

Bertram, Justus; Ruhnke, Carsten S.; Schöndube, Jens Robert

Working Paper

Optimal degree of remote work

Hannover Economic Papers (HEP), No. 718

Provided in Cooperation with:

School of Economics and Management, University of Hannover

Suggested Citation: Bertram, Justus; Ruhnke, Carsten S.; Schöndube, Jens Robert (2024) : Optimal degree of remote work, Hannover Economic Papers (HEP), No. 718, Leibniz Universität Hannover, Wirtschaftswissenschaftliche Fakultät, Hannover

This Version is available at:

<https://hdl.handle.net/10419/296568>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Optimal Degree of Remote Work

Justus Bertram, Carsten S. Ruhnke and Jens Robert Schöndube

Leibniz Universität Hannover*

March 21, 2024

Abstract

As a new work style remote work has become an increasingly important factor for firms and their employees. Employees potentially benefit from a higher flexibility when working remotely. Firms can make use of this non-financial benefit to increase their attractiveness on the job market and to substitute financial wage payments to the employees. However, working remotely offers chances for the employees to engage in unproductive activities at the cost of productive working time. Hence, firms need to trade off the benefits against the costs in order to decide which degree of remote work is optimal. We use an agency model to examine the optimal degree of remote work and its interaction with the optimal incentive rate. Higher uncertainty in the productive outcome or higher risk aversion of the employee leads to both a lower degree of remote work and a lower incentive rate, while the effect of the employee's productivity on the degree of remote work is ambiguous. If pay-performance sensitivity is sufficiently high, an increase in the employee's productivity leads to a decrease in the degree of remote work, whereas it is the other way around for a low pay-performance sensitivity. In addition, we find that the optimal degree of remote work increases in the employee's preferred degree of remote work. While in the first-best solution the optimal degree of remote work is always higher than the preferred degree, in the second-best solution it can be higher or lower.

Keywords: Remote Work, New Work Style, Agency Theory, Multi-Task Problem

JEL-Codes: C02, D82, D83, J21, J22, J24, J33, L23, M51, M52

*Institute of Managerial Accounting, Faculty of Economics and Management, Leibniz Universität Hannover, Königsworther Platz 1, 30167 Hannover, Germany. Electronic addresses: bertram@controlling.uni-hannover.de, ruhnke@controlling.uni-hannover.de, schoendube@controlling.uni-hannover.de.

1 Introduction

The COVID-19 pandemic has led to a significant increase in employees working remotely, as remote work has been proposed by the World Health Organisation as a mean of pandemic control (Irawanto et al., 2021). The proportion of highly educated workers who work exclusively from home increased by 40.7 percent from February to May 2020 (Bick et al., 2023). However, remote work is not just a phenomenon evoked by the COVID-19 pandemic (Bick et al., 2023), it is an ongoing trend and part of a new work style. In line with the latest research, "Remote work is the new signing bonus" (Cutter and Dill, 2021) headlined the Wall Street Journal. Up to 37% of all US jobs could be done from home, with 46% of total US wages paid in these potential remote work jobs (Dingel and Neiman, 2020).

Findings confirm that candidates are willing to sacrifice on average 8% of their salary for the opportunity to work remotely (Mas and Pallais, 2017). One reason for this may be that remote work can increase job satisfaction, at least to a certain amount of hours per week (Golden and Veiga, 2005).¹ In addition, there is a negative association between remote work and work stress, which indicates positive effects on the conflict between work and other parts of life (Raghuram and Wiesenfeld, 2004), such as the work-family conflict (Golden et al., 2006). Clearly, most employees prefer to work remotely to a certain degree. Firms can set the actual degree of remote work as part of their incentive schemes and thus use it as a kind of reward within the overall compensation package. However, they need to consider that fewer possibilities of monitoring might lead to shirking of the employees due to the substitution of work tasks by private activities (Holmström, 2017), which in turn could be a reason for the employees' preference to work from home. Restrepo and Zeballos (2020) find that employees spend less time on work tasks and more time on private activities such as sleeping or food production when working from home compared to when they work away from home. This problem is also recognized by supervisors who see a lack of control over their employees as a major challenge (Felstead et al., 2003).² In this context, Bloom et al. (2015) state that firms might fear that the employees are "shirking from home".

The above aspects are highly relevant for companies seeking to maximize the productive output of their employees, which is undoubtedly higher in a more

¹ In the sample of Golden and Veiga (2005), job satisfaction increases up to 15.1 hours of remote work per week and plateaus there.

² Pianese et al. (2023) provide a review of several measures of organizational control and analyze how an increased physical distance due to remote work affects the organizational control.

conducive work environment. According to the new work trend, the optimal solution may be a mix of in-office and remote work. Likewise, the corporate landscape reports mixed views on remote work. For example, JPMorgan Chase and Goldman Sachs want their employees to continue to work in the traditional office five days a week (Barrabi, 2023; Moynihan, 2023). Rite Aid CEO Heyward Doningen, on the other hand, sees a good fit of remote work and believes in it (Business Wire, 2021). Other firms such as Apple and Google advocate a middle-way approach and see the benefits of flexible work, whereby on-site work cannot be replaced by remote work so that at least some work needs to be done in the office (CBS News Bay Area, 2022a,b). According to these statements and guidelines, firms might wish to weigh up the costs and benefits of working from home and adjust their remote work policies accordingly in the future (Behrens et al., 2021). This raises the inevitable question: What is the optimal degree of remote work and how does it interact with the incentive contract, the productivity and the (risk) preferences of the employees?

We address this question in a principal-agent model that includes the possibility for the agent to work remotely. Thereby, we consider an agent who exerts a productive effort and can also engage in a costly unproductive action when working remotely. We assume the agent to have a clear preference concerning the degree of remote work. Different preferences concerning the degree of remote work represent different types of employees with respect to remote work. On the one hand, the agent's overall utility might decrease due to a difference between his preferred degree of remote work and the actual degree of remote work. On the other hand, his utility might increase due to personal benefits from the unproductive action he engages in when working remotely. We derive first-best and second-best efforts as well as incentive rates and degrees of remote work.

The results show that the optimal degree of remote work and the incentive rate act as complements with respect to the agent's effort allocation. There is a lower degree of remote work with increasing uncertainty of the productive outcome or with increasing risk aversion of the agent. In addition, the higher the agent's preference for remote work, the higher is the optimal degree of remote work that the firm should implement. Thereby, the actual degree of remote work might even surpass the preferred degree of the agent. A higher productivity of the agent leads to a decrease in the first-best degree of remote work. However, the effect is ambiguous in the second-best solution, as the productivity also affects the incentive rate, which in turn affects the degree of remote work. For low-powered incentives, the optimal degree of remote work increases in the agent's productivity, whereas it is the other way around for high-powered incentives.

The rest of the paper is organized as follows: Section 2 provides a brief overview of the related literature. Then, section 3 introduces the model and section 4 presents the equilibrium analysis as well as the results. Section 5 contains the discussion of the results and, finally, section 6 concludes. All proofs are relegated to the Appendix.

2 Literature overview

As firms are under pressure to stay competitive on the (global) market, flexible work has become an ubiquitous topic and a main aspect of the new working style. Kingma (2019) states that new ways of working affect the organizational design, leading to more open, virtual, paperless and flexible workspaces. The goal is to enable the employees to work more efficiently and effectively by providing them with higher degrees of freedom and self-control (Blok et al., 2012). Telework represents such a flexible work approach which ensures that employees can work independent of time, place, type of communication and use of information (Irawanto et al., 2021). Baruch (2001) recognizes telework as a part of workplace flexibility and as an alternative way of working made possible by technological advances and the increasing use of information technology. In particular, it is characterized by the separation of the work process from the physical work place and specific working hours (Tietze, 2002). Besides telework, a variety of terms is used in the literature to describe this form of flexible work arrangement, including remote work, telecommuting and working from home (Chong et al., 2020). We use the term remote work as a representative of the wide range of terms presented in the literature. Thereby, remote work is characterized by the fact that the employee spends his working time outside the traditional office, as he works from home.

Remote work has a significant effect on the organization of work and the employee behavior. Employees who work remotely have higher degrees of autonomy, but at the same time they are controlled by their superiors in new and different ways, made possible by the usage of information technology (Sewell and Taskin, 2015). Leonardi (2021) examines the kind of data that is collected from employees working remotely and how artificial intelligence might use this data to predict and potentially affect employee behavior. Employee behavior in the context of remote work is influenced by the relationship between industrial and household production (Tietze and Musson, 2005). Several studies consider the impact of remote work on the personal life and, in particular, the work-family conflict (Hill et al., 2003; Golden et al., 2006; Kossek et al., 2006). Azar et al. (2018) find that remote work can reduce the work-life conflict and that this effect can even be enhanced by efficient planning

behavior. This might be a reason why remote work can have a positive impact on job satisfaction (at least to a certain degree) (Golden and Veiga, 2005). In contrast, remote work can lead to professional as well as personal isolation and therefore potentially causes psychological distress for the employees (Cooper and Kurland, 2002; Van Zoonen and Sivunen, 2022). Besides that, employees who work remotely might engage more strongly in impression management activities (Barsness et al., 2005), which can cause efficiency losses for the organization. In addition, remote work has an effect on the employees who stay in the office. Golden (2007) finds that the employees' satisfaction is negatively affected by co-workers working remotely, whereby this effect becomes even stronger if the co-workers spend more time outside the office.

The above aspects show that remote work has ambiguous effects on employee behavior and therefore on the organization itself. Hence, it becomes clear that this kind of flexible work approach needs to be implemented in the right way, posing challenges from a leadership and employee perspective. Thereby, the managers' attitudes towards remote work play an important role for its implementation as new way of working. Peters and Heusinkveld (2010) show how the organizational context can influence these attitudes. Forooraghi et al. (2022) underline the importance of the working environment on the employees' well-being, which is of particular interest when working from home. In addition, leadership and management with regard to employees working remotely crucially affect the employees' well-being (Nayani et al., 2018). In line with this, Alonderiene and Majauskaite (2016) find that the leadership style affects the job satisfaction of employees. The studies of Khan et al. (2020) and Jung et al. (2003) show that leadership has a significant effect on innovative work behaviour and organizational innovation. Besides the right way of managing employees who work remotely, the amount of work carried out from home should be set to the optimal degree of remote work, as we show in our model.

By analyzing the effects of remote work in an agency model, we add a theoretical viewpoint to this field. In particular, we consider two different actions of the agent so that we add to the literature on multi-task problems and time scarcity. Early work in this field has been done by Holmström and Milgrom (1991) by extending the standard principal-agent model to additional actions and performance measures. Feltham and Xie (1994) follow a similar approach and focus on the congruity of performance measures. Since then, several authors have dealt with problems in multi-task models, e.g., by considering the difference between tasks being complements or substitutes (Bond and Gomes, 2009), by considering a risk-neutral manager with limited liability (Laux, 2001), by analyzing the task

allocation with relational contracts in a repeated setting (Schöttner, 2008) and by analyzing the optimal allocation of scarce working time to different tasks (Mauch and Schöndube, 2019). Because time is not an infinite resource, the allocation of the agent’s time between multiple tasks is an important factor for the principal in the incentivization of the agent (Fried and Slowik, 2004).

The problem of scarce working time becomes even more relevant if only one task can be contracted upon by the principal, as analyzed in the two-task model by Fehr and Schmidt (2004), which is similar to our idea. We consider a productive effort that contributes towards the output which can be contracted upon and an unproductive effort. The unproductive effort is not productive in the sense that it does not add any value to the firm’s output, which is similar to the unproductive effort considered by Akerlof (2016). However, the unproductive effort possibly leads to utility gains for the agent, which are reflected in a lower fixed wage to be paid to the agent in equilibrium.

The unproductive action of the agent is not controllable by the incentive rate but by the degree of remote work, as the agent only engages in this action when working remotely. Besides the unproductive action, remote work has a direct effect on the agent’s utility. This effect can be interpreted as a private benefit from remote work.³ In the literature, private benefits are usually referred to as control benefits (Grossman and Hart, 1988) or empire benefits (Baldenius, 2003). Managers receive these benefits when being in control of a project, which incentivizes them to stay in control of current projects and/or to take over control of more projects and can also have an impact on capital allocation (Eisfeldt and Rampini, 2008). The key difference between the private benefits of control and the private benefit in our model is that the benefits of control can be affected by the decisions of the manager, whereas, in our model, the benefit depends on the degree of remote work, which is set by the firm.

3 Model setup

We consider a one-period principal-agent model within a LEN-setting in which a risk-neutral principal employs a risk-averse agent. The agent exerts productive

³ We model this direct effect as a cost effect as the agent experiences higher personal costs the more the actual degree of remote work differs from his preferred degree of remote work. These costs become zero if his preferred degree of remote work is implemented. Hence, a higher private benefit due to remote work is represented by lower personal costs.

effort a_1 so that the output is given by

$$x = ba_1 + \varepsilon, \quad (1)$$

with $\varepsilon \sim N(0, \sigma^2)$ and $b \in \mathbb{R}_+$ as a measure of the agent's productivity due to his task-related ability and skill. The principal offers a linear compensation contract to the agent, which is based on the output x :

$$s(x) = w + vx, \quad (2)$$

with $v \in [0, 1]$ as the incentive rate and w as the fixed payment. The agent can either work in the office or remotely from home. The factor $\gamma \in [0, 1]$ denotes the degree of remote work, i.e., $\gamma = 1$ means that the agent works completely at home and $\gamma = 0$ means that the agent works only in the office. If the agent works at home, he potentially conducts private (outside) activities in the sense of Holmström and Milgrom (1991), denoted by the effort a_2 . These activities may comprise watching TV, sleeping, or making private phone calls, all during working time (Holmström, 2017). The unproductive activities do not add any value towards the firm's output but have the following two effects: first, the agent personally benefits from them and second, they compete with productive effort for scarce working time, i.e., the higher a_2 , the less time the agent can spend on productive work (Holmström, 2017, p. 1769). The conflict for scarce time between a_1 and a_2 is captured, similar to Holmström and Milgrom (1991), by the (personal) cost function $C(a_1, a_2) = (a_1 + a_2)^2$. The agent's personal benefit due to the private activities is given by the function

$$V(\gamma, a_2) = \gamma\sqrt{a_2}, \quad (3)$$

with $V(0, a_2) = 0$ and $\partial V/\partial a_2 > 0$. We note that this "activity effect" depends on both the degree of remote work and the extent of the private activities. The higher the degree of remote work, the better are the opportunities for private activities. For example, watching a movie via a streaming service during working time is easier to "manage" with 100% remote work than with 10% remote work. Besides the activity effect, remote work may induce a "direct cost effect" for the agent. Therefore, we assume that the agent has a preferred degree of remote work, denoted by $c \in (0, 1)$. Throughout the paper we assume $b > b^{crit} = \frac{1}{4(1-c)}$ to ensure that the optimal degree of remote work is always between 0 and 100 percent. If the preferred degree of remote work is implemented, the agent experiences no additional personal costs. However, if the actual degree of remote work differs from his preferred degree, he incurs personal costs that increase in the difference between the actual and his

preferred degree of remote work. The factor c enables us to consider different types of employees with respect to the preferences concerning remote work. On the one hand, some employees might enjoy working from home because it enhances their work-life-balance (e.g., more time for the family due to flexible work arrangements), which would be represented by a high c . On the other hand, employees might prefer to work more in the office in order to have a clear separation between work and the private life or because they enjoy working and socializing with their colleagues in person. This would be represented by a relatively low c . We model the direct cost effect by the following cost function:

$$DC(\gamma) = -(\gamma - c)^2. \quad (4)$$

The agent benefits from an increased degree of remote work until his preferred degree c is reached because it induces "an increased feeling of freedom and flexibility" not to be hold captive in the office and thus leads to lower direct costs. If the degree of remote work exceeds the preferred degree, the effect is the other way around, as the agent would prefer to spend more time in the office. Figure 1 shows the effect of the degree of remote work on the agent's benefit V and the direct costs DC graphically. The benefit from the private activities (dotted line) increases in the degree of remote work, whereas the direct costs (dashed line) are zero for $\gamma = c$ and increase in the difference between γ and c in either direction. This leads to the overall effect of remote work denoted by $\Delta_{RW} = V + DC$ (solid line). The actual levels of the preferred degree of remote work c as well as the unproductive action a_2 determine whether the overall effect Δ_{RW} strictly increases in γ or not.

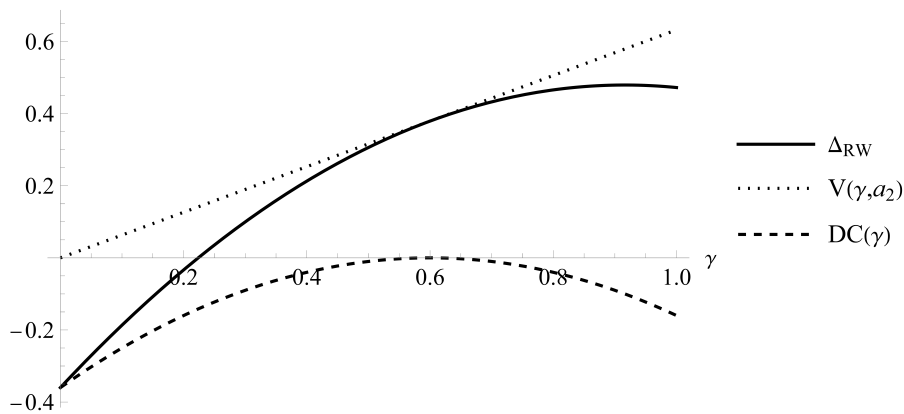


Figure 1: Effects of remote work on the agent's certainty equivalent for $c = 0.6$ and $a_2 = 0.4$.

Given our LEN-setting, the agent's certainty equivalent is provided by the following

problem becomes

$$\begin{aligned} \max_{a_1, a_2, \gamma} CEP_{FB} &= E(s(x)) - C(a_1, a_2) + DC(\gamma) + V(\gamma, a_2) \\ &= ba_1 - (a_1 + a_2)^2 - (\gamma - c)^2 + \gamma\sqrt{a_2}. \end{aligned} \quad (9)$$

From the first-order-conditions for a_1 and a_2 ,

$$\frac{\partial CEP_{FB}}{\partial a_1} = b - 2a_1 - 2a_2 = 0, \quad (10)$$

$$\frac{\partial CEP_{FB}}{\partial a_2} = -2a_1 - 2a_2 + \frac{\gamma}{2\sqrt{a_2}} = 0, \quad (11)$$

we derive the first-best efforts depending on γ :

$$a_1 = \frac{b}{2} - \frac{\gamma^2}{4b^2} = \frac{b}{2} - a_2, \quad (12)$$

$$a_2 = \frac{\gamma^2}{4b^2}. \quad (13)$$

We find that the overall level of effort is constant at $\frac{b}{2}$. Depending on the degree of remote work γ and the productivity b , the agent allocates his time among the two different kinds of effort. While, in general, productive effort might become negative in our model, throughout the paper we consider only parameter settings where both efforts are positive such that the benefit of production will never be sapped by the relaxation of the participation constraint due to outside activities. Optimizing (9) over γ under consideration of (12) and (13) leads to the first-best degree of remote work as presented in the following lemma.

Lemma 1 *The first-best degree of remote work is*

$$\gamma^{FB} = \frac{4bc}{4b - 1}, \quad (14)$$

and the first-best efforts are

$$a_1^{FB} = \frac{b}{2} - \frac{4c^2}{(4b - 1)^2}, \quad (15)$$

$$a_2^{FB} = \frac{4c^2}{(4b - 1)^2}. \quad (16)$$

We note that $\gamma^{FB} \in (0, 1)$, as $b > b^{crit}$ and $c \in (0, 1)$. As $\frac{\partial \gamma^{FB}}{\partial c} > 0$, it is optimal for the principal to increase the degree of remote work if the agent prefers a higher degree of remote work. A higher degree of remote work leads to a lower productive

effort a_1^{FB} and a higher unproductive effort a_2^{FB} (see (12) and (13)). Hence, the agent spends more of his (constant) overall working time on unproductive activities and therefore less on the productive effort. Consequently, the productive effort a_1^{FB} decreases in c , whereas the unproductive effort increases in c . Surprisingly, the principal always sets the first-best degree of remote work higher than the agent's preferred degree of remote work, $\gamma^{FB} > c$. The principal benefits from a higher degree of remote work because it relaxes the participation constraint and thus reduces the fixed wage she needs to pay to the agent. As the agent's benefit V from the unproductive activities increases in γ and the personal costs DC equally increase in both directions of γ from the point $\gamma = c$, it is beneficial to set γ higher than c . Due to the observability and contractibility of the agent's efforts, the principal can still perfectly control the agent's unproductive activities a_2 .

Interestingly, an increasing productivity of the agent leads to a decrease of the first-best degree of remote work ($\frac{\partial \gamma^{FB}}{\partial b} < 0$). According to (12) and (13), if the agent's productivity b increases, for a given degree of remote work γ , it is optimal to induce higher productive effort and less outside activities. Thus, the benefit from outside activities (V) ceteris paribus decreases and the principal decreases the degree of remote work. As a higher productivity renders the productive effort more beneficial relative to the outside activities (due to the increasing marginal benefit of the productive effort), the overall effect of an increasing b leads to $\frac{\partial a_1^{FB}}{\partial b} > 0$ and $\frac{\partial a_2^{FB}}{\partial b} < 0$, see Lemma 1.

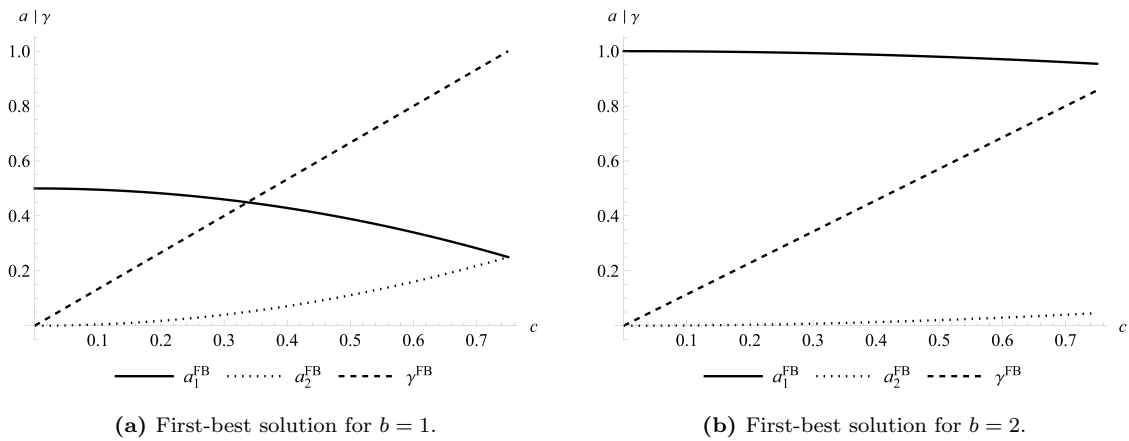


Figure 3: Comparison of first-best solutions a_1^{FB} , a_2^{FB} and γ^{FB} for different levels of productivity b .

Figures 3a and 3b show some of the effects that are derived above graphically. They display the first-best results of the degree of remote work and the agent's efforts from Lemma 1 as functions of c for different levels of b . Obviously, γ^{FB} (dashed lines)

increases in c for both levels of b . In addition, the comparison between both figures shows that γ^{FB} is lower for a higher level of productivity b as in Figure 3b. As discussed before, the productive effort a_1^{FB} (solid lines) decreases in c , whereas the unproductive activities (dotted lines) increase in c . In case of the lower productivity in Figure 3a, the level of productive effort is lower compared to the case of higher productivity in Figure 3b. For the unproductive activities it is the other way around. In addition, the comparison between both figures shows that the impact of the preferred degree of remote work c on the agent's efforts is stronger for a relatively low level of productivity. As a low b represents a low marginal benefit of the productive effort, the principal does not focus so much on the productive output but uses the degree of remote work in order to maximize her expected surplus. Hence, for high values of c she implements a relatively high degree of remote work and therefore accepts a relatively high level of unproductive effort in order to benefit from the agent's high personal benefits and low personal costs.

4.2 Second-best solution

4.2.1 Interplay between incentive rate and degree of remote work

With unobservable efforts a_1 and a_2 the principal faces the following optimization problem:

$$\max_{\gamma, v, w} CEP = E(x) - E(s(x)) \quad (17)$$

subject to

$$CEA = E(s(x)) - C(a_1, a_2) + DC(\gamma) + V(\gamma, a_2) - \frac{r}{2} Var(s(x)) \geq 0, \quad (18)$$

$$(a_1, a_2) \in \operatorname{argmax}_{a_1', a_2'} CEA. \quad (19)$$

To ensure that the principal's objective function is strictly concave in γ and v , we additionally assume $b > \frac{1}{4v^2}$ for any $v \in (0, 1]$ in the second-best solution. As in the first-best solution, the optimization problem is subject to the agent's participation constraint (18). In addition, the incentive constraint, given by (19), represents the agent's optimal levels of effort for a given contract and degree of remote work. By optimizing CEA as in (5) over a_1 and a_2 , the incentive constraint can be rewritten as follows:

$$a_1 = \frac{bv}{2} - \frac{\gamma^2}{4b^2v^2} = \frac{bv}{2} - a_2, \quad (20)$$

$$a_2 = \frac{\gamma^2}{4b^2v^2}. \quad (21)$$

The overall level of effort in the second-best solution, $a_1 + a_2 = \frac{bv}{2}$, increases in the incentive rate v . The principal chooses the incentive rate v and the degree of remote work simultaneously to incentivize the desired allocation of working time among the agent's two different kinds of activities. Thereby, she trades off expected output, the agent's personal costs and benefits and the agent's risk premium. Under consideration of the binding participation constraint and the incentive constraint, the optimization problem becomes

$$\max_{v, \gamma} CEP_{SB} = \frac{2b^3v^3 - \gamma^2}{4bv^2} - \frac{b^2v^2}{4} - (\gamma - c)^2 + \frac{\gamma^2}{2bv} - \frac{r}{2}v^2\sigma^2 \quad (22)$$

Optimizing (22) over γ yields the results presented in the following proposition.

Proposition 1 *For a given incentive rate v , the second-best degree of remote work is given by*

$$\gamma^{SB}(v) = \frac{4bcv^2}{4bv^2 - 2v + 1}, \quad (23)$$

and the second-best efforts are

$$a_1^{SB}(v) = \frac{bv}{2} - \frac{4c^2v^2}{(4bv^2 - 2v + 1)^2}, \quad (24)$$

$$a_2^{SB}(v) = \frac{4c^2v^2}{(4bv^2 - 2v + 1)^2}. \quad (25)$$

As $b > b^{crit}$ and $c \in (0, 1)$, it follows that $\gamma^{SB}(v) \in (0, 1)$. Moreover, $\gamma^{SB} = \gamma^{FB}$ holds true if and only if $v = 1$ and $\gamma^{SB} < \gamma^{FB}$ follows from $v < 1$ (which will turn out to be true at the optimum). We find that the second-best degree of remote work increases in the incentive rate v , $\frac{d\gamma^{SB}(v)}{dv} > 0$, as displayed by the dashed line in Figure 4 (additionally $\frac{dv^{SB}}{d\gamma^{SB}} > 0$ holds). A higher incentive rate ceteris paribus induces more productive effort and less outside activities (see solid and dotted lines in Figure 4) so that the benefit from outside activities (V) decreases. To motivate an appropriate level of outside activities and a corresponding benefit, the optimal second-best degree of remote work increases in the level of the incentive rate. Thus, the incentive rate and the degree of remote work act as complements in controlling productive effort and outside activities. Similar to the effect of a higher productivity in the first-best solution, increasing the incentive rate v leads to a decrease in the unproductive effort a_2 , although, at the same time, it leads to an increase in the

degree of remote work. The reason for this is that the change in the incentive rate has a stronger impact on the allocation of the manager's time among the efforts than the change in the degree of remote work (caused by the changing incentive rate).

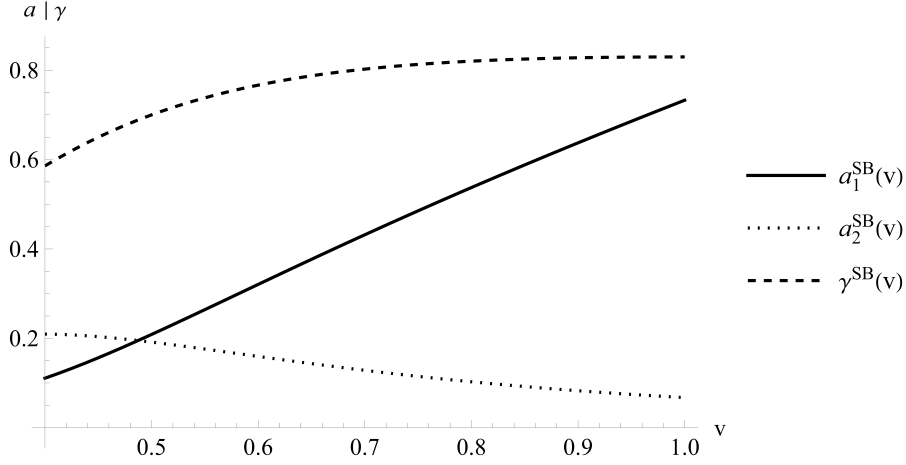


Figure 4: Second-best solutions $a_1^{SB}(v)$, $a_2^{SB}(v)$ and $\gamma^{SB}(v)$ for $b = 1.6$ and $c = 0.7$.

Figure 4 shows the effects described above graphically. We see that for a sufficiently low incentive rate the unproductive effort can even be higher than the productive effort, although the degree of remote work is also relatively low. Besides that, the incentive rate has a relatively strong impact on the productive effort compared to the impact on the unproductive effort, as the slopes of the graphs show. In line with this, the overall level of effort also increases in v (as it is equal to $\frac{bv}{2}$).

4.2.2 Optimality considerations and comparative statics

In the following, we analyze the equilibrium solutions of v and γ and the results of the respective comparative statics as well as the comparative statics of the equilibrium efforts. The second-best solutions of v and γ are characterized by the first-order-condition for v ($\frac{\partial CEP_{SB}}{\partial v} = 0$) and $\gamma^{SB}(v)$ as given by (23). The optimal incentive rate and the results of its comparative statics are presented in the following proposition.

Proposition 2 *There exists a unique $v^{SB} \in (0, 1)$, which is implicitly defined by*

$$-\frac{2\gamma^{SB}(v)^2}{bv^2} - b^2(2v - 2) + \frac{2\gamma^{SB}(v)^2}{bv^3} - 4r\sigma^2v = 0, \quad (26)$$

where $\gamma^{SB}(v)$ is given by (23). The comparative statics results of v^{SB} are as follows:

$$\frac{dv^{SB}}{dr} < 0, \quad (27)$$

$$\frac{dv^{SB}}{d\sigma^2} < 0, \quad (28)$$

$$\frac{dv^{SB}}{dc} > 0, \quad (29)$$

$$\frac{dv^{SB}}{db} \begin{cases} \geq \\ \leq \end{cases} 0, \text{ if and only if } b \begin{cases} \geq \\ \leq \end{cases} b'(v^{SB}), \quad (30)$$

where the threshold $b'(v^{SB})$ is defined in the proof of the proposition.

The next proposition presents the comparative statics results of the second-best degree of remote work γ^{SB} .

Proposition 3 *The comparative statics results of the optimal degree of remote work γ^{SB} are as follows:*

$$\frac{d\gamma^{SB}(v^{SB})}{dr} < 0, \quad (31)$$

$$\frac{d\gamma^{SB}(v^{SB})}{d\sigma^2} < 0, \quad (32)$$

$$\frac{d\gamma^{SB}(v^{SB})}{dc} > 0, \quad (33)$$

$$\frac{d\gamma^{SB}(v^{SB})}{db} \begin{cases} \geq \\ \leq \end{cases} 0, \text{ depending on parameter values,} \quad (34)$$

whereby $\frac{d\gamma^{SB}(v^{SB})}{db} > 0$ if $v^{SB} \leq \frac{1}{2}$ and $\frac{d\gamma^{SB}(v^{SB})}{db} < 0$ if v^{SB} is sufficiently high.

The second-best incentive rate decreases with increasing uncertainty of the output and increasing risk aversion of the agent, which mirrors the results of standard agency models (see, e.g., Feltham and Xie (1994)). However, the result of a positive association between the optimal incentive rate v^{SB} and the productivity b only holds true for sufficiently high values of $b > b'(v^{SB})$. If b is relatively low, the marginal benefit from the productive effort is also relatively low. Ceteris paribus, an increase in b shifts the focus of the agent towards the productive effort. For a relatively low level of b , the principal benefits more from the agent engaging in unproductive activities so that she decreases the incentive rate in order to counteract the shift in

the agent's focus due to the increase in b . In addition, the optimal incentive rate increases if the agent prefers a higher degree of remote work, which is represented by a higher c . With a higher preference for remote work, the optimal degree of remote work from the principal's view ($\gamma^{SB}(v^{SB})$) increases. As the optimal incentive rate is only affected by c through γ and the optimal degree of remote work and the optimal incentive rate are complements, the optimal incentive rate increases in c , too.

As $v^{SB} < 1$, the second-best degree of remote work is lower than the first-best degree, $\gamma^{SB} < \gamma^{FB}$. Hence, the principal is not willing to permit as much remote work when she cannot observe and contract upon the agent's actions. Additionally, offering a contract with a lower incentive rate v goes along with a lower degree of remote work as discussed above. For $0 < v^{SB} \leq \frac{1}{2}$, the second-best degree of remote work is (weakly) lower than the preferred degree c of the agent, whereas the opposite holds for $\frac{1}{2} < v^{SB} < 1$. A sufficiently high incentive rate ensures that the level of the agent's productive effort is relatively high so that the principal is able to implement a higher degree of remote work in order to benefit from the agent's personal benefits due to engaging more in unproductive activities. This is similar to the first-best solution in which the degree of remote work is always higher than the agent's preferred degree. However, with a relatively low incentive rate, the agent already has relatively strong incentives to engage in unproductive activities when working remotely, which is why the principal keeps the degree of remote work lower than the agent's preference c . Figure 5 shows the above results graphically. Thereby, γ^{SB} (solid line) increases in v^{SB} so that it is greater than c (dotted line) for $v^{SB} > \frac{1}{2}$ and approaches γ^{FB} (dashed line) for $v^{SB} \rightarrow 1$. The actual value of v^{SB} depends on the parameter constellation so that different incentive rates are implemented due to changes in the parameters.⁴

⁴ In Figure 5, b and c are held at constant values so that the change in v^{SB} along the x-axis is induced by changes in r and/or σ^2 . These parameters do not affect the second-best degree of remote work directly but only indirectly through v^{SB} .

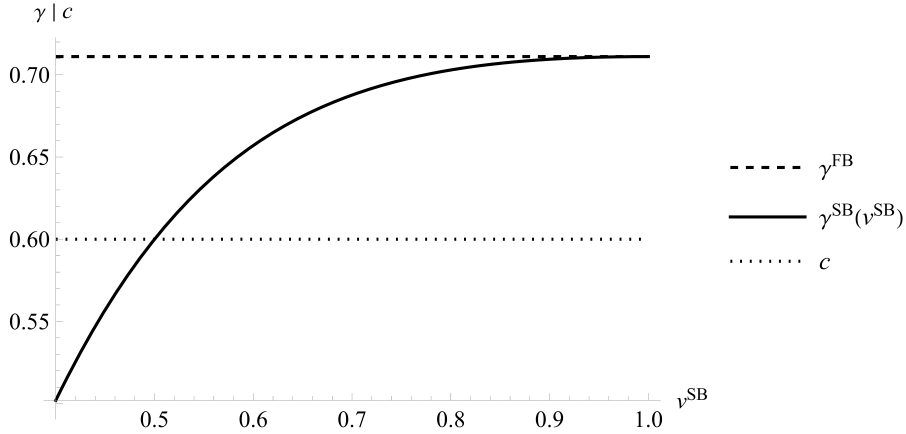


Figure 5: $\gamma^{SB}(v^{SB})$, γ^{FB} and c over v^{SB} for $b = 1.6$ and $c = 0.6$.

The second-best degree of remote work decreases in the uncertainty of the output and in the risk aversion of the agent, which are indirect effects via v^{SB} . As shown in Proposition 2, the optimal incentive rate also decreases in the risk aversion of the agent and in the uncertainty of the output. Hence, ceteris paribus, the productive effort decreases and outside activities increase. Similar to the response to a lower incentive rate, the principal decreases the degree of remote work to counteract these effects, as the degree of remote work and the incentive rate act complementary.

The effect of the productivity b on the second-best degree of remote work is ambiguous. For a sufficiently low level of the incentive rate $v^{SB} \leq \frac{1}{2}$, the optimal degree of remote work increases in the productivity b . As the optimal degree of remote work increases in the incentive rate, a low level of the incentive rate indicates a relatively low degree of remote work. An increase in the productivity b increases the information content of the output, which has a similar effect as decreasing the uncertainty of the output so that it is optimal for the principal to increase the degree of remote work as described above. However, increasing b also increases the marginal benefit from engaging in the productive effort a_1 and thus makes it more beneficial for the principal to induce a higher level of the productive effort a_1 and to reduce the unproductive effort a_2 accordingly. This effect dominates for a sufficiently high incentive rate. Hence, in this case, it is optimal to decrease the degree of remote work in order to shift the focus more towards the productive effort rather than the unproductive activities. Figure 6 shows $\gamma^{SB}(v^{SB})$ as a function of the productivity b . It becomes clear that the optimal degree of remote work increases in b for relatively low values of b and decreases in b for sufficiently high values of b . As $b > b'(v^{SB})$ holds for the parameters in Figure 6, v^{SB} increases in b so that relatively low values of b indicate relatively low values of v^{SB} , whereas higher values of b indicate higher values of v^{SB} . Hence, the graph shows the ambiguous effects of the productivity b

on the second-best degree of remote work, as described above.

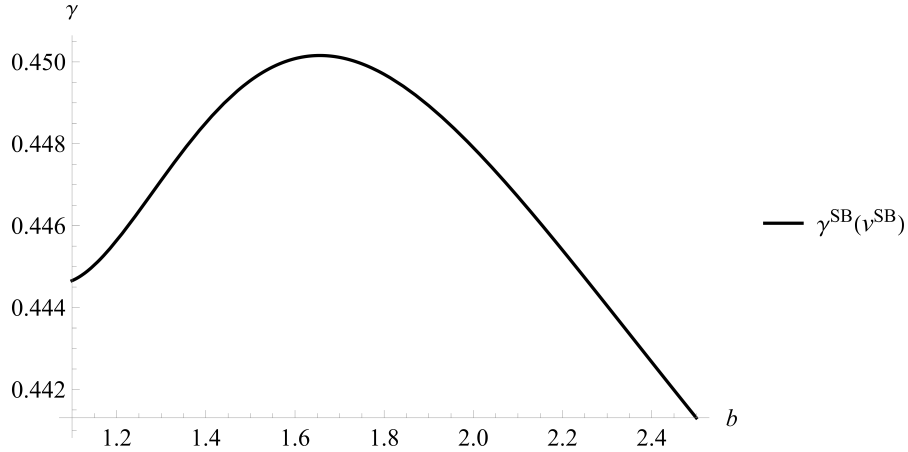


Figure 6: $\gamma^{SB}(v^{SB})$ as function of b for $c = 0.4$, $\sigma = 0.9$ and $r = 1$.

Taking into account the above results for v^{SB} and γ^{SB} , we derive the comparative statics results of the equilibrium efforts $a_1^{SB}(v^{SB})$ and $a_2^{SB}(v^{SB})$ as given by (24) and (25). With an increasing impact of risk in the agency, which is represented by an increase in r and/or σ^2 , the productive effort $a_1^{SB}(v^{SB})$ decreases, whereas the unproductive effort $a_2^{SB}(v^{SB})$ increases. As shown in the above propositions, both the incentive rate and the degree of remote work decrease in r and σ^2 . Thereby, the decrease in the degree of remote work is caused by the decrease in the incentive rate, as r and σ have no direct effect on γ . The direct effect of the decreasing incentive rate on the efforts dominates the indirect effect of the decrease in γ caused by the decrease in v , which leads to the above results. The agent is induced to focus more on outside activities because the personal benefit from these activities is risk-free, whereas higher productive effort needs higher incentive compensation based on the risky productive output of the firm.

We find that, for a sufficiently high productivity $b > b'(v^{SB})$ and for $v^{SB} \leq \frac{1}{2}$ or an optimal incentive rate $v^{SB} \rightarrow 1$, the optimal productive effort increases in the productivity b , whereas the unproductive effort decreases in b , $\frac{da_1^{SB}(v^{SB})}{db} > 0$ and $\frac{da_2^{SB}(v^{SB})}{db} < 0$ (see Figure 7a). The productivity b has a direct effect on the efforts and also indirectly affects them through the incentive rate v^{SB} . As a more productive agent has a higher marginal benefit from exerting productive effort, ceteris paribus, he has stronger incentives to exert productive effort. Therefore, the direct effect of b on the productive effort is positive and the direct effect on the unproductive activities is negative, $\frac{\partial a_1^{SB}(v^{SB})}{\partial b} > 0$ and $\frac{\partial a_2^{SB}(v^{SB})}{\partial b} < 0$. This aspect also drives the first-best solution. However, as opposed to the first-best efforts, the second-best efforts are affected by the incentive rate v^{SB} , which is a function of b . The agent's

productive effort increases in v^{SB} , whereas the level of the unproductive activities decreases in v^{SB} , $\frac{da_1^{SB}(v^{SB})}{dv^{SB}} > 0$ and $\frac{da_2^{SB}(v^{SB})}{dv^{SB}} < 0$. Hence, if v^{SB} increases in the productivity b , the indirect effect through the incentive rate enhances the direct effect of b on the efforts so that the overall effect on the efforts is in line with the direct effect. This is the case for a sufficiently high productivity $b > b'(v^{SB})$ and for $v^{SB} \leq \frac{1}{2}$. In the special case of $v^{SB} \rightarrow 1$, the indirect effect on the efforts through v^{SB} vanishes so that the overall effect of b on the efforts is equal to the direct effect.

The comparative statics results of the efforts with respect to the agent's preferred degree of remote work c are as follows. For a sufficiently high incentive rate v^{SB} , the productive effort decreases in c , whereas the unproductive effort increases in c , $\frac{da_1^{SB}(v^{SB})}{dc} < 0$ and $\frac{da_2^{SB}(v^{SB})}{dc} > 0$, as shown in Figure 7b. If c becomes sufficiently high, the level of unproductive activities might even exceed the level of productive effort. An increase in c leads to an increase in both the optimal incentive rate and the optimal degree of remote work, but with a relatively high incentive rate the effect of the change in the degree of remote work on the efforts dominates. The reason is that for a relatively high incentive rate, the impact of a change in c on the incentive rate is relatively low. Hence, the relatively strong increase in γ^{SB} due to a higher c leads to more opportunities to engage in unproductive activities and thus enhances the unproductive effort, whereas the productive effort decreases. If v^{SB} is low, the signs of the derivatives of the efforts with respect to c might change. With a rather low incentive rate, the increase in v^{SB} due to the increasing c is relatively strong so that the respective effect on the efforts might dominate the effect due to the increase in the degree of remote work γ^{SB} .

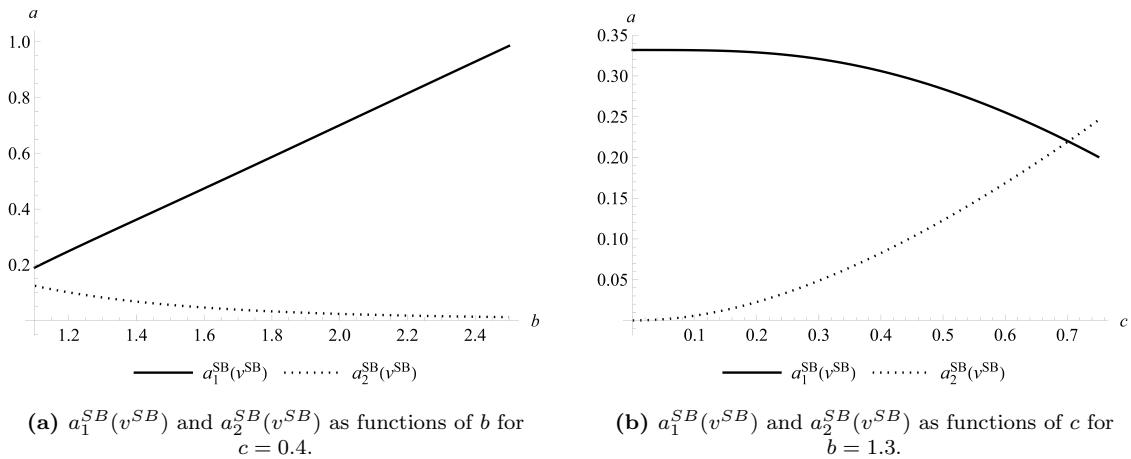


Figure 7: Comparison of equilibrium second-best solutions $a_1^{SB}(v^{SB})$ and $a_2^{SB}(v^{SB})$ as functions of b and c with $\sigma = 0.9$ and $r = 1$.

5 Discussion

In this section, we discuss the results of our model and provide practical and empirical implications. As shown in Proposition 2, the possibility of remote work in combination with outside activities does not lead to a change in the comparative static results of the optimal incentive rate with respect to the impact of risk (see, e.g., Feltham and Xie (1994)). However, as opposed to the standard results, the incentive rate might decrease in the agent's productivity b for sufficiently low levels of b . The reason lies in the optimal allocation of the agent's working time among the productive and the unproductive activities. For low values of b (representing low marginal benefits of the productive effort), a relatively low amount of time should be dedicated to the productive effort. The principal ensures this by decreasing the incentive rate as a counteract to the increase in b .

As stated in Proposition 3, we find that the second-best degree of remote work is lower for higher risk-averse employees. Thus, we not only expect lower incentive rates but also lower degrees of remote work for people with higher risk aversion and for jobs where more risk-averse employees work.⁵ Likewise, the optimal degree of remote work decreases in the uncertainty in the firm's output. Uncertainty of the outcome is a significant factor in creative tasks (Dewett, 2006). As most complex tasks require some degree of creativity and potentially lead to diverse results, their output can also be seen as relatively uncertain. In addition, creative tasks can benefit from teamwork (Fay et al., 2015) and therefore are more beneficial in the office (Bloom et al., 2015).⁶ It is striking that characteristics such as high complexity and/or high creativity apply to tasks that can be completed very well remotely, such as 84% of management occupations (Dingel and Neiman, 2020). Consequently, from the employer's point of view, it makes sense to reduce the degree of remote work for these kinds of tasks.

In contrast, the employer should agree to a relatively high degree of remote work if the uncertainty of the output is low. However, this might come with certain difficulties in practice. Low uncertainty of the output exists in many professions with limited mental and instead mainly physical challenges, such as production, construction and cleaning, that can hardly or not completely be done remotely

⁵ Employees with a relatively high risk aversion might decide to work in fields with "safe" jobs as opposed to "risky" occupations with a high variability of wage offers (Pissarides, 1974). For example, employees in the public sector are likely to have a high degree of risk aversion compared to employees in the private sector (Buurman et al., 2012; Bellante and Link, 1981).

⁶ Van der Lippe and Lippényi (2019) find that team performance becomes worse when co-workers work from home.

(Dingel and Neiman, 2020). Nevertheless, there are jobs for which the requirements of a high degree of remote work apply. While creative and complex tasks might benefit from working on-site, routine tasks can be regarded as the opposite of creative tasks and can be considered to have low uncertainty in the output. An example are tasks in a call center, which can be performed well from home (Bloom et al., 2015), since they are characterized by low complexity and low creativity. Hence, the output is highly informative about the employees' performance so that low uncertainty results even when employees work 100% remotely, as the experiment by Bloom et al. (2015) shows. A lesson from this experiment is to allow employees to work remotely if they work on these kinds of tasks. This finding is consistent with the results of our model, predicting that relatively high degrees of remote work should be observed for jobs with low output uncertainty.

We find ambiguous results for the link between the optimal degree of remote work and the employee's productivity. If (optimal) pay-performance sensitivity is low, the firm benefits from letting more productive employees work remotely at a higher degree. Interestingly, although they work remotely at a higher degree, the more productive employees still exert more productive effort and engage less in unproductive activities than their less productive co-workers. However, if pay-performance sensitivity is sufficiently high, the firm prefers to let more productive employees work at lower degrees of remote work compared to their less productive co-workers.

There are several studies that deal with the impact of remote work on the employees' productivity. On the one hand, Deole et al. (2022) find that the self-perceived productivity is higher when working from home. Other authors also find that employees work with a greater performance (Gajendran et al., 2015) and at a higher intensity (Felstead and Henseke, 2017) when working remotely, where they benefit from reduced noise (Banbury and Berry, 1998) and fewer distractions. On the other hand, studies reveal that the actual productivity of the employees significantly decreased when working from home during the COVID-19 pandemic (Morikawa, 2022; Gibbs et al., 2023). We do not consider a change in the productivity factor b when working remotely. However, it is important to clarify that b represents the agent's productivity in the sense of his work-related ability or skill. Thus, in our model, the productivity b is a personal characteristic rather than the amount of productive output per time. Our results show that, for a given incentive rate, the productive effort of the agent decreases when working from home, as the agent engages in unproductive activities. As the overall working time is constant for a given compensation contract (given v), the lower productive effort leads to a lower

output per time due to remote work, which is in line with some of the studies mentioned above. This kind of lower productivity is accepted by the principal in our model (even with symmetric information), as she benefits from lower wage payments to the agent due to his increased expected utility from working remotely. Besides that, the principal can use a higher incentive rate v to increase the overall level of effort and at the same time incentivize the agent to spend more time on the productive task and less time on unproductive activities. Hence, an increase in the incentive rate would increase the productivity of the agent in terms of productive output per time, although it would also induce a higher degree of remote work (see Proposition 3). A higher incentive rate, however, comes at a cost for the principal, as she imposes more compensation risk on the risk-averse agent.

The results presented in our model have several empirical implications. They imply that employees who perform tasks with highly uncertain outputs, such as, e.g., creative or complex tasks, are likely to work less from home than employees who produce less uncertain outputs, e.g., in routine tasks. In general, our results suggest that employees with high degrees of remote work should also have compensation contracts with high pay-performance sensitivities. In addition, we expect to see higher degrees of remote work for employees that have a strong preference towards remote work. Finally, our results suggest that firms that offer remote work show lower productive outcome per time than firms with the same incentive structure that do not offer remote work, but firm performance is not necessarily lower. For firms within the same business (and thus similar employees and output), we expect higher firm performance in firms that offer remote work due to lower wage payments resulting from the benefits of remote work.

6 Conclusion

We consider the possibility to (partially) work remotely in our agency model. Thereby, remote work offers the chance for the employee to engage in unproductive activities that yield a personal benefit for him. On the one hand, this might be a problem from the organizational point of view because unproductive activities are competing for scarce working time with the productive effort of the employee. On the other hand, outside activities yield a personal benefit for the employee and he experiences personal costs if the actual degree of remote work differs from his preferred degree. Trading off the above effects, the firm determines the optimal degree of remote work jointly with the optimal incentive contract for the employee.

We show that the firm increases the degree of remote work if the employee prefers a higher degree of remote work. By this, the firm reduces the personal costs of the employee, which is reflected in a lower wage payment and thus a higher profit for the firm. Furthermore, higher uncertainty in the output or higher risk aversion of the employee leads to a decrease in the degree of remote work. This is an indirect effect stemming from the reduction in the incentive rate, as the degree of remote work and the incentive rate act as complements.

As opposed to the output noise or the employee's risk aversion, the employee's productivity also directly affects the optimal degree of remote work. Interestingly, we find this effect to be ambiguous. If the degree of remote work is relatively low (indicated by a low incentive rate), the firm increases the degree of remote work with higher productivity of the employee. For relatively high degrees of remote work it is the other way around.

Overall, it becomes clear that it is important to consider the employee's personal characteristics such as productivity and preferences for the determination of the optimal degree of remote work. For example, firms might learn about their potential employees' preferences for remote work during job interviews. Besides that, firms should be aware of the employee's engagement in potentially unproductive activities when working remotely.

7 Appendix

Proof of Lemma 1:

Under consideration of the efforts given by (12) and (13) and the participation constraint from (8), which is binding in equilibrium, the principal's optimization problem in the first-best solution becomes

$$\max_{\gamma, v} CEP_{FB} = \frac{2b^3 - \gamma^2}{4b} - \left(\frac{b}{2}\right)^2 - (\gamma - c)^2 + \frac{\gamma^2}{2b} - \frac{r}{2}v^2\sigma^2. \quad (35)$$

Hence, the first-order conditions are as follows:

$$\frac{\partial CEP_{FB}}{\partial \gamma} = -\frac{\gamma}{2b} - 2(\gamma - c) + \frac{\gamma}{b} = 0, \quad (36)$$

$$\frac{\partial CEP_{FB}}{\partial v} = -rv\sigma^2 = 0. \quad (37)$$

Solving (36) and (37) with respect to γ and v leads to the first-best solution as in (14) and proves that $v^{FB} = 0$.

Inserting γ^{FB} into the efforts (12) and (13) leads to the first-best efforts given by (15) and (16).

In order to check the second-order conditions for the first-best solution presented in Lemma 1 (and $v^{FB} = 0$), we form the hessian matrix:

$$H_f = \begin{pmatrix} \frac{\partial^2 CEP_{FB}}{\partial v^2} & \frac{\partial^2 CEP_{FB}}{\partial v \partial a_1} & \frac{\partial^2 CEP_{FB}}{\partial v \partial a_2} & \frac{\partial^2 CEP_{FB}}{\partial v \partial \gamma} \\ \frac{\partial^2 CEP_{FB}}{\partial a_1 \partial v} & \frac{\partial^2 CEP_{FB}}{\partial a_1^2} & \frac{\partial^2 CEP_{FB}}{\partial a_1 \partial a_2} & \frac{\partial^2 CEP_{FB}}{\partial a_1 \partial \gamma} \\ \frac{\partial^2 CEP_{FB}}{\partial a_2 \partial v} & \frac{\partial^2 CEP_{FB}}{\partial a_2 \partial a_1} & \frac{\partial^2 CEP_{FB}}{\partial a_2^2} & \frac{\partial^2 CEP_{FB}}{\partial a_2 \partial \gamma} \\ \frac{\partial^2 CEP_{FB}}{\partial \gamma \partial v} & \frac{\partial^2 CEP_{FB}}{\partial \gamma \partial a_1} & \frac{\partial^2 CEP_{FB}}{\partial \gamma \partial a_2} & \frac{\partial^2 CEP_{FB}}{\partial \gamma^2} \end{pmatrix}$$

$$= \begin{pmatrix} -r\sigma^2 & 0 & 0 & 0 \\ 0 & -2 & -2 & 0 \\ 0 & -2 & -2 - \frac{\gamma^{FB}}{4(a_2^{FB})^{\frac{3}{2}}} & \frac{1}{2\sqrt{a_2^{FB}}} \\ 0 & 0 & \frac{1}{2\sqrt{a_2^{FB}}} & -2 \end{pmatrix}$$

We now calculate the determinants of the principal minors:

$$\det(-r\sigma^2) = -r\sigma^2 < 0,$$

$$\det \begin{pmatrix} -r\sigma^2 & 0 \\ 0 & -2 \end{pmatrix} = 2r\sigma^2 > 0,$$

$$\det \begin{pmatrix} -r\sigma^2 & 0 & 0 \\ 0 & -2 & -2 \\ 0 & -2 & -2 - \frac{\gamma^{FB}}{4(a_2^{FB})^{\frac{3}{2}}} \end{pmatrix} = -r\sigma^2 \frac{\gamma^{FB}}{2(a_2^{FB})^{\frac{3}{2}}} < 0,$$

$$\det(H_f) = r\sigma^2 \left(8 + \frac{\gamma^{FB}}{(a_2^{FB})^{\frac{3}{2}}} \right) > 0.$$

As the algebraic signs of the determinants are alternating, H_f is negative definite, which implies that the first-best solution represents a local maximum.

Proof of Proposition 1:

The optimization problem in (22) leads to the following first-order condition for γ :

$$\frac{\partial CEP_{SB}}{\partial \gamma} = -\frac{\gamma}{2bv^2} - 2(\gamma - c) + \frac{\gamma}{bv} = 0. \quad (38)$$

Solving (38) with respect to γ leads to the second-best degree of remote work as in (23). As $\frac{\partial^2 CEP_{SB}}{\partial \gamma^2} < 0$, the second-order condition for a local maximum holds.

Inserting $\gamma^{SB}(v)$ into the efforts (20) and (21) leads to the second-best efforts depending on v as given by (24) and (25). In order to check the second-order conditions for the second-best efforts, we form the hessian matrix:

$$\begin{aligned} H_f &= \begin{pmatrix} \frac{\partial^2 CE A_{SB}}{\partial a_1^2} & \frac{\partial^2 CE A_{SB}}{\partial a_1 \partial a_2} \\ \frac{\partial^2 CE A_{SB}}{\partial a_2 \partial a_1} & \frac{\partial^2 CE A_{SB}}{\partial a_2^2} \end{pmatrix} \\ &= \begin{pmatrix} -2 & -2 \\ -2 & -2 - \frac{\gamma^{SB}(v)}{4(a_2^{SB}(v))^{\frac{3}{2}}} \end{pmatrix} \end{aligned}$$

We now calculate the determinants of the principal minors:

$$\det(-2) = -2 < 0,$$

$$\det(H_f) = \frac{\gamma^{SB}(v)}{2(a_2^{SB}(v))^{\frac{3}{2}}} > 0.$$

As the algebraic signs of the determinants are alternating, H_f is negative definite, which implies that the second-best efforts represent a local maximum of CEA_{SB} as used in (19).

Proof of Proposition 2:

From CEP_{SB} as given in (22) we derive

$$\frac{\partial^2 CEP_{SB}}{\partial v^2} = -\frac{2r v^4 \sigma^2 b + b^3 v^4 - 2\gamma^2 v + 3\gamma^2}{2b v^4} < 0, \quad (39)$$

$$\frac{\partial^2 CEP_{SB}}{\partial \gamma^2} = -\frac{4b v^2 - 2v + 1}{2b v^2} < 0, \quad (40)$$

$$\begin{aligned} \frac{\partial^2 CEP_{SB}}{\partial v^2} \frac{\partial^2 CEP_{SB}}{\partial \gamma^2} - \left(\frac{\partial^2 CEP_{SB}}{\partial v \partial \gamma} \right)^2 = \\ \frac{(4b v^2 - 2v + 1)(2r v^4 \sigma^2 b + b^3 v^4 - 2\gamma^2 v + 3\gamma^2)}{4b^2 v^6} - \frac{\gamma^2 (v-1)^2}{b^2 v^6} > 0. \end{aligned} \quad (41)$$

As per assumption $b > \frac{1}{4v^2}$ for all v , (40) holds true and the determinant of the hessian of CEP_{SB} , $\frac{\partial^2 CEP_{SB}}{\partial v^2} \frac{\partial^2 CEP_{SB}}{\partial \gamma^2} - \left(\frac{\partial^2 CEP_{SB}}{\partial v \partial \gamma} \right)^2$, is strictly positive (see (41)). Thus, CEP_{SB} is strictly concave in (γ, v) such that a unique maximum (γ^{SB}, v^{SB}) exists. Given $\gamma^{SB}(v)$ from (23), the first-order condition for v is given by (26). We define the left-hand-side of (26) as Z so that at the optimum

$$Z = -\frac{2\gamma^{SB}(v)^2}{bv^2} - b^2(2v-2) + \frac{2\gamma^{SB}(v)^2}{bv^3} - 4r\sigma^2 v = 0. \quad (42)$$

We can determine the following boundary values for Z :

$$\lim_{v \rightarrow 0} Z = 2b^2 > 0, \quad (43)$$

$$Z(v=1) = -\frac{2\gamma^{SB}(v=1)^2}{b} + \frac{2\gamma^{SB}(v=1)^2}{b} - 4r\sigma^2 = -4r\sigma^2 < 0. \quad (44)$$

In addition, the derivative with respect to v is as follows:

$$\begin{aligned} \frac{\partial Z}{\partial v} &= -\frac{2 \left(bv^4 (b^2 + 2r\sigma^2) + 2(v-1)v\gamma^{SB}(v)\gamma^{SB'}(v) + (3-2v)\gamma^{SB}(v)^2 \right)}{bv^4} \\ &= \frac{32b^2 c^2 (8bv^3 - 12bv^2 + 1)}{(4bv^2 - 2v + 1)^3} - 2b^2 - 4r\sigma^2 < 0. \end{aligned} \quad (45)$$

As per assumption $b > \frac{1}{4v^2}$, the above derivative is negative. The boundary values jointly with (45) prove that $0 < v^{SB} < 1$ must hold true.

Implicit differentiation leads to the following comparative statics of v^{SB} :

$$\frac{dv^{SB}}{dr} = \frac{4\sigma^2 v^{SB}}{\frac{\partial Z}{\partial v^{SB}}} < 0, \quad (46)$$

$$\frac{dv^{SB}}{d\sigma^2} = \frac{4rv^{SB}}{\frac{\partial Z}{\partial v^{SB}}} < 0, \quad (47)$$

$$\frac{dv^{SB}}{dc} = \frac{-\frac{4\frac{\partial\gamma^{SB}(v^{SB})}{\partial c}\gamma^{SB}(v^{SB})(1-v^{SB})}{b(v^{SB})^3}}{\frac{\partial Z}{\partial v^{SB}}} > 0, \quad (48)$$

$$\frac{dv^{SB}}{db} = \frac{-\frac{2\gamma^{SB}(v^{SB})(1-v^{SB})\left(\gamma^{SB}(v^{SB})-2b\frac{\partial\gamma^{SB}(v^{SB})}{\partial b}\right)}{b^2(v^{SB})^3} + 4b(1-v^{SB})}{\frac{\partial Z}{\partial v^{SB}}} \stackrel{\geq}{\leq} 0 \text{ for } b \stackrel{\geq}{\leq} b'. \quad (49)$$

As $\frac{\partial Z}{\partial v} < 0$ holds true (see (45)), the denominator of equations (46) to (49) is negative, turning the entire fractions in (46) and (47) negative. The numerator and denominator in (48) are negative so that the overall expression is positive. Under consideration of $\gamma^{SB}(v)$ from (23) the numerator in (49) is positive if and only if $b > b'(v^{SB})$, whereby $b'(v^{SB})$ is implicitly given by

$$b' = \frac{8c^2v^{SB}}{(4b' \cdot (v^{SB})^2 - 2v^{SB} + 1)^2} \frac{(4b' \cdot (v^{SB})^2 + 2v^{SB} - 1)}{(4b' \cdot (v^{SB})^2 - 2v^{SB} + 1)}. \quad (50)$$

The condition $b > b'(v^{SB})$ with $b'(v^{SB})$ from (50) is very similar to the condition that needs to hold in order to ensure a positive second-best productive effort. To ensure that $a_1^{SB}(v^{SB}) > 0$, the following condition must hold:

$$b > \frac{8c^2v^{SB}}{(4b \cdot (v^{SB})^2 - 2v^{SB} + 1)^2}. \quad (51)$$

As we focus on those parameter constellations that ensure positive efforts, the condition (51) always holds.

For $v^{SB} \leq \frac{1}{2}$ the second fraction on the right side of (50) is not greater than one so that the condition $b > b'(v^{SB})$ represents a relaxation of the condition in (51). As (51) holds for the parameter constellations we focus on, so does the condition $b > b'(v^{SB})$ for $v^{SB} \leq \frac{1}{2}$. Hence, for $v^{SB} \leq \frac{1}{2}$ it follows that $b > b'(v^{SB})$ and $\frac{dv^{SB}}{db} > 0$ hold.

Proof of Proposition 3:

First of all, we know:

$$\frac{d\gamma^{SB}(v^{SB})}{dv^{SB}} = -\frac{8bc(v^{SB}-1)v^{SB}}{(4b(v^{SB})^2-2v^{SB}+1)^2} > 0. \quad (52)$$

We derive the following comparative statics results for γ^{SB} as follows:

$$\frac{d\gamma^{SB}(v^{SB})}{dr} = \frac{\partial\gamma^{SB}(v^{SB})}{\partial v^{SB}} \frac{dv^{SB}}{dr} = \underbrace{\frac{\partial\gamma^{SB}(v^{SB})}{\partial v^{SB}}}_{>0} \underbrace{\frac{dv^{SB}}{dr}}_{<0} < 0, \quad (53)$$

$$\frac{d\gamma^{SB}(v^{SB})}{d\sigma^2} = \frac{\partial\gamma^{SB}(v^{SB})}{\partial v^{SB}} \frac{dv^{SB}}{d\sigma^2} = \underbrace{\frac{\partial\gamma^{SB}(v^{SB})}{\partial v^{SB}}}_{>0} \underbrace{\frac{dv^{SB}}{d\sigma^2}}_{<0} < 0, \quad (54)$$

$$\begin{aligned} \frac{d\gamma^{SB}(v^{SB})}{dc} &= \frac{\partial\gamma^{SB}(v^{SB})}{\partial c} + \frac{\partial\gamma^{SB}(v^{SB})}{\partial v^{SB}} \frac{dv^{SB}}{dc} \\ &= \underbrace{\frac{4b(v^{SB})^2}{4b(v^{SB})^2-2v^{SB}+1}}_{>0} + \underbrace{\frac{\partial\gamma^{SB}(v^{SB})}{\partial v^{SB}}}_{>0} \underbrace{\frac{dv^{SB}}{dc}}_{>0} > 0. \end{aligned} \quad (55)$$

$$\begin{aligned} \frac{d\gamma^{SB}(v^{SB})}{db} &= \frac{\partial\gamma^{SB}(v^{SB})}{\partial b} + \frac{\partial\gamma^{SB}(v^{SB})}{\partial v^{SB}} \frac{dv^{SB}}{db} \\ &= \underbrace{\frac{4c(1-2v^{SB})(v^{SB})^2}{(4b(v^{SB})^2-2v^{SB}+1)^2}}_{\leq 0} + \underbrace{\frac{\partial\gamma^{SB}(v^{SB})}{\partial v^{SB}}}_{>0} \underbrace{\frac{dv^{SB}}{db}}_{\leq 0} \leq 0. \end{aligned} \quad (56)$$

While the signs of the derivatives in (52) to (55) are unambiguous, the sign of (56) depends on the parameter setting. For $v^{SB} \leq \frac{1}{2}$ the first term in (56) is non-negative and the second term is positive (as $\frac{dv^{SB}}{db} > 0$ for $v^{SB} \leq \frac{1}{2}$, see proof of Proposition 2) so that overall the derivative is positive. For $v^{SB} > \frac{1}{2}$ the first term is negative and strictly decreasing in v^{SB} . The algebraic sign of the second term is ambiguous. We can derive the following boundary values:

$$\lim_{v^{SB} \rightarrow 1} \frac{\partial\gamma^{SB}(v^{SB})}{\partial b} = -\frac{4c}{(4b-1)^2} < 0, \quad (57)$$

$$\lim_{v^{SB} \rightarrow 1} \frac{\partial\gamma^{SB}(v^{SB})}{\partial v^{SB}} \frac{dv^{SB}}{db} = 0. \quad (58)$$

Hence, there exists a critical value $v^{crit} \in (\frac{1}{2}, 1)$ so that $\frac{d\gamma^{SB}(v^{SB})}{db} < 0$ for $v^{SB} > v^{crit}$.

Comparative statics of equilibrium efforts:

As we discuss the results of the comparative statics of the second-best efforts in the course of our analysis, we determine the respective derivatives subsequently.

Given $a_1^{SB}(v)$ and $a_2^{SB}(v)$ from (24) and (25), the derivatives with respect to v are

$$\frac{da_1^{SB}(v)}{dv} = \frac{b}{2} - \frac{8c^2v(1-4bv^2)}{(4bv^2-2v+1)^3} > 0, \quad (59)$$

$$\frac{da_2^{SB}(v)}{dv} = \frac{8c^2v(1-4bv^2)}{(4bv^2-2v+1)^3} < 0. \quad (60)$$

We note that the above conditions hold true, as we assume $b > \frac{1}{4v^2}$ for all v so that they also hold in equilibrium for $v = v^{SB}$.

Given the above results and the derivatives of v^{SB} as shown in Proposition 2, we calculate

$$\frac{da_1^{SB}(v^{SB})}{dr} = \underbrace{\frac{\partial a_1^{SB}(v^{SB})}{\partial v^{SB}}}_{>0} \underbrace{\frac{dv^{SB}}{dr}}_{<0} < 0, \quad (61)$$

$$\frac{da_2^{SB}(v^{SB})}{dr} = \underbrace{\frac{\partial a_2^{SB}(v^{SB})}{\partial v^{SB}}}_{<0} \underbrace{\frac{dv^{SB}}{dr}}_{<0} > 0, \quad (62)$$

$$\frac{da_1^{SB}(v^{SB})}{d\sigma^2} = \underbrace{\frac{\partial a_1^{SB}(v^{SB})}{\partial v^{SB}}}_{>0} \underbrace{\frac{dv^{SB}}{d\sigma^2}}_{<0} < 0, \quad (63)$$

$$\frac{da_2^{SB}(v^{SB})}{d\sigma^2} = \underbrace{\frac{\partial a_2^{SB}(v^{SB})}{\partial v^{SB}}}_{<0} \underbrace{\frac{dv^{SB}}{d\sigma^2}}_{<0} > 0, \quad (64)$$

$$\begin{aligned} \frac{da_1^{SB}(v^{SB})}{db} &= \frac{\partial a_1^{SB}(v^{SB})}{\partial b} + \frac{\partial a_1^{SB}(v^{SB})}{\partial v^{SB}} \frac{dv^{SB}}{db} \\ &= \underbrace{\frac{32c^2(v^{SB})^4}{(4b(v^{SB})^2 - 2v^{SB} + 1)^3}}_{>0} + \frac{v^{SB}}{2} + \underbrace{\frac{\partial a_1^{SB}(v^{SB})}{\partial v^{SB}}}_{>0} \underbrace{\frac{dv^{SB}}{db}}_{\leq 0} \leq 0, \end{aligned} \quad (65)$$

$$\begin{aligned} \frac{da_2^{SB}(v^{SB})}{db} &= \frac{\partial a_2^{SB}(v^{SB})}{\partial b} + \frac{\partial a_2^{SB}(v^{SB})}{\partial v^{SB}} \frac{dv^{SB}}{db} \\ &= -\underbrace{\frac{32c^2(v^{SB})^4}{(4b(v^{SB})^2 - 2v^{SB} + 1)^3}}_{<0} + \underbrace{\frac{\partial a_2^{SB}(v^{SB})}{\partial v^{SB}}}_{<0} \underbrace{\frac{dv^{SB}}{db}}_{\leq 0} \geq 0, \end{aligned} \quad (66)$$

$$\begin{aligned}
\frac{da_1^{SB}(v^{SB})}{dc} &= \frac{\partial a_1^{SB}(v^{SB})}{\partial c} + \frac{\partial a_1^{SB}(v^{SB})}{\partial v^{SB}} \frac{dv^{SB}}{dc} \\
&= \underbrace{-\frac{8c(v^{SB})^2}{(4b(v^{SB})^2 - 2v^{SB} + 1)^2}}_{<0} + \underbrace{\frac{\partial a_1^{SB}(v^{SB})}{\partial v^{SB}}}_{>0} \underbrace{\frac{dv^{SB}}{dc}}_{>0} \leq 0, \tag{67}
\end{aligned}$$

$$\begin{aligned}
\frac{da_2^{SB}(v^{SB})}{dc} &= \frac{\partial a_2^{SB}(v^{SB})}{\partial c} + \frac{\partial a_2^{SB}(v^{SB})}{\partial v^{SB}} \frac{dv^{SB}}{dc} \\
&= \underbrace{\frac{8c(v^{SB})^2}{(4b(v^{SB})^2 - 2v^{SB} + 1)^2}}_{>0} + \underbrace{\frac{\partial a_2^{SB}(v^{SB})}{\partial v^{SB}}}_{<0} \underbrace{\frac{dv^{SB}}{dc}}_{>0} \leq 0. \tag{68}
\end{aligned}$$

The algebraic signs of the derivatives in (61) to (64) are unambiguous. While $\left(\frac{\partial a_1^{SB}(v^{SB})}{\partial v^{SB}} \frac{dv^{SB}}{db}\right) \rightarrow 0$ and $\left(\frac{\partial a_2^{SB}(v^{SB})}{\partial v^{SB}} \frac{dv^{SB}}{db}\right) \rightarrow 0$ for $v^{SB} \rightarrow 1$, the first term in (65) is strictly positive and the first term in (66) is strictly negative. Hence, for sufficiently high values of v^{SB} we know that $\frac{da_1^{SB}(v^{SB})}{db} > 0$ and $\frac{da_2^{SB}(v^{SB})}{db} < 0$. As $\frac{dv^{SB}}{db} > 0$ for $v^{SB} \leq \frac{1}{2}$ and for $b > b'(v^{SB})$, it follows that $\frac{da_1^{SB}(v^{SB})}{db} > 0$ and $\frac{da_2^{SB}(v^{SB})}{db} < 0$ also hold in these cases. While $\left(\frac{\partial a_1^{SB}(v^{SB})}{\partial v^{SB}} \frac{dv^{SB}}{dc}\right) \rightarrow 0$ and $\left(\frac{\partial a_2^{SB}(v^{SB})}{\partial v^{SB}} \frac{dv^{SB}}{dc}\right) \rightarrow 0$ for $v^{SB} \rightarrow 1$, the first term in (67) is strictly negative and the first term in (68) is strictly positive. Hence, for sufficiently high values of v^{SB} it follows that $\frac{da_1^{SB}(v^{SB})}{dc} < 0$ and $\frac{da_2^{SB}(v^{SB})}{dc} > 0$.

References

- Akerlof, R. (2016). The importance of legitimacy. *The World Bank Economic Review* 30, 157–165.
- Alonderiene, R. and M. Majauskaite (2016). Leadership style and job satisfaction in higher education institutions. *International Journal of Educational Management* 30(1), 140–164.
- Azar, S., A. Khan, and W. van Eerde (2018). Modelling linkages between flexible work arrangements’ use and organizational outcomes. *Journal of Business Research* 91, 134–143.
- Baldenius, T. (2003). Delegated investment decisions and private benefits of control. *The Accounting Review* 78(4), 909–930.
- Banbury, S. and D. C. Berry (1998). Disruption of office-related tasks by speech and office noise. *British Journal of Psychology* 89(3), 499–517.
- Barrabi, T. (2023). JPMorgan orders managing directors back to office 5 days a week: ‘Lead by example’. URL: <https://nypost.com/2023/04/12/jpmorgan-orders-managing-directors-back-to-office-five-days-a-week-lead-by-example/>. [Online, accessed 03 March 2024].
- Barsness, Z. I., K. A. Diekmann, and M.-D. L. Seidel (2005). Motivation and opportunity: The role of remote work, demographic dissimilarity, and social network centrality in impression management. *Academy of Management Journal* 48(3), 401–419.
- Baruch, Y. (2001). The status of research on teleworking and an agenda for future research. *International Journal of Management Reviews* 3(2), 113–129.
- Behrens, K., S. Kichko, and J.-F. Thisse (2021). Working from home: Too much of a good thing? *CESifo Working Paper, No. 8831*.
- Bellante, D. and A. N. Link (1981). Are public sector workers more risk averse than private sector workers? *Industrial and Labor Relations Review* 34(3), 408–412.
- Bick, A., A. Blandin, and K. Mertens (2023). Work from home before and after the COVID-19 outbreak. *American Economic Journal: Macroeconomics* 15(4), 1–39.
- Blok, M. M., L. Groenesteijn, R. Schelvis, and P. Vink (2012). New ways of working: Does flexibility in time and location of work change work behavior and affect business outcomes? *Work* 41(Supplement 1), 2605–2610.

- Bloom, N., J. Liang, J. Roberts, and Z. J. Ying (2015). Does working from home work? Evidence from a chinese experiment. *The Quarterly Journal of Economics* 130(1), 165–218.
- Bond, P. and A. Gomes (2009). Multitask principal–agent problems: Optimal contracts, fragility, and effort misallocation. *Journal of Economic Theory* 144(1), 175–211.
- Business Wire (2021). Rite Aid brings together corporate workforce through remote-first collaboration. URL: <https://www.businesswire.com/news/home/20210914005465/en/Rite-Aid-Brings-Together-Corporate-Workforce-Through-Remote-First-Collaboration>. [Online, accessed 03 March 2024].
- Buurman, M., J. Delfgaauw, R. Dur, and S. van den Bossche (2012). Public sector employees: Risk averse and altruistic? *Journal of Economic Behavior & Organization* 83(3), 279–291.
- CBS News Bay Area (2022a). Apple CEO Tim Cook says return to office beginning on April 11. URL: <https://www.cbsnews.com/sanfrancisco/news/apple-return-to-office-april-11-tim-cook-says/>. [Online, accessed 03 March 2024].
- CBS News Bay Area (2022b). Google confirms plan for employees to return to offices. URL: <https://www.cbsnews.com/sanfrancisco/news/google-confirms-plan-for-employees-to-return-to-offices/>. [Online, accessed 03 March 2024].
- Chong, S., Y. Huang, and C.-H. Chang (2020). Supporting interdependent telework employees: A moderated-mediation model linking daily COVID-19 task setbacks to next-day work withdrawal. *Journal of Applied Psychology* 105(12), 1408–1422.
- Cooper, C. D. and N. B. Kurland (2002). Telecommuting, professional isolation, and employee development in public and private organizations. *Journal of Organizational Behavior* 23(4), 511–532.
- Cutter, C. and K. Dill (2021). Remote work is the new signing bonus: Workers are trading jobs, enticed by the guarantee of flexible schedules and continued work from home. URL: <https://www.wsj.com/articles/remote-work-is-the-new-signing-bonus-11624680029>. [Online, accessed 03 March 2024].
- Deole, S. S., M. Deter, and Y. Huang (2022). Home sweet home: Working from home and employee performance during the COVID-19 pandemic in the UK. *Labour Economics* 80, 1–16.

- Dewett, T. (2006). Exploring the role of risk in employee creativity. *Journal of Creative Behavior* 40(1), 27–45.
- Dingel, J. I. and B. Neiman (2020). How many jobs can be done at home? *Journal of Public Economics* 189, 1–8.
- Eisfeldt, A. L. and A. A. Rampini (2008). Managerial incentives, capital reallocation, and the business cycle. *Journal of Financial Economics* 87(1), 177–199.
- Fay, D., H. Shipton, M. A. West, and M. Patterson (2015). Teamwork and organizational innovation: The moderating role of the HRM context. *Creativity and Innovation Management* 24(2), 261–277.
- Fehr, E. and K. M. Schmidt (2004). Fairness and incentives in a multi-task principal-agent model. *The Scandinavian Journal of Economics* 106(3), 453–474.
- Felstead, A. and G. Henseke (2017). Assessing the growth of remote working and its consequences for effort, well-being and work-life balance. *New Technology, Work and Employment* 32(3), 195–212.
- Felstead, A., N. Jewson, and S. Walters (2003). Managerial control of employees working at home. *British Journal of Industrial Relations* 41(2), 241–264.
- Feltham, G. A. and J. Xie (1994). Performance measure congruity and diversity in multi-task principal/agent relations. *The Accounting Review* 69(3), 429–453.
- Forooraghi, M., A. Cobaleda-Cordero, and M. Babapour Chafi (2022). A healthy office and healthy employees: A longitudinal case study with a salutogenic perspective in the context of the physical office environment. *Building Research & Information* 50(1-2), 134–151.
- Fried, Y. and L. H. Slowik (2004). Enriching goal-setting theory with time: An integrated approach. *Academy of Management Review* 29(3), 404–422.
- Gajendran, R. S., D. A. Harrison, and K. Delaney-Klinger (2015). Are telecommuters remotely good citizens? Unpacking telecommuting’s effects on performance via i-deals and job resources. *Personnel Psychology* 68(2), 353–393.
- Gibbs, M., F. Mengel, and C. Siemroth (2023). Work from home and productivity: Evidence from personnel and analytics data on information technology professionals. *Journal of Political Economy Microeconomics* 1(1), 7–41.

- Golden, T. D. (2007). Co-workers who telework and the impact on those in the office: Understanding the implications of virtual work for co-worker satisfaction and turnover intentions. *Human Relations* 60(11), 1641–1667.
- Golden, T. D. and J. F. Veiga (2005). The impact of extent of telecommuting on job satisfaction: Resolving inconsistent findings. *Journal of Management* 31(2), 301–318.
- Golden, T. D., J. F. Veiga, and Z. Simsek (2006). Telecommuting’s differential impact on work-family conflict: Is there no place like home? *Journal of Applied Psychology* 91(6), 1340–1350.
- Grossman, S. J. and O. D. Hart (1988). One share-one vote and the market for corporate control. *Journal of Financial Economics* 20, 175–202.
- Hill, E. J., M. Ferris, and V. Mårtinson (2003). Does it matter where you work? A comparison of how three work venues (traditional office, virtual office, and home office) influence aspects of work and personal/family life. *Journal of Vocational Behavior* 63(2), 220–241.
- Holmström, B. (2017). Pay for performance and beyond. *American Economic Review* 107(7), 1753–1777.
- Holmström, B. and P. Milgrom (1991). Multitask principal-agent analyses: Incentive contracts, asset ownership, and job design. *The Journal of Law, Economics, and Organization* 7(Special Issue), 24–52.
- Irawanto, D. W., K. R. Novianti, and K. Roz (2021). Work from home: Measuring satisfaction between work-life balance and work stress during the COVID-19 pandemic in Indonesia. *Economies* 9(3), 96.
- Jung, D. I., C. Chow, and A. Wu (2003). The role of transformational leadership in enhancing organizational innovation: Hypotheses and some preliminary findings. *The Leadership Quarterly* 14(4), 525–544.
- Khan, M. A., F. B. Ismail, A. Hussain, and B. Alghazali (2020). The interplay of leadership styles, innovative work behavior, organizational culture, and organizational citizenship behavior. *SAGE Open* 10(1), 1–16.
- Kingma, S. (2019). New ways of working (NWW): Work space and cultural change in virtualizing organizations. *Culture and Organization* 25(5), 383–406.

- Kossek, E. E., B. A. Lautsch, and S. C. Eaton (2006). Telecommuting, control, and boundary management: Correlates of policy use and practice, job control, and work–family effectiveness. *Journal of Vocational Behavior* 68(2), 347–367.
- Laux, C. (2001). Limited-liability and incentive contracting with multiple projects. *The RAND Journal of Economics* 32(3), 514–526.
- Leonardi, P. M. (2021). COVID-19 and the new technologies of organizing: Digital exhaust, digital footprints, and artificial intelligence in the wake of remote work. *Journal of Management Studies* 58(1), 249–253.
- Mas, A. and A. Pallais (2017). Valuing alternative work arrangements. *American Economic Review* 107(12), 3722–3759.
- Mauch, C. and J. R. Schöndube (2019). Controlling scarce working time in a multi-task incentive problem. *European Accounting Review* 28(1), 151–175.
- Morikawa, M. (2022). Work-from-home productivity during the COVID-19 pandemic: Evidence from Japan. *Economic Inquiry* 60(2), 508–527.
- Moynihan, L. (2023). Goldman Sachs CEO David Solomon: 65% of workforce back in office 5 days a week. URL: <https://nypost.com/2022/10/18/goldman-sachs-ceo-65-of-workforce-back-in-office-5-days-a-week/>. [Online, accessed 03 March 2024].
- Nayani, R. J., K. Nielsen, K. Daniels, E. J. Donaldson-Feilder, and R. C. Lewis (2018). Out of sight and out of mind? A literature review of occupational safety and health leadership and management of distributed workers. *Work & Stress* 32(2), 124–146.
- Peters, P. and S. Heusinkveld (2010). Institutional explanations for managers’ attitudes towards telehomeworking. *Human Relations* 63(1), 107–135.
- Pianese, T., L. Errichiello, and J. V. Da Cunha (2023). Organizational control in the context of remote working: A synthesis of empirical findings and a research agenda. *European Management Review* 20(2), 326–345.
- Pissarides, C. A. (1974). Risk, job search, and income distribution. *Journal of Political Economy* 82(6), 1255–1267.
- Raghuram, S. and B. Wiesenfeld (2004). Work-nonwork conflict and job stress among virtual workers. *Human Resource Management* 43(2-3), 259–277.

- Restrepo, B. J. and E. Zeballos (2020). The effect of working from home on major time allocations with a focus on food-related activities. *Review of Economics of the Household* 18(4), 1165–1187.
- Schöttner, A. (2008). Relational contracts, multitasking, and job design. *The Journal of Law, Economics, and Organization* 24(1), 138–162.
- Sewell, G. and L. Taskin (2015). Out of sight, out of mind in a new world of work? Autonomy, control, and spatiotemporal scaling in telework. *Organization Studies* 36(11), 1507–1529.
- Tietze, S. (2002). When "work" comes "home": Coping strategies of teleworkers and their families. *Journal of Business Ethics* 41(4), 385–396.
- Tietze, S. and G. Musson (2005). Recasting the home-work relationship: A case of mutual adjustment? *Organization Studies* 26(9), 1331–1352.
- Van der Lippe, T. and Z. Lippényi (2019). Co-workers working from home and individual and team performance. *New Technology, Work and Employment* 35(1), 60–79.
- Van Zoonen, W. and A. E. Sivunen (2022). The impact of remote work and mediated communication frequency on isolation and psychological distress. *European Journal of Work and Organizational Psychology* 31(4), 610–621.