and profit where e^N, E^N, π^N, A^N, z^N and w^N denote the optimal values for case *N*. We arrive at the following expressions;

$$\frac{\partial e^N}{\partial \alpha} = (1 + b_\alpha^N) e_\alpha = 0, \qquad \frac{\partial E^N}{\partial \alpha} = (1 + b_\alpha^N) E_\alpha = 0 \tag{b6}$$

$$\frac{\partial e^N}{\partial \beta} = e_\beta + e_b b_\beta^N \leq (>) 0, \qquad \frac{\partial E^N}{\partial \beta} = E_\beta + E_b b_\beta^N \geq (<) 0 \tag{b7}$$

$$\frac{\partial \pi^N}{\partial \alpha} = 0, \;\; \frac{\partial \pi^N}{\partial \beta} = (1 - b^N - \alpha) y_e \frac{\partial e^N}{\partial \beta} + (1 - \beta) x_E \frac{\partial E^N}{\partial \beta} \geq (<) 0 \tag{b8}$$

In contrast to case *U*, an increase in the motivation for the incentivized activity, α, has no effect on the two efforts since $b_\alpha^N = -1$ (see b6). The effects that arise from a higher motivation for the non-incentivized activity, β, are parallel to the ones identified for case *U*, since for independent (non-independent) efforts, the effort that produces the incentivized remains constant (indeterminate) while the effort that produces the non-incentivized activity is positive (indeterminate). In contrast to case *U*, an increase in α has no impact on the principal's profit (see b8). As for case *U*, an increase in β may lead to an increase or a decrease in profit (see b8). For independent efforts, however, the profit increases with a higher β for $\beta < 1$.This occurs since $v_{eE} = 0 \Longrightarrow\; b^N = 1 - \alpha$ and $\frac{\partial E^N}{\partial \beta} > 0$.

The impacts on fixed, variable and total wage from a change in each of the two inner motivations are;

$$\frac{\partial A^N}{\partial \alpha} = y(e^N) > 0, \quad \frac{\partial z^N}{\partial \alpha} = -y(e^N) < 0, \qquad \frac{\partial w^N}{\partial \alpha} = 0 \tag{b9}$$

$$\frac{\partial A^N}{\partial \beta} = v_E \frac{\partial E^N}{\partial \beta} - \; b_\beta^N y + \alpha y_e \frac{\partial e^N}{\partial \beta} \geq (<) 0, \qquad \frac{\partial z^N}{\partial \beta} = b_\beta^N y + b^N y_e \frac{\partial e^N}{\partial \beta} \geq (<) 0$$
$$\frac{\partial w^N}{\partial \beta} = v_E \frac{\partial E^N}{\partial \beta} + v_e \frac{\partial e^N}{\partial \beta} \;\geq (<) 0 \tag{b10}$$

A higher motivation for the incentivized activity implies a higher fixed payment, lower variable payments and a total compensation that remains constant (see b9). The increase in α is met by a similar reduction in the optimal bonus. This reduction ensures that the effort invested into activity *y* remains constant, thus no change in the total compensation is needed. We observe from (b10) that a higher motivation for the non-incentivized activity has indeterminate effects on fixed payment, variable payments and the total compensation. If the direct positive effect on E dominates, the overall increase in E is likely to increase the agent's disutility thus making a higher total compensation necessary.

The Income Constraint (Case *I*): b^I Is Determined by an Internal Solution)

By using (3a) and (3b), it follows that the optimal bonus for *I*, b^I, if being determined by (a4), has to satisfy:

$$b^I = \frac{\alpha v_E E_b + \beta v_e e_b}{-v_E E_b} = -\beta \frac{v_e e_b}{v_E E_b} - \alpha = \beta \frac{v_e}{v_E} \frac{(v_{EE} - \beta x_{EE})}{v_{eE}} - \alpha \tag{b11}$$

The expression for the optimal bonus, given an interior solution, deviates from the same expression for case *U* and for case *N*. However, as is the case for case *N*, both α and β enter in a direct way (not only indirectly via the agent's response function), thus neither of the two motivations induces a motivational rent for the principal. It is also seen, in contrast to case *N*, that the spill-over effect determines the optimal bonus also when $\beta = 1$. Differentiation of (b11) with regard to α and β, using (5abc) and former assumptions in (A2), yields the following expressions;

$$\frac{\partial b^I}{\partial \alpha} = b_\alpha^I = -1 < 0 \tag{b12}$$

$$\frac{\partial b^I}{\partial \beta} = b_\beta^I = \frac{y_e x_{EE} + x_{EE} v_{eE} E_\beta - y_{ee} e_\beta (v_{EE} - \beta x_{EE})}{y_{ee} e_b (v_{EE} - \beta x_{EE}) - x_{EE} v_{eE} E_b} > 0 \tag{b13}$$

The results in (b12) and (b13) are in accordance with the effects identified for case *N*, i.e. a higher motivation for the incentivized activity implies an equivalent reduction in the optimal bonus, and a higher motivation for the non-incentivized activity implies a higher optimal bonus. It follows from (b12), that an increase in α is always accompanied by an equal reduction in the bonus, *b*, because the principal wants to keep the effort level of *e* unchanged.

The impacts from higher motivations on efforts and profit (e^I, E^I and π^I denote the optimal values for *I*), given the interior solution, are as follows;

$$\frac{\partial e^I}{\partial \alpha} = (1 + b_\alpha^I) e_\alpha = 0, \qquad \frac{\partial E^I}{\partial \alpha} = (1 + b_\alpha^I) E_\alpha = 0 \tag{b14}$$

$$\frac{\partial e^I}{\partial \beta} = e_\beta + e_b b_\beta^I \leq (>) 0, \quad \frac{\partial E^I}{\partial \beta} = E_\beta + E_b b_\beta^I \geq (<) 0 \tag{b15}$$

$$\frac{\partial \pi^I}{\partial \alpha} = 0, \;\; \frac{\partial \pi^I}{\partial \beta} = y_e \frac{\partial e^I}{\partial \beta} + x_E \frac{\partial E^I}{\partial \beta} \geq (<) 0 \tag{b16}$$

The signs of the partial effects (see b14-b16) coincide with the ones identified for case *N*. An interesting difference between case *U* and the other two constraints (case *N* and case *I)* is that an increase in the motivation for the incentivized task is beneficial for the principal given case *U* while this is not the case for the two alternatives. For case *N* and case *I* this finding follows because an increase in α always is offset by an equal reduction in the optimal bonus.

APPENDIX 3: AN ALTERNATIVE WELFARE FUNCTION (NON-UTILITARIAN)

The strictly utilitarian approach means a "double" counting of the utilities stemming from producing *y* and *x*. If, however, inner motivations are not considered to be a legitime part of social preferences, the welfare function simply becomes;

$$\boldsymbol{V = y(e) + x(E) - v(e, E)} \tag{c1}$$

Given (c1), the first best solution is defined by;

$$V_e = y_e - v_e = 0 \tag{c2}$$

$$V_E = x_E - v_E = 0 \tag{c3}$$

(given prior assumptions the second order conditions are satisfied, i.e. $V_{ee} = y_{ee} - v_{ee} < 0, V_{EE} = x_{EE} - v_{EE} < 0, V_{eE} = -v_{eE} \leq 0$ and $K = V_{ee}V_{EE} - (V_{eE})^2 > 0$). The conditions in (c2) and (c3) are analogous to the conditions that follows from maximizing the profit of the principal, given case *N* (see 11). In the following, the first best effort values defined by (c2) and (c3) are denoted by e^V and E^V. Given (A3), it follows that $e^V = E^V = \frac{1}{1+\gamma}$. Now, if we also include this alternative welfare solution and the case where the income participation constraint may occur, the ranking of the variables in the model is summarized in an extended version of Table 2, termed Table A1 below.

TABLE A1
THE RANKING OF THE OPTIMAL – AND THE FIRST BEST EFFORTS (UTILITARIAN AND NON-UTILITARIAN) FOR CASE U, CASE N AND CASE I. QUADRATIC DISUTILITY FUNCTION AND LINEAR PRODUCTION FUNCTIONS WHEN $0 < \alpha < 1$ AND $0 < \beta < 1$

	$\gamma = 0$	$0 < \gamma < \frac{\alpha}{\beta}, \gamma < 1$	$0 < \gamma = \frac{\alpha}{\beta} < 1$	$0 < \frac{\alpha}{\beta} < \gamma < 1$
b	$b^N < b^U = b^I = 1$	$b^N < b^U < b^I = 1$	$b^N = b^U < b^I = 1$	$b^U < b^N < b^I = 1$
e	$e^N = e^V < e^U = e^W = e^I$	$e^N = e^V < e^U = e^W = e^I$	$e^U = e^V = e^N = e^W < e^I$	$e^W = e^U < e^V = e^N < e^I$
E	$E^I = E^N = E^U < E^V < E^W$	$E^I < E^U < E^N < E^W$ $E^N < E^V$ $E^V \lesseqgtr E^W$ as $\gamma \gtreqless \frac{\beta}{\alpha}$	$E^I < E^U = E^N < E^V < E^W$	$E^I < E^N < E^U < E^W$ $E^N < E^V < E^W$ $E^V \lesseqgtr E^U$ as $1 - \gamma^2 \lesseqgtr \beta - \gamma\alpha$

It follows from Table A1, that for case *I*, given the maximal bonus, the agent typically chooses a too high (low) level of the incentivized effort, *e* (the non-incentivized effort; *E)*. The only exception matters for incentivized effort given independent efforts. In this particular case, the optimal effort level coincides with the first best level defined by the utilitarian welfare function. For case *U*, given a utilitarian welfare function, the level of non-incentivized effort, *E*, is always too low relatively to the first best level while the level of incentivized effort, *e*, coincides with the first best level. The conclusion for incentivized effort is self-evident for independent efforts. For non-independent efforts (substitutes), however, our conclusion follows from presence of two opposing effects. A lower *E* for case *U*, relatively to the first best level implies that incentivized effort becomes higher. However, for non-independent efforts, the optimal bonus becomes less than *1*, thus pulling towards less incentivized effort. In our example, the positive and negative effects are equally strong. For case *U*, given a non-utilitarian welfare function, incentivized effort becomes too high when $0 \leq \gamma < \frac{\alpha}{\beta}$ and too low when $\gamma > \frac{\alpha}{\beta}$, while non-incentivized effort becomes too low when $0 \leq \gamma \leq \frac{\alpha}{\beta}$. Surprisingly, for $\gamma > \frac{\alpha}{\beta}$, non-incentivized effort can be both lower or higher than the first best non-utilitarian level. When $1 - \gamma^2 < \beta - \alpha\gamma$ holds, non-incentivized effort becomes too high. This might for example be the case when α is relatively low, β is relatively high, and γ is in the medium range. For case *N* and a non-utilitarian welfare function, incentivized effort coincides with the first best level while non-incentivized effort becomes too low relatively to the first best level. The result that incentivized effort (*N* and a non-utilitarian welfare function) coincides with the first best level is caused by the mechanisms already described above. Non-incentivized effort also becomes too low for case N when applying a utilitarian welfare function, while incentivized effort in this case becomes too low when $0 \leq \gamma < \frac{\alpha}{\beta}$ and too high when $\gamma \geq \frac{\alpha}{\beta}$. For $0 < \gamma < \frac{\alpha}{\beta}$, we observe from Table A1 that the ranking of the first best levels for non-incentivized effort for the utilitarian and the non-utilitarian welfare function depends on the relative strength of the inner motivations relatively to the degree of substitutability, i.e. $E^V \lesseqgtr E^W$ as $\gamma \gtreqless \frac{\beta}{\alpha}$. For instance, the non-utilitarian welfare function gives a higher first best level of E than the utilitarian welfare function when we have a relatively high α, a relatively low β and a γ that is in the medium range.