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Working Paper

Empowerment and the Dark Side of Delegation

IZA Discussion Papers, No. 11289

Provided in Cooperation with:

IZA – Institute of Labor Economics

Suggested Citation: Kräkel, Matthias (2018) : Empowerment and the Dark Side of Delegation, IZA Discussion Papers, No. 11289, Institute of Labor Economics (IZA), Bonn

This Version is available at:

<https://hdl.handle.net/10419/177093>

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DISCUSSION PAPER SERIES

IZA DP No. 11289

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JANUARY 2018

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ABSTRACT

Empowerment and the Dark Side of Delegation

The existing delegation literature has focused on different preferences of principal and agent concerning project selection, which makes delegating authority costly for the principal. This paper shows that delegation has a cost even when the preferences of principal and agent are exogenously aligned. As application, the commitment effect of empowerment is considered, which has been addressed by the management and social psychology literature. In addition, it is shown that even in a setting without task commitment and other behavioral effects the principal might forgo delegation though being efficient.

JEL Classification: D86, J33, J41, M5

Keywords: commitment, delegation, limited liability, moral hazard, renegotiation

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1 Introduction

Delegating project choice to an agent can be beneficial to a principal for several reasons (Aghion and Tirole 1997, Bester and Krämer 2008, 2017, Armstrong and Vickers 2010). It can provide incentives to the agent if he is authorized to pick a project. If incentives are not an issue, delegating project choice may relax the agent’s participation constraint, which makes hiring the agent less expensive for the principal. Furthermore, delegating authority allows the principal to make use of the agent’s decentralized information that is not available to the principal otherwise (e.g., via a revelation mechanism). However, the previous delegation literature has emphasized that delegating authority is always associated with a cost, because principal and agent have different preferences concerning project selection. This paper shows that delegation has a cost even when the preferences of principal and agent are exogenously aligned.

Delegation of authority (e.g., to choose projects or to design the organization of work) has been labeled “empowerment” in the management and social psychology literature. The concept of commitment is at the heart of empowerment (Argyris 1998, Baron and Kreps 1999, chapters 9 and 13).¹ If individuals obtain authority rights over their work environment, their work outcome will be mainly determined by their own decisions so that they feel committed to their tasks, which boosts incentives.² In other words, if a worker is free how to perform a task or to solve a problem, success will directly accrue to the responsible worker, who will feel pride and identification with the outcome. Altogether, empowered workers should be more motivated via the commitment effect.³ In economic terms, an empowered agent receives an additional utility in case of success, which makes the use of empowerment efficient. Although the vast majority of contributions on empowerment emphasize this positive effect, some papers are more cautious and indicate that empowered subordinates might abuse their authority to pursue own goals (Bowen and Lawler 1992, Aghion and Tirole 1997, Mills and Ungson 2003, Bass and Riggio 2006, Spreitzer 2008).

This paper analyzes the incentive effects of empowerment within a principal-agent setting where an empowered agent has to choose between different tasks that can be either more or less productive. In a second step, the agent has to exert hidden effort to complete the task. The analysis shows that

¹This concept has a large impact in social psychology; see, e.g., Allen and Meyer (1990), Meyer et al. (1993), Jaros (2007) and the huge literature cited therein.

²“Autonomy on the job, particularly regarding the choice of tasks, can raise commitment, as the employee feels more in control of the work environment and work processes. For this reason, high-commitment HR systems generally involve substantial grants of autonomy, to increase intrinsic incentives and commitment” (Baron and Kreps 1999, p. 327).

³See Benabou and Tirole (2003) on an alternative explanation based on self-confidence how empowerment can improve incentives.

delegation has a cost although neither the principal nor the agent realizes an exogenously given private benefit from picking a specific task. This cost can materialize as both a higher rent that has to be left to the agent for incentive reasons and a welfare loss. It is shown how an empowered agent's possible abuse of authority by picking a less productive task determines the optimal incentive contract. If the possible manipulation of incentive pay by the agent is only moderate and his task commitment sufficiently strong, the principal will still rely on empowerment. If, however, the manipulation yields a large increase in incentive pay, the principal will refrain from empowerment although being efficient to reduce the agent's rent. In the optimal solution of the basic model, the principal always prevents the agent from picking a less productive task. The discussion section introduces alternative settings in which an empowered agent does pick a less productive task and exerts inefficiently low effort, which constitute two additional sources of welfare losses. Moreover, it is shown that the main finding even holds in the absence of task commitment and other behavioral effects: delegation can be costly and the principal might forgo efficient delegation even when both principal and agent benefit from the higher success probability of a more productive task and do not have conflicting preferences concerning task selection.

Importantly, feeling committed to one's task due to empowerment and abusing authority by choosing a less productive task do not lead to an inconsistency. Depending on the agent's personality traits and other determinants, empowerment might lead to strong or less strong commitment. If an empowered agent does not feel sufficiently committed to his task, problems due to abused authority cannot be excluded any longer. Several empirical findings document that empowered agents indeed choose detrimental actions from their principal's point of view despite possible commitment. Barrutia et al. (2009) investigate the effects of salesperson empowerment in banks. They differentiate between process-driven empowerment (PDE) and decision-making-driven empowerment (DDE). PDE refers to the delegation of authority to employees, given clearly defined commercial targets. According to DDE, employees get more decision rights, including the rights to negotiate with customers (e.g., discounts) and to take risks. Barrutia et al. (2009) show that employees are positively affected by PDE (i.e., their motivation rises) but, at the same time, negatively affected by DDE (i.e., they make detrimental interest rate and risk decisions). Frank and Obloj (2014) report that bank managers who received discretion over the marketing expenditures, loan sizes and loan interest rates abuse their authority to game their employer's incentive system (e.g., by offering generous discounts).⁴ To sum up, feeling only weakly committed to one's task

⁴Examples for an abuse of authority are not restricted to the banking sector. See Courty and Marschke (2004),

might not suffice to prevent an agent from opportunistic behavior.

Consequently, Section 4 discusses situations in which the agent only feels little task commitment so that the principal cannot expect loyal behavior. This section points to three additional effects of empowerment. Section 4.1 shows that higher returns from a successfully completed task can be detrimental in terms of lower profits and lower welfare. The higher the returns the more the principal will be susceptible to manipulation of incentive pay as the principal is mainly interested to secure high effort incentives. There exist situations with high returns in which the agent can manipulate incentive pay, whereas under lower returns manipulation is impossible as the principal prefers saving implementation costs to inducing high incentives. By the same argument, the principal might forgo efficient empowerment in a situation with high returns to prevent the agent from a manipulation of incentive pay whereas applying this drastic measure is not necessary under lower returns.

Section 4.2 addresses the role of the timing of information. In the basic model, both the principal and the agent already know the characteristics of the available tasks before the contract is signed. In Section 4.2, however, the principal and the agent only learn this information after having signed the contract. In that case, an empowered agent might prefer to choose a less productive task to force the principal into renegotiating the initial incentive contract. Moreover, it is shown under which conditions an empowered agent exerts inefficiently low effort. Both results highlight that delegation, although being efficient in principle, might lead to further welfare losses.

Section 4.3. abstracts from task commitment and other behavioral effects. Instead, it considers a more traditional setting where the agent has better information than the principal when selecting tasks. In this scenario, delegation is efficient to use the agent's decentralized information. It is assumed that over time the principal learns whether the agent has chosen a more or a less productive task (e.g., when the agent presents the selected task and how to complete it). As the agent can force the principal into renegotiation of the initial contract to boost his rent, the principal will once again abstain from empowering the agent if the manipulation problem is sufficiently severe.

The paper is related to the economic literature that analyzes empowerment and the delegation of authority. Aghion and Tirole (1997) investigate the consequences of agents' formal and real authority when being empowered. An agent has formal authority when receiving decision rights from the principal, whereas real authority results from having effective control over a decision (e.g.,

Larkin (2014), Benson (2015), and Owan et al. (2015) on further examples for the gaming of incentive schemes. Bowen and Lawler (1992) mention the generous use of giveaways and creative rule breaking as general problems of empowering. Miller and Perloth (2013) report that in 2013 the corporations Yahoo and Best Buy abolished their work-from-home policies because of tremendous abuse of working time autonomy by the employees. Opportunistic abuse of working time autonomy is also documented for dull telecommuting by the experiment of Dutcher (2012).

due to an informational advantage). Bester and Krämer (2008) consider a situation in which a principal can delegate the selection of a project to an agent, who is also rewarded by monetary pay. Their results show that an agent that is protected by limited liability should not obtain authority over project selection for incentive reasons. Bester (2009) extends the delegation framework by introducing the communication of private information. Armstrong and Vickers (2010) analyze delegated project choice in a setting where the principal can restrict the agent's scope of discretion. Bester and Krämer (2017) show why authority rights should be assigned to the better informed party, whereas exit rights are given to the uninformed party so that the latter can choose its exit option whenever the informed party deviates from the promised action. All five papers are based on the central problem that principal and agent have different preferences concerning project choice, which makes delegation costly for the principal. In my model, however, delegation leads to a cost although both parties' preferences are exogenously aligned. In a two-period setting, Kräkel (2017a) analyzes the incentive problems from delegating authority to self-organizing teams but does not address the commitment effect of empowerment. Friebel and Schnedler (2011) analyze motivation by the commitment effect of empowerment, but do not consider the problem of rent manipulation. Instead, they discuss how managerial intervention can harm a committed worker's incentives by distorting his beliefs about his co-worker, who may be either committed or uncommitted.

The concept of task commitment, stemming from social psychology, is quite vague. Hence, integrating it into a formal economic model bears the risk that the original idea is not perfectly implemented. However, as the paper is especially interested in the interplay of empowerment and task commitment, it tries to capture the effects described by Baron and Kreps (1999) on this topic. The modeling of task commitment is most closely related to the modeling by Friebel and Schnedler (2011). In their setting, a committed agent also receives an extra utility from successful production. Friebel and Schnedler motivate their approach by the parallels to agents that are mission-oriented and, therefore, intrinsically motivated. When introducing the commitment effect in their model, they refer to Francois (2000) and Besley and Ghatak (2005). In the latter model, mission-oriented agents get an extra utility in case of success, similar to Friebel and Schnedler (2011) and the approach used in this paper. In Francois (2000), there is no uncertain success and the motivated agent's utility directly increases in the amount of public service provided. Finally, Choe and Ishiguro (2012) and Kräkel (2017b) investigate incentives of a CEO and two division managers who will feel responsibility for an organizational unit if they are given decision authority over this unit and who receive an extra utility in case the unit is successful. In all these papers,

possible rent manipulation by empowered agents is not an issue.

Finally, there are parallels between this paper and the moral-hazard literature that also combines binary effort with limited liability (e.g., Che and Yoo 2001, Hermalin 2005, Laffont and Martimort 2002, Schmitz 2005, 2013, Chen and Chiu 2013). This setting has the advantage that the optimal contract can be specified without restricting the set of possible contracts *ex ante*. The paper adds to this literature by analyzing how an empowered agent can manipulate his rent upward and under which conditions the principal prefers to forgo empowerment to dispose of this problem.

The paper is organized as follows. The next two sections introduce the basic model and offer a solution to it. Section 4 extends the basic model by considering the impact of task returns and the impact of the timing of information about the tasks' characteristics. Moreover, it shows that the main finding qualitatively also holds for a modified setting without task commitment and behavioral effects. Section 5 concludes.

2 The Basic Model

I consider a situation where a principal (“she”) has to hire an agent (“he”) for the completion of a task. For example, this task may comprise the serving of customers, or selecting and performing projects. By exerting effort e the agent determines the probability of successful completion of the task. The agent can decide between working hard ($e = 1$) or not ($e = 0$) leading to effort costs $e \cdot c$ with $c > 0$. If $e = 0$, the agent will be successful with probability $p_0 > 0$. If $e = 1$, the agent's success probability will be given by $p_0 + \Delta p$ with $\Delta p > 0$ and $p_0 + \Delta p \in (0, 1)$. Success of the agent yields returns $\pi > 0$ for the principal. The principal, however, obtains zero returns if the agent fails. Whether the agent succeeds or fails is observable by the agent and the principal, and verifiable by a third party so that explicit incentive pay can be made contingent on the agent's performance. I assume that the chosen effort level $e \in \{0, 1\}$ is only observable by the agent. Hence, the principal faces a moral-hazard problem. As the usual tie-breaking rule, I assume that if the agent is indifferent between $e = 1$ and $e = 0$, he will choose working hard. Both agent and principal are risk neutral.

There are two types of tasks, characterized by the additional success probability Δp . Either the task is more productive – $\Delta p = \Delta p_H$ – or the task is less productive – $\Delta p = \Delta p_L < \Delta p_H$. As an example, suppose the agent has to serve customers. A specific customer may be more likely satisfied by the agent when exerting effort ($\Delta p = \Delta p_H$) or less likely ($\Delta p = \Delta p_L$). As another

example, suppose that the agent has to select and perform a specific investment project, which can be either more ($\Delta p = \Delta p_H$) or less ($\Delta p = \Delta p_L$) promising. Δp is assumed to be observable by the agent and the principal but not verifiable by a third party. The agent has the capacity of performing exactly one task.

Either the principal or the agent has the authority to select a task with $\Delta p \in \{\Delta p_H, \Delta p_L\}$. On the one hand, the principal can keep the authority to select the task herself ($\chi = 0$). On the other hand, the principal can empower the agent ($\chi = 1$), who then has the authority to select $\Delta p \in \{\Delta p_H, \Delta p_L\}$. As tie-breaking rule, I assume that if the agent is indifferent between the two types, he will choose the more productive task. According to the social psychology literature (e.g., Allen and Meyer, 1990; Meyer et al., 1993; Baron and Kreps, 1999; Jaros, 2007), empowerment may lead to task commitment. Similar to Friebel and Schnedler (2011), I assume that if the agent is empowered, he will feel committed to the chosen task and, therefore, receives the extra utility $\theta \geq 0$ when being successful.⁵ Thus, the setting allows for the case of standard textbook preferences without any commitment ($\theta = 0$) as well as for a continuum of different degrees of commitment. However, if the principal decides against empowerment ($\chi = 0$), the commitment effect will be zero. Both θ and the principal's choice of $\chi \in \{0, 1\}$ are assumed to be observable by the agent and the principal but not verifiable by a third party. Hence, ex post, the principal can always overrule the agent and switch from $\chi = 1$ to $\chi = 0$, which would then lead to a complete loss of the agent's intrinsic motivation via θ .⁶ To sum up, the commitment effect of empowerment yields additional motivation of the agent so that empowerment is both beneficial for the principal and efficient.

It seems natural to differentiate between two scenarios given the agent has been empowered ($\chi = 1$). On the one hand, we can imagine that there are still alternative tasks available after the agent has picked a specific task and costs for switching the task are negligible. In that case, the agent's task selection would be *reversible*, i.e., overruling by the principal is effective as she can immediately choose another type of task without delay or additional costs. On the other hand, there are also situations in which the agent's task selection is *irreversible*, because switching the task is too costly or impossible as no alternative task is available at the moment. Imagine, for example, a situation where a sales agent has to decide between two customers and the unselected

⁵See also Francois (2000), Besley and Ghatak (2005), Hart and Holmstrom (2010), Choe and Ishiguro (2012), and Kräkel (2017b) for a similar modeling of intrinsic motivation. Section 4.3 considers a variant of the model without task commitment and other behavioral effects that, nevertheless, leads to inefficient delegation decisions.

⁶Baker et al. (1999) and Hart and Holmstrom (2010) also assume that the principal can always overrule the agent ex post. However, such overruling is costly for the principal if it leads to a breach of relational contract (Baker et al. 1999) or an increased level of aggrievement and shading (Hart and Holmstrom 2010). In the next paragraph, I come back to the costs of overruling when differentiating between reversible and irreversible task selection.

customer walks away to buy at another store. As another example, let the task be some project that has to be selected and completed by the agent. Then project-specific investments, formally signed contracts, or the closing of windows of opportunity as projects are only temporarily available can make overruling the agent by the principal quite ineffective. In the following, both reversible and irreversible task selection by the agent will be considered.

The agent is assumed to have a zero reservation value. As usual tie-breaking rule, the agent will accept the principal's contract offer if he is indifferent between accepting and rejecting. Besides the possible intrinsic motivation from feeling committed (i.e., $\chi \cdot \theta$), the principal can also provide the agent with monetary incentives based on performance. Let w_1 denote the agent's compensation if he succeeds and w_0 the compensation if he fails. Two scenarios will be considered. On the one hand, no restriction is imposed on the principal's choice of w_1 and w_0 (*unlimited liability*). On the other hand, I consider the case that the principal is not allowed to impose negative wages (*limited liability*). In that case, due to the agent's zero reservation value and zero effort costs if not working hard, all contracts satisfying $w_1, w_0 \geq 0$ are accepted in equilibrium so that the agent's participation constraint can be ignored.⁷

To avoid case-by-case analysis for effort implementation, the principal's returns π are assumed to be sufficiently large so that the principal will always be interested in implementing high effort.⁸ In other words, it is assumed that even in case of a less productive task and without commitment ($\theta = 0$) the principal's additional expected returns from inducing high effort exceed the incentive-compatible payment to the agent:⁹

$$\pi > (p_0 + \Delta p_L) \frac{c}{\Delta p_L^2} =: \tilde{\pi} \quad (1)$$

The timeline can be described by the following six stages. (1) The principal chooses $\chi \in \{0, 1\}$ and offers the contract (w_1, w_0) to the agent to maximize expected net profits. (2) The agent either accepts or rejects the contract offer. (3) If the agent rejects, he will receive his zero reservation value and the game ends. If the contract is accepted, a task with $\Delta p \in \{\Delta p_H, \Delta p_L\}$ has to be chosen. In case of $\chi = 1$, the agent picks the task; if $\chi = 0$, the principal decides on Δp . (4) Given $\chi = 1$, the principal observes the type of task chosen by the agent. In case of *reversible task*

⁷See, e.g., Laffont and Martimort (2002).

⁸See, e.g., Laffont and Martimort (2002), p. 155, Schmitz (2005), p. 322, and Schmitz (2013), p. 110, among many others, on the same kind of argumentation.

⁹This condition immediately follows from inserting the incentive-compatible wages $w_1 = c/\Delta p_L$ and $w_0 = 0$ into the principal's objective function and comparing the profit with the profit if zero effort is implemented, i.e., we must have $(p_0 + \Delta p_L)(\pi - c/\Delta p_L) > p_0\pi$.

selection, the principal can effectively overrule the agent (i.e., switch from $\chi = 1$ to $\chi = 0$) and choose an alternative task the agent has to perform. In case of *irreversible task selection*, overruling is ineffective. In addition, two possibilities concerning renegotiation of the initial contract (w_1, w_0) are considered. On the one hand, I address the scenario where a renegotiation of the initial contract is infeasible (*no renegotiation*). On the other hand, the case is analyzed where, for a given task, the principal and the agent can renegotiate the initial contract (w_1, w_0) if both parties agree to do so, i.e., no party can unilaterally be forced to accept contract modifications (*renegotiation*). As contract renegotiations will be anticipated, an initial contract with renegotiations in the future cannot be credible. For this reason, at stage 1, I focus on *renegotiation-proof contracts* – i.e., on contracts that do not leave space for renegotiations ex post. Following Fudenberg and Tirole (1990), Hermalin and Katz (1991), and Ma (1991), it is assumed that the principal has full bargaining power at the renegotiation stage and makes a take-it-or-leave-it offer to the agent. (5) The agent chooses effort. (6) Success is realized or failure occurs, and payments are made.

3 Solution to the Basic Model

In the following, four different scenarios are considered. As benchmark scenario, I start with the efficient solution, which can be achieved in the absence of any informational and contractual frictions. The remaining three scenarios address the moral-hazard problem between the agent and the principal and add at least one contractual friction. The second scenario assumes unlimited liability but allows for contract renegotiation. The third scenario excludes contract renegotiation but assumes that the agent is protected by limited liability. The fourth scenario considers the combination of both contract renegotiation and limited liability. In each scenario, the question is addressed whether the principal uses empowerment or not, and, if yes, under which conditions.

3.1 Efficient Solution

In a first-best scenario without informational and contractual frictions, the principal chooses $\chi \in \{0, 1\}$ and implements effort $e \in \{0, 1\}$ to maximize expected welfare $(p_0 + e \cdot \Delta p) (\pi + \chi \cdot \theta) - e \cdot c$. As, for given $\chi \in \{0, 1\}$, condition

$$(p_0 + \Delta p) (\pi + \chi \cdot \theta) - c > p_0 (\pi + \chi \cdot \theta) \Leftrightarrow \Delta p (\pi + \chi \cdot \theta) > c$$

holds due to (1), the principal implements $e = 1$ and chooses empowerment ($\chi = 1$). The empowered agent is indifferent between more and less productive tasks and, because of the tie-breaking rule, chooses a more productive task with $\Delta p = \Delta p_H$. Hence, under first-best conditions, expected welfare amounts to

$$W^{FB} := (p_0 + \Delta p_H)(\pi + \theta) - c. \quad (2)$$

In the following, this benchmark solution will be compared with the outcomes under moral hazard and at least one contractual friction – renegotiation and limited liability.

3.2 Unlimited Liability and Renegotiation

In the following, it is assumed that only the agent knows the chosen effort level $e \in \{0, 1\}$. However, the principal can use the contract (w_1, w_0) to implement a specific effort and in this subsection she is even allowed to specify negative wages, i.e., the agent is not protected by limited liability. As renegotiation of the initial contract is possible at stage 4, feasible contracts are restricted to the class of renegotiation-proof contracts.

The game is solved by backward induction, starting with stage 5, at which the agent decides on effort. For a given task with additional success probability Δp , a given value of χ and a given contract (w_1, w_0) , the agent maximizes

$$(p_0 + e \cdot \Delta p)(\chi \cdot \theta + w_1) + (1 - (p_0 + e \cdot \Delta p))w_0 - e \cdot c. \quad (3)$$

He will prefer $e = 1$ to $e = 0$ if and only if

$$\begin{aligned} (p_0 + \Delta p)(\chi \cdot \theta + w_1) + (1 - (p_0 + \Delta p))w_0 - c &\geq p_0(\chi \cdot \theta + w_1) + (1 - p_0)w_0 \\ \Leftrightarrow \chi \cdot \theta + \Delta w &\geq \frac{c}{\Delta p} \end{aligned} \quad (4)$$

with $\Delta w := w_1 - w_0$ as wage spread. As, by assumption, the principal always prefers high to low effort, condition (4) is satisfied under the optimal contract irrespective of the value of $\chi \cdot \theta$ and the given kind of task. The wage w_0 is then used by the principal to extract all rents:¹⁰

Proposition 1 *Suppose the agent is not protected by limited liability but contract renegotiation is feasible. Irrespective of whether task selection is reversible or not, the principal optimally chooses*

¹⁰The formal proofs of this proposition and the following results are relegated to the Appendix.

$\chi^* = 1$ and offers a contract that makes the agent's participation constraint bind. The agent picks a more productive task with $\Delta p = \Delta p_H$, leading to first-best welfare W^{FB} .

The proposition shows that under unlimited liability the principal will prefer empowerment and achieve efficiency even if contracts have to be renegotiation-proof as she can extract all rents. It can be easily shown that a similar outcome also holds for modified but related settings:

Corollary 1 *The principal will choose $\chi^* = 1$, and the agent will pick a task with $\Delta p = \Delta p_H$ so that first-best welfare W^{FB} is achieved if either (i) the agent is protected by limited liability but has a sufficiently large reservation value and the principal wants to hire the agent, or (ii) two identical principals with zero reservation values compete for the services of the agent.*

To sum up, the analysis of this section has shown that if the agent either receives zero rents or, at the other extreme, the full surplus, there will be no efficiency loss, even if contracts have to be renegotiation-proof. Intuitively, if an empowered agent has no chance to earn a positive rent or already receives the highest possible rent, he cannot abuse his authority to boost his rent by forcing the principal into renegotiation. Thus, the sole opportunity of renegotiating the initial contract does not prevent the principal from choosing empowerment.

3.3 Limited Liability and No Renegotiation

As in the previous subsection, the principal faces a moral-hazard problem. However, now the agent is protected by limited liability so that the principal is not allowed to choose negative wages for extracting rents. On the other hand, contract renegotiation is not feasible any longer, i.e., the initially signed contract has to be executed even if both parties mutually prefer to change it ex post.

At stage 5, the optimal contract again satisfies the incentive constraint (4) and induces the choice of high effort by the agent. Recall from Section 2 that the limited-liability constraint $w_1, w_0 \geq 0$ already implies the participation constraint. As $w_0 > 0$ only reduces incentives (see (4)) and increases the principal's labor costs, the optimal contract specifies $w_0 = 0$ and makes the incentive constraint (4) bind:

$$w_1 = \max \left\{ \frac{c}{\Delta p} - \chi \cdot \theta, 0 \right\}. \quad (5)$$

Suppose the principal has chosen empowerment ($\chi = 1$). If the agent's intrinsic motivation from feeling committed is sufficiently strong ($\theta \geq c/\Delta p$), the principal will not need to further motivate

him by offering additional monetary incentives. If, however, the cost-probability ratio, $c/\Delta p$, is quite large such that $c/\Delta p > \theta$, it will be more difficult to motivate the agent for exerting high effort. The principal now has to offer incentive pay to make successful performance sufficiently attractive for the agent. In both cases, the principal strictly benefits from empowerment by saving expected labor costs. If the principal has decided against empowerment ($\chi = 0$), high monetary incentives with $w_1 = c/\Delta p$ have to replace the missing intrinsic incentives from the commitment effect.

The optimal behavior of the principal and the agent at the first four stages depends on the parameter values. The following result can be obtained:

Proposition 2 *Suppose the agent is protected by limited liability but contract renegotiation is not feasible. Irrespective of whether task selection is reversible or not, the principal optimally chooses $\chi^* = 1$ and offers the contract*

$$(w_1^*, w_0^*) = \left(\max \left\{ \frac{c}{\Delta p_H} - \theta, 0 \right\}, 0 \right).$$

The agent picks a more productive task with $\Delta p = \Delta p_H$, leading to first-best welfare W^{FB} .

According to Proposition 2, under limited liability and no renegotiation the principal again empowers the agent and achieves efficiency. The intuition for this finding is similar to that for Proposition 1, although the principal now has to leave a positive rent to the agent. Again, the principal remains passive at stage 4. Contract renegotiation is not possible by assumption. In case of reversible task selection, overruling the agent when facing $\Delta p = \Delta p_L$ is not useful for the principal as it would erase the agent's intrinsic motivation from feeling committed, leading to zero effort at stage 5. Thus, if the agent is empowered and has to pick a task at stage 3, he cannot influence the principal's behavior at the subsequent stage. In particular, a manipulation of the incentive contract by the choice of a specific type of task is not possible for the agent as contract renegotiation is infeasible. Given the incentive-compatible payment by the principal, the best the agent can do at stage 3 is to choose a more productive task with $\Delta p = \Delta p_H$. This choice maximizes the agent's probability of receiving the extra utility θ from feeling committed and, in case this extra utility is not large enough, the complementing monetary payment $w_1^* > 0$.

3.4 Limited Liability and Renegotiation

Now, the principal faces two contractual frictions. First, the agent is protected by limited liability so that the principal has to leave a strictly positive rent to him when inducing incentives.¹¹ Second, when designing optimal incentives, the principal is restricted to the class of renegotiation-proof contracts. By defining the two critical values

$$\bar{\theta} := \frac{p_0 + \Delta p_L}{p_0 + \Delta p_H} \frac{c}{\Delta p_L} \quad \text{and} \quad \underline{\theta} := \frac{(\Delta p_H - \Delta p_L) p_0}{(p_0 + \Delta p_H) \Delta p_H} \frac{c}{\Delta p_L}, \quad (6)$$

which satisfy $\bar{\theta} > \underline{\theta}$, and the threshold

$$\tilde{\pi} := \frac{p_0 + \Delta p_L}{\Delta p_H - \Delta p_L} \underline{\theta} - \frac{p_0}{\Delta p_H \Delta p_L} c \quad (7)$$

for the returns, the following results can be obtained:

Proposition 3 *Suppose the agent is protected by limited liability and contract renegotiation is feasible.*

(i) *If task selection is reversible, the principal optimally chooses $\chi^* = 1$ and the renegotiation-proof contract*

$$(w_1^*, w_0^*) = \begin{cases} \left(\max \left\{ \frac{c}{\Delta p_H} - \theta, 0 \right\}, 0 \right) & \text{if } \pi > \tilde{\pi}, \\ \left(\max \{ \bar{\theta} - \theta, 0 \}, 0 \right) & \text{otherwise.} \end{cases} \quad (8)$$

The agent picks a more productive task with $\Delta p = \Delta p_H$, leading to first-best welfare W^{FB} .

(ii) *If task selection is irreversible, the principal optimally chooses*

$$\begin{aligned} \chi^* = 0 \text{ and } (w_1^*, w_0^*) = \left(\frac{c}{\Delta p_H}, 0 \right) & \quad \text{if } \theta < \underline{\theta}, \\ \text{but } \chi^* = 1 \text{ and } (w_1^*, w_0^*) = \left(\max \{ \bar{\theta} - \theta, 0 \}, 0 \right) & \quad \text{if } \theta \geq \underline{\theta}. \end{aligned} \quad (9)$$

The agent picks a more productive task with $\Delta p = \Delta p_H$. Expected welfare is $(p_0 + \Delta p_H) \pi - c$ ($< W^{FB}$) if $\theta < \underline{\theta}$, but W^{FB} otherwise.

First, there are parameter constellations with θ being so large that optimal monetary incentives are zero. These constellations are not problematic for the principal – neither in case of Proposition 2 nor in case of Proposition 3 – as the agent feels sufficiently strong commitment to his task. Thus,

¹¹Recall that the agent has a zero reservation value.

the agent strictly prefers a more productive task with $\Delta p = \Delta p_H$ to maximize the probability of receiving the extra utility θ .

The proof of Proposition 3 shows that, under limited liability and contract renegotiation, stage 3 of the game is the most critical one. Here, an empowered agent chooses either a more productive task with $\Delta p = \Delta p_H$ or a less productive one with $\Delta p = \Delta p_L$. The agent is protected by limited liability and earns a strictly positive rent because the principal wants to implement high effort. In this situation, the agent might be tempted to pick a task with $\Delta p = \Delta p_L$ in order to increase this rent via renegotiation at stage 4. To show this effect, neglect for a moment the principal's possibility to overrule the agent at stage 4 (i.e., switching from $\chi = 1$ to $\chi = 0$ and choosing another task) and let θ be small enough so that the principal has to provide additional monetary incentives. Given a task with $\Delta p \in \{\Delta p_L, \Delta p_H\}$, according to (5) the principal has to offer incentive pay $w_1 = \frac{c}{\Delta p} - \theta$ to make the agent choose high effort. This incentive pay leads to the rent $p_0 c / \Delta p$ for the agent. Thus, if the principal's initial contract offer specifies $w_1 = \frac{c}{\Delta p_H} - \theta$ and the agent picks a less productive task with $\Delta p = \Delta p_L$ at stage 3, the principal has to renegotiate the initial contract by offering the higher wage $w_1 = \frac{c}{\Delta p_L} - \theta$ to restore incentives. As the agent benefits from the renegotiation in terms of a higher rent $p_0 c / \Delta p_L > p_0 c / \Delta p_H$, in the given situation he would strictly prefer a less productive task with $\Delta p = \Delta p_L$ at stage 3.

In case of *reversible task selection* and initial wage offer $w_1 = \frac{c}{\Delta p_H} - \theta$, the principal has two alternatives to restore incentives when facing $\Delta p = \Delta p_L$ at stage 4. On the one hand, as explained in the paragraph before, she can renegotiate the old contract by offering the higher incentive pay $w_1 = \frac{c}{\Delta p_L} - \theta$. On the other hand, she can overrule the agent by switching from $\chi = 1$ to $\chi = 0$ and choose a more productive task with $\Delta p = \Delta p_H$. In that situation, the principal also has to renegotiate the initial contract because overruling the agent eliminates his intrinsic motivation from task commitment. Thus, the principal has to offer the higher incentive pay $w_1 = \frac{c}{\Delta p_H}$ to compensate the agent for the missing extra utility θ in case of successful performance. Either alternative can be optimal for the principal. The first alternative has the advantage that she can still make use of the intrinsic motivation due to task commitment so that θ replaces monetary incentive pay. However, the magnitude of θ determines which incentive pay $w_1 = \frac{c}{\Delta p_L} - \theta$ or $w_1 = \frac{c}{\Delta p_H}$ is lower. The second alternative has the advantage that the probability of a successful task completion is higher: $p_0 + \Delta p_H > p_0 + \Delta p_L$.

If the returns from a successful task, π , are sufficiently large and θ is sufficiently small, the principal prefers the second alternative – overruling the agent in combination with renegotiation

– to restore incentives. This scenario corresponds to the first line of (8) in Proposition 3. The principal’s preference is anticipated by an empowered agent when picking a task at stage 3. In that case, he knows that he will not benefit from picking a task with $\Delta p = \Delta p_L$ because overruling and renegotiating will lead to the same rent as picking a more productive task with $\Delta p = \Delta p_H$, namely $p_0 c / \Delta p_H$. Therefore, in that scenario an empowered agent chooses a more productive task at stage 3 and the outcome is the same as in Proposition 2, where renegotiation is not feasible.

If, however, the returns from a successful task, π , are only moderate and θ is sufficiently large, the principal will prefer a direct renegotiation of low incentive pay instead of overruling in combination with renegotiation when facing a task with $\Delta p = \Delta p_L$ at stage 3. This scenario is reflected by the second line of (8) in Proposition 3. Now, the agent will indeed pick a task with $\Delta p = \Delta p_L$ if the principal initially offers low incentive pay $w_1 = \frac{c}{\Delta p_H} - \theta$. Therefore, a contract with $w_1 = \frac{c}{\Delta p_H} - \theta$ is not renegotiation-proof in the given situation. In contrast, the principal has to offer an incentive pay $w_1 \in (\frac{c}{\Delta p_H} - \theta, \frac{c}{\Delta p_L} - \theta)$ that is sufficiently high so that the agent prefers $\Delta p = \Delta p_H$ to $\Delta p = \Delta p_L$ at stage 3. This incentive pay will be strictly smaller than $\frac{c}{\Delta p_L} - \theta$, because the agent has a higher success probability under $\Delta p = \Delta p_H$ compared to $\Delta p = \Delta p_L$. As the proof of Proposition 3 shows, from the principal’s perspective the wage $w_1 = \bar{\theta} - \theta$ is optimal. Compared to Proposition 2, where renegotiation is not feasible, this wage leads to the higher rent $p_0 c / \Delta p_L$ for the agent (instead of $p_0 c / \Delta p_H$) and, thus, to a redistribution of wealth at the expense of the principal. All in all, result (i) of Proposition 3 points out that under reversible task selection this redistribution is detrimental for the principal but does not impair efficiency.

This outcome clearly differs from that under *irreversible task selection*, described by result (ii) of Proposition 3. To restore incentives, now the principal can only rely on renegotiating an initially low incentive pay $w_1 = \frac{c}{\Delta p_H} - \theta$ when facing a task with $\Delta p = \Delta p_L$ at stage 4. Overruling the agent would not be effective any longer as the initially picked task cannot be replaced by a task with $\Delta p = \Delta p_H$. Thus, if the renegotiation-proof incentive pay $w_1 = \bar{\theta} - \theta$ is large as θ is small, the principal will optimally decide against empowerment (i.e., $\chi^* = 0$), pick a more productive task with $\Delta p = \Delta p_H$ at stage 1, and complement the task selection by the incentive pay $w_1 = \frac{c}{\Delta p_H}$. The effect of this policy is twofold. First, compared to Proposition 2 and result (i) of Proposition 3, the incentive pay leads to higher labor costs for the principal as she has to compensate the agent for the missing extra utility θ . Second, the higher labor costs do not correspond to a redistribution of wealth in favor of the agent but yields a welfare loss, as in the given situation the principal does not generate first-best welfare W^{FB} but only welfare $(p_0 + \Delta p_H)\pi - c < W^{FB}$.

According to result (ii), the principal will decide against empowerment and reduce welfare if

$$\theta < \underline{\theta} = \left(\frac{p_0c}{\Delta p_L} - \frac{p_0c}{\Delta p_H} \right) \cdot \frac{1}{p_0 + \Delta p_H}.$$

The rent difference $\frac{p_0c}{\Delta p_L} - \frac{p_0c}{\Delta p_H}$ describes the magnitude of the wealth redistribution via renegotiation. If this expression is large, even agents that feel considerably committed to their task will pick a less productive one to manipulate their rent. In other words, the larger $\underline{\theta}$ the more severe will be the principal's redistribution problem and the more she will tend to solve the problem by *not* empowering the agent.

In addition, result (ii) shows that, if the extra utility θ is sufficiently large (i.e., if $\theta \geq \underline{\theta}$), the principal will empower the agent also under irreversible task selection. Now, the principal prefers to offer the moderate incentive pay $w_1 = \bar{\theta} - \theta$ in combination with empowerment, although this leads to a redistribution of wealth as the agent earns the large rent $p_0c/\Delta p_L > p_0c/\Delta p_H$. As θ is sufficiently large, the redistribution at the expense of the principal is not too detrimental for the principal in that case.

To sum up, Proposition 3 characterizes the conditions under which empowerment is problematic as it is abused by the agent to increase his rent. If the agent is empowered but does not feel strongly committed to his task (i.e., θ is too low), he will be tempted to pick a less productive task at stage 3 of the game to increase his rent via contract renegotiation at stage 4. This kind of rent manipulation leads to a redistribution of wealth at the expense of the principal and the latter accepts this redistribution as long as it is not too large. Otherwise, however, the principal takes an alternative action. In case of reversible task selection, she eliminates the manipulation problem by the credible threat of overruling the agent when he picks a less productive task. In case of irreversible task selection, she solves the manipulation problem by *not* empowering the agent, which then leads to a welfare loss. This welfare loss is based on four conditions – the agent only feels little task commitment so that the principal cannot expect loyal behavior from him, the agent earns a positive rent that can be further increased, contract renegotiation is feasible, and the principal cannot rely on overruling as a powerful disciplining device.

4 Discussion

This section serves two purposes. First, it can be shown that, in variants of the basic model, additional negative welfare effects may arise. In particular, it can be possible that an empowered

agent picks a less productive task, or that the principal does not implement efficient effort. Second, it is shown that in a setting without task commitment and other behavioral effects the main finding still holds: delegation has a cost even when the preferences of principal and agent are exogenously aligned, and if these costs are sufficiently large the principal will forgo delegation though being efficient.

4.1 The Impact of Returns

In this subsection, two alternative scenarios are considered. In one scenario, the returns in case of a successful completion of the task take the high value $\pi = \bar{\pi}$. In the other scenario, returns take the lower value $\pi = \underline{\pi} < \bar{\pi}$. Furthermore, condition (1) is cancelled, i.e., the principal might not always prefer to induce high effort as the expected returns might not be large enough to justify high incentive pay. The following results can be derived:

Proposition 4 *Suppose the agent is protected by limited liability and contract renegotiation is feasible. Let $\theta < c/\Delta p_H$, task selection be irreversible and*

$$\underline{\pi} < \frac{(p_0 + \Delta p_L)c}{\Delta p_L^2} - \frac{p_0 c}{\Delta p_L \Delta p_H} - \theta \leq \bar{\pi}. \quad (10)$$

(i) *If $\theta \in [\underline{\theta}, c/\Delta p_H)$, the principal will choose $\chi^* = 1$ for both $\pi = \bar{\pi}$ and $\pi = \underline{\pi}$. Expected profits will be larger for $\pi = \underline{\pi}$ than for $\pi = \bar{\pi}$ iff $\bar{\theta} - \frac{c}{\Delta p_H} > \bar{\pi} - \underline{\pi}$.*

(ii) *If $\theta < \underline{\theta}$, the principal will choose $\chi^* = 0$ given $\pi = \bar{\pi}$, but $\chi^* = 1$ given $\pi = \underline{\pi}$. Expected profits will be larger for $\pi = \underline{\pi}$ than for $\pi = \bar{\pi}$ iff $\theta > \bar{\pi} - \underline{\pi}$.*

As we know from the previous results, if the agent feels sufficiently strong committed to his task, the principal will always empower the agent because the latter will never abuse his authority. If, however, the agent's task commitment is only weak, he might be tempted to manipulate his rent by choosing a less productive task. For this reason, Proposition 4 focuses on these problematic situations with $\theta < c/\Delta p_H$.

The results of Proposition 4 show that higher returns can correspond to both lower expected profits and lower welfare. The proof of the proposition highlights the intuition for these findings. It shows that the magnitude of the returns π is crucial for whether the principal wants to renegotiate initially low incentive pay when the agent has picked a less productive task at stage 3. If returns are large ($\pi = \bar{\pi}$), the principal will be interested in high effort by the agent and, hence, prefer

increasing the initial incentive pay to restore incentives under $\Delta p = \Delta p_L$. If, however, returns are not large enough ($\pi = \underline{\pi}$), the principal may prefer to save labor costs by not renegotiating the initial incentive pay. As the agent anticipates that rent manipulation is impossible in this scenario, he voluntarily picks a more productive task at stage 3. According to the proof of result (i), the principal will benefit from lower returns $\underline{\pi}$ if they are small enough to prevent renegotiation but not too small so that $\bar{\pi} - \underline{\pi}$ takes a moderate value.

Although result (i) of Proposition 4 only refers to expected profits, it can also point to a welfare implication. Suppose that the principal can endogenously choose between $\bar{\pi}$ and $\underline{\pi}$ before the game described in Section 2 starts. For example, the principal might – at similar cost – provide the agent with a more effective technology that yields returns $\pi = \bar{\pi}$ in case of success, or with a less effective technology that generates returns $\pi = \underline{\pi}$ if the agent succeeds. If in this situation the principal prefers the less effective technology to prevent renegotiation with an empowered agent, expected profits might be increased but welfare will be reduced. Result (ii) directly refers to welfare. The proof shows that high returns $\bar{\pi}$ can induce the principal not to empower the agent to avoid rent manipulation via renegotiation at stage 4, whereas low returns $\underline{\pi}$ can make renegotiation unattractive to the principal so that the agent picks a more productive task and the principal chooses empowerment. As empowerment is welfare increasing, lower returns might be associated with higher welfare than higher returns.

4.2 The Impact of the Timing of Information

So far, agent and principal perfectly know the returns and success probabilities of the available tasks *before* the game starts, although task selection only occurs at stage 3. This timing of information leads to an optimal renegotiation-proof contract that takes all possible actions into account. However, it is not unrealistic to assume that the two parties get to know the exact characteristics of the available tasks *after* they have signed the contract. Thus, in this subsection, I assume that at stage 1 agent and principal only have uncertain information about the available tasks. With probability $1 - \alpha_H - \alpha_L$ both kinds of tasks described in Section 2 will be available at stage 3, with probability α_H only more productive tasks with $\Delta p = \Delta p_H$ are available, and with probability α_L only less productive tasks with $\Delta p = \Delta p_L$ are available. At the beginning of stage 3, the agent and the principal observe which state of the world is realized. All other assumptions from Section 2 remain unchanged. The following results are obtained:¹²

¹²The threshold $\bar{\pi}$ has been defined in (7).

Proposition 5 *Suppose $\theta < c/\Delta p_H$, the agent is protected by limited liability and contract renegotiation is feasible.*

(i) *Let task selection be reversible. If $\pi > \bar{\pi}$, the principal will optimally choose $\chi^* = 1$ and the contract $(w_1^*, w_0^*) = (\frac{c}{\Delta p_H} - \theta, 0)$. If $\pi \leq \bar{\pi}$, the principal will optimally choose $\chi^* = 1$ and the contract $(w_1^*, w_0^*) = (\bar{\theta} - \theta, 0)$ given that α_H is sufficiently small, but $\chi^* = 1$ in combination with contract $(w_1, w_0) = (\frac{c}{\Delta p_H} - \theta, 0)$ given that α_H is not sufficiently small. In the latter case, the agent picks a less productive task with $\Delta p = \Delta p_L$ if both kinds of tasks are available.*

(ii) *Let task selection be irreversible. If α_H is sufficiently large, the principal optimally chooses $\chi^* = 1$ and the contract $(w_1^*, w_0^*) = (\frac{c}{\Delta p_H} - \theta, 0)$; the agent will pick a less productive task with $\Delta p = \Delta p_L$ if both kinds of tasks are available. If α_H is not sufficiently large, the principal optimally chooses $\chi^* = 1$ and the contract $(w_1^*, w_0^*) = (\bar{\theta} - \theta, 0)$ if*

$$\frac{\alpha_L}{1 - \alpha_L} \geq \frac{p_0 + \Delta p_H}{(p_0 + \Delta p_L) \theta} \left(\bar{\theta} - \frac{c}{\Delta p_H} - \theta \right), \quad (11)$$

and $\chi^ = 0$ in combination with contract $(w_1^*, w_0^*) = (\frac{c}{\Delta p_H}, 0)$ otherwise.*

The proposition shows that optimal contracts are no longer renegotiation-proof. Instead of choosing an initial contract with high incentive pay, it is always better for the principal to start with moderate incentives and increase incentive pay whenever nature chooses a state of the world where such renegotiation is necessary to restore incentives. Similar to Proposition 4, the results of Proposition 5 also refer to situations in which the agent only feels little task commitment (i.e., $\theta < c/\Delta p_H$) so that the principal must be afraid of possible rent manipulation.

At first sight, the optimal contracts that are already known from Proposition 3 are again optimal under the alternative timing of information considered in this subsection. Again, the principal sometimes forgoes empowerment if task selection is irreversible. However, there is a crucial difference to the model of Section 2. In case of Proposition 3, the contract $(w_1, w_0) = (\frac{c}{\Delta p_H} - \theta, 0)$ with low-powered incentives is only chosen by the principal if she prefers overruling in combination with renegotiation to direct renegotiation when facing a task with $\Delta p = \Delta p_L$ at stage 4. In that case, the principal can be sure that the agent, who anticipates being overruled when picking a task with $\Delta p = \Delta p_L$, voluntarily picks a more productive task. Now, the principal will additionally prefer contract $(w_1, w_0) = (\frac{c}{\Delta p_H} - \theta, 0)$ if, ex ante, it is sufficiently likely that only tasks with $\Delta p = \Delta p_H$ are available at stage 3 (i.e., α_H is large). This result holds irrespective of whether task

selection is reversible or irreversible.¹³ In these situations, the contract $(w_1, w_0) = (\frac{c}{\Delta p_H} - \theta, 0)$ leads to a new kind of inefficiency. With probability $1 - \alpha_H - \alpha_L$ nature chooses the state where both kinds of tasks are available, and in that state the agent picks a less productive task with $\Delta p = \Delta p_L$ to force the principal into renegotiation. Whereas in the model of Section 2 an empowered agent always chooses a more productive task at stage 3 as contracts are renegotiation-proof, now it is possible that an empowered agent chooses a less productive task to boost his rent. In that state of the world, expected welfare is only $(p_0 + \Delta p_L)(\pi + \theta) - c$, which is strictly smaller than (2).

Finally, I consider the case that renegotiation is not possible at stage 4. By defining

$$\hat{\pi} := \frac{1}{\Delta p_L} \left[\frac{1 - \alpha_L}{\alpha_L} (p_0 + \Delta p_H) + p_0 \right] \left(\frac{c}{\Delta p_L} - \frac{c}{\Delta p_H} \right) + \frac{c}{\Delta p_L} - \theta \quad (12)$$

the following result can be obtained:¹⁴

Proposition 6 *Suppose $\theta < c/\Delta p_H$, the agent is protected by limited liability and contract renegotiation is not feasible. Irrespective of whether task selection is reversible or not, the principal chooses $\chi^* = 1$. The optimal contract will be $(w_1, w_0) = (\frac{c}{\Delta p_L} - \theta, 0)$ if $\pi \geq \max\{\hat{\pi}, \tilde{\pi}\}$ and $\alpha_L > 0$; otherwise contract $(w_1, w_0) = (\frac{c}{\Delta p_H} - \theta, 0)$ will be optimal.*

Similar to the finding of Proposition 2, the impossibility of renegotiation makes the principal's threat of overruling the agent incredible in cases the latter has picked a less productive task. Nevertheless, the principal always prefers empowerment as infeasible renegotiation also prevents the principal from being manipulated by an empowered agent, who might be tempted to boost his rent via the choice of a less productive task. However, Proposition 6 also crucially differs from Proposition 2, because a new kind of inefficiency arises. If $\tilde{\pi} \leq \pi < \hat{\pi}$ and $\alpha_L > 0$, the principal prefers to gamble by choosing low-powered incentives $(w_1, w_0) = (\frac{c}{\Delta p_H} - \theta, 0)$ and hoping that a state of the world will arise in which more productive tasks are available. As $\tilde{\pi} \leq \pi < \hat{\pi}$ and condition (12) show, this contract will be optimal if returns are not large enough and α_L , the probability that only less productive tasks are available, is small. In that situation, with probability α_L the principal implements inefficiently low effort $e = 0$.

¹³For reversible task selection, only the additional condition $\pi \leq \tilde{\pi}$ has to be satisfied so that the principal does not want to overrule the agent at stage 4.

¹⁴ $\tilde{\pi}$ has been defined in (1).

4.3 Empowerment Without Task Commitment

Although the previous results of Section 4 are all based on the assumption that θ is small, one might nevertheless question how important the behavioral effect of task commitment is for the central findings of the paper. In particular, if $\theta = 0$, empowerment is no longer necessary for achieving an efficient outcome, and the principal will strictly prefer not to empower the agent. However, this subsection abstracts from behavioral effects and uses a traditional argument – asymmetric information – to show that the main finding qualitatively still holds: if the agent has an informational advantage in distinguishing between less and more productive tasks, empowerment will be efficient to use the agent’s decentralized information; delegation has still a cost although the preferences of principal and agent are exogenously aligned, i.e., in principle both parties prefer more productive tasks.

I assume that $\theta = 0$ and that there exist the same three states of the world as in Section 4.2. At stage 1, principal and agent only know that with probability $1 - \alpha_H - \alpha_L$ both more productive and less productive tasks will be available at stage 3, with probability α_H only Δp_H -tasks will be available, and with probability α_L only Δp_L -tasks will be available. At the beginning of stage 3, due to his decentralized information, only the agent can observe the realized state of the world and distinguish between less and more productive tasks if different tasks exist. If $\chi = 1$, the agent will choose a specific task. If $\chi = 0$, the uninformed principal randomly picks a task. Over time the principal learns the kind of chosen task (e.g., she learns more details about how the task can be best accomplished) so that she has the same information as the agent at the renegotiation stage 4. All other assumptions from Section 2 remain unchanged. For this modified setting the following result can be obtained:

Proposition 7 *Suppose the agent is protected by limited liability and contract renegotiation is feasible. Let task selection be irreversible. If*

$$\pi < \frac{1 + \alpha_H - \alpha_L}{1 - \alpha_H - \alpha_L} \frac{p_0}{\Delta p_H \Delta p_L} c, \quad (13)$$

the principal will optimally choose $\chi^ = 0$ and the contract $(w_1, w_0) = (\frac{c}{\Delta p_H}, 0)$ so that with probability $(1 - \alpha_H - \alpha_L)/2$ she picks a less productive task although more productive tasks are also available.*

The proposition shows under which conditions the principal does not empower the agent despite

his valuable information. Hence, the principal also behaves inefficiently in this modified setting without task commitment. Here, we have the following trade-off. On the one hand, empowerment is efficient to make use of the agent's decentralized information, as otherwise the principal randomly picks a less productive task with probability $1/2$ in that state of the world where both kinds of tasks are available. On the other hand, empowerment is costly for the principal because she has to offer high incentive pay to prevent the agent from rent manipulation. Such wage policy induces the agent to use his decentralized information and to always pick a more productive task if both kinds of tasks are available. This trade-off is reflected by condition (13). In particular, forgoing empowerment will be optimal if the probability of the state of the world in which both kinds of tasks are available, $1 - \alpha_H - \alpha_L$, is sufficiently small, which corresponds to a low probability of inefficient task selection when the principal randomly picks a task. Moreover, the optimal wage that prevents rent manipulation under empowerment, $w_1 = \bar{\theta}$, increases with p_0 and c , and decreases with Δp_H and Δp_L . The same holds for the right-hand side of condition (13). Thus, forgoing empowerment is optimal for the principal if preventing rent manipulation is too costly.

5 Conclusion

The management and social psychology literature emphasizes that empowerment leads to additional incentives from feeling committed. Thus, in economic terms, empowerment enhances efficiency. This paper shows that a principal sometimes prefers to forgo empowerment, though being efficient. Under empowerment, the agent obtains the authority to choose and perform a specific task. The agent can abuse authority to manipulate his compensation package, which harms the principal. If this problem is sufficiently severe, the principal will violate efficiency. However, there also exist situations in which the commitment effect is so strong that the principal strictly prefers empowerment as she need not be afraid of the agent abusing authority.

The analysis points to several testable predictions. In real life, an agent with high reservation value or unlimited liability corresponds to an employee with a high qualification, which implies a large outside option or a negligible wealth constraint. Thus, against the background of the findings for the basic model, empowerment should be primarily observed for highly qualified employees. Furthermore, competition for workers shifts rents from firms to workers and forces the firms to rely on efficient work practices like empowerment. Therefore, we should expect for real employment relationships that firms make more extensively use of empowerment the higher the degree of

competition for workers' services. In addition, the model predicts that the need to use monetary incentives declines with the level of task commitment resulting from the empowerment of the agent.

The results yield two managerial implications. First, if a firm wants to apply empowerment, it should do so in a very consequent way. If the firm delegates full authority to its employees – i.e., the employees are free to decide on the whole production process including task selection without being monitored by the firm – and only observes output, it will completely eliminate detrimental manipulation of incentive pay by the employees. This finding nicely corresponds to the observation of Barth et al. (2008) that the combination of delegated authority, performance-related pay and the omission of monitoring can be found in many Norwegian establishments. Second, this kind of consequent empowerment without interim monitoring even works if employees have private information about the possible tasks that can be chosen. Due to incentive-compatible compensation and the missing possibility of manipulating incentive pay, the employees voluntarily choose tasks that are most productive to the firm. In this situation, the principal strongly benefits from remaining ignorant. In practice, the principal may even save transaction costs by giving the agent full responsibility and forgoing interim monitoring.

Appendix

Proof of Proposition 1. From stage 5, it is known that (4) is satisfied. At stage 4, there is no renegotiation as the initial contract has to be renegotiation-proof. In particular, the initial contract induces sufficiently high incentives so that, in any case, the agent prefers working hard. In addition, the principal is interested in empowerment and, in case of reversible task selection, not overruling the agent at stage 4: As the agent is not protected by limited liability, the principal's optimal contract makes the agent's participation constraint just bind so that the principal extracts all rents from the agent. Empowering and not overruling the agent preserves the agent's expected utility from feeling committed, $(p_0 + \Delta p)\theta$, which relaxes the binding participation constraint and, thus, increases the principal's expected profits.

At stage 3, given a renegotiation-proof contract, an empowered agent cannot do better than choosing a more profitable task with $\Delta p = \Delta p_H$ to maximize the probability of realizing $w_1 + \theta$. He would be worse off choosing a less profitable task with $\Delta p = \Delta p_L$ and not being overruled by the principal at stage 4. Choosing a task with $\Delta p = \Delta p_L$ and being overruled by the principal at

stage 4 would also not benefit the agent compared to directly choosing a more productive task with $\Delta p = \Delta p_H$.

At stage 1, the principal optimally chooses $\chi = 1$ and offers a contract (w_1, w_0) that satisfies the incentive constraint (4), makes the participation constraint bind, and is renegotiation-proof. Such optimal contract under unlimited liability is not unique. Suppose the contract specifies a wage spread satisfying

$$\Delta w \geq \frac{c}{\Delta p_L}. \quad (\text{A.1})$$

Such wage spread induces high effort at stage 5 irrespective of whether $\Delta p = \Delta p_L$ or $\Delta p = \Delta p_H$, and whether the agent is empowered or not. In other words, such wage spread is incentive-compatible and renegotiation-proof even in cases where the agent is overruled. The corresponding optimal wage w_0 is described by the binding participation constraint

$$\begin{aligned} (p_0 + \Delta p_H)(\theta + w_1) + (1 - (p_0 + \Delta p_H))w_0 - c &= 0 \Leftrightarrow \\ w_0 &= c - (p_0 + \Delta p_H)(\Delta w + \theta). \end{aligned} \quad (\text{A.2})$$

The principal optimally chooses a contract (w_1^*, w_0^*) that satisfies conditions (A.1) and (A.2).

Proof of Corollary 1. (i) Recall that the basic model with unlimited liability assumes a zero reservation value for the agent. If, on the contrary, the agent is protected by limited liability but has a sufficiently large reservation value and the principal wants to hire the agent, there will be qualitatively the same outcome as in the main model: the principal optimally chooses empowerment and incentive-compatible wages that make the participation constraint just bind. The only difference to the setting considered in the basic model is that now w_0 might be positive and sufficiently large to make the agent sign the contract.

(ii) A principal earns zero profit if she cannot hire the agent. The agent accepts the contract that offers the highest payoff. Each principal wants to hire the agent and make him choose high effort. Participation of the agent is now determined by the principals' competing contract offers. Like in Bertrand competition, the two identical principals bid for the agent so that in equilibrium each principal earns zero profit and the full surplus goes to the agent. Competition forces both principals to decide in favor of empowerment and a wage spread that always guarantees high effort, e.g., a Δw satisfying (A.1). Such wage spread does not leave room for renegotiation and makes the agent voluntarily choose a more productive task if being hired. Altogether, a similar outcome as

under unlimited liability is obtained. The only difference is that now the agent has full bargaining power and extracts all rents.

Proof of Proposition 2. (a) Let $\theta < c/\Delta p_H$, i.e., the commitment effect is not strong enough to make an empowered agent work hard on a more profitable task without additional monetary incentives. Suppose $\chi = 1$ and $w_1 = \frac{c}{\Delta p_H} - \theta$. If, at stage 4, the principal observes that the agent has chosen a task with $\Delta p = \Delta p_H$, the contract specifying $w_1 = \frac{c}{\Delta p_H} - \theta$ will be incentive-compatible. If, however, the principal observes a task with $\Delta p = \Delta p_L$, the contract will not be incentive-compatible, the agent will choose zero effort at stage 5, and the principal's expected profits will amount to¹⁵

$$p_0 \left(\pi - \frac{c}{\Delta p_H} + \theta \right). \quad (\text{A.3})$$

At stage 4, contract renegotiation is infeasible by assumption but, if facing $\Delta p = \Delta p_L$ and task selection is reversible, the principal might prefer to overrule the agent, switch to $\chi = 0$ and choose a task with $\Delta p = \Delta p_H$. In that case, the agent's intrinsic motivation from empowerment is destroyed so that the wage $w_1 = \frac{c}{\Delta p_H} - \theta$ is still not large enough to induce high effort, i.e., the principal's expected profits are again described by (A.3). At stage 3, given $\chi = 1$, the agent will choose $\Delta p = \Delta p_H$ instead of $\Delta p = \Delta p_L$ even if he expects not to be overruled by the principal in the latter case (so that the extra utility due to task commitment, θ , is not destroyed), as

$$(p_0 + \Delta p_H) \left(\theta + \frac{c}{\Delta p_H} - \theta \right) - c \geq p_0 \left(\theta + \frac{c}{\Delta p_H} - \theta \right)$$

holds with equality. At stage 1, the principal has to decide on χ and the incentive contract. The principal's expected profits from $\chi = 0$, the choice of a task with $\Delta p = \Delta p_H$ by her own, and corresponding incentive-compatible wage $w_1 = \frac{c}{\Delta p_H}$ are given by

$$(p_0 + \Delta p_H) \left(\pi - \frac{c}{\Delta p_H} \right).$$

As these profits are strictly smaller than expected profits from $\chi = 1$ and offering $w_1 = \frac{c}{\Delta p_H} - \theta$, i.e.,

$$(p_0 + \Delta p_H) \left(\pi - \frac{c}{\Delta p_H} + \theta \right),$$

given $\theta < c/\Delta p_H$ the principal prefers empowerment ($\chi^* = 1$) and the corresponding optimal

¹⁵Note that $\pi > \frac{c}{\Delta p_H} - \theta$ is true according to (1).

incentive contract $(w_1^*, w_0^*) = \left(\frac{c}{\Delta p_H} - \theta, 0\right)$.

(b) Let $c/\Delta p_H \leq \theta < c/\Delta p_L$. Suppose $\chi = 1$ and $w_1 = 0$. If, at stage 4, the principal observes a task with $\Delta p = \Delta p_H$, the wage $w_1 = 0$ will be incentive-compatible, leading to expected profits $(p_0 + \Delta p_H)\pi$. If, however, the principal faces $\Delta p = \Delta p_L$, the wage $w_1 = 0$ will not be incentive-compatible, the agent will choose zero effort at stage 5, and the principal's expected profits will be $p_0\pi$. When facing $\Delta p = \Delta p_L$ at stage 4 and task selection is reversible, the principal could overrule the agent, switch to $\chi = 0$ and choose a task with $\Delta p = \Delta p_H$, which would destroy the agent's intrinsic motivation, thus leading again to zero effort and expected profits $p_0\pi$. At stage 3, given $\chi = 1$, the agent will prefer $\Delta p = \Delta p_H$ to $\Delta p = \Delta p_L$ even if he expects not to be overruled by the principal in the latter case, as

$$(p_0 + \Delta p_H)\theta - c \geq p_0\theta$$

holds due to $\theta \in [c/\Delta p_H, c/\Delta p_L)$. At stage 1, the principal has to decide on χ and w_1 . Her expected profits from $\chi = 0$, the choice of $\Delta p = \Delta p_H$ by her own, and the corresponding incentive-compatible wage $w_1 = \frac{c}{\Delta p_H}$ are given by

$$(p_0 + \Delta p_H) \left(\pi - \frac{c}{\Delta p_H} \right) < (p_0 + \Delta p_H)\pi.$$

Thus, given $c/\Delta p_H \leq \theta < c/\Delta p_L$, the principal prefers empowerment ($\chi^* = 1$) and the corresponding optimal incentive contract $(w_1^*, w_0^*) = (0, 0)$.

(c) Let $\theta \geq c/\Delta p_L$. Suppose $\chi = 1$ and $w_1 = 0$. Irrespective of the type of task the principal faces at stage 4, the agent chooses high effort at stage 5, leading to expected profits $(p_0 + \Delta p)\pi$ for given $\Delta p \in \{\Delta p_H, \Delta p_L\}$. At stage 3, given $\chi = 1$, the agent strictly prefers $\Delta p = \Delta p_H$ to $\Delta p = \Delta p_L$, yielding expected payoff $(p_0 + \Delta p_H)\theta - c$ instead of $(p_0 + \Delta p_L)\theta - c$. Hence, given $\theta \geq c/\Delta p_L$, the principal chooses empowerment ($\chi^* = 1$) and $(w_1^*, w_0^*) = (0, 0)$.

Proof of Proposition 3. I start with considering reversible task selection, summarized by the following cases (a)–(c). Cases (d)–(f) deal with irreversible task selection.

Reversible task selection:

(a) Let $\theta < c/\Delta p_H$. Suppose $\chi = 1$ and the initial contract has $w_1 = \frac{c}{\Delta p_H} - \theta$ (if $\theta < c/\Delta p_H$, the principal will never offer an initial wage w_1 that is smaller than $\frac{c}{\Delta p_H} - \theta$, because she anticipates that she will switch to an incentive-compatible contract at the renegotiation stage 4). If the principal observes a task with $\Delta p = \Delta p_H$ at stage 4, the initial contract will be incentive-compatible so that

the principal is not interested in renegotiation or overruling the agent. If, however, the principal faces $\Delta p = \Delta p_L$, the initial contract will not be incentive-compatible, the agent will choose zero effort at stage 5, and the principal's expected profits will be described by (A.3). The principal can restore incentives in two different ways – she can either (I) renegotiate the initial contract by offering the incentive-compatible wage $w_1 = \frac{c}{\Delta p_L} - \theta$, or (II) overrule the agent by switching to $\chi = 0$, choose a more profitable task with $\Delta p = \Delta p_H$, and then renegotiate the initial contract by offering the incentive-compatible wage $w_1 = \frac{c}{\Delta p_H}$. In case of alternative (I), expected profits after the renegotiation would be

$$(p_0 + \Delta p_L) \left(\pi - \frac{c}{\Delta p_L} + \theta \right). \quad (\text{A.4})$$

The principal will benefit from the renegotiation iff

$$(p_0 + \Delta p_L) \left(\pi - \frac{c}{\Delta p_L} + \theta \right) \geq p_0 \left(\pi - \frac{c}{\Delta p_H} + \theta \right) \Leftrightarrow \pi \geq \frac{(p_0 + \Delta p_L)c}{\Delta p_L^2} - \frac{p_0 c}{\Delta p_L \Delta p_H} - \theta, \quad (\text{A.5})$$

which is true by (1). The agent would approve the renegotiation as the new wage offer is larger than the initial one. In case of alternative (II), overruling the agent, choosing a more profitable task with $\Delta p = \Delta p_H$, and offering the new wage $w_1 = \frac{c}{\Delta p_H}$ induces high effort to the agent so that expected profits would be

$$(p_0 + \Delta p_H) \left(\pi - \frac{c}{\Delta p_H} \right).$$

The principal will benefit from overruling and renegotiating iff

$$(p_0 + \Delta p_H) \left(\pi - \frac{c}{\Delta p_H} \right) > p_0 \left(\pi - \frac{c}{\Delta p_H} + \theta \right) \Leftrightarrow \pi > \frac{c + p_0 \theta}{\Delta p_H},$$

which is true by (1) and the fact that $\theta < c/\Delta p_H$ in the given scenario. Again, the agent would approve the renegotiation as the new wage offer $w_1 = \frac{c}{\Delta p_H}$ is larger than the initial one, $\frac{c}{\Delta p_H} - \theta$. To sum up, both alternatives (I) and (II) are feasible to restore the agent's incentives when the principal faces a task with $\Delta p = \Delta p_L$ at stage 4 but, so far, it is not clear which alternative is the preferred one. The principal will prefer alternative (II) to alternative (I) iff

$$(p_0 + \Delta p_H) \left(\pi - \frac{c}{\Delta p_H} \right) > (p_0 + \Delta p_L) \left(\pi - \frac{c}{\Delta p_L} + \theta \right) \Leftrightarrow \pi > \frac{p_0 + \Delta p_L}{\Delta p_H - \Delta p_L} \theta - \frac{p_0}{\Delta p_H \Delta p_L} c =: \tilde{\pi}. \quad (\text{A.6})$$

Note that condition (A.6) can be satisfied or not. In particular, it is not necessarily implied by

condition (1), which requires that $\pi > (p_0 + \Delta p_L) \frac{c}{\Delta p_L^2}$ must hold: the inequality

$$\frac{(p_0 + \Delta p_L) c}{\Delta p_L^2} > \frac{\Delta p_L + p_0}{\Delta p_H - \Delta p_L} \theta - \frac{p_0 c}{\Delta p_H \Delta p_L} \Leftrightarrow \theta < \frac{(\Delta p_H^2 - \Delta p_L^2) p_0}{\Delta p_H \Delta p_L^2 (\Delta p_L + p_0)} c + \frac{(\Delta p_H - \Delta p_L) c}{\Delta p_L (\Delta p_L + p_0)}$$

is satisfied for sufficiently small values of θ , but does not hold for sufficiently small values of $\Delta p_H - \Delta p_L$.

At stage 3, given an initial contract with $w_1 = \frac{c}{\Delta p_H} - \theta$, the agent has to choose between a more profitable task with $\Delta p = \Delta p_H$ and a less profitable one with $\Delta p = \Delta p_L$. Suppose condition (A.6) holds, i.e., the agent anticipates that the principal prefers overruling in combination with renegotiation at stage 4 when facing $\Delta p = \Delta p_L$. The agent's payoff from choosing a more profitable task with $\Delta p = \Delta p_H$ at stage 3 is

$$(p_0 + \Delta p_H) \left(\theta + \frac{c}{\Delta p_H} - \theta \right) - c = \frac{p_0}{\Delta p_H} c.$$

His payoff from choosing a less profitable task with $\Delta p = \Delta p_L$ at stage 3 and anticipating being overruled at stage 4 and being offered the higher incentive pay $w_1 = \frac{c}{\Delta p_H}$ is

$$(p_0 + \Delta p_H) \frac{c}{\Delta p_H} - c = \frac{p_0}{\Delta p_H} c.$$

Hence, according to the tie-breaking rule of Section 2, the agent would choose $\Delta p = \Delta p_H$ at stage 3. Altogether, if condition (A.6) holds, the contract $(w_1^*, w_0^*) = (\frac{c}{\Delta p_H} - \theta, 0)$ is renegotiation-proof and optimal for the principal in combination with empowerment ($\chi = 1$) as it implements high effort at lowest possible cost.

Now, suppose that condition (A.6) does not hold. At stage 3, given an initial contract with $w_1 = \frac{c}{\Delta p_H} - \theta$, the agent again has to pick a task with $\Delta p \in \{\Delta p_L, \Delta p_H\}$. He anticipates that the principal will prefer renegotiation (without overruling) by offering the high incentive pay $w_1 = \frac{c}{\Delta p_L} - \theta$ when facing $\Delta p = \Delta p_L$ at stage 4. In this situation, the agent strictly prefers a task with $\Delta p = \Delta p_L$ to a task with $\Delta p = \Delta p_H$ because the former leads to a higher payoff:

$$(p_0 + \Delta p_L) \left(\theta + \frac{c}{\Delta p_L} - \theta \right) - c = \frac{p_0}{\Delta p_L} c > (p_0 + \Delta p_H) \left(\theta + \frac{c}{\Delta p_H} - \theta \right) - c = \frac{p_0}{\Delta p_H} c.$$

Therefore, if condition (A.6) does not hold, an initial contract with $w_1 = \frac{c}{\Delta p_H} - \theta$ will not be renegotiation-proof.

Given that condition (A.6) does not hold, a renegotiation-proof contract has to specify an initial wage $w_1 \in (\frac{c}{\Delta p_H} - \theta, \frac{c}{\Delta p_L} - \theta]$ that is sufficiently attractive for the agent so that he prefers a more productive task with $\Delta p = \Delta p_H$ at stage 3 instead of $\Delta p = \Delta p_L$ in combination with anticipated renegotiation, leading to wage $w_1 = \frac{c}{\Delta p_L} - \theta$ ex post. From the principal's perspective, the respectively optimal wage, \hat{w}_1 , makes the agent just indifferent between $\Delta p = \Delta p_H$ and $\Delta p = \Delta p_L$ at stage 3 so that he chooses a task with $\Delta p = \Delta p_H$ according to the tie-breaking rule of Section 2:¹⁶

$$\frac{p_0}{\Delta p_L} c = (p_0 + \Delta p_H) (\theta + \hat{w}_1) - c \Leftrightarrow \hat{w}_1 = \bar{\theta} - \theta \quad \text{with} \quad \bar{\theta} := \frac{p_0 + \Delta p_L}{p_0 + \Delta p_H} \frac{c}{\Delta p_L}.$$

However, empowering the agent ($\chi = 1$) and offering this wage \hat{w}_1 as part of the initial contract will only be preferred by the principal if the corresponding expected profits are (weakly) larger than expected profits from choosing $\chi = 0$ and $w_1 = \frac{c}{\Delta p_H}$ at stage 1, and $\Delta p = \Delta p_H$ at stage 3:

$$(p_0 + \Delta p_H) (\pi - \bar{\theta} + \theta) \geq (p_0 + \Delta p_H) \left(\pi - \frac{c}{\Delta p_H} \right) \Leftrightarrow \theta \geq \frac{(\Delta p_H - \Delta p_L) p_0}{(p_0 + \Delta p_H) \Delta p_H} \frac{c}{\Delta p_L} =: \underline{\theta}. \quad (\text{A.7})$$

This condition is always satisfied in the given situation, where (A.6) does not hold.¹⁷ Intuitively, if overruling the agent at stage 4 is not attractive for the principal, she will also not prefer $\chi = 0$ to $\chi = 1$ at stage 1.

To summarize, given $\theta < c/\Delta p_H$, the principal always prefers $\chi = 1$. If condition (A.6) holds, she will choose the renegotiation-proof contract $(w_1^*, w_0^*) = (\frac{c}{\Delta p_H} - \theta, 0)$; otherwise, she will choose the renegotiation-proof contract $(w_1^*, w_0^*) = (\bar{\theta} - \theta, 0)$.

(b) Let $c/\Delta p_H \leq \theta < c/\Delta p_L$. Suppose $\chi = 1$ and let the initial contract be $(w_1, w_0) = (0, 0)$ (note that any positive wage $w_1 < \frac{c}{\Delta p_L} - \theta$ cannot be optimal). If the principal observes a more productive task with $\Delta p = \Delta p_H$ at stage 4, she will not prefer to overrule the agent and/or renegotiate the initial contract because the agent will choose high effort at stage 5. If, however, she observes a less productive task with $\Delta p = \Delta p_L$, the initial contract will lead to zero effort and expected profits $p_0\pi$. As in case (a), the principal has two alternatives to restore incentives – she can either (I) renegotiate the initial contract by offering the higher incentive pay $w_1 = \frac{c}{\Delta p_L} - \theta$, or (II) overrule the agent, choose a task with $\Delta p = \Delta p_H$, and then renegotiate the initial contract

¹⁶Note that $\bar{\theta} - \theta \in (\frac{c}{\Delta p_H} - \theta, \frac{c}{\Delta p_L} - \theta)$.

¹⁷As a necessary condition for (A.6) not to hold, incentive pay under overruling in combination with renegotiation must be larger than the incentive pay from direct renegotiation at stage 4, i.e., $\frac{c}{\Delta p_H} > \frac{c}{\Delta p_L} - \theta \Leftrightarrow \theta > \frac{(\Delta p_H - \Delta p_L)c}{\Delta p_H \Delta p_L}$, implying (A.7).

by offering $w_1 = \frac{c}{\Delta p_H}$. Under alternative (I), the agent chooses high effort, and expected profits change from $p_0\pi$ to (A.4). The principal will prefer to renegotiate the initial contract iff

$$(p_0 + \Delta p_L) \left(\pi - \frac{c}{\Delta p_L} + \theta \right) > p_0\pi \Leftrightarrow \pi > \frac{p_0 + \Delta p_L}{\Delta p_L} \left(\frac{c}{\Delta p_L} - \theta \right),$$

which holds according to (1). The agent approves renegotiation as the new wage offer is larger than the initial zero wage. Under alternative (II), overruling the agent, switching to $\Delta p = \Delta p_H$, and offering the new wage $w_1 = \frac{c}{\Delta p_H}$ induces high effort to the agent so that expected profits would be

$$(p_0 + \Delta p_H) \left(\pi - \frac{c}{\Delta p_H} \right).$$

The principal will benefit from overruling in combination with renegotiating iff

$$(p_0 + \Delta p_H) \left(\pi - \frac{c}{\Delta p_H} \right) > p_0\pi \Leftrightarrow \pi > (p_0 + \Delta p_H) \frac{c}{\Delta p_H^2},$$

which is true by (1). Again, the agent would approve the renegotiation as the new wage offer $w_1 = \frac{c}{\Delta p_H}$ is larger than the initial zero wage. As we know from case (a), the principal will prefer alternative (II) to alternative (I), if and only if condition (A.6) is satisfied.

At stage 3, given an initial contract with $w_1 = 0$, the agent has to choose between a task with $\Delta p = \Delta p_H$ and one with $\Delta p = \Delta p_L$. Suppose condition (A.6) holds. The agent's payoff from choosing a more profitable task with $\Delta p = \Delta p_H$ at stage 3 is $(p_0 + \Delta p_H)\theta - c$. His payoff from choosing a less profitable task with $\Delta p = \Delta p_L$ and anticipating being overruled at stage 4 and being offered incentive pay $w_1 = \frac{c}{\Delta p_H}$ is $(p_0 + \Delta p_H) \frac{c}{\Delta p_H} - c$. As $\theta \in [c/\Delta p_H, c/\Delta p_L]$, the agent prefers $\Delta p = \Delta p_H$ at stage 3. Thus, if condition (A.6) holds, contract $(w_1^*, w_0^*) = (0, 0)$ will be renegotiation-proof and – in combination with empowerment ($\chi = 1$) – optimal for the principal.

Now, suppose condition (A.6) does not hold. At stage 3, given an initial contract with $w_1 = 0$, the agent again has to select a task with $\Delta p \in \{\Delta p_L, \Delta p_H\}$. He anticipates that in case of $\Delta p = \Delta p_L$ the principal renegotiates the initial contract at stage 4 by offering the high incentive pay $w_1 = \frac{c}{\Delta p_L} - \theta$. The agent will prefer a task with $\Delta p = \Delta p_H$ to a task with $\Delta p = \Delta p_L$ iff¹⁸

$$(p_0 + \Delta p_H)\theta - c \geq (p_0 + \Delta p_L) \left(\theta + \frac{c}{\Delta p_L} - \theta \right) - c \Leftrightarrow \theta \geq \bar{\theta}. \quad (\text{A.8})$$

¹⁸Note that $\bar{\theta} \in (c/\Delta p_H, c/\Delta p_L)$.

Thus, if condition (A.6) does not hold but condition (A.8) is satisfied, again contract $(w_1^*, w_0^*) = (0, 0)$ will be renegotiation-proof and – in combination with empowerment ($\chi = 1$) – optimal for the principal. If, however, both conditions (A.6) and (A.8) do not hold, an initial contract with $w_1 = 0$ will not be renegotiation-proof.

Finally, suppose conditions (A.6) and (A.8) do not hold. A renegotiation-proof contract has to specify an initial wage $w_1 \in (0, \frac{c}{\Delta p_L} - \theta]$ that is sufficiently attractive for the agent so that he prefers a task with $\Delta p = \Delta p_H$ at stage 3 instead of $\Delta p = \Delta p_L$ in combination with anticipated renegotiation, leading to wage $w_1 = \frac{c}{\Delta p_L} - \theta$ ex post. In analogy to case (a), from the principal's perspective the optimal wage makes the agent just indifferent between $\Delta p = \Delta p_H$ and $\Delta p = \Delta p_L$ at stage 3 so that he chooses a task with $\Delta p = \Delta p_H$ according to the tie-breaking rule of Section 2. Hence, we obtain the same optimal wage as in case (a): $\hat{w}_1 = \bar{\theta} - \theta$. In addition, as in case (a), the violation of condition (A.6), i.e., $(p_0 + \Delta p_L)(\pi - \frac{c}{\Delta p_L} + \theta) > (p_0 + \Delta p_H)(\pi - \frac{c}{\Delta p_H})$, implies $(p_0 + \Delta p_H)(\pi - \hat{w}_1) > (p_0 + \Delta p_H)(\pi - \frac{c}{\Delta p_H})$ so that the principal prefers $\chi = 1$ in combination with contract $(w_1, w_0) = (\hat{w}_1, 0)$ to $\chi = 0$ in combination with contract $(w_1, w_0) = (\frac{c}{\Delta p_H}, 0)$.

To summarize, given $c/\Delta p_H \leq \theta < c/\Delta p_L$, the principal always prefers $\chi = 1$. If either condition (A.6) or condition (A.8) holds, she will choose the renegotiation-proof contract $(w_1^*, w_0^*) = (0, 0)$; otherwise, she will choose the renegotiation-proof contract $(w_1^*, w_0^*) = (\bar{\theta} - \theta, 0)$.

(c) Let $\theta \geq c/\Delta p_L$. Both principal and agent know that intrinsic motivation from feeling committed is so large that the agent will choose high effort given any task and non-negative wages. Thus, the principal optimally chooses $\chi = 1$ and offers $w_0^* = w_1^* = 0$. As the agent cannot increase his income by choosing a task with $\Delta p = \Delta p_L$ instead of one with $\Delta p = \Delta p_H$, because the principal will never agree to renegotiate the zero wages, he prefers a task with $\Delta p = \Delta p_H$ to maximize the probability of receiving θ .

Result (i) of Proposition 3 summarizes the findings on reversible task selection.

Irreversible task selection:

(d) Let $\theta < c/\Delta p_H$. Suppose $\chi = 1$ and the initial contract has $w_1 = \frac{c}{\Delta p_H} - \theta$. If the principal observes a task with $\Delta p = \Delta p_L$ at stage 4, the initial contract will not be incentive-compatible, the agent will choose zero effort at stage 5, and the principal's expected profits will be described by (A.3). As the task selection is irreversible, the principal's only possibility to restore incentives is to renegotiate the initial contract by offering $w_1 = \frac{c}{\Delta p_L} - \theta$ at stage 4. From case (a) we know that both principal and agent would benefit from renegotiating. We also know from case (a) that, given an initial contract with $w_1 = \frac{c}{\Delta p_H} - \theta$, the agent prefers $\Delta p = \Delta p_L$ to $\Delta p = \Delta p_H$ at stage 3.

Therefore, an initial contract with $w_1 = \frac{c}{\Delta p_H} - \theta$ is not renegotiation-proof.

A renegotiation-proof contract has to specify an initial wage $w_1 \in (\frac{c}{\Delta p_H} - \theta, \frac{c}{\Delta p_L} - \theta]$ that is sufficiently attractive for the agent so that he prefers a more productive task with $\Delta p = \Delta p_H$ at stage 3 instead of $\Delta p = \Delta p_L$ in combination with anticipated renegotiation, leading to wage $w_1 = \frac{c}{\Delta p_L} - \theta$ ex post. As we know from case (a), from the principal's perspective, the respectively optimal wage, \hat{w}_1 , makes the agent just indifferent between $\Delta p = \Delta p_H$ and $\Delta p = \Delta p_L$ at stage 3 so that he chooses a task with $\Delta p = \Delta p_H$ according to the tie-breaking rule of Section 2: $\hat{w}_1 = \bar{\theta} - \theta$.

At stage 1, the principal will only choose $\chi = 1$ and the renegotiation-proof contract with $w_1 = \hat{w}_1$ if the corresponding expected profits are larger than expected profits from choosing $\chi = 0$ and $w_1 = \frac{c}{\Delta p_H}$ at stage 1, and $\Delta p = \Delta p_H$ at stage 3, which yields condition (A.7) above; otherwise, the principal prefers not to empower the agent.

(e) Let $c/\Delta p_H \leq \theta < c/\Delta p_L$. Suppose $\chi = 1$ and let the initial contract be $(w_1, w_0) = (0, 0)$. As we know from case (b), if the principal observes a task with $\Delta p = \Delta p_L$ at stage 4, both the principal and the agent prefer a renegotiated contract with $w_1 = \frac{c}{\Delta p_L} - \theta$.

At stage 3, given an initial contract with $w_1 = 0$, the agent has to select a task with $\Delta p \in \{\Delta p_L, \Delta p_H\}$. As we know from case (b), the agent will prefer a task with $\Delta p = \Delta p_H$ to a task with $\Delta p = \Delta p_L$ iff condition (A.8) is satisfied (i.e., $\theta \geq \bar{\theta}$), which is stronger than condition (A.7). Thus, contract $(w_1^*, w_0^*) = (0, 0)$ will be renegotiation-proof and – in combination with empowerment ($\chi = 1$) – optimal for the principal iff condition (A.8) holds.

Suppose condition (A.8) does not hold. We know from case (b) that a renegotiation-proof contract then has $w_1 = \hat{w}_1$. Furthermore, from case (d) we know that, at stage 1, the principal will only choose $\chi = 1$ and the renegotiation-proof contract with $w_1 = \hat{w}_1$ if the corresponding expected profits are larger than expected profits from choosing $\chi = 0$ and $w_1 = \frac{c}{\Delta p_H}$ at stage 1, and $\Delta p = \Delta p_H$ at stage 3, leading to condition (A.7); otherwise, the principal prefers not to empower the agent.

(f) Let $\theta \geq c/\Delta p_L$. In strict analogy to case (c), the principal optimally chooses $\chi = 1$ and offers $w_0^* = w_1^* = 0$, which is renegotiation-proof.

Result (ii) of Proposition 3 summarizes the findings on irreversible task selection.

Proof of Proposition 4. Suppose the principal has chosen $\chi = 1$ and the initial contract has $w_1 = \frac{c}{\Delta p_H} - \theta$.

(i) According to (10), condition (A.5) is satisfied for $\pi = \bar{\pi}$ so that the principal is interested in

renegotiating the initial wage $w_1 = \frac{c}{\Delta p_H} - \theta$ at stage 4 if the agent has chosen $\Delta p = \Delta p_L$ at stage 3. Thus, given $\pi = \bar{\pi}$, result (ii) of Proposition 3 applies: the principal optimally chooses $\chi^* = 1$ and the renegotiation-proof contract $(w_1^*, w_0^*) = (\bar{\theta} - \theta, 0)$. The principal's expected profits amount to $(p_0 + \Delta p_H)(\bar{\pi} - \bar{\theta} + \theta)$.

According to (10), condition (A.5) is *not* satisfied for $\pi = \underline{\pi}$. If the principal observes a task with $\Delta p = \Delta p_H$ at stage 4, the initial contract with $w_1 = \frac{c}{\Delta p_H} - \theta$ will be incentive-compatible so that the principal is not interested in renegotiating. If she faces $\Delta p = \Delta p_L$, the initial contract will not be incentive-compatible, the agent will choose zero effort, and expected profits will be described by (A.3). The principal can restore incentives by renegotiating the initial contract and offering $w_1 = \frac{c}{\Delta p_L} - \theta$, which would lead to expected profits (A.4). However, she will *not* benefit from the renegotiation if expected profits (A.3) are larger than (A.4), which is true because condition (A.5) does not hold for $\pi = \underline{\pi}$. Thus, the agent can either choose a task with $\Delta p = \Delta p_H$ at stage 3, yielding the payoff $p_0 c / \Delta p_H$, or a task with $\Delta p = \Delta p_L$, yielding the same payoff: $p_0(\theta + \frac{c}{\Delta p_H} - \theta) = p_0 c / \Delta p_H$. According to the tie-breaking rule, the agent chooses a task with $\Delta p = \Delta p_H$ at stage 3 so that the initial contract with $w_1 = \frac{c}{\Delta p_H} - \theta$ is renegotiation-proof for $\pi = \underline{\pi}$ and – in combination with $\chi = 1$ – optimal for the principal. Expected profits amount to $(p_0 + \Delta p_H)(\underline{\pi} - \frac{c}{\Delta p_H} + \theta)$. They will be larger than expected profits for $\pi = \bar{\pi}$ iff $(p_0 + \Delta p_H)(\underline{\pi} - \frac{c}{\Delta p_H} + \theta) > (p_0 + \Delta p_H)(\bar{\pi} - \bar{\theta} + \theta) \Leftrightarrow \bar{\theta} - \frac{c}{\Delta p_H} > \bar{\pi} - \underline{\pi}$.

(ii) As, according to (10), condition (A.5) is satisfied for $\pi = \bar{\pi}$, the principal would prefer to renegotiate the initial wage $w_1 = \frac{c}{\Delta p_H} - \theta$ when facing $\Delta p = \Delta p_L$ at stage 4, and result (ii) of Proposition 3 applies: given $\pi = \bar{\pi}$, the principal optimally chooses $\chi^* = 0$ and the renegotiation-proof contract $(w_1^*, w_0^*) = (\frac{c}{\Delta p_H}, 0)$. Expected profits amount to $(p_0 + \Delta p_H)(\bar{\pi} - \frac{c}{\Delta p_H})$. According to (10), condition (A.5) is *not* satisfied for $\pi = \underline{\pi}$. Hence, by the same argumentation as in the proof of result (i), the initial contract with $w_1 = \frac{c}{\Delta p_H} - \theta$ is renegotiation-proof for $\pi = \underline{\pi}$ and – in combination with $\chi = 1$ – optimal for the principal, yielding expected profits $(p_0 + \Delta p_H)(\underline{\pi} - \frac{c}{\Delta p_H} + \theta)$. They are larger than $(p_0 + \Delta p_H)(\bar{\pi} - \frac{c}{\Delta p_H})$ iff $\theta > \bar{\pi} - \underline{\pi}$.

Proof of Proposition 5. I start with irreversible task selection (i.e., result (ii)) to considerably shorten the proof for reversible task selection.

Irreversible task selection:

The principal has to choose between three possible solutions.¹⁹ (1) She can choose $\chi = 0$ and the contract $(w_1, w_0) = (\frac{c}{\Delta p_H}, 0)$, which (with probability α_L) has to be renegotiated if only less

¹⁹The fourth possibility, choosing $\chi = 1$ and the contract $(w_1, w_0) = (\frac{c}{\Delta p_L} - \theta, 0)$, is dominated by the second possibility (i.e., $\chi = 1$ and $(w_1, w_0) = (\bar{\theta} - \theta, 0)$).

productive tasks are available so that $w_1 = \frac{c}{\Delta p_L}$. The corresponding expected profits are

$$\Pi_1(\alpha_L) := (1 - \alpha_L)(p_0 + \Delta p_H) \left(\pi - \frac{c}{\Delta p_H} \right) + \alpha_L(p_0 + \Delta p_L) \left(\pi - \frac{c}{\Delta p_L} \right).$$

(2) The principal can choose $\chi = 1$ and the contract $(w_1, w_0) = (\bar{\theta} - \theta, 0)$. As we know from the proof of Proposition 3, this initial contract induces the agent to pick the more productive task if both kinds of tasks are available at stage 3. With probability α_L incentives are not strong enough so that the principal has to renegotiate the initial contract and offer incentive pay $w_1 = \frac{c}{\Delta p_L} - \theta$. Expected profits are

$$\Pi_2(\alpha_L) := (1 - \alpha_L)(p_0 + \Delta p_H) (\pi - \bar{\theta} + \theta) + \alpha_L(p_0 + \Delta p_L) \left(\pi - \frac{c}{\Delta p_L} + \theta \right).$$

(3) The principal can choose $\chi = 1$ and the contract $(w_1, w_0) = (\frac{c}{\Delta p_H} - \theta, 0)$. With probability α_H the initial contract is incentive-compatible. With probability α_L it is not incentive-compatible and has to be renegotiated so that $w_1 = \frac{c}{\Delta p_L} - \theta$. With probability $1 - \alpha_H - \alpha_L$ we are in the situation where the agent picks a less productive task to make the principal renegotiate the initial contract and offer $w_1 = \frac{c}{\Delta p_L} - \theta$ (see the proof of Proposition 3). Thus, expected profits are

$$\Pi_3(\alpha_H) := \alpha_H(p_0 + \Delta p_H) \left(\pi - \frac{c}{\Delta p_H} + \theta \right) + (1 - \alpha_H)(p_0 + \Delta p_L) \left(\pi - \frac{c}{\Delta p_L} + \theta \right).$$

As $\Pi_3(\alpha_H)$ is monotonically increasing and $\alpha_H \rightarrow 1$ implies $\alpha_L \rightarrow 0$, the principal will prefer $\Pi_3(\alpha_H)$ to $\Pi_1(\alpha_L)$ and $\Pi_2(\alpha_L)$ if α_H is sufficiently large. If α_H is not sufficiently large, the principal will prefer either $\Pi_1(\alpha_L)$ or $\Pi_2(\alpha_L)$; in that case she will prefer $\Pi_2(\alpha_L)$ iff $\Pi_2(\alpha_L) \geq \Pi_1(\alpha_L)$, which can be rewritten to condition (11).

Reversible task selection:

Suppose $\pi > \tilde{\pi}$. In that case, the principal prefers $\chi = 1$ in combination with contract $(w_1, w_0) = (\frac{c}{\Delta p_H} - \theta, 0)$: with probability α_H the initial contract is incentive-compatible. With probability α_L it is not incentive-compatible and has to be renegotiated so that $w_1 = \frac{c}{\Delta p_L} - \theta$. Due to $\pi > \tilde{\pi}$, with probability $1 - \alpha_H - \alpha_L$ we are in the situation where the principal will overrule the agent and choose a more productive task if the agent has picked a less productive one at stage 3 (see the proof of Proposition 3); anticipating the principal's behavior, the agent voluntarily chooses a more productive task and the initial contract is incentive-compatible. Expected profits

are $(1 - \alpha_L)(p_0 + \Delta p_H)(\pi - \frac{c}{\Delta p_H} + \theta) + \alpha_L(p_0 + \Delta p_L)(\pi - \frac{c}{\Delta p_L} + \theta)$. Comparison with Π_1 , Π_2 , and Π_3 immediately shows that all possible alternatives are dominated.

Suppose $\pi \leq \tilde{\pi} \Leftrightarrow (p_0 + \Delta p_L)(\pi - \frac{c}{\Delta p_L} + \theta) \geq (p_0 + \Delta p_H)(\pi - \frac{c}{\Delta p_H})$ (i.e., the principal prefers direct renegotiation to overruling in combination with renegotiation in order to restore incentives at stage 4; see the proof of Proposition 3), which implies that $\Pi_2 > \Pi_1$ as $\bar{\theta} < \frac{c}{\Delta p_L}$. Thus, the principal has to choose between the two solution candidates (2) and (3) from the case of irreversible task selection above. Comparing Π_2 and Π_3 , and summarizing all findings leads to result (i) of Proposition 5.

Proof of Proposition 6. As we know from Proposition 2, if the agent is empowered and has selected a less productive task under reversible task selection, the principal's threat of overruling will be ineffective because overruling would destroy the agent's intrinsic motivation from feeling committed and restoring incentives via renegotiation is impossible by assumption. For this reason, the principal can only determine optimal incentives by choosing an incentive contract (w_1, w_0) at stage 1 – irrespective of whether task selection is reversible or not.

As $\theta < c/\Delta p_H$, if the principal empowers the agent, she will either offer contract $(w_1, w_0) = (\frac{c}{\Delta p_L} - \theta, 0)$ or contract $(w_1, w_0) = (\frac{c}{\Delta p_H} - \theta, 0)$. If $\alpha_L = 0$, then $(w_1, w_0) = (\frac{c}{\Delta p_H} - \theta, 0)$ will be optimal: given that only more productive tasks are available, this contract is incentive compatible; if the agent can choose between more and less productive tasks, he will choose a more productive one so that the contract again leads to high incentives.²⁰ If, however, $\alpha_L > 0$, the principal might either want to always ensure high effort by offering $(w_1, w_0) = (\frac{c}{\Delta p_L} - \theta, 0)$ or prefers low-powered incentives by offering $(w_1, w_0) = (\frac{c}{\Delta p_H} - \theta, 0)$. Expected profits in the first case amount to

$$\alpha_L(p_0 + \Delta p_L) \left(\pi - \frac{c}{\Delta p_L} + \theta \right) + (1 - \alpha_L)(p_0 + \Delta p_H) \left(\pi - \frac{c}{\Delta p_L} + \theta \right), \quad (\text{A.9})$$

whereas in the latter case expected profits are given by²¹

$$\alpha_L p_0 \left(\pi - \frac{c}{\Delta p_H} + \theta \right) + (1 - \alpha_L)(p_0 + \Delta p_H) \left(\pi - \frac{c}{\Delta p_H} + \theta \right). \quad (\text{A.10})$$

²⁰The agent earns the same expected income when picking a more productive task (i.e., $(p_0 + \Delta p_H)(\frac{c}{\Delta p_H} - \theta + \theta) - c = c \frac{p_0}{\Delta p_H}$) or a less productive task (i.e., $p_0(\frac{c}{\Delta p_H} - \theta + \theta) = c \frac{p_0}{\Delta p_H}$) so that he chooses a task with $\Delta p = \Delta p_H$ according to the tie-breaking rule.

²¹If both less and more productive tasks are available, by the argument given in the previous footnote, the agent will choose a more productive one.

Expression (A.9) will be larger than expression (A.10) iff

$$\pi \geq \frac{1}{\Delta p_L} \left[\frac{1 - \alpha_L}{\alpha_L} (p_0 + \Delta p_H) + p_0 \right] \left(\frac{c}{\Delta p_L} - \frac{c}{\Delta p_H} \right) + \frac{c}{\Delta p_L} - \theta =: \hat{\pi}.$$

If $\alpha_L = 1$, this condition will simplify to

$$\pi \geq \frac{p_0 (\Delta p_H - \Delta p_L) + \Delta p_H \Delta p_L}{\Delta p_H \Delta p_L^2} c - \theta,$$

which is satisfied as²²

$$\frac{p_0 (\Delta p_H - \Delta p_L) + \Delta p_H \Delta p_L}{\Delta p_H \Delta p_L^2} c - \theta < \tilde{\pi} \Leftrightarrow -c \frac{p_0}{\Delta p_H \Delta p_L} < \theta$$

clearly holds. If, however, $\alpha_L \rightarrow 0$, then $\hat{\pi}$ goes to infinity so that $\pi \geq \hat{\pi}$ can only be satisfied for extremely high values of π . Hence, it is not clear which cutoff – $\hat{\pi}$ or $\tilde{\pi}$ – is larger. Altogether, in case of empowerment the principal will offer contract $(w_1, w_0) = (\frac{c}{\Delta p_L} - \theta, 0)$ if $\pi \geq \max\{\hat{\pi}, \tilde{\pi}\}$ and $\alpha_L > 0$, and contract $(w_1, w_0) = (\frac{c}{\Delta p_H} - \theta, 0)$ otherwise.

Suppose the principal decides against empowerment. If $\alpha_L = 0$, then $(w_1, w_0) = (\frac{c}{\Delta p_H}, 0)$ will be optimal as the principal can always pick a more productive task. However, labor costs are higher than under empowerment. If $\alpha_L > 0$, then only one of the two contracts $(w_1, w_0) = (\frac{c}{\Delta p_L}, 0)$ and $(w_1, w_0) = (\frac{c}{\Delta p_H}, 0)$ can be optimal. If the principal wants to always implement high effort, she will offer the contract $(w_1, w_0) = (\frac{c}{\Delta p_L}, 0)$, leading to expected profits

$$\alpha_L (p_0 + \Delta p_L) \left(\pi - \frac{c}{\Delta p_L} \right) + (1 - \alpha_L) (p_0 + \Delta p_H) \left(\pi - \frac{c}{\Delta p_L} \right),$$

which are strictly smaller than the respective profits (A.9) under empowerment. If the principal offers the contract $(w_1, w_0) = (\frac{c}{\Delta p_H}, 0)$, expected profits will be

$$\alpha_L p_0 \left(\pi - \frac{c}{\Delta p_H} \right) + (1 - \alpha_L) (p_0 + \Delta p_H) \left(\pi - \frac{c}{\Delta p_H} \right),$$

which are strictly smaller than the respective profits (A.10) under empowerment. To sum up, $\chi = 1$ dominates $\chi = 0$.

Proof of Proposition 7. Similar to the proof of Proposition 5, there exist three candidate

²² $\tilde{\pi}$ has been defined in (1).

solutions for the principal.

(1) She can choose $\chi = 0$ and the contract $(w_1, w_0) = (\frac{c}{\Delta p_H}, 0)$. In this scenario, the principal randomly picks a task, and with probability $\alpha_L + \frac{1-\alpha_L-\alpha_H}{2}$ the contract has to be renegotiated so that $w_1 = \frac{c}{\Delta p_L}$. With probability $\alpha_H + \frac{1-\alpha_L-\alpha_H}{2}$, however, the principal has picked a more productive task, and the initial contract is incentive compatible. Expected profits for this candidate solution are

$$\hat{\Pi}_1 := \left(\alpha_H + \frac{1-\alpha_L-\alpha_H}{2} \right) (p_0 + \Delta p_H) \left(\pi - \frac{c}{\Delta p_H} \right) + \left(\alpha_L + \frac{1-\alpha_L-\alpha_H}{2} \right) (p_0 + \Delta p_L) \left(\pi - \frac{c}{\Delta p_L} \right).$$

(2) The principal can choose $\chi = 1$ and the contract $(w_1, w_0) = (\bar{\theta}, 0)$, which induces the agent to pick a more productive task if both kinds of tasks are available at stage 3 (see the proof of Proposition 3). Expected profits are

$$\hat{\Pi}_2 := (1 - \alpha_L) (p_0 + \Delta p_H) (\pi - \bar{\theta}) + \alpha_L (p_0 + \Delta p_L) \left(\pi - \frac{c}{\Delta p_L} \right).$$

(3) The principal can choose $\chi = 1$ and the contract $(w_1, w_0) = (\frac{c}{\Delta p_H}, 0)$. In that case, with probability $1 - \alpha_H - \alpha_L$ the agent picks a less productive task to manipulate incentive pay. Expected profits are

$$\hat{\Pi}_3 := \alpha_H (p_0 + \Delta p_H) \left(\pi - \frac{c}{\Delta p_H} \right) + (1 - \alpha_H) (p_0 + \Delta p_L) \left(\pi - \frac{c}{\Delta p_L} \right).$$

We can immediately see that $\hat{\Pi}_1 > \hat{\Pi}_3$. Intuitively, the first candidate solution strictly dominates the third because under the first the principal has to renegotiate the initial contract only with probability 1/2 in the state of the world in which both kinds of tasks are available, whereas in the same state the principal always has to renegotiate the initial contract under the third candidate solution. Inequality $\hat{\Pi}_1 > \hat{\Pi}_2$ can be rewritten – using the definition of $\bar{\theta}$ – to the condition in Proposition 7.

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