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Policy Unbundling and Special Interest Politics

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Abstract

When is it better to bundle policy-tasks into a single office versus unbundle them into separate offices? Which institutional arrangement is better for preventing interest group capture? How does transparency of political agent's actions affect the relative merits of both institutional frameworks? We consider a simple career-concerns model of political accountability with variation in complexity across policy areas. We find that when relative policy area complexities are sufficiently high and symmetric, bundling policy areas may lead to higher total effort, selection of more more competent politicians and better resistance to policy capture by special interests than unbundling. The opposite is true when policy area complexities are sufficiently asymmetric. While the effect of the possibility of interest group capture under unbundling conforms to standard intuitions, we show that under bundling: (1) interest groups may have negative spillover effects across policy areas under bundling; (2) the presence of interest groups may decrease or increase effort under bundling and reverse the welfare ordering of institutions both ways. Transparency of agent's actions may have positive as well as negative consequences for the Principal under bundling, generally decreasing utility discrepancies between multiple equilibria. Further, transparency's overall effect is to increase the relative appeal of unbundling.

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1 Introduction

One of the central dimensions of institutional variation across political jurisdictions and levels of government concerns the concentration and division of responsibility among public officials. While in some jurisdictions voters elect a single executive charged with administering a bundle of policies across issue dimensions, in others, they elect several officials, each for a distinct subset of the policy area. This variation in the *bundling* of policy areas is notable at the state and local levels in the US and is gaining prominence as an important institutional factor to be considered in constitutional design more broadly (Besley and Coate, 2003; Marshall, 2006; Berry and Gersen, 2008; Gersen, 2010; Calabresi and Terrell, 2008).[1] To take one of the starkest examples of variation among elected officials: the Governor is the single elected state-level executive in Maine and New Hampshire, and one of two in New Jersey, but one of nine in South Carolina and Washington; the average across all states is over a half of that range (Berry and Gersen, 2008).[2] But the variation in the extent of bundling of policy authority occurs in the non-elected positions as well: the authority granted to individual members of government cabinets often expands and narrows across time and with different office holders[3]; the policy authority over a given area may be assigned to an existing or to a newly created agency (Ting, 2002; O'Connell, 2006; Biber, 2009).[4]

A key concern with respect to the bundling of policy areas is political accountability. Because bundling affects the range of signals that political principals receive about their agents' performance, the range of choices that principals have to respond to them, and, through those, the actions of the agents themselves, it fundamentally influences the agency problems at the core of the relationship between political principals and agents. Yet, with the few exceptions we discuss below,[5] these effects have received little attention, despite the burgeoning political economy scholarship on accountability[6] and the apparent ubiquity and

[1]Following Berry and Gersen (2008), we refer, throughout, to the relevant institutions as *bundling* and *unbundling*.

[2]Separately elected positions in various states include the Governor and Lieutenant Governor, Attorney General, Secretary of State, Secretary of the Treasury, Comptroller General, Agriculture Commissioner, Insurance Commissioner, Superintendent of Education, and others.

[3]In many parliamentary democracies, this phenomenon is the rule, rather than the exception; major authority domain reshuffles in the UK and Israeli government cabinets after their respective 2015 parliamentary elections provide most recent examples. A related phenomenon can be observed in presidential democracies, such as the U.S., where the office of the President often usurps from and, less often, returns policy control over particular issue areas to cabinet members. Some of the best known examples here include the appointment of policy "tzars" within the office of the President, with ultimate control over, e.g., the drug policy, bailout of the auto industry, the prosecution of foreign policy with respect to Afghanistan and Pakistan, etc.

[4]The cases in point include the accretion of authority over policy areas by the U.S. Food and Drug Administration; the separation of the border control and immigration services in the U.S. following the re-organization of the U.S. Immigration and Naturalization Service; and the creation of the U.S. Fish and Wildlife Service alongside the U.S. Forest Service.

[5]Most notably, Besley and Coate (2003) and Ashworth and Bueno de Mesquita (2015).

[6]Examples of the theoretical work on agency problems in the context of politicians' career concerns include Ashworth (2005); Ashworth and Bueno de Mesquita (2006, 2008); Lohmann (1998); Persson and Tabellini (2002)

variation in policy (un-)bundling.

We develop a career-concerns model of political accountability that focuses on two factors that we believe are particularly relevant for analyzing the welfare implications of policy (un-)bundling. The first is the extent of complexity of policy areas, which is a key salient feature of the policy-making environment in our model under the various institutional conditions we consider. The second factor is the susceptibility of the policy-making process to the capture by special interests, to which we turn in the latter half of the paper, after characterizing the institutional implications of (un-)bundling in the classic binary political principal-agent setting. The outcome of policy-making has a complementarity between effort and competence in the sense that the policy return on the Agent's effort is higher, the higher her competence. Under bundling, principals choose whether to retain the incumbent agent after observing two policy outcomes, which are stochastically induced from the incumbent's choices, her competence level, and the degree of policy area complexity; under unbundling, principals make distinct retention choices for each agent assigned to a given policy area after observing similarly induced policy outcomes in that policy area.

Complexity of a policy area may depend on how hard it is to find the right "type" of office holder for that area. It may also depend on the specific details of the choice setting facing the office holder: e.g., is there much institutional knowledge or prior experimentation in this policy area to minimize chance—as opposed to choice—driven consequences? How sovereign is a given policy maker in determining the policy?[7] The analysis we present shows that policy area complexity fundamentally affects the incentives and behavior of both political principals and agents and, with those, the relative merits of policy (un-)bundling. In particular, our core set of results points to the social welfare-maximizing properties of "moderate" retention incentives – promising retention for at least partial policy success. We show that, under policy bundling, such retention rules can sustain maximal effort by the incumbent in the middle range of policy complexity and make it superior to unbundling in terms of both incentivizing the office holders and selecting those of high quality. A key (partial) intuition for this effect in our model is that, in the presence of multiple policy areas under bundling, such retention rules afford the office holder a kind of insurance: the success in some policy areas may compensate for the failure in others, and that can, in effect, give the political principal greater effective power over the office holder under bundling than under unbundling; the incumbent will find "purchasing" such insurance attractive precisely when the complexity of each policy area is neither too high nor too low.

The strategy profile associated with the equilibrium with "moderate" retention incentives is better for the principal than the profile in the "strict" incentives equilibrium, in which the principal requires policy successes in both areas to retain the agent and the agent does her best to deliver that outcome. The latter equilibrium exists when the complexity of each policy area is low and, in that environment, gives an edge to policy bundling because of better quality of agent selection.[8] When values of policy complexity are sufficiently asymmetric,

[7]Both of these aspects of task complexity are present in the seminal discussion in March and Simon (1958) and have been developed in subsequent literature on political economy of organizations and firms, e.g., Campbell (1988); Garicano and Wu (2012).

[8]While the complementarity of action and type in our model ensures multiplicity of equilibria with differ-

neither of these retention rules is consistent with equilibrium play, and the welfare comparison of preferred institutions may favor the unbundling, especially so when agents' choices are transparent to the principals.

One of our primary interests in the paper is in characterizing the interaction between the different incentives associated with policy (un-)bundling and the susceptibility of the policy-making process to capture by special interests. Concern with capture by special interests is a mainstay of the debates about political accountability of elected officials (Grossman and Helpman, 1994), Grossman and Helpman (2001, Chapter 7-9), Persson and Tabellini (2002, Chapter 7), Snyder and Ting (2008), Acemoglu, Egorov and Sonin (2012). A policy influence that is disproportional and at the expense of the majority is a prima facie challenge to effective representative governance. The ability of special interests to capture the policy-making depends on how easy it is for the voters to resist it with electoral incentives to the office holders.[9] Intuitively, unbundling of policy areas gives voters an opportunity to target their electoral incentives for separate policy areas separately, without a sacrifice of a captured policy area of secondary importance for getting a preferred policy in the area of primary interest. This intuitive logic is at the core of the most influential accounts of the institutional incentives with respect to policy bundling (Besley and Coate, 2003; Berry and Gersen, 2008), which endorse policy unbundling as an institutional arrangement that allows for finer tailoring of incentives to the agents and lowers susceptibility to capture. This logic operates in our model as well, and, in fact, we show that its consequences may be even more detrimental to principal's welfare under bundling than at first appears: the expectation of the policy capture by the interest group in a given policy area may have negative spillovers for the incumbent's choice in other policy areas, leading to a more global failure of policy-making under bundling.

But our analysis also suggests that the accountability channels affect principals' and agents' expectations in ways that can undercut and even reverse the welfare implications suggested by this logic. Indeed, we show that when complexity of both tasks is relatively high, policy bundling may be better at preventing interest group capture than unbundling. By increasing the agents' return on investment into effort in the form of the sanctioned office benefit, the moderate incentives retention rule increases the agents' resistance to the unsanctioned benefit from the sale of policy to the interest group. Perhaps more surprisingly still, we show that under bundling, the presence of the interest group, with preferences adverse to those of the voters, can increase the range of circumstances under which the voters can anticipate higher performance from the incumbents. This occurs because under the moderate retention incentives, the presence of a potent interest group can weaken the signal about the incumbent (in-)competence from policy failures. While the net result of interest group influence is quite complex, these effects suggest that the effect of policy bundling on the likelihood of policy capture is more nuanced than has been recognized.

ent levels of principal and agent welfare (see Dewatripont, Jewitt and Tirole (1999*b*); Ashworth, Bueno de Mesquita and Friedenberg (2015)), the set of equilibria at a given vector of primitives does not generically include both strict and moderate incentives equilibria.

[9] See Prat (2002*b*), Prat (2002*a*), Ashworth (2006), Gordon and Hafer (2007), Bernhardt, Câmara and Squintani (2011).

Among other results we provide, perhaps the most interesting concern the different incentives arising from the transparency of policy-making under different institutional conditions. To our knowledge, the present paper offers the first formal analysis of the implications of transparency in a political accountability model with career concerns (Holmström, 1999)[10], uncovering a number of implications that are new to the literature. At the most general level, we find that transparency has the effect of decreasing utility discrepancies between multiple equilibria in the multi-task accountability game (under bundling). Transparency eliminates the utility highs that stem from high effort across policy areas: it can worsen agent incentives and selection, reduce the size of the political contribution that the interest group needs to pay and distort effort away from the policy area in which there is an interest group; but it also eliminates the utility lows from being "trapped" in the low-expectations, low-performance equilibria. Relative to a given equilibrium, the welfare consequences of transparency depend on the underlying complexity of the policy areas. Further, transparency's overall effect is to increase the relative appeal of unbundling.

The remainder of the paper is organized as follows. We begin, in Sections 2 and 3, with the baseline analysis of the binary relationship between the principal and the agent(s) under bundling and unbundling institutions. In Section 4, we introduce into that setting an interest group whose preferences are opposite of the principal's, and consider the consequences for the equilibrium play and the welfare comparison of institutions. In Section 5 we discuss some of the considerations of robustness and compare our results to the results in related models.

2 The Baseline Model

2.1 Actors and Order of Play

We model an interaction between a Principal (denoted P) and one or two Agents. (In Section 4, we expand the model by adding an Interest Group.) There are two tasks, a_1, and a_2. We consider two institutions. In the first one, called *bundling*, a single Agent (denoted A) is responsible for both tasks. In the second institution, which we call *unbundling*, there are two Agents (denoted A_1 and A_2 respectively) each responsible for one of the two tasks. On each of these two tasks the responsible Agent can choose whether to exert effort. We denote $a_i = 0$ the choice of the Agent not to exert effort on task $i = 1, 2$, and $a_i = 1$ the choice to exert effort.

The outcome on task i, $o_i \in \{s, f\}$, where s stands for *success* and f for *failure*, depends stochastically on the effort choice a_i and on the competence of the Agent responsible for task i. Specifically, we assume that each Agent can be of one of two types $\theta \in \{\theta_L, \theta_H\}$ with

[10]The bulk of the previous studies on the implications of transparency in accountability settings are set in the context of signaling models (see Prat, 2005; Fox, 2007; Ashworth and Shotts, 2010; Morelli and Van Weelden, 2013; Fox and Van Weelden, 2012). In these models, when the electorate observes the incumbents actions and those actions are in themselves informative as to the incumbents type, incumbents may be led to act according to how the principal expects a good incumbent to act a priori, instead of choosing those actions which are in fact best for the electorate. This mechanism is unavailable in the career-concerns models, given their setting of symmetric uncertainty.

$Pr(\theta = \theta_H) = \pi \in (0, 1)$. If the Agent chooses to exert effort on task i, i.e. chooses $a_i = 1$, then the probability of success is e_i^L if the Agent is of low competence θ_L, and e_i^H if the Agent is of high competence θ_H with $0 \leq e_i^L < e_i^H \leq 1$. Further, if the Agent chooses not to exert any effort, then the probability of success is 0 independent of his type.

We adopt a career concerns framework and assume that the competence of each Agent is not observed by any of the actors ex ante. The distribution of types is commonly known, however. It follows that the ex ante probability of success from choosing $a_i = 1$ is $\pi e_i^H + (1 - \pi) e_i^L =: e_i$. We interpret e_i as representing the complexity of the task. It is immediate that the lower e_i, the less control the Agent has over success or failure on policy task i.[11] Note that in this setting there is complementarity between effort and competence in the sense that the Principal learns more about the competence of the Agent when the Agent exerts effort than when he does not. Indeed, if the Agent does not exert effort the outcome will be failure independent of the type of the Agent and will thus be uninformative about the type of the Agent.

Unless noted otherwise, we assume that the Principal observes the outcome of the Agent(s)'s actions on each task but not the actions themselves. This assumption is particularly plausible in the applications of the model to the agency relationship between the voters and the elected executives, where it is consistent with the standard empirical descriptions of limited knowledge of incumbents' choices by the voters. In some of the other applications we noted in the introduction – where the Principal is the head of government – action observability (transparency) may, perhaps, be more plausible. With those applications in mind, and to provide a broader institutional analysis of the effects of improving the Principal's informational environment, we also consider, where indicated, the possibility of the actions taken by the Agent being transparent to the Principal.

Upon observing the outcomes o_1 and o_2, the Principal makes his retention decision(s). Under bundling, the Principal chooses whether to retain the single Agent, whereas under unbundling, the Principal chooses whether to retain each Agent A_i separately. If the Principal dismisses an Agent, then the replacement is of high competence with probability π. To summarize, the order of play is as follows:

1. Under bundling the Agent chooses to exert effort or not on each task i, i.e. the Agent chooses $(a_1, a_2) \in \{(0,0), (0,1), (1,0), (1,1)\}$. Under unbundling, each Agent A_i chooses whether to exert effort on task i, i.e. chooses $a_i \in \{0, 1\}$.

2. Nature chooses the competence $\theta \in \{\theta_L, \theta_H\}$ of each Agent and the outcomes $o_i \in \{s, f\}, i = 1, 2$.

3. The Principal observes the outcomes o_1 and o_2 and subsequently chooses whether to retain the Agent under bundling and each Agent A_i separately under unbundling.

In Section 4, we study a version of this model in which at the beginning of the game, the Interest Group can offer the Agent a utility transfer in exchange for a guarantee of

[11] We discuss our interpretation of task complexity in more detail below.

policy failure. Focusing our initial analysis on the baseline environment (the environment without the Interest Group, or, equivalently, one in which the Interest Group's resources are commonly known to be too low to afford it a policy influence) allows us to understand the conceptually simpler agency problem faced by the Principal and how it is affected by the variation in policy complexity under bundling.

2.2 Payoffs

The Principal prefers success on each task and receives payoff $u_P(o_i = s) > 0$ from success on task i and zero from failure. The Principal receives an additional payoff of $R > 0$ for each task i for returning to the office an Agent of high competence. (This additional payoff may be thought of as the value added to the Principal of having in office a high type, which, in a more general model may be derived from an explicitly modeled continuation game.) As a consequence, the Principal only retains an Agent if the Principal believes, upon observing the policy outcome(s), that this Agent is of type θ_H with probability superior or equal to π.[12]

Agents value retention and prefer to avoid effort. More specifically: under bundling, the Agent receives an additional payoff of $B > 0$ when retained and a payoff of zero when dismissed from office. Similarly, under unbundling, each Agent A_i receives an additional payoff of B_i when retained and a payoff of zero when dismissed. In the interest of comparison and to focus on the institutional effects, we assume throughout that $B_1 + B_2 = B$.[13] Let $k > 0$ be the cost to the Agent of choosing to exert effort, i.e. $a_i = 1$. The costs are additively separable, i.e. the Agent incurs cost $2k$ under bundling when choosing to exert effort on both tasks, i.e. $(a_1 = 1, a_2 = 1)$.[14]

2.3 Interpretation of Task Complexity

As indicated above, our notion of task complexity is closely connected to related ideas in the literatures on the political economy of organizations and industrial design (March and Simon, 1958; Campbell, 1988; Garicano and Wu, 2012).

It is immediate from the definition of e_i that low complexity of task i may naturally correspond to two distinct possibilities:

(a) both e_i^L and e_i^H are high; or

(b) e_i^H is high while e_i^L is low, and π is high.

[12] Thus, we abstract away from the possibility of primitive heterogeneous valuation of tasks by the Principal, as in Ashworth and Bueno de Mesquita (2015); the differences in the Principal's responsiveness to tasks in our model are induced entirely by the expectations of the Agent(s)'s choices.

[13] Unless noted otherwise we assume that the pair (B_1, B_2) is exogenous. We consider the possibility of the Principal allocating the values of holding office B_1 and B_2 optimally under unbundling in section 5.1.2. Endogenizing B_1 and B_2 does not alter the substance of the comparison between bundling and unbundling.

[14] In section 5.1.1 we consider the possibility of tasks being complements or substitutes. The general thrust of the argument goes through in these cases as well.

Similarly, high complexity of task i naturally corresponds to

(a) both e_i^L and e_i^H are low; or

(b) e_i^H is high while e_i^L is low, and π is low.

These two distinct sets of possibilities correspond to two prominent interpretations of task complexity in the existing literature. Corresponding to options (a), task complexity may be thought of a function of "objective task characteristics": the task is hard for everyone or easy for everyone, and while the performer's competence is relevant to success, the outcome is driven primarily by the features of the task itself. In contrast, the options (b) correspond to the account of complexity in which the success is, in the first place, a function of the "interaction between task and person characteristics"; a high complexity task is one in which the high competence agent may do considerably better than the low competence agent, but the high competence agents are hard to come by. As an example, consider the tasks facing the tax collecting agency and the education department in a Western industrialized country – tasks or policies that are, in a number of jurisdictions assigned to independently elected officials. A moderately competent head of the tax collecting agency is likely to have a high probability of success (assuming that success is conventionally measured). In contrast, highly competent education chiefs have been known to do significantly better than average, but are notoriously hard to identify.

As a substantive matter, the binary relation of task complexity is, intuitively, complete when, at a fixed π, for pair of tasks i, j, both $e_i^L \leq e_j^L$ and $e_i^H \leq e_j^H$: in such a case, $e_i \leq e_j$. The case in which $e_i^L < e_j^L$ while $e_i^H > e_j^H$ is mathematically well-defined, but substantively hard to interpret, and the task complexity comparison at a fixed π is hard to motivate. When interpreting our results, we will have in mind the former, more intuitive, case. With that case in mind, our formalization of task complexity can be seen as a special case of the stochastic dominance approach (Garicano and Wu, 2012). Holding fixed π, and letting $e_i^L \leq e_j^L$ and $e_i^H \leq e_j^H$, the distribution of outcomes for the task j first-order stochastically dominates the distribution of outcomes for the more complex task i. Finally, while our definition of task complexity allows for indexing π with respect to the task, we abstract away from that possibility in our analysis.

3 Analyzing the Baseline Model

As described above, this is a career concerns model of political accountability. We restrict attention to pure strategy Perfect Bayesian equilibria. Before proceeding, note first that there always exists an equilibrium in which the Agent chooses $(a_1 = 0, a_2 = 0)$, and the Principal randomizes between retaining and not retaining with any probability. When the Agent makes such a choice, the outcome, which is always $(o_1 = f, o_2 = f)$, is completely uninformative of the Agent's type, and, correspondingly, the Principal cannot update on her prior. This equilibrium persists under both bundling and unbundling. As such, it is not relevant for evaluating the consequences of institutional variation.[15] We focus our analysis on evaluating the differential effect of the two institutions in incentivizing the Agent(s) to exert effort.

3.1 Bundling

We begin our analysis of the equilibrium behavior in the baseline model of bundling by defining distinct retention rules for the Principal that play a central role in our analysis of the baseline and of the more general model. We will say that the Principal uses the *strict retention rule* when he retains the Agent if, and only if, he is successful on both tasks. We will say that the Principal uses the *moderate retention rule* when he retains the Agent if, and only if, he is successful on at least one task. We will also sometimes use the language of a i^{th}*-task retention rule* to refer to the rule whereby the Agent is retained if, and only if, the outcome is success on the i^{th}-task (regardless of the outcome on the other task).

The following proposition specifies parameter values for which the Agent can be incentivized, in equilibrium, to exert effort (1) on both tasks, (2) on only one of the two tasks, or (3) on neither task. The proposition also specifies the retention behavior that is used in equilibrium by the Principal to incentivize these effort choices.[16]

Proposition 1. *On the equilibrium path of play under bundling:*

1. *The Agent chooses to exert effort on both tasks if, and only if, either*

   (a) *the complexity of each task is sufficiently low,* $e_i \geq \frac{2k}{e_j B}$*, and the Principal's estimation of the Agent's competence decreases unless the outcome is success on both tasks,* $e_i^H(1-e_j^H) \leq e_i^L(1-e_j^L)$ *for all* $i = 1, 2$*; or*

   (b) *the complexity of each task is moderate,* $1 - \frac{k}{e_j B} \geq e_i \geq \frac{k}{(1-e_j)B}$*, and the Principal's estimation of the Agent's competence increases when the outcome is success on at least one task,* $e_i^H(1-e_j^H) \geq e_i^L(1-e_j^L)$ *for all* $i = 1, 2$.

   In case (a), the Principal adopts the strict retention rule, in case (b), the moderate retention rule.

2. *The Agent chooses to exert effort on a single task* i *when the complexity of that task is sufficiently low,* $e_i \geq k/B$*, and the Principal adopts the* i^{th}*-task retention rule.*

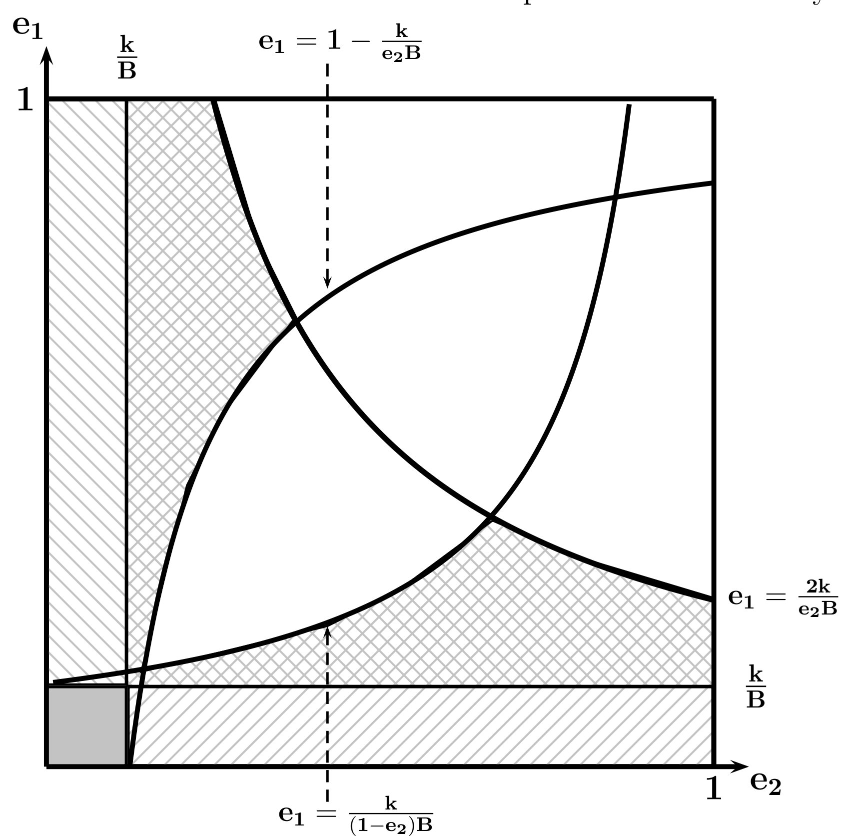
3. *The Agent chooses to exert no effort on either task when the complexity of each task is sufficiently high,* $e_i < k/B$ *for all* $i = 1, 2$*, independent of the Principal's retention rule.*

[15] It is also fragile, since the off-path events of $o_i = s$ are informative of the Agent's competence, and the sequentially rational Principal will need to update accordingly.

[16] A full derivation of equilibrium behavior can be found in the Appendix.

We illustrate these results in Figure 1 below. This figure represents for given values of the cost of effort k, and the value of holding office B, the highest level of effort by the Agent that can be sustained in equilibrium under bundling as a function of the probabilities of success e_1, and e_2. In particular, we set $B = 1$, $k = .125$. (Recall that e_1 and e_2 are compound probabilities, with $e_i := \pi e_i^H + (1-\pi)e_i^L$ for all $i = 1, 2$. As specified in Proposition 1 above, additional restrictions on e_i^H, e_i^L, $i = 1, 2$, need to be satisfied to sustain an equilibrium in which the Agent exerts effort on both tasks. Although these restrictions are not depicted in the figure, we show in the Appendix that, for any value of $(e_1, e_2) \in (0, 1)^2$, there exists an infinity of e_i^H, e_i^L, $i = 1, 2$, and π that satisfy those restrictions.)

Figure 1: Highest Level of Effort Sustainable on the Equilibrium Path of Play under Bundling



Regions of the figure and the highest equilibrium-consistent levels of effort at the corresponding pairs of (e_1, e_2):

- $(\mathbf{a_1 = 0, a_2 = 0})$
- $(\mathbf{a_1 = 1, a_2 = 0})$
- $(\mathbf{a_1 = 1, a_2 = 1})$
- $(\mathbf{a_1 = 0, a_2 = 1})$
- $(\mathbf{a_1 = 1, a_2 = 0})$ or $(\mathbf{a_1 = 0, a_2 = 1})$

Several aspects of this characterization are worthy of particular note. The first is that while the equilibrium profile that yields the Agent's investment into effort on both tasks is unique for any parameter vector (except on a non-generic set), there are two distinct strategies, each of which is consistent with equilibrium play, that may support that investment – albeit for different values of the probabilities of success e_1 and e_2. In the first of these, the Principal uses the strict retention rule, and in the second, the moderate retention rule.

The moderate retention rule is effective at incentivizing effort on both dimensions when the probabilities of success e_1 and e_2 take on intermediate values. Their lower bounds of that intermediate range are lower than the lower bounds sustaining high effort under the strict rule. The reason is intuitive: switching to the moderate rule increases the expected utility to the Agent of trying and sometimes failing: relative to the strict rule, the expected utility of exerting effort on both tasks increases from e_1e_2B-2k to $(e_1e_2+e_1(1-e_2)+(1-e_1)e_2)B-2k$, while the expected utility of exerting effort only on task i increases from $-k$ to e_iB-k. Consequently, the moderate retention rule can incentivize the Agent to exert effort on both tasks for probabilities of success which would be too low under the strict retention rule.

However, the moderate rule provides inferior incentives when complexity of at least one of the tasks drops sufficiently far (i.e., if either e_1 or e_2 is sufficiently high). Indeed, for the Agent to best-respond to the moderate retention rule by exerting effort on both tasks rather than on a single one, it must be the case that $(e_1e_2+e_1(1-e_2)+(1-e_1)e_2)B-2k \geq e_iB-k$ for all $i=1,2$, or equivalently $e_j(1-e_i)B-k \geq 0$ for all $i=1,2, j \neq i$. The expression $e_j(1-e_i)B-k$ represents the expected additional benefit of exerting effort on both tasks rather than on task i alone. If the probability of success e_i is very high, $e_j(1-e_i)B-k$ drops below 0, signifying that the Agent can be fairly certain of the successful outcome on task i, and so of being retained by the Principal independent of the outcome on task j. In this case, the moderate retention rule cannot incentivize the Agent to exert effort on both tasks, but a strict rule can. Similarly, to sustain the effort on both tasks with the moderate rule, the probabilities of success e_1 and e_2 cannot be too low either, as then $e_j(1-e_i)B-k$ is again lower than 0.

For intermediate values of the probabilities of success, then, the moderate retention rule provides a kind of insurance for the Agent. Exerting effort on task j on top of exerting effort on task i, gives the Agent a second chance at being retained. When failure on task i is not unlikely, and the chances of being successful on task j are real, the Agent has incentives to pay the cost of effort to get this second chance.

Next, note that if Agent type heterogeneity had no effect on the post-election utility of the Principal, the parameter ranges sustaining the equilibrium investment into both tasks under the strict and under the moderate incentives would overlap. However, if, as in our model, the Principal has a preference over the type of Agent in office, this is no longer the case (except on a non-generic set) because the Principal's beliefs about the incumbent that sustain these equilibrium-consistent strategies are, in fact opposite. When the Agent is expected to invest into effort on both tasks, the strict retention rule is sequentially rational only if the Principal updates downwards on the competence of the Agent upon observing failure on any task. In other words, the strict retention rule is sequentially rational only if the moderate retention rule is not. The converse is also true. The moderate retention rule is sequentially rational only if the Principal updates positively on the competence of the Agent upon observing success on any task. But then, the strict retention rule is not sequentially rational. How the Principal should update on the Agent's type upon observing the outcome profile depends on the parameter values $e_1^H, e_1^L, e_2^H, e_2^L$, and the corresponding conditions on these values sustaining in equilibrium the strict and the moderate retention rules, respectively, are formalizing the mutually exclusive posterior updates by the Principal.

Finally, the characterization also points to the presence in our setting of "accountability traps."[17] If the Principal expects the Agent to exert effort only on task i, the Principal will consider the outcome on task j to not contain any information about the Agent's competence. But then the performance of the Agent on dimension j becomes irrelevant and the Agent does not have any incentive to signal his competence by exerting effort on task j. Conversely, if the Principal expects the Agent to exert effort on both tasks, the Principal will consider the outcomes on both tasks relevant when assessing the competence of the Agent, which gives the Agent incentives to perform well on both dimensions. The condition under which the single-effort equilibrium exists, namely $e_i \geq B/k$, is consistent with the conditions that need to be satisfied to sustain either one of the two equilibria in which the Agent exerts effort on both tasks.[18] The Principal may, thus, be "trapped" in the equilibrium in which the Agent exerts effort on only one task, while there exists, for the same parameter values, an equilibrium in which the Agent exerts effort on both tasks. The welfare consequences for the Principal of being trapped in the lower-effort equilibrium are unequivocally negative: both in that the Agent is exerting lower effort, and in that the Principal also learns less about the competence of the Agent.

As expected, the range of values of $e_1^H, e_1^L, e_2^H, e_2^L$, and π for which the Agent exerts effort in equilibrium, increases in the value of holding office B and decreases in the cost of effort k. Surprisingly, however, while an increase in the probability of success e_i, $i = 1, 2$, may increase effort, it may also decrease effort. As we have shown above, the probabilities of success e_1 and e_2 must be neither too high nor too low to sustain a moderate incentives equilibrium. Consequently, there are conditions under which an increase in the probability of success e_i breaks the moderate incentives equilibrium, as it leads the Agent to best-respond to the moderate retention rule by exerting effort only on task i, rather than on both tasks.

So far, we have assumed that the Principal does not observe the effort choices of the Agent(s). In the remainder of the paper, we will refer to it as the case with "no transparency". We consider next the implications of having the Principal observe the actions (a_1, a_2) chosen by the Agent ("transparency"). As our next result shows, transparency of actions significantly affects equilibrium behavior under bundling. To state the result com-

[17] In the sense of Landa (2010) and Ashworth, Bueno de Mesquita and Friedenberg (2015).

[18] As Dewatripont, Jewitt and Tirole (1999*a*,*b*) show, these accountability traps stem from the complementarity between competence and effort: the outcome is more informative about the Agent's competence the higher the effort. A somewhat different, though related, way of looking at it is suggested by Ashworth, Bueno de Mesquita and Friedenberg (2015), who show that if the noise density relative to the cross-product of action and type satisfies the strict MLRP, then the necessary and sufficient condition for equilibrium multiplicity is that when the voter expects the agent to take higher action, the agent's expected probability of retention is higher. While we do not make the MLRP assumption on the noise density, their necessary and sufficient condition for multiplicity also holds in our model.

pactly, let $\mathcal{X}$ be the set of all possible vectors $x := (e_1^H, e_1^L, e_2^H, e_2^L, \pi, k, B)$ and let $\mathcal{M} \subset \mathcal{X}$ and $\mathcal{M}^T \subset \mathcal{X}$ include all such vectors for which there is an equilibrium under bundling in which the Agent exerts effort on both tasks and the Principal retains the Agent using the moderate retention rule, under no transparency ($\mathcal{M}$) and under transparency ($\mathcal{M}^T$), respectively.[19]

Proposition 2. *1. Given transparency, under bundling:*

(a) equilibrium is unique for essentially all parameter values[20];

(b) there exists no equilibrium in which the Agent chooses to exert effort on both tasks and the Principal retains using the strict retention rule.

2. $\mathcal{M} = \mathcal{M}^T$.

Part 1(a) of this result points to the first significant substantive difference between the transparency and the no transparency cases: it implies that there are no *accountability traps* under transparency (except on a non-generic set). In the no transparency case, multiplicity of equilibria stems from self-fulfilling behaviors when competence and effort are complements: if the Principal expects the Agent to exert effort only on task i, the Agent is induced to exert effort only on task i, which in turn leads the Principal to pay attention only to the outcome on task i to assess the Agent's competence. Under transparency, this self-fulfilling prophecy of the Principal's expectations about the Agent's behavior is broken. Independently of the Principal's expectations, if the Agent exerts effort only on task j, the Principal, observing the Agent's actions, will assess the competence of the Agent only through the outcome on task j. Transparency essentially gives the Agent, as the first mover, the power to choose the effort allocation which maximizes his expected utility conditional on the retention rule this effort allocation induces. Transparency therefore unambiguously improves the Agent's welfare.

As an implication, the Agent can profitably deviate from the strict incentives equilibrium. Under the strict retention rule, the Agent receives an expected payoff of $e_1 e_2 B - 2k$. If the Agent deviates to exerting effort solely on task i, the Principal, observing these effort choices, will retain the Agent if, and only if, the outcome o_i is success. Consequently, by deviating to $(a_i = 1, a_j = 0)$, the Agent increases his expected payoff to $e_i B - k > e_1 e_2 B - 2k$. In other words, transparency of actions makes it impossible for the Principal to enforce the strict retention rule. To put the consequence in stark terms, transparency makes it impossible to incentivize the Agent to exert effort on both tasks when the probabilities of success e_1 and e_2 are both sufficiently high, i.e. when the agency problem seems ex ante to be the least problematic!

In sum, transparency of actions (weakly) increases the lower bound of the Principal's welfare by 'killing off' accountability traps, but (weakly) decreases the upper bound of the Principal's welfare by 'killing off' the strict incentives equilibrium. Both of these effects of

[19] We give a precise statement of the conditions that define $\mathcal{M}$ and $\mathcal{M}^T$ in the Appendix.

[20] More precisely, the set of parameter values for which there is equilibrium multiplicity is non-generic.

transparency, one positive for the Principal, the other negative, are a consequence of the multidimensionality of the policy space; as we will see in the analysis of bundling in the presence of the interest group, transparency will interact with multi-dimensionality of the policy space there as well, with the effects, some of which are traceable to those we describe in this section.

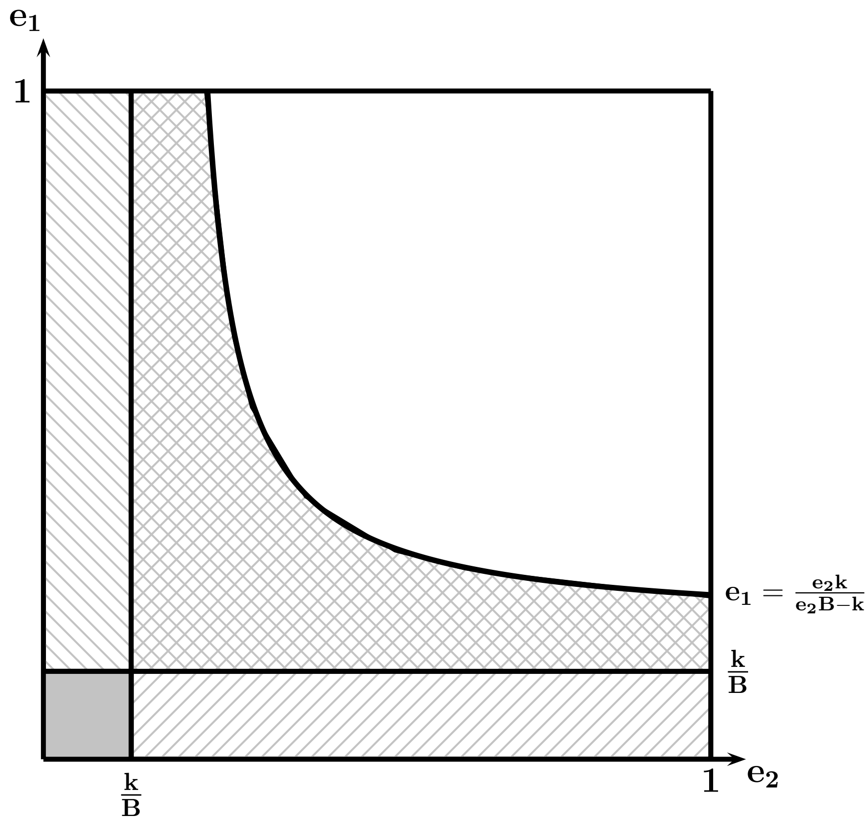
With these results in the background, it is, perhaps, particularly interesting that transparency has no effect on the standing of the moderate retention rule equilibrium. Remember that exerting effort on both tasks is a best-response to the moderate retention rule if, and only if, $(e_1 e_2 + e_1(1 - e_2) + (1 - e_1)e_2)B - 2k \geq e_i B - k \geq 0$ for all $i = 1, 2$. Notice that the right-hand side of this inequality is the expected utility of deviating to choosing effort solely on the i^{th} task (and provoking the retention based on the success of the i^{th} task from the Principal). Thus, when the moderate retention rule is a best-response to observing effort on both tasks, and exerting effort on both tasks is a best-response to the moderate retention rule, it is, given the sequential rationality of the Principal, the effort allocation that maximizes the Agent's expected utility. Consequently, when the moderate incentives equilibrium exists, it maximizes the welfare of the Principal and of the Agent. Indeed, the range of parameter values for which there exists a moderate incentives equilibrium is identical under transparency of actions and under no transparency.

3.2 Unbundling

If the Principal expects Agent A_i to exert effort with positive probability, then, in equilibrium, given that success is a signal of high competence and failure a signal of low competence, he should retain upon observing success and dismiss upon observing failure. The incentive effects are maximized with the same rule. The expected payoff to Agent A_i of choosing to exert effort, is, then, $e_i B_i - k$, and so the strategy profile under which Agent A_i chooses to exert effort and is retained if, and only if, the Principal observes success on task i is consistent with equilibrium play if, and only if, $e_i B_i - k \geq 0$.

It follows that given values of the cost of effort k and the overall value of holding office B, there exists a feasible pair (B_1, B_2) such that both Agents exert effort if, and only if, $e_1 \geq \frac{e_2 k}{e_2 B - k}$. The following figure displays the result graphically:

Figure 2: Highest Level of Effort Sustainable on the Equilibrium Path of Play under Unbundling



Regions of the figure and the highest equilibrium-consistent levels of effort at the corresponding pairs of (e_1, e_2):

$(\mathbf{a_1 = 0, a_2 = 0})$
$(\mathbf{a_1 = 1, a_2 = 0})$
$(\mathbf{a_1 = 1, a_2 = 1})$
$(\mathbf{a_1 = 0, a_2 = 1})$
$(\mathbf{a_1 = 1, a_2 = 0})$ or $(\mathbf{a_1 = 0, a_2 = 1})$

Note that this equilibrium characterization does not depend on action observability: even when the Principal observes that the Agent exerted effort, the Principal retains the Agent if, and only if, the outcome is success as he wants to retain a high competence Agent and, as before, success is a signal of high competence and failure a signal of low competence. The incentives that the Principal provides to the Agent A_i are therefore not altered by the transparency of actions.

3.3 Comparing Institutions

We begin by considering what institution does best with respect to the selection of agents. We will say that *selection is better under the institution I than under the institution I'* if the ex ante (average) probability that the retention results in the selection of the Agent of high competence under I is higher than it is under I'. The threats to selection may come from both the institution, which may fail to generate enough of high quality information about the Agent(s), and the retention rule used by the Principal, which may create incentives for the Agent that discourage revelation of information about the Agent's type or use that information inefficiently. The following result provides the comparison between bundling and unbundling with respect to selection:

Proposition 3. *1. If effort is positive and (weakly) higher under bundling, selection is strictly better under bundling.*

2. If effort is higher under unbundling, selection may be better under bundling or unbundling, depending on the values of e_i^H, e_i^L, $i = 1, 2$.

Proposition 3 implies that both institutions can be optimal, ex ante, in terms of selection. But it also points to an asymmetry in favor of bundling when the effort level is positive and equal or higher under bundling. The intuition behind this result is simple. The competence of the Agent is held constant for each policy task. Therefore, the outcome on task i is informative about the competence of the Agent on task $j \neq i$. If, under both institutions, effort is exerted on task i, but not on task j, the Principal receives information about the competence, and therefore future performance, of the Agent who exerted effort on task i. However, because under bundling that Agent is assigned to both tasks, the Principal under bundling can make better use of that information than the Principal under unbundling, because in the latter case the Principal receives no information about the Agent $A_{j \neq i}$ who is assigned to task j. Similarly, if, under both institutions, effort is exerted on both tasks, the Principal receives two informative signals about the overall competence of the Agent under bundling, but only one signal for each Agent A_i under unbundling. In other words, if the same level of effort is exerted under bundling and under unbundling the resulting outcome vector is more informative about the overall competence of the office-holder(s) under bundling than under unbundling. This greater informativeness allows the Principal to select more competent Agents under bundling, as soon as the effort level is positive and weakly higher under bundling.

Recall, however, that there is a complementarity between effort and competence in our model in the sense that each outcome o_i is informative about the competence of the Agent, only if the Agent exerts effort. Hence, when the effort level is strictly higher under unbundling than under bundling, the institutional comparison generates a tradeoff. Indeed, suppose both Agents exert effort under unbundling, while the Agent only exerts effort on task j under bundling (in, for example, j^{th}-task retention rule equilibrium). Then, the Principal receives two informative signals under unbundling, but only one informative signal o_j under bundling. However, the signal o_j is informative about the competence of the Agent on both policy dimensions under bundling, while each signal o_i, $i = 1, 2$, is only informative about the competence of Agent A_i on task i under unbundling. Depending on the parameter values e_i^H, e_i^L, $i = 1, 2$, bundling or unbundling may be better at selecting competent Agents.

We next study under what institution the Principal is able to induce the Agent(s) to choose higher levels of effort. We start by comparing the conditions under which the Agent(s) choose to exert effort on task 1, but not on task 2, in equilibrium. Under bundling, there exists an equilibrium in which the Agent chooses that effort allocation whenever $e_1 \geq \frac{k}{B}$, whereas under unbundling Agent A_1 chooses to exert effort on task 1 whenever $e_1 \geq \frac{k}{B_1}$. Thus, for any parameter values e_1, k, and B, such that an equilibrium exists in which the Agent exerts effort only on task 1 under bundling, there exists a feasible pair (B_1, B_2) for which such an effort allocation is also sustained in equilibrium under unbundling. A similar statement holds with respect to the case where effort is only exerted on task 2.

The more interesting, and less straightforward, question concerns the ability to sustain effort investment into both tasks. To state the result, we define the sets of parameter values that sustain the distinct types of equilibrium behavioral profiles under bundling. Recall that we defined $\mathcal{M}$ to be the set of all parameter vectors $x = (e_1^H, e_1^L, e_2^H, e_2^L, \pi, k, B) \in \mathcal{X}$ such that there is an equilibrium under bundling in which the Agent exerts effort on both tasks and the Principal retains using the moderate retention rule. Similarly, define $\mathcal{S} \subset \mathcal{X}$ as the set of all parameter vectors $x \in \mathcal{X}$ such that with no action observability by the Principal, there is an equilibrium under bundling, in which the Agent exerts effort on both tasks and the Principal retains using the strict retention rule. Finally, let $\mathcal{U} \subset \mathcal{X}$ be the set of all parameter vectors x such that there exists a feasible allocation (B_1, B_2) for which in equilibrium under unbundling, each Agent exerts effort on their respective task $i = 1, 2$, and the Principal retains the Agent if, and only if, there is success on her task.[21]

There, we have the following result:

Proposition 4. *Regardless of action transparency,*

1. *there exists $M \subset \mathcal{M}$, $M \neq \emptyset$, such that $M \cap \mathcal{U} = \emptyset$ and in equilibrium, effort is exerted on both tasks under bundling, but not under unbundling, if, and only if, $x \in M$;*

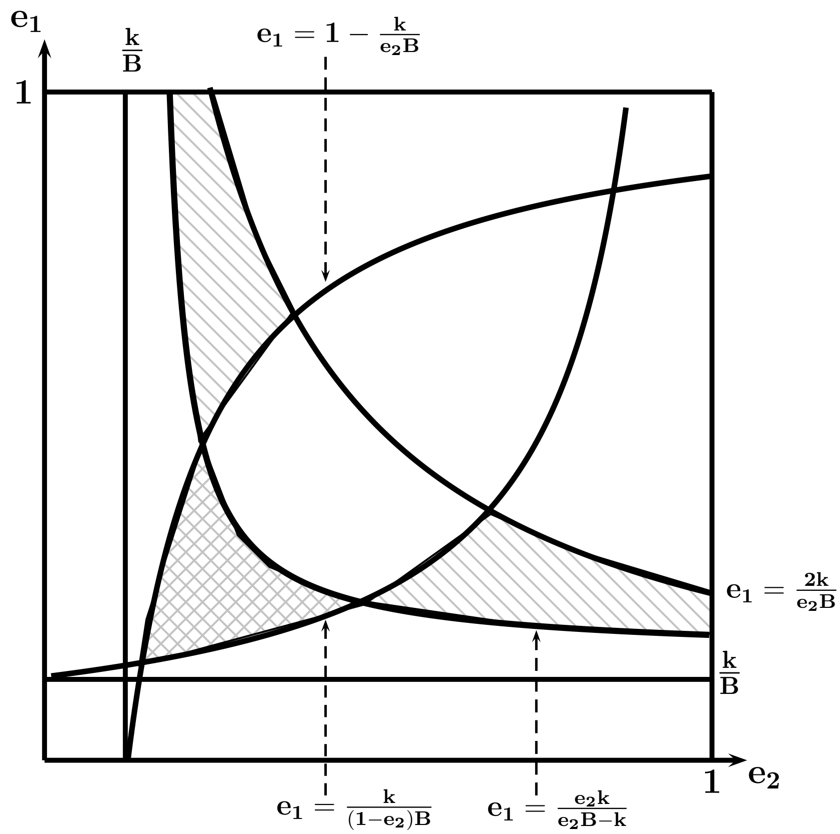
2. *there exists $U \subset \mathcal{U}$, $U \neq \emptyset$ such that $U \cap \mathcal{M} = \emptyset$, $U \cap \mathcal{S} = \emptyset$, and in equilibrium, effort is exerted on both tasks under unbundling but not under bundling if, and only if, $x \in U$.*

Proposition 4 states that there are parameter values such that effort on both tasks can be sustained under bundling, but not under unbundling, and vice versa, suggesting distinct underlying mechanisms and rich incentive dynamics in the relationship between the Principal and the Agent(s). In particular, part 1 of Proposition 4 states that bundling supersedes unbundling in terms of incentives only for parameter values under which the moderate retention rule is used in equilibrium under bundling. This has several important implications. First, the probabilities of success e_1 and e_2 need to be sufficiently low for bundling to dominate unbundling in terms of incentives. Second, for any parameter values for which a strict incentives equilibrium holds, there exists a feasible pair (B_1, B_2) such that effort is exerted on both tasks under unbundling.

We illustrate some aspects of Proposition 4 in the following figure:

[21] We give a precise statement of the conditions that define $\mathcal{M}$, $\mathcal{S}$, and $\mathcal{U}$ in the Appendix.

Figure 3: Comparison of Highest Effort



Regions for which $(a_1 = 1, a_2 = 1)$ can be sustained in equilibrium under one institution but not the other as a function of (e_1, e_2):

$(\mathbf{a_1 = 1, a_2 = 1})$ under unbundling but not under bundling

$(\mathbf{a_1 = 1, a_2 = 1})$ under bundling but not under unbundling

4 Interest Group Influence

In this section, we consider an expanded model in which the Interest Group is seeking to influence the policy outcome with respect to the policy dimension relevant to it. In particular, suppose that, before the Agent responsible for task a_1 chooses whether to exert effort, the Interest Group (abbreviated IG) can offer the Agent a utility transfer, which we will refer to as "bribe" $b \geq 0$, in exchange for no effort on task 1. We follow Grossman and Helpman (1994) and others in modeling IG's utility transfer as an action contract with the payment conditional on a specified, observed, policy decision of the Agent. Thus, if the Agent accepts the bribe b, he does not exert effort on task 1, i.e. $a_1 = 0$. If, however, the Agent rejects the bribe he is free to choose $a_1 = 0$ or $a_1 = 1$.

As before, we assume initially that the Principal observes the outcome of the Agent(s)'s actions on each task but not the actions themselves, thus creating an informational asymmetry between IG and the Principal. Again, such an asymmetry is natural in the context of the agency relationship between the voters and the elected executives, where limited knowledge of incumbents' choices by the voters contrasts with the highly professionalized and incentivized information acquisition and decision-making by the interest groups. To assess the welfare effects of increasing voter's information and with the other applications in mind, we will, then, consider the possibility of the actions taken by the Agent being transparent to the Principal.

The IG has policy preferences opposed to those of the Principal and receives a payoff of $u_{IG} \geq 0$ when the outcome on dimension a_1 is failure and a payoff of zero when it is success.[22] Moreover, the Interest Group has disutility $-b$ when paying a bribe b to the Agent. Throughout, we assume that IG's resource constraint does not bind and study the level of the bribe that IG would have to pay to the Agent in order to get the Agent to implement $a_1 = 0$ and whether, given u_{IG}, IG chooses to pay that bribe to the Agent.[23] We assume that the value of failure to IG, u_{IG}, is drawn from an arbitrary distribution function $F(\cdot)$ with full support on $\mathbb{R}_+$. We further assume that the Principal knows the distribution $F(\cdot)$ but not the realization u_{IG}.

4.1 Bundling with Interest Group

We begin with the analysis of how IG affects the level of effort chosen by the Agent in equilibrium under bundling. Remember that IG prefers failure to success on task 1 and does not care about task 2. Thus, if in the absence of IG, the Agent chooses not to exert effort on task 1, IG has no incentive to try to influence the Agent as it already is assured to receive its preferred outcome. If, on the other hand, the Agent chooses to exert effort on task 1 in the absence of IG's influence, IG has an incentive to influence the Agent. To convince the Agent not to exert effort on task 1 after all, IG needs to offer the Agent a bribe that compensates the Agent for the expected utility loss of not exerting effort on task 1. The level of this utility loss depends on the retention rule used by the Principal and the parameter values. (We provide a characterization of that relationship in Lemma 3 in the Appendix.) IG, in turn, only offers such a bribe to the Agent if the value of failure, u_{IG}, is sufficiently high to warrant paying the bribe.

It is straightforward that the bribe that IG needs to pay to contract no effort on task 1 is increasing in the probability of success e_1 and in the value of holding office B, and decreasing in the cost of effort k. An increase in e_1 or in B and a decrease in k raise the expected benefit to the Agent of exerting effort on task 1. Consequently, the compensation that IG needs to offer to the Agent not to exert effort on task 1 needs to increase as well.

Somewhat more surprisingly, the level of the bribe may also depend on the probability of success e_2, and, depending on the retention rule used by the Principal, the relationship

[22] The baseline environment we analyzed in Section 3 is, thus, a special case of this expanded model; in that special case, $u_{IG} = 0$, and thus IG does not try to influence policy.

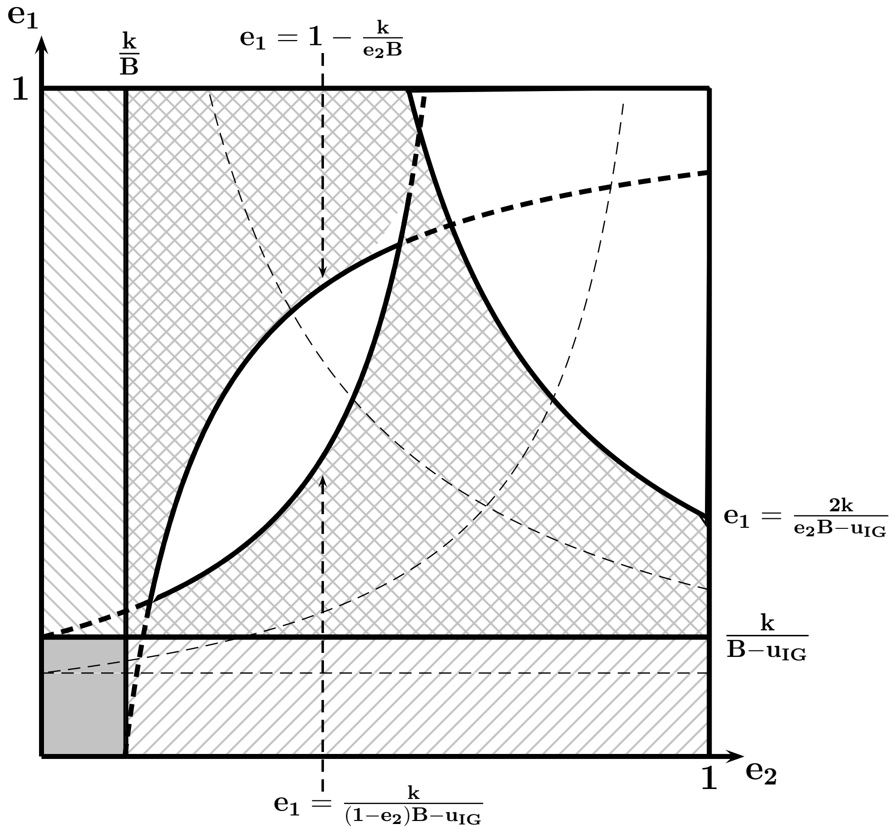
[23] Note that u_{IG} determines an upper bound on the willingness of IG to pay a bribe to the Agent. To be sure, IG certainly would not want to pay a bribe $b > u_{IG}$. As such, introducing an exogenous resource constraint on the competence of IG to pay a bribe would not alter the thrust of the results nor yield additional insights.

can be either positive or negative. Suppose that in the absence of IG's influence, the Agent exerts effort on both tasks in equilibrium. In such a case, the expected benefit to the Agent of exerting effort on task 1 depends on the probability of success on task 2 and correspondingly the bribe does too. Under strict incentives, as e_2 increases, the expected utility to the Agent of exerting effort on both tasks increases as well and the compensation needs to increase correspondingly. Under moderate incentives, however, the level of the bribe is decreasing in e_2. As e_2 increases, the expected benefit of exerting effort on task 1 on top of task 2 decreases because the Agent is less in need of a second chance. Thus, IG can convince the Agent not to exert effort on task 1 with a smaller bribe. An important implication of this last result is that there are conditions for which, as the probability of success e_2 increases, IG is more likely to bribe the Agent.

Proposition 13 in the Appendix provides a characterization of the level of effort exerted by the Agent and the retention rule used by the Principal in equilibrium. This characterization is a generalization of that in Proposition 1 above. Qualitatively, the two characterizations are quite similar, with a key exception that the more general one incorporates in the underlying conditions the value to IG of the policy failure u_{IG}. Rather than restating that result here, we illustrate it graphically in Figure 4 below and highlight the most important consequences of the differences in the equilibrium conditions due to the expected interest group activity.

Figure 4 represents for given values of k, B, and u_{IG}, the highest level of effort by the Agent that can be sustained in equilibrium as a function of the probabilities of success e_1, and e_2. In particular, we set $B = 1$, $k = .125$, and $u_{IG} = .3$. (Similar to Figure 1, additional restrictions on e_i^H, e_i^L, $i = 1, 2$, need to be satisfied to sustain an equilibrium in which the Agent exerts effort on both tasks. Although those restrictions are not depicted in the figure, for any value of $(e_1, e_2) \in (0, 1)^2$, there exists an infinity of e_i^H, e_i^L, $i = 1, 2$, and π that satisfy those restrictions.)

Figure 4: Highest Level of Effort Sustainable on the Equilibrium Path of Play under Bundling in the Presence of Interest Groups



Regions of the figure and the highest equilibrium-consistent levels of effort at the corresponding pairs of (e_1, e_2):

- $(\mathbf{a_1 = 0, a_2 = 0})$
- $(\mathbf{a_1 = 1, a_2 = 0})$
- $(\mathbf{a_1 = 1, a_2 = 1})$
- $(\mathbf{a_1 = 0, a_2 = 1})$
- $(\mathbf{a_1 = 1, a_2 = 0})$ or $(\mathbf{a_1 = 0, a_2 = 1})$

The IG activity influences the effort level chosen by the Agent in distinct ways, some of which are intuitive and expected, while others much less so. As one might have expected, IG's influence decreases the range of probabilities of success e_1 and e_2 for which in equilibrium the Agent exerts effort on task 1. This decrease is stronger as the value of failure to IG, u_{IG}, increases.

Perhaps less expected, IG's influence can also decrease the level of effort exerted by the Agent on task 2. Suppose the Principal retains the Agent if, and only if, he is successful on both tasks and suppose IG convinces the Agent not to exert effort on task 1. Then, the outcome on task 1 is failure for sure and the Agent will not be retained by the Principal independent of the outcome on task 2. But then, there are no incentives for the Agent to exert effort on task 2. This *negative spillover effect* of IG influence is a direct consequence of the strict retention rule and points to another reason why strict incentives may be counterproductive.

Also less expected is the fact that the possibility of IG influence may *increase* the level of effort exerted by the Agent. The basic intuition is as follows. Although the Principal does not observe the effort levels chosen by the Agent, she has expectations over these effort levels and, in the absence of IG, these expectations are correct in equilibrium. The presence of IG introduces uncertainty into these expectations: as the Principal does not observe the realization of the value of failure to IG, u_{IG}, nor the action chosen by the Agent, the Principal does not know whether the Agent has been captured by IG. This "blurring" of the expectations about the Agent's effort affects how the Principal assesses the competence of the Agent and therefore the Principal's retention rule. If the Principal expects the Agent to exert effort on both tasks then failure on task 1 is a signal of low competence, while success on task 2 is a signal of high competence. If, on the other hand, the Principal expects the Agent to exert effort on task 2 but is now uncertain as to whether the Agent is exerting effort on task 1, then observing failure on task 1 conveys a weaker signal about the competence of the Agent, whereas observing success on task 2 is still a strong signal of high competence. Thus, the Principal updates more positively upon observing failure on task 1 and success on task 2 in the presence of IG than in its absence. The effect of the change in this update is that the Principal will now prefer to use the moderate retention rule instead of the 2^{nd}*−task retention rule*, and this change in the retention rule gives the Agent incentives to exert effort on both tasks instead of on task 2 only. We refer to this effect as the *competence cover effect* of IG influence.

To express this idea more precisely, let $\check{u}(e_1, e_2)$ be the value of failure to IG above which IG bribes the Agent. Then, for any probabilities of success e_1^H, e_1^L, e_2^H and e_2^L, such that, if the Principal expects the Agent to exert effort on both tasks, the Principal updates negatively on the competence of the Agent upon observing failure on task 1 and success on task 2, there exists a probability of capture $1 - F(\check{u}(e_1, e_2))$ such that, if the Principal expects the Agent to choose $(a_1 = 1, a_2 = 1)$ with probability $F(\check{u}(e_1, e_2))$ and $(a_1 = 0, a_2 = 1)$ with probability $1 - F(\check{u}(e_1, e_2))$, the Principal updates positively on the competence of the Agent upon observing failure on task 1 and success on task 2. The equilibrium effect, then, is to create a positive probability of $(a_1 = 1, a_2 = 1)$ effort profile in equilibrium with the newly supportable moderate retention rule for the values of the prior probabilities of success that could not support such a rule or the $(a_1 = 1, a_2 = 1)$ effort profile without IG.

Finally, recall that $\mathcal{X}$ is the set of all vectors $x = (e_1^H, e_1^L, e_2^H, e_2^L, \pi, k, B)$. Let $\mathcal{M}_{IG} \subset \mathcal{X}$ be the set vectors $x \in \mathcal{X}$ such that there exists an equilibrium under bundling in which the Principal uses the moderate retention rule and, if the value of failure to IG is sufficiently low, the Agent exerts effort on both tasks.[24]

The following proposition summarizes the preceding discussion:

Proposition 5. *1. The range of probabilities of success e_1 and e_2 for which in equilibrium the Agent exerts effort on task 1 is decreasing in the value to the Interest Group of policy*

[24] We give a precise statement of the conditions that define $\mathcal{M}_{IG}$ in the Appendix. Note that, unlike for $\mathcal{M}$, these conditions will depend on $F(\check{u}(e_1, e_2))$.

failure on that task.

2. ***(negative spillover effect)*** *If the Principal is using the strict retention rule, then the range of probabilities of success e_1 and e_2 for which the Agent exerts effort on task 2 is (weakly) decreasing in the value to the Interest Group of policy failure on task 1.*

3. ***(competence cover effect)*** $\mathcal{M} \subset \mathcal{M}_{IG}$.

It is interesting to note that, while the competence cover effect clearly improves the expected effort, its effects on selection of the next period's office-holder are ambiguous. It is straightforward to show that if, in the absence of IG, the equilibrium played for $x \in \mathcal{X}$ is the second task equilibrium, but, in its presence, it is the moderate incentives equilibrium, selection is weakened. However, if in the absence of IG, the equilibrium played is the first task equilibrium then, whether the selection of the office-holder is improved, may depend on the probability $1 - F(\check{u}(e_1, e_2))$ that the Agent is bribed in equilibrium.

Our last element of analysis in this subsection concerns the effects of transparency on the equilibrium behavior under bundling in the presence of IG. As one might have expected from the fact that transparency eliminates the strict incentives rule equilibrium in the baseline environment (Proposition 2), the negative spillover effect, which relies on the Principal adopting such a rule, disappears under transparency. Of course, whereas the underlying effect was negative for the Principal's welfare in the absence of IG, the elimination of the negative spillover effect has the opposite welfare effect. The Principal's inability to enforce the strict retention rule in the presence of transparency may turn out, in the presence of IG, to be beneficial to her.

However, transparency of actions in the presence of IG also has a different, negative, implication as well, and this second implication is logically distinct from the implications of transparency in the baseline environment. Transparency eliminates the competence cover effect. Recall that the competence cover effect is driven by the fact that the presence of IG creates uncertainty on the part of the Principal about the actions chosen by the Agent in equilibrium and thereby alters the way the Principal updates her beliefs about the competence of the Agent. If the Principal observes the actions chosen by the Agent, the presence of IG cannot create such uncertainty, and so the competence cover effect cannot occur. The parameter vectors under which, in the absence of transparency, the presence of IG made it possible to sustain the equilibrium with the moderate incentives retention rule, in the presence of transparency can longer sustain such a rule, as the Principal shifts back to the 2nd-task retention rule.

Let $\mathcal{M}^T_{IG}$ to be the set of parameter vectors $x \in \mathcal{X}$ such that, with transparency, there exists an equilibrium under bundling in which the Principal uses the moderate retention rule and, if the value of failure to IG is sufficiently low, the Agent exerts effort on both tasks. The following proposition summarizes the preceding arguments.

Proposition 6. *1. Under bundling, transparency eliminates both the negative spillover effect and the competence cover effect of IG influence. Further:*

2. $\mathcal{M}^T_{IG} \subset \mathcal{M}_{IG}$.

The mix of the distinct welfare-enhancing and welfare-diminishing effects of transparency in the presence of IG adds further dimensions to the picture of the heterogenous welfare implications of transparency suggested by our analysis of the baseline model. At the most general level, though, the overall effect of transparency in the presence of IG is consonant with what we saw in the baseline setting: transparency (weakly) increases the lower bound of the Principal's welfare (through the elimination of the negative spillover effect), but also (weakly) decreases the upper bound of the Principal's welfare (through the elimination of the competence cover effect), effectively moderating the realized welfare values in equilibrium.

4.2 Unbundling with Interest Group

In this subsection, we consider the model of unbundling with the Interest Group. Recall that we are modeling IG as seeking to affect the outcome of the first task. The equilibrium behavior with respect to the second task is equivalent to that in the baseline model, so we focus our analysis here on how the presence of IG affects equilibrium behavior on task 1.

As in the baseline model, the expected payoff to Agent A_i of choosing to exert effort, is $e_iB_i - k$. Thus, if $e_1B_1 - k < 0$, Agent A_1 will choose not to exert effort independent of the offer from IG, which, therefore, has no incentive to influence A_1's behavior. If, on the other hand, $e_1B_1 - k \geq 0$, A_1 exerts effort absent a bribe and IG has an incentive to influence him. In this case, A_1 accepts a bribe if, and only if, it compensates him for the utility loss from not exerting effort, i.e. if, and only if, $b \geq e_1B_1 - k$. Thus, IG offers $b_u := e_1B_1 - k$ when the value of task failure to it is sufficiently high and $b = 0$ otherwise.

Summarizing the discussion above, we have the following characterization:

Proposition 7. *For all (e_i, B_i, k) such that $e_iB_i - k \geq 0$,*

1. *the Interest Group offers a bribe $b_u = e_1B_1 - k$ if, and only if, $u_{IG} \geq B_1 - k/e_1 \geq 0$;*
2. *Agent A_2 chooses to exert effort, and Agent A_1 accepts the bribe if, and only if, $b \geq e_1B_1 - k$, and chooses $a_1 = 0$ if accepting and $a_1 = 1$ if rejecting; and*
3. *the Principal retains Agent A_i if, and only if, the outcome is success on task i.*

For all (e_i, B_i, k) such that $e_iB_i - k < 0$, Agent A_i chooses to exert no effort on task i independent of the bribe and the Principal's retention rule.

From the equilibrium characterization in Proposition 7, it follows that given values of the cost of effort k, the overall value of holding office B, and the value of failure to IG, u_{IG}, there exists a feasible pair (B_1, B_2) such that both Agents exert effort if, and only if, $e_1 \geq \frac{e_2k}{e_2(B-u_{IG})-k}$. The graphical representation of the highest level of effort sustainable in equilibrium under unbundling with Interest Groups is thus very similar to the graphical representation provided in Figure 2. The only difference is that the range of values for which effort is exerted on both tasks decreases as the value of e_1 above which effort is exerted on both tasks shifts up from $e_1 = \frac{e_2k}{e_2B-k}$ to $e_1 = \frac{e_2k}{e_2(B-u_{IG})-k}$.

The comparative statics on the equilibrium size of IG bribe and on the conditions under which the Agent chooses to exert effort are straightforward and intuitive. As the expected benefit to the Agent of exerting effort increases – either because the probability of success e_1 or the benefit of holding office B_1 go up or because the cost of effort k goes down – both the ex ante likelihood that he does exert it and the bribe that IG needs to pay the Agent to incentivize him not to do it must increase (in the case of the ex ante likelihood of effort – weakly) as well. Also intuitively, the Agent is (weakly) less likely to exert effort and IG is more likely to bribe the Agent as the value u_{IG} that IG assigns to policy failure increases.

4.3 Comparing Institutions: the Effect of IG

We now re-examine the institutional comparison analyzed above in the light of the equilibrium effects of IG's behavior. Our first observation concerns the quality of agent selection. Proposition 3 on the comparison between bundling and unbundling with respect to selection goes through in the presence of IG, with the following caveat. As discussed in section 4.1, the competence cover effect may weaken selection under bundling. As a consequence, there exists parameter values such that the competence cover effect incentivizes the Agent to exert effort on both tasks under bundling but weakens selection to the point that it is lower than under unbundling. Similarly, a result equivalent to Proposition 4 holds as well, but for the parameter vectors that include the specification of utility to IG of obtaining policy failure on task 1.

As we now show, an increase in the value of failure to the Interest Group can reverse the comparison in terms of incentives in each direction with no transparency.

Proposition 8. *1. For all $x \in \mathcal{S}$, there exists (B_1, B_2) such that expected effort is strictly higher on both tasks under unbundling than under bundling in the presence of IG.*

2. For all $x \in \mathcal{M} \cap \mathcal{U}$,

(a) if $e_2 < \sqrt{k}/\sqrt{B}$, then for any (B_1, B_2) expected effort is strictly higher on at least one task under bundling than under unbundling in the presence of IG.

(b) if $e_2 > \sqrt{k}/\sqrt{B}$, there exists (B_1, B_2) such that expected effort is strictly higher on task 1 and weakly higher on task 2 under unbundling than under bundling in the presence of IG.

3. The competence cover effect can shift the comparison of incentives in favor of bundling: There exist $x \in \mathcal{X}$ such that $x \in \mathcal{M}_{IG}$, yet $x \notin \mathcal{S} \cup \mathcal{M} \cup \mathcal{U}$, and $x \in \mathcal{X}$ such that $x \in \mathcal{M}_{IG} \cap \mathcal{U}$, yet $x \notin \mathcal{S} \cup \mathcal{M}$.

Part 1 of Proposition 8 points once again to the negative aspects of the strict retention rule. Indeed, consider any vector $x \in \mathcal{S}$, that is any vector of parameter values for which a strict incentives equilibrium can be sustained under bundling in the absence of IG. Proposition 4 states that, in the absence of IG, there exists (B_1, B_2) such that effort on both tasks can be sustained in equilibrium under unbundling for any $x \in \mathcal{S}$. In other words, for any $x \in \mathcal{S}$, there exists (B_1, B_2) such that expected effort is identical under bundling and under unbundling in the absence of IG. As we show in the Appendix, in the presence of IG, however, there exists (B_1, B_2) such that for any $x \in \mathcal{S}$ the bribe that IG needs to pay to the responsible Agent to contract no effort on task 1 is lower under unbundling than under bundling. Consequently, for any $x \in \mathcal{S}$, there exists (B_1, B_2) such that the responsible Agent is either (1) bribed under neither institutions (when u_{IG} is sufficiently low), or (2) bribed under bundling but not under unbundling (when u_{IG} takes on moderate values), or (3) bribed under both institutions (when u_{IG} is sufficiently high). In other words, for any such $x \in \mathcal{S}$, there exists (B_1, B_2) such that it is ex ante more likely that the Agent will be bribed under bundling. Because of the negative spillover effect under strict incentives, this implies that expected effort is now lower under bundling than under unbundling on both tasks in the presence of IG.

The situation is significantly different under the moderate retention rule. Consider any $x \in \mathcal{M} \cap \mathcal{U}$, that is any vector of parameter values such that, in the absence of IG, the Agent can be incentivized to exert effort on both tasks under both institutions, with the Principal using the moderate retention rule to do so under bundling. As we discussed in subsection 4.1, the level of the bribe is decreasing in e_2 under bundling and moderate incentives. As we show in the Appendix, this has the following implication. If $e_2 > \sqrt{k}/\sqrt{B}$, there exists (B_1, B_2) such that A_2 exerts effort on task 2 and the level of the bribe to contract no effort on task 1 is higher under unbundling than under bundling. Consequently, there exists (B_1, B_2) such that expected effort is strictly higher on task 1 and weakly higher on task 2 under unbundling than under bundling in the presence of IG. If $e_2 < \sqrt{k}/\sqrt{B}$, however, then for any (B_1, B_2) that sustains effort on task 2 under unbundling the level of the bribe is higher under bundling than under unbundling. In other words, for any $x \in \mathcal{M} \cap \mathcal{U}$, if $e_2 < \sqrt{k}/\sqrt{B}$, then for any (B_1, B_2) expected effort is strictly higher under bundling than under unbundling on at least one task in the presence of IG.

Finally, part 3 of Proposition 8 states that the competence cover effect can shift the comparison of incentives in favor of bundling in two ways. First, there exist parameter vectors $x \in \mathcal{X}$, such that effort on both tasks cannot be sustained in equilibrium under either institution in the absence of IG (that is $x \notin \mathcal{S} \cup \mathcal{M} \cup \mathcal{U}$), yet, via the competence cover effect, it can ($x \in \mathcal{M}_{IG}$) in the presence of IG. Similarly, there are parameter vectors $x \in \mathcal{X}$, such that in the presence of IG, effort on both tasks can be sustained in equilibrium under both institutions (that is $x \in \mathcal{M}_{IG} \cap \mathcal{U}$), while, in the absence of IG, the Principal cannot incentivize the Agent to choose $(a_1 = 1, a_2 = 1)$ under bundling ($x \notin \mathcal{S} \cup \mathcal{M}$).

Our final analysis in this section concerns the effects of transparency on the comparison between bundling and unbundling. We have the following result:

Proposition 9.

1. *For any $(e_1^H, e_1^L, e_2^H, e_2^L, \pi, k, B, u_{IG})$, if, with no transparency, effort on both tasks can be sustained in equilibrium under unbundling but not under bundling, then the same is true with transparency.*

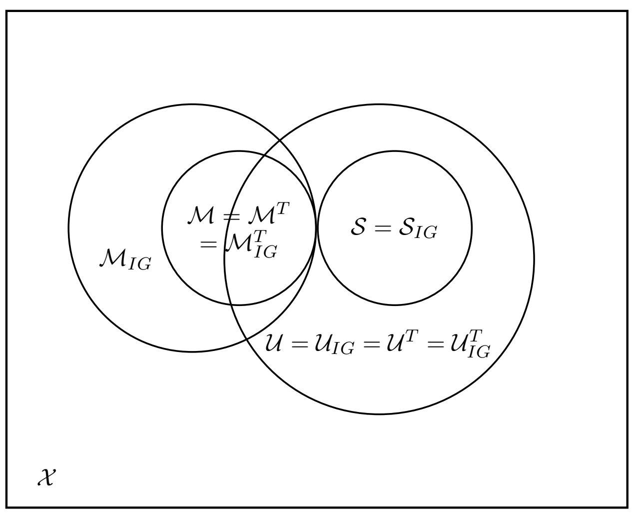
2. *There exist $(e_1^H, e_1^L, e_2^H, e_2^L, \pi, k, B, u_{IG})$, such that, with no transparency, the maximum expected effort is weakly higher under bundling, but, with transparency, it is higher under unbundling.*

3. $\mathcal{M} = \mathcal{M}^T_{IG}$.

Parts (1) and (2) of proposition 9 follow directly from the fact that transparency of actions decreases the upper bound on the Principal's welfare under bundling and state that transparency of actions may reverse the comparison of the highest expected effort between bundling and unbundling in favor of unbundling but not the other way around. Overall, transparency of actions then tends to make bundling less attractive as an institution. Part (3) of proposition 9, however, points to the robust power of the moderate retention rule. It states the following, in particular. For any parameter vector $x \in \mathcal{X}$ for which, with no transparency and in the absence of IG, there exists a moderate incentives equilibrium in which the Agent exerts effort on both tasks, there also exists such an equilibrium with transparency and in the presence of IG. Combined with Proposition 4 and the fact that $\mathcal{U} = \mathcal{U}_{IG}$, this implies that there exists a non-empty set of parameter vectors $x \in \mathcal{X}$ for which, with transparency and in the presence of IG, effort on both tasks can be sustained under bundling, but not under unbundling. It moreover implies that for any such parameter vector, effort on both tasks is sustained via the moderate retention rule under bundling.

The figure below shows the relationship between the different subsets of the set of the underlying model parameters $\mathcal{X}$ described in the paper.

Figure 5: Relationship between the different subsets of model parameter vectors $(e_1^H, e_1^L, e_2^H, e_2^L, \pi, k, B) \in \mathcal{X}$.



5 Discussion

5.1 Further Considerations of Robustness

5.1.1 Interactions between Tasks

So far we have assumed that the two tasks do not interact. We now establish that our previous results hold qualitatively as long as the tasks are not strong substitutes; when they are, unbundling provides better incentives than bundling. To establish these claims, we now assume that the cost of exerting effort on task $i = 1, 2$ depends on the effort exerted on task $j \neq i$. Formally, we assume that the cost of exerting effort on task $i = 1, 2$ is $k > 0$, if no effort is exerted on task $j \neq i$, but γk if effort is exerted on task $j \neq i$. Consequently, under bundling, the cost of exerting effort on both tasks is now $2\gamma k$. We impose the restriction that exerting effort on both tasks is more costly than exerting effort on a single task, i.e. we assume $2\gamma k > k$, or equivalently $\gamma > 1/2$. If $\gamma \in (1/2, 1)$, we say that tasks are complement: exerting effort on task $i = 1, 2$ reduces the cost of effort on task $j \neq i$. If $\gamma > 1$, tasks are substitutes: exerting effort on task $i = 1, 2$ increases the cost of effort on task $j \neq i$.

Proposition 10. *For all (k, B, u_{IG}) such that there exists a non-empty open set $(e_1^H, e_1^L, e_2^H, e_2^L, \pi)$ for which bundling generates overall higher effort than unbundling there exists $\hat{\gamma}(k, B, u_{IG}) > 1$ such that there exists a non-empty open set for which bundling generates overall higher effort than unbundling if, and only if, $\gamma < \hat{\gamma}(k, B, u_{IG})$.*

Proposition 11. *Suppose $B > 2k + u_{IG}$. Then, if $\gamma \in (\frac{B-u_{IG}}{8k} + \frac{1}{2}, \frac{B-u_{IG}}{2k})$ there exists a non-empty open set of (e_1, e_2) such that effort is exerted on both tasks under unbundling but not under bundling, but there does not exist (e_1, e_2) such that effort is exerted on both tasks under bundling but not under unbundling.*

5.1.2 Endogenous Allocation of B

So far we have assumed that the values of holding office B_1 and B_2 are exogenous. It is instructive to pause and consider what allocations of B to B_1 and B_2 the Principal would want to choose, in the presence of IG, if she were able to control those allocations. Supposing such a control, an ex ante expected utility-maximizing Principal would choose between the following two allocations: (1) $(B_1 = B - B_2, B_2 = k/e_2)$ and (2) $(B_1 = B, B_2 = 0)$. The first allocation maximizes the probability that both Agents exert effort in equilibrium. Under this allocation, the Principal chooses the highest B_1, and thus the strongest protection against the influence of IG, conditional on B_2 being just high enough to incentivize Agent 2 to exert effort. Given that allocation, the level of the bribe that IG pays to Agent 1 in equilibrium is increasing in the probability of success e_2. As e_2 increases, $B_2 = k/e_2$ decreases and $B_1 = B - B_2$ increases, which strengthens the incentives for Agent 1 to exert effort. IG must thus offer a higher bribe $b_u = e_1 B_1 - k$ to convince the Agent 1 not to exert effort. Note that under this allocation, the Agent chooses to exert effort on both tasks if, and only if, $e_1 \geq \frac{e_2 k}{e_2(B-u_{IG})-k}$. This condition is identical to the one derived in section 4.2, thus establishing that the comparison of highest effort, $(a_1 = 1, a_2 = 1)$, under both institutions is robust to the endogenous allocation of B.

Under the second allocation, Agent 2 is not incentivized to exert effort as the value of holding office B_2 equals 0. This allocation, however, maximizes the probability that Agent 1 chooses to exert effort as $B_1 = B$ reaches its absolute maximum. This may be the utility maximizing allocation for the Principal when the probability of success e_2 is relatively low and the probability of success e_1 is relatively high. When this is the case, incentivizing Agent 1 to exert effort is more valuable to the Principal than incentivizing Agent 2 to exert effort as Agent 1 is more likely to produce success. The first allocation may then not be optimal as it makes it rather likely that Agent 1 will be bribed. Indeed, the lowest value of holding office $B_2 = k/e_2$ which incentivizes Agent 2 to exert effort is high when the probability of success e_2 is low. The value of holding office $B_1 = B - B_2$ allocated to task 1 is then correspondingly low, which makes it likely that Agent 1 will be bribed. Note, however, that this allocation $(B_1 = B, B_2 = 0)$ does not affect the comparison of bundling versus unbundling, because if the Principal expects the Agent to exert effort only on task 1 under bundling, the Principal provides the Agent with the same incentives as the allocation $(B_1 = B, B_2 = 0)$ provides the Agents under unbundling.

5.2 Other arguments on unbundling

In this subsection, we highlight the relationship between our model and results and those of two most closely related papers that concern institutional effects of (un-)bundling: Besley and Coate (2003) and Ashworth and Bueno de Mesquita (2015).[25]

Besley and Coate (2003) consider a citizen-candidate model and show that under bundling regulatory issues are more likely to be captured by stakeholder interests than under unbundling. The specification of our model that is closest to theirs is the case where the probabilities of success e_1 and e_2 converge to one on both dimensions, actions are observable (transparent) and IG seeks to influence policy. In this case, the highest level of effort by the Agent that can be sustained in equilibrium under bundling is $(a_1 = 0, a_2 = 1)$. Under unbundling, however, there exists a range of parameter values under which effort is exerted on both tasks. Thus, as in the Besley and Coate model, we find that unbundling better protects the Principal from the influence of interest groups under those conditions. Our analysis shows, however, that this result, and the broader intuitive argument in favor of unbundling that it captures, do not generalize as one might have expected. First, even in the case of action observability and full policy control, i.e. $e_1 = e_2 \to 1$, bundling may give the Principal a higher welfare than unbundling, due to the improved capacity of the Principal to select high competence Agents under bundling. Indeed, as we show in Section 4.3, there exist conditions under which the ex ante second period welfare of the Principal is higher under bundling than under unbundling even when effort is exerted on both tasks under unbundling, but only on

[25]More distantly related to our analysis is the paper by Ting (2002) who studies the allocation of tasks to bureaucratic agencies. He studies a pure moral hazard model in a contract-theoretic framework and finds that bundling supersedes unbundling when the Agency wants to spend less on the various policy fields than Congress, while unbundling dominates when the Agencies want to spend more.

a single task under bundling. Second, the intuitive argument in favor of unbundling is not robust to the Agent's actions being unobservable. As shown in Section 4.3, when e_1 and e_2 are both high, effort may be exerted on both tasks under unbundling as well as under bundling, yet bundling gives the Principal the power to select better Agents and is therefore the preferred institution. Finally, our results suggest that the intuitive argument in favor of unbundling is not robust to the considerations of task complexity. When the probabilities of success e_1 and e_2 are moderate, bundling may dominate unbundling due to the power of moderate incentives.

Our baseline model is related to the model in Ashworth and Bueno de Mesquita (2015) who also study the welfare effects of policy unbundling. In their analysis, they focus on the tradeoffs that are generated by a variation in the exogenous correlation in politician competence across tasks and a variation in the differential valuation of each task by voters. In contrast, we hold these two aspects fixed and focus our analysis on the variations in (a) task complexity measured by the conditional likelihood of policy success, (b) strength of special interests, and (c) transparency of policy choices. A second key difference is that, in their model, Agent's effort and competence are substitutes while in our model they are complements.[26] These differences, along with the differences between continuity vs. discreteness of policy outcomes, lead to different results and to fundamentally different mechanisms operating in our models. In the parameter specification of their model that brings it closest to our baseline environment, they find that bundling strictly dominates unbundling both in terms of incentives and selection. The intuition is as follows. When the policy outcome production technology is additive (effort and competence are substitutes), the informativeness of a policy outcome about the competence of the Agent does not depend on the level of effort exerted by the Agent(s). Hence, selection is always better under bundling because the voters receive two informative signals and, in consequence, their posterior beliefs about the Agent(s)'s competence put less weight on their prior beliefs under bundling. This gives the Agent stronger incentives to exert effort in order to try to fool voters into thinking he is more competent than expected by generating higher policy outcomes. In contrast, we find that bundling or unbundling may dominate in terms of both incentives and selection. When tasks are asymmetrically complex, effort may be higher under unbundling and higher effort improves selection because of the complementarity between effort and competence. When bundling dominates unbundling in our model, the underlying mechanisms depend on the level of task complexity. As we explained above, on the range of parameter values that sustains the moderate incentives equilibrium the mechanism is one of insurance which is fundamentally distinct from the mechanism in Ashworth and Bueno de Mesquita (2014).

[26] Hatfield and Padro i Miquel (2006) also study the welfare implication of unbundling in a career concerns model with additive policy outcome production technology. Because their primary source of parameter variation is the benefits of holding office, the focus and the results of their analysis are substantially different from ours.

6 Appendix

Lemma 1 (Best-response of the Principal)**.** *1. If the Principal expects that the Agent chooses $(a_1 = 1, a_2 = 1)$ or if the Principal observes that the Agent chooses $(a_1 = 1, a_2 = 1)$, then the Principal retains the Agent upon observing $(o_1 = s, o_2 = s)$, retains upon observing $(o_i = s, o_j = f)$ if, and only if, $e_i^H(1 - e_j^H) \geq e_i^L(1 - e_j^L)$ for all $i = 1, 2$, and does not retain upon observing $(o_1 = f, o_2 = f)$.*

2. If the Principal expects that the Agent chooses $(a_i = 1, a_j = 0)$ or if the Principal observes that the Agent chooses $(a_i = 1, a_j = 0)$, then the Principal retains the Agent if, and only if, $o_i = s$.

3. If the Principal expects that the Agent chooses $(a_1 = 0, a_2 = 0)$ or if the Principal observes that the Agent chooses $(a_1 = 0, a_2 = 0)$, then the Principal is indifferent between retaining and dismissing the Agent upon observing any of the outcome pairs.

Proof of Lemma 1. We denote $(\mathring{a}_1, \mathring{a}_2)$ the Principal's expectations about the Agent's actions when the Principal does not observe the actions (a_1, a_2) chosen by the Agent. The Principal's posterior belief about the Agent's competence, upon observing outcomes (o_1, o_2) and given expectations $(\mathring{a}_1, \mathring{a}_2)$, is then denoted $Pr(\theta = \theta_H|(o_1, o_2); (\mathring{a}_1, \mathring{a}_2))$. Similarly, the Principal's posterior, upon observing outcomes (o_1, o_2) and effort choices (a_1, a_2), is denoted $Pr(\theta = \theta_H|(o_1, o_2); (a_1, a_2))$. Note that we have $Pr(\theta = \theta_H|(o_1, o_2); (\mathring{a}_1, \mathring{a}_2)) = Pr(\theta = \theta_H|(o_1, o_2); (a_1, a_2))$ whenever $(o_1, o_2); (\mathring{a}_1, \mathring{a}_2) = (o_1, o_2); (a_1, a_2)$. To simplify notation, we thus only look at $Pr(\theta = \theta_H|(o_1, o_2); (\mathring{a}_1, \mathring{a}_2))$ in the sequel of this proof. Remember that it is a best response for the Principal to retain the Agent if, and only if, $Pr(\theta = \theta_H|(o_1, o_2); (\mathring{a}_1, \mathring{a}_2)) \geq \pi$. We have

$$Pr(\theta = \theta_H|(o_1 = s, o_2 = s); (\mathring{a}_1 = 1, \mathring{a}_2 = 1)) = \frac{e_1^H e_2^H \pi}{e_1^H e_2^H \pi + e_1^L e_2^L (1 - \pi)},$$

$$Pr(\theta = \theta_H|(o_1 = f, o_2 = f); (\mathring{a}_1 = 1, \mathring{a}_2 = 1)) = \frac{(1 - e_1^H)(1 - e_2^H)\pi}{(1 - e_1^H)(1 - e_2^H)\pi + (1 - e_1^L)(1 - e_2^L)(1 - \pi)},$$

and

$$Pr(\theta = \theta_H|(o_i = s, o_j = f); (\mathring{a}_1 = 1, \mathring{a}_2 = 1)) = \frac{e_i^H(1 - e_j^H)\pi}{e_i^H(1 - e_j^H)\pi + e_i^L(1 - e_j^L)(1 - \pi)}.$$

Because $e_i^H > e_i^L$ for all $i = 1, 2$, we have $Pr(\theta = \theta_H|(o_1 = s, o_2 = s); (\mathring{a}_1 = 1, \mathring{a}_2 = 1)) = Pr(\theta = \theta_H|(o_1 = s, o_2 = s); (a_1 = 1, a_2 = 1)) > \pi$ and $Pr(\theta = \theta_H|(o_1 = f, o_2 = f); (\mathring{a}_1 = 1, \mathring{a}_2 = 1)) = Pr(\theta = \theta_H|(o_1 = f, o_2 = f); (a_1 = 1, a_2 = 1)) < \pi$. Consequently, the Principal's best response is to retain upon observing $(o_1 = s, o_2 = s)$, and to dismiss upon observing $(o_1 = f, o_2 = f)$. In turn, $Pr(\theta = \theta_H|(o_i = s, o_j = f); (\mathring{a}_1 = 1, \mathring{a}_2 = 1)) = Pr(\theta = \theta_H|(o_i = s, o_j = f); (a_1 = 1, a_2 = 1)) \geq \pi$ if, and only if, $e_i^H(1 - e_j^H) \geq e_i^L(1 - e_j^L)$. Consequently, the Principal's best response is to retain upon observing $(o_i = s, o_j = f)$ if, and only if, $e_i^H(1-e_j^H) \geq e_i^L(1-e_j^L)$. Similarly, we have

$$Pr(\theta = \theta_H | (o_i = s, o_j = f); (\mathring{a}_i = 1, \mathring{a}_j = 0)) = \frac{e_i^H \pi}{e_i^H \pi + e_i^L(1-\pi)},$$

and

$$Pr(\theta = \theta_H | (o_i = f, o_j = f); (\mathring{a}_i = 1, \mathring{a}_j = 0)) = \frac{(1-e_i^H)\pi}{(1-e_i^H)\pi + (1-e_i^L)(1-\pi)}.$$

Because $e_i^H > e_i^L$ for all $i = 1, 2$, we have $Pr(\theta = \theta_H | (o_i = s, o_j = f); (\mathring{a}_i = 1, \mathring{a}_j = 0)) = Pr(\theta = \theta_H | (o_i = s, o_j = f); (a_i = 1, a_j = 0)) > \pi$ and $Pr(\theta = \theta_H | (o_i = f, o_j = f); (\mathring{a}_i = 1, \mathring{a}_j = 0)) = Pr(\theta = \theta_H | (o_i = f, o_j = f); (a_i = 1, a_j = 0)) < \pi$. Consequently the Principal's best response is to retain upon observing $(o_i = s, o_j = f)$, and to dismiss upon observing $(o_i = f, o_j = f)$. Outcomes $(o_i = s, o_j = s)$ and $(o_i = f, o_j = s)$ are off the equilibrium path in this case and any retention decision is a best response.

Finally,

$$Pr(\theta = \theta_H | (o_i = f, o_j = f); (\mathring{a}_i = 0, \mathring{a}_j = 0)) = \pi.$$

Outcomes $(o_i = s, o_j = s)$ and $(o_i = f, o_j = s)$ are off the equilibrium path in this case and any retention decision is a best response. □

Lemma 2.

1. *If the Principal retains the Agent if, and only if, $(o_1 = s, o_2 = s)$, then the Agent's best response is to choose $(a_1 = 1, a_2 = 1)$ if $e_1 e_2 B - 2k \geq 0$ and to choose $(a_1 = 0, a_2 = 0)$ if $e_1 e_2 B - 2k \leq 0$.*

2. *If the Principal retains the Agent if, and only if, $o_i = s$ for at least some $i = 1, 2$, then the Agent's best response is to choose $(a_1 = 1, a_2 = 1)$ if $e_i(1-e_j)B - k \geq 0$ for all $i = 1, 2$, to choose $(a_i = 1, a_j = 0)$ if $[0 \geq e_j(1-e_i)B - k, e_i \geq e_j$ and $e_i B - k \geq 0]$, and to choose $(a_1 = 0, a_2 = 0)$ if $e_i B - k \leq 0$ for all $i = 1, 2$.*

3. *If the Principal retains the Agent if, and only if, $o_i = s$ for specific $i = 1, 2$, then the Agent's best response is to choose $(a_i = 1, a_j = 0)$ if $e_i B - k \geq 0$, and to choose $(a_i = 0, a_j = 0)$ if $e_i B - k \leq 0$.*

4. *If the Principal always or never retains the Agent, then the Agent's best response is to choose $(a_1 = 0, a_2 = 0)$.*

Proof of Lemma 2. Suppose first that the Principal retains the Agent if, and only if, $(o_1 = s, o_2 = s)$. Let us denote this retention rule by r_s. Then

$$U_A((a_1 = 1, a_2 = 1), r_s) = e_1 e_2 B - 2k$$
$$U_A((a_i = 1, a_j = 0), r_s) = -k$$
$$U_A((a_1 = 0, a_2 = 0), r_s) = 0.$$

Choosing $(a_i = 1, a_j = 0)$ is never a best response because $-k < 0$. Hence, choosing $(a_1 = 1, a_2 = 1)$ is the Agent's best response to the strict retention rule if, and only if, $e_1e_2B - 2k \geq 0$, while choosing $(a_1 = 0, a_2 = 0)$ is the Agent's best response if, and only if, $e_1e_2B - 2k \leq 0$.

Suppose now that the Principal retains the Agent if, and only if, $o_i = s$ for at least some $i = 1, 2$. Let us denote this retention rule by r_m. Then

$$\begin{aligned}
U_A((a_1 = 1, a_2 = 1), r_m) &= (e_1e_2 + e_1(1 - e_2) + (1 - e_1)e_2)B - 2k \\
U_A((a_1 = 1, a_j = 0), r_m) &= e_1B - k \\
U_A((a_1 = 0, a_2 = 1), r_m) &= e_2B - k \\
U_A((a_1 = 0, a_2 = 0), r_m) &= 0.
\end{aligned}$$

Hence, choosing $(a_1 = 1, a_2 = 1)$ is the Agent's best response to the moderate retention rule if, and only if, the following two conditions are satisfied: (1) $(e_1e_2+e_1(1-e_2)+(1-e_1)e_2)B-2k \geq e_iB - k$ for all $i = 1, 2$, and (2) $(e_1e_2 + e_1(1 - e_2) + (1 - e_1)e_2)B - 2k \geq 0$. Condition (1), in turn, is satisfied if, and only if, $[e_1(1 - e_2)B - k \geq 0, \text{ and } (1 - e_1)e_2B - k \geq 0]$ which implies condition (2). Choosing $(a_i = 1, a_j = 0)$ is the Agent's best response if the following three conditions hold: (1) $e_iB-k \geq 0$, (2) $e_iB-k \geq e_jB-k$, and (3) $e_iB-k \geq (e_1e_2+e_1(1-e_2)+(1-e_1)e_2)B-2k$ which is equivalent to $[0 \geq e_j(1 - e_i)B - k, e_i \geq e_j \text{ and } e_iB - k \geq 0]$. Finally, choosing $(a_i = 0, a_j = 0)$ is the Agent's best response if the following two conditions hold: (1) $0 \geq e_iB - k$ for all $i = 1, 2$, and (2) $0 \geq (e_1e_2 + e_1(1 - e_2) + (1 - e_1)e_2)B - 2k$. Because (1) implies (2), this is equivalent to $e_iB - k \leq 0$ for all $i = 1, 2$.

Suppose next that the Principal retains the Agent if, and only if, $o_i = s$ for a specific $i = 1, 2$. Denote this retention rule by r_i. Then

$$\begin{aligned}
U_A((a_1 = 1, a_2 = 1), r_i) &= e_iB - 2k \\
U_A((a_i = 1, a_j = 0), r_i) &= e_iB - k \\
U_A((a_i = 0, a_j = 1), r_i) &= -k \\
U_A((a_1 = 0, a_2 = 0), r_i) &= 0.
\end{aligned}$$

Hence, choosing $(a_1 = 1, a_2 = 1)$ is never a best-response to the i^{th}-task retention rule because $e_iB - 2k < e_iB - k$. Similarly, $(a_i = 0, a_j = 1)$ is never a best response because $-k < 0$. Choosing $(a_i = 1, a_j = 0)$ is thus the Agent's best response to the i^{th}-task retention rule if, and only if, $e_iB - k \geq 0$, while choosing $(a_i = 0, a_j = 0)$ is the Agent's best response if, and only if, $e_iB - k \leq 0$.

If the Principal never retains (or always retains), then $U_A(a_1 = 1, a_2 = 1) < U_A(a_i = 1, a_j = 0) < U_A(a_1 = 0, a_2 = 0)$ and the Agent's best response is to choose $(a_1 = 0, a_2 = 0)$. Looking for mutual best responses yields the proposition. □

Proof of Proposition 1. Follows from Lemmata 1 and 2 by looking for mutual best responses. □

Corollary 1. *From Proposition 1, we can formally define* $\mathcal{M}$ *and* $\mathcal{S}$. *We have,* $\mathcal{M} = \{x \in \mathcal{X} | 1 - \frac{k}{e_jB} \geq e_i \geq \frac{k}{(1-e_j)B}, e_i^H(1 - e_j^H) \geq e_i^L(1 - e_j^L)$ *for all* $i = 1, 2\}$ *and* $\mathcal{S} = \{x \in \mathcal{X} | e_i \geq$

$\frac{2k}{e_j B}, e_i^H(1-e_j^H) \leq e_i^L(1-e_j^L)$ *for all* $i = 1, 2\}$.

Proposition 12. *On the equilibrium path of play under bundling with transparency of actions:*

1. *The Agent chooses to exert effort on both tasks if, and only if, the complexity of each task is moderate,* $1 - \frac{k}{e_j B} \geq e_i \geq \frac{k}{(1-e_j)B}$*, and the Principal's estimation of the Agent's competence increases when the outcome is success on at least one task,* $e_i^H(1-e_j^H) \geq e_i^L(1-e_j^L)$ *for all* $i = 1, 2$.

2. *The Agent chooses to exert effort only on task* i *if, and only if, all of the following three conditions hold: (1) the complexity of that task is sufficiently low,* $e_i \geq k/B$*, (2) it is (weakly) lower than the complexity of task* $j \neq i$*,* $e_i \geq e_j$*, and (3) the conditions to sustain an equilibrium in which the Agent chooses to exert effort on both tasks (stated in part 1) are not satisfied.*

3. *The Agent chooses to exert no effort on either task if, and only if, the complexity of each task is sufficiently high:* $e_i \leq k/B$ *for all* $i = 1, 2$.

Proof of Proposition 12. Suppose the Agent chooses $(a_i = 1, a_j = 0)$. By Lemma 1, the Principal then retains the Agent if, and only if, $o_i = s$. Consequently, the Agent's expected utility from choosing $(a_i = 1, a_j = 0)$ is $e_i B - k$.

Suppose next the Agent chooses $(a_1 = 1, a_2 = 1)$. By Lemma 1, the Principal then uses one of the following three retention rules:

1. If $e_i^H(1-e_j^H) < e_i^L(1-e_j^L)$ for all $i = 1, 2$, the Principal retains if, and only if $(o_1 = s, o_2 = s)$.

2. If $e_i^H(1-e_j^H) > e_i^L(1-e_j^L)$ for all $i = 1, 2$, the Principal retains if, and only if $o_i = s$ for at least some task $i = 1, 2$.

3. If $e_i^H(1-e_j^H) > e_i^L(1-e_j^L)$ for $i = 1, 2$, and $e_j^H(1-e_i^H) < e_j^L(1-e_i^L)$ for $j \neq i$, the Principal retains if, and only if $o_i = s$ for $i = 1, 2$.

In case 1. the Agent's expected utility from choosing $(a_1 = 1, a_2 = 1)$ is $e_1 e_2 B - 2k$. In case 2. the Agent's expected utility from choosing $(a_1 = 1, a_2 = 1)$ is $(e_1 + e_2 - e_1 e_2)B - 2k$. In case 3. the Agent's expected utility from choosing $(a_1 = 1, a_2 = 1)$ is $e_i B - 2k$. Finally choosing $(a_1 = 0, a_2 = 0)$ induces, by Lemma 1 again, the Principal to dismiss the Agent who then receives a payoff of 0.

The Principal then chooses the effort allocation (a_1, a_2) which maximizes his expected utility given the retention rule that is induced by (a_1, a_2). Because $e_1 e_2 B - 2k < e_i B - k$ and $e_i B - 2k < e_i B - k$ for all $i = 1, 2$, the Agent never chooses $(a_1 = 1, a_2 = 1)$ if it induces retention rule 1. or 3. The Agent chooses $(a_1 = 1, a_2 = 1)$ if, and only if, $(a_1 = 1, a_2 = 1)$ induces retention rule 2. and $(e_1 + e_2 - e_1 e_2)B - 2k \geq e_i B - k \geq 0$ for all $i = 1, 2$, which is equivalent to $e_i(1 - e_j)B - k \geq 0$ for all $i = 1, 2$. The Agent chooses $(a_i = 1, a_j = 0)$ if, and only if, one of the two following sets of conditions hold; (1) $(a_1 = 1, a_2 = 1)$ induces retention rule 2. and $e_i B - k \geq \max\{e_j B - k, (e_1 + e_2 - e_1 e_2)B - 2k, 0\}$, or (2) $(a_1 = 1, a_2 = 1)$ does not induce retention rule 2. and $e_i B - k \geq \max\{e_j B - k, 0\}$. The Agent chooses $(a_1 = 0, a_2 = 0)$ if, and only if, $0 > e_i B - k$ for all $i = 1, 2$. Note that $0 > e_i B - k$ for all $i = 1, 2$, implies $0 > (e_1 + e_2 - e_1 e_2)B - 2k$. □

Proof of Proposition 2. Part 1 follows directly from Proposition 12.

By Part 1 (b) of Proposition 1, we have $\mathcal{M} = \{x \in \mathcal{X} | 1 - \frac{k}{e_j B} \geq e_i \geq \frac{k}{(1-e_j)B}, e_i^H(1 - e_j^H) \geq e_i^L(1 - e_j^L)$ for all $i = 1, 2\}$ Similarly, by Part 1 of Proposition 12, we have $\mathcal{M}^T = \{x \in \mathcal{X} | 1 - \frac{k}{e_j B} \geq e_i \geq \frac{k}{(1-e_j)B}, e_i^H(1 - e_j^H) \geq e_i^L(1 - e_j^L)$ for all $i = 1, 2\}$. Hence, $\mathcal{M} = \mathcal{M}^T$. □

Proposition 3. Denote by $U_P^U(a_1, a_2)$ the ex ante second period welfare of the Principal under unbundling when (a_1, a_2) is exerted in equilibrium. We have

$$
\begin{aligned}
U_P^U(a_1 = 1, a_2 = 1) &= \sum_{i=1}^{2} \pi \left[e_i^H R + (1 - e_i^H)\pi R \right] + (1 - \pi)(1 - e_i^L)\pi R \\
U_P^U(a_i = 1, a_j = 0) &= \pi \left[e_i^H R + (1 - e_i^H)\pi R \right] + (1 - \pi)(1 - e_i^L)\pi R + \pi R \\
U_P^U(a_1 = 0, a_2 = 0) &= 2\pi R.
\end{aligned}
$$

Simple algebra establishes that $U_P^U(a_1 = 1, a_2 = 1) > U_P^U(a_i = 1, a_j = 0) > U_P^U(a_1 = 0, a_2 = 0)$.

Similarly, denote $U_P^B((a_1, a_2), r)$ the ex ante second period welfare of the Principal under bundling when (a_1, a_2) is exerted by the Agent and the Principal uses retention rule r.

We have

$$
\begin{aligned}
U_P^B(a_1 = 1, a_2 = 1, r_s) &= \pi \left[e_1^H e_2^H 2R + (1 - e_1^H e_2^H)\pi 2R \right] + (1 - \pi)(1 - e_1^L e_2^L)\pi 2R \\
U_P^B(a_1 = 1, a_2 = 1, r_m) &= \pi \left[(e_1^H + e_2^H - e_1^H e_2^H) 2R + (1 - e_1^H)(1 - e_2^H)\pi 2R \right] \\
&\quad + (1 - \pi)(1 - e_1^L)(1 - e_2^L)\pi 2R \\
U_P^B(a_i = 1, a_j = 0, r_i) &= \pi \left[e_i^H 2R + (1 - e_i^H)\pi 2R \right] + (1 - \pi)(1 - e_i^L)\pi 2R \\
U_P^U(a_1 = 0, a_2 = 0, r) &= 2\pi R.
\end{aligned}
$$

Simple algebra establishes (1) that $U_P^B(a_i = 1, a_j = 0, r_i) > U_P^B(a_1 = 0, a_2 = 0, r)$, (2) that $U_P^B(a_1 = 1, a_2 = 1, r_m) > U_P^B(a_i = 1, a_j = 0, r_i)$ when $e_i^H(1 - e_j^H) \geq e_i^L(1 - e_j^L)$ for all $i = 1, 2, j \neq i$, and (3) that $U_P^B(a_1 = 1, a_2 = 1, r_s) > U_P^B(a_i = 1, a_j = 0, r_i)$ when $e_i^H(1 - e_j^H) \leq e_i^L(1 - e_j^L)$ for all $i = 1, 2, j \neq i$.

Some more algebra then establishes (1) that $U_P^B(a_1 = 1, a_2 = 1, r_m) > U_P^U(a_1 = 1, a_2 = 1)$ when $e_i^H(1 - e_j^H) \geq e_i^L(1 - e_j^L)$ for all $i = 1, 2, j \neq i$, (2) $U_P^B(a_1 = 1, a_2 = 1, r_s) > U_P^U(a_1 = 1, a_2 = 1)$ when $e_i^H(1 - e_j^H) \leq e_i^L(1 - e_j^L)$ for all $i = 1, 2, j \neq i$, and (3) that $U_P^B(a_i = 1, a_j = 0, r_i) > U_P^U(a_i = 1, a_j = 0)$, which, combined with $U_P^U(a_1 = 1, a_2 = 1) > U_P^U(a_i = 1, a_j = 0) > U_P^U(a_1 = 0, a_2 = 0)$, establishes Part 1 of Proposition 3.

Finally, we have (1) $U_P^U(a_1 = 1, a_2 = 1) > U_P^B(a_i = 1, a_j = 0, r_i)$ if, and only if, $e_i^H - e_i^L < e_j^H - e_j^L$, (2) $U_P^U(a_1 = 1, a_2 = 1) > U_P^B(a_1 = 0, a_2 = 0, r)$, and (3) $U_P^U(a_i = 1, a_j = 0) > U_P^B(a_1 = 0, a_2 = 0, r) = U_P^U(a_1 = 0, a_2 = 0)$, which establishes Part 2 of Proposition 3. □

Proof of Proposition 4. Proving Proposition 4 is equivalent to proving the following two statements:

1. Effort on both tasks can be sustained in equilibrium under bundling, but not under unbundling, if, and only if, for all $i = 1, 2, j \neq i$, (1) $\frac{k}{(1-e_j)B} \leq e_i \leq \min\{\frac{2k}{e_jB}, 1 - \frac{k}{e_jB}\}$, and (2) $e_i^H(1 - e_j^H) \geq e_i^L(1 - e_j^L)$. There exists an infinity of vectors $(e_1^H, e_1^L, e_2^H, e_2^L, \pi)$ that satisfy conditions (1) and (2) if, and only if, $B > 4k$.

2. If $4k \geq B > 2k$, then effort on both tasks can be sustained in equilibrium under unbundling, but not under bundling, if $\frac{2k}{e_2B} > e_1 \geq \frac{e_2k}{e_2B-k}$. If $B > 4k$, then effort on both tasks can be sustained in equilibrium under unbundling, but not under bundling, if $\frac{2k}{e_2B} > e_1 \geq \frac{e_2k}{e_2B-k}$ and if $e_1 \notin \left[\frac{k}{(1-e_2)B}, 1 - \frac{k}{e_2B}\right]$.

We first establish that for all parameter values such that there exists a strict incentives equilibrium under bundling, there exists a feasible pair (B_1, B_2) such that both Agents exert effort under unbundling. Consequently, for any $x \in \mathcal{X}$ such that, in equilibrium, effort is exerted on both tasks under bundling, yet not under unbundling, it must be the case that the Principal uses the moderate retention rule. If the Principal uses the strict retention rule, the Agent chooses $(a_1 = 1, a_2 = 1)$ if, and only if, $e_1e_2B - 2k \geq 0$ or equivalently $1 \geq e_1 \geq \frac{2k}{e_2B}$. Similarly, there exists (B_1, B_2) such that both Agents exert effort under unbundling if, and only if, $1 \geq e_1 \geq \frac{e_2k}{e_2B-k}$. We now prove that for all $(e_1, e_2) \in [0,1]^2$, if $1 \geq e_1 \geq \frac{2k}{e_2B}$ then $1 \geq e_1 \geq \frac{e_2k}{e_2B-k}$. Note first that if $0 \leq e_2 < \frac{2k}{B}$, then $\frac{2k}{e_2B} > 1$ and there is no value of e_1 that satisfies $1 \geq e_1 \geq \frac{2k}{e_2B}$. Similarly, if $0 < B < 2k$ there is no $(e_1, e_2) \in [0,1]^2$ that satisfies $1 \geq e_1 \geq \frac{2k}{e_2B}$. We have $\frac{e_2k}{e_2B-k} < \frac{2k}{e_2B}$ if, and only if, $Q(e_2) := e_2^2B - 2e_2B + 2k < 0$. If $e_2 = \frac{2k}{B}$, then $Q(e_2) \leq 0$ whenever $B \geq 2k$. Moreover, $\frac{dQ}{de_2} = 2e_2B - 2B < 0$ for all $e_2 \in [0,1)$. Hence, $\frac{e_2k}{e_2B-k} \leq \frac{2k}{e_2B}$ for all $e_2 \in \left[\frac{2k}{B}, 1\right]$, which establishes the claim.

We now show that if $B > 4k$ there exists a non-empty open set of vectors $(e_1^H, e_1^L, e_2^H, e_2^L, \pi)$ for which $(a_1 = 1, a_2 = 1)$ can be sustained in equilibrium under bundling, but not under unbundling. Let e^u be the intersection between $e_1 = \frac{e_2k}{e_2B-k}$ and $e_1 = e_2$. We have $e^u = \frac{2k}{B}$. Note that $e^u < 1$ as $B > 4k$. For the rest of the paragraph we restrict attention to values of (e_1, e_2) such that $e_1 = e_2$. Abusing notation slightly, we work with $e = e_1 = e_2$. For any $e < e^u$, effort is exerted on at most one task under unbundling because we have $e < \frac{ek}{eB-k}$ whenever $e < e^u$. We now derive the set of values of e that satisfy $e(1-e)B - k \geq 0$. We have $e(1-e)B - k = 0$ for $\frac{1}{2} - \frac{\sqrt{B(B-4k)}}{2B} := \underline{e}^m$ and for $\frac{1}{2} + \frac{\sqrt{B(B-4k)}}{2B} := \overline{e}^m$. If $B > 4k$, $\underline{e}^m$ and $\overline{e}^m$ are well-defined and $0 \leq \underline{e}^m < 1/2 < \overline{e}^m \leq 1$. Moreover, $e(1-e)B - k$ reaches its maximum at $e = 1/2$ and is strictly increasing on $[0, 1/2)$ and strictly decreasing on $(1/2, 1]$. Thus, for all $e \in [\underline{e}^m, \overline{e}^m]$, we have $e(1-e)B - k \geq 0$. Simple algebra shows that $\underline{e}^m < e^u$

if $B > 4k$. It follows that for all $e \in [\underline{e}^m, e^u)$, $(a_1 = 1, a_2 = 1)$ cannot be sustained under unbundling, but can be sustained under bundling, provided the Principal uses the moderate retention rule.

In equilibrium, the Principal uses the moderate retention rule if, and only if, $e_i^H(1-e_j^H) \geq e_i^L(1-e_j^L)$ for all $i,j = 1,2, j \neq i$. We now show that for any $(e_1,e_2) \in (0,1)^2$ there exists an infinity of $(e_1^H, e_1^L, e_2^H, e_2^L, \pi)$ such that $e_i = \pi e_i^H + (1-\pi)e_i^L$ and $e_i^H(1-e_j^H) \geq e_i^L(1-e_j^L)$ for all $i,j = 1,2, j \neq i$. Suppose first $e_1 = e_2 \in (0,1)$. Note that for any $e_1^H, e_1^L, e_2^H, e_2^L$ such that (1) $e_1^H = e_2^H$, (2) $e_1^L = e_2^L$, (3) $e_1^L < e_1 < e_1^H$, and (4) $|e_1^H - 1/2| \leq |e_1^L - 1/2|$, we have $e_i^H(1-e_j^H) \geq e_i^L(1-e_j^L)$ for all $i,j = 1,2, j \neq i$. It is easy to see that there is an infinity of $e_1^H, e_1^L, e_2^H, e_2^L$ that satisfy conditions (1) through (4). Now let $\pi = \frac{e_i - e_i^L}{e_i^H - e_i^L}$. Because $e_i^H > e_i > e_i^L$, we have $\pi \in (0,1)$. Moreover, some simple algebra establishes that $e_i = \pi e_i^H + (1-\pi)e_i^L$. WLOG suppose next that $1 > e_1 > e_2 > 0$. Some simple algebra establishes that $e_i^H(1-e_j^H) > e_i^L(1-e_j^L)$ for all $i,j = 1,2, j \neq i$ if, and only if $e_1^H < 1 - e_2^L$ and $e_1^L < 1 - e_2^H$. Choose any e_1^H and e_2^L such that (1) $e_1^H < 1 - e_2^L$, (2) $e_2 > e_2^L > 0$, and (3) $\frac{1-e_2^L}{e_2 - e_2^L} e_1 > e_1^H > e_1$. It is easy to see that there is an infinity of e_1^H's and e_2^L's that satisfy conditions (1) through (3). Now choose $\pi \in (\frac{e_2 - e_2^L}{1 - e_2^L}, \frac{e_1}{e_1^H}) \subset (0,1)$ close enough to $\frac{e_1}{e_1^H}$. By condition (3) we have $\frac{e_2 - e_2^L}{1 - e_2^L} < \frac{e_1}{e_1^H}$. Therefore such a value of π exists. Now let $e_1^L = \frac{e_1 - \pi e_1^H}{1-\pi}$ and $e_2^H = \frac{e_2 - (1-\pi)e_2^L}{\pi}$. By this definition of e_1^L and e_2^H, we have $e_i = \pi e_i^H + (1-\pi)e_i^L$ for all $i = 1,2$. Moreover, because $\pi < \frac{e_1}{e_1^H}$, we have $e_1^L > 0$. Similarly, $\pi > \frac{e_2 - e_2^L}{1 - e_2^L}$ implies that $1 > e_2^H$. Finally, we have $e_2^H < 1 - e_1^L$ if, and only if, $\frac{e_2 - (1-\pi)e_2^L}{\pi} < 1 - \frac{e_1 - \pi e_1^H}{1-\pi}$, if, and only if, $f(\pi) := \pi^2(1 - e_2^L - e_1^H) + \pi(-1 - e_2 + 2e_1^L + e_1) + e_2 - e_2^L < 0$. As $e_1^H < 1$, which by assumption is lower than $\frac{e_1}{e_2}$, some simple algebra shows that $f(\frac{e_1}{e_1^H}) < 0$. As $f(\pi)$ is a continuous function of π, we have $f(\pi) < 0$ for any value of π close enough to $\frac{e_1}{e_1^H}$, which establishes the result.

We now show that if $B > 4k$, there exists $(e_1, e_2) \in [0,1]^2$ such that $\frac{2k}{e_2 B} > e_1 \geq \frac{e_2 k}{e_2 B - k}$ and $e_1 \notin \left[\frac{k}{(1-e_2)B}, 1 - \frac{k}{e_2 B}\right]$. Let $e_2 = \frac{2k}{B}$. Then $\frac{2k}{e_2 B} = 1$, $1 - \frac{k}{e_2 B} = 1/2$, $\frac{k}{(1-e_2)B} = \frac{k}{B-2k}$, and $\frac{e_2 k}{e_2 B - k} = \frac{2k}{B}$. Because $B > 4k$, we have $\frac{k}{(1-e_2)B} = \frac{k}{B-2k} < 1/2$, and $\frac{e_2 k}{e_2 B - k} = \frac{2k}{B} < 1/2$. Hence, if $e_2 = \frac{2k}{B}$, then any $e_1 \in (1/2, 1)$ satisfies the required conditions. Moreover, it is easy to see that around any (e_1, e_2) such that $e_1 \in (1/2, 1)$ and $e_2 = \frac{2k}{B}$ there is an open ball that satisfies the required conditions. □

Lemma 3. *Under bundling:*

1. *Suppose the Principal retains the Agent if, and only if, there is success on task 1 and assume that $e_1 B - k \geq 0$. Then, the Interest Group offers the Agent a bribe $b = e_1 B - k$ if, and only if, $u_{IG} \geq B - k/e_1$.*

2. *Suppose the Principal retains the Agent if, and only if, there is success on both tasks and assume that $e_1 e_2 B - 2k \geq 0$. Then, the Interest Group offers the Agent a bribe $b = e_1 e_2 B - 2k$ if, and only if, $u_{IG} \geq e_2 B - 2k/e_1$.*

3. *Suppose the Principal retains the Agent if, and only if, there is success on at least one task and assume that* $e_i(1-e_j)B-k \geq 0$ *for all* $i = 1, 2$. *Then, the Interest Group offers the Agent a bribe* $b = e_1(1-e_2)B-k$ *if, and only if,* $u_{IG} \geq (1-e_2)B-k/e_1 =: \check{u}(e_1, e_2)$.

Proof of lemma 3. 1. Suppose the Principal retains the Agent if, and only if, there is success on task 1 and assume that $e_1B - k \geq 0$. Then, if IG does not offer a bribe, the Agent chooses $(a_1 = 1, a_2 = 0)$. The Agent's expected utility is then $e_1B - k$. If IG offers the Agent a bribe b and the Agent accepts the bribe, the Agent chooses $(a_1 = 0, a_2 = 0)$ and receives an expected utility of b. It follows that the Agent accepts the bribe b if, and only if, $b \geq e_1B - k$. IG thus chooses between the lowest bribe that the Agent accepts, i.e. $b = e_1B - k$ and $b = 0$. Upon offering $b = e_1B - k$, IG receives a payoff of $u_{IG} - b = u_{IG} - (e_1B - k)$. Upon offering $b = 0$, IG receives a payoff of $(1 - e_1)u_{IG}$. Hence, IG offers $b = e_1B - k$ if, and only if, $u_{IG} \geq B - k/e_1$.

2. Suppose the Principal retains the Agent if, and only if, there is success on both tasks and assume that $e_1e_2B - 2k \geq 0$. Then, if IG does not offer a bribe, the Agent chooses $(a_1 = 1, a_2 = 1)$. The Agent's expected utility is then $e_1e_2B - 2k$. If IG offers the Agent a bribe b and the Agent accepts the bribe, the Agent chooses $(a_1 = 0, a_2 = 0)$ and receives an expected utility of b. It follows that the Agent accepts the bribe b if, and only if, $b \geq e_1e_2B - 2k$. IG thus chooses between the lowest bribe that the Agent accepts, i.e. $b = e_1e_2B - 2k$ and $b = 0$. Upon offering $b = e_1e_2B - 2k$, IG receives a payoff of $u_{IG} - b = u_{IG} - (e_1e_2B - 2k)$. Upon offering $b = 0$, IG receives a payoff of $(1 - e_1)u_{IG}$. Hence, IG offers $b = e_1e_2B - 2k$ if, and only if, $u_{IG} \geq e_2B - 2k/e_1$.

3. Suppose the Principal retains the Agent if, and only if, there is success on at least one task and assume that $e_i(1 - e_j)B - k \geq 0$ for all $i = 1, 2, j \neq i$. Then, if IG does not offer a bribe, the Agent chooses $(a_1 = 1, a_2 = 1)$. The Agent's expected utility is then $(e_1e_2 + e_1(1-e_2) + (1-e_1)e_2)B - 2k$. Note that $e_2(1-e_1)B - k \geq 0$ implies $e_2B - k \geq 0$. Hence, if IG offers the Agent a bribe b and the Agent accepts the bribe, the Agent chooses $(a_1 = 0, a_2 = 1)$ and receives an expected utility of $b + e_2B - k$. It follows that the Agent accepts the bribe b if, and only if, $b + e_2B - k \geq (e_1e_2 + e_1(1-e_2) + (1-e_1)e_2)B - 2k$, i.e. if, and only if, $b \geq e_1(1 - e_2)B - k$. IG thus chooses between the lowest bribe that the Agent accepts, i.e. $b = e_1(1-e_2)B - k$ and $b = 0$. Upon offering $b = e_1(1-e_2)B - k$, IG receives a payoff of $u_{IG} - b = u_{IG} - (e_1(1 - e_2)B - k)$. Upon offering $b = 0$, IG receives a payoff of $(1 - e_1)u_{IG}$. Hence, IG offers $b = e_1(1 - e_2)B - k$ if, and only if, $u_{IG} \geq (1 - e_2)B - k/e_1$.

□

Proposition 13. *On the equilibrium path of play under bundling with IG:*

1. *The Agent chooses* $(a_1 = 1, a_2 = 1)$ *if, and only if, either*

   (a) *the complexity of each task, as well as the value of failure to IG, are sufficiently low,* $e_1 \geq \frac{2k}{e_2B - u_{IG}}$ *and the Principal's estimation of the Agent's competence decreases* *unless the outcome is success on both tasks,* $e_i^H(1-e_j^H) \leq e_i^L(1-e_j^L)$ *for all* $i=1,2, j \neq i$*; or*

(b) *the complexity of each task is moderate and the value of failure to IG is sufficiently low,* $1-\frac{k}{e_2 B} \geq e_i \geq \frac{k}{(1-e_2)B-u_{IG}}$*, and the Principal's estimation of the Agent's competence increases when the outcome is success on at least one task,* $e_1^H(1-e_2^H) \geq e_1^L(1-e_2^L)$*, and* $e_2^H(1-e_1^H F(\check{u}(e_1,e_2))) \geq e_2^L(1-e_1^L F(\check{u}(e_1,e_2)))$*.*

In case (a), the Principal adopts the strict retention rule, in case (b), the moderate retention rule.

2. *The Agent chooses* $(a_1=1, a_2=0)$ *when the complexity on task 1, as well as the value of failure to IG, are sufficiently low,* $e_1 \geq k/(B-u_{IG})$*, and the Principal adopts the* 1^{th}*-task retention rule.*

3. *The Agent chooses* $(a_1=0, a_2=1)$ *when the complexity on task 2 is sufficiently low,* $e_2 > k/B$*, and the Principal retains if* $(o_1=f, o_2=s)$ *and dismisses if* $(o_1=f, o_2=f)$*.*

4. *The Agent chooses* $(a_1=0, a_2=0)$ *if*

   (a) $e_1 < k/(B-u_{IG})$*, and* $e_2 < k/B$*, independent of the Principal's retention rule, or*

   (b) $e_1 < \frac{2k}{e_2 B - u_{IG}}$ *and the Principal adopts the strict retention rule (which requires* $e_i^H(1-e_j^H) \leq e_i^L(1-e_j^L)$ *for all* $i=1,2$*).*

Proof of Proposition 13. 1. From Proposition 1 we know that the Agent chooses to exert effort on both tasks if, and only if, the Principal uses either the strict retention rule or the moderate retention rule.

(a) Suppose the Principal uses the strict retention rule. The Agent then chooses to exert effort on both tasks if, and only if, $e_1 e_2 B - 2k \geq 0$ and IG did not bribe the Agent. From Lemma 3, IG, in turn, does not bribe the Agent if, and only if, $u_{IG} \leq e_2 B - 2k/e_1$ which is equivalent to $e_1 \geq \frac{2k}{e_2 B - u_{IG}} \geq \frac{2k}{e_2 B}$. The conditions under which it is sequentially rational for the Principal to use the strict retention rule are not altered by the possibility of IG influence. The derivation is similar to the one found in the proof of Lemma 1.

(b) Suppose the Principal uses the moderate retention rule. The Agent then chooses to exert effort on both tasks if, and only if, $1-\frac{k}{e_2 B} \geq e_1 \geq \frac{k}{(1-e_2)B}$, and IG did not bribe the Agent. From Lemma 3, IG, in turn, does not bribe the Agent if, and only if, $u_{IG} \leq (1-e_2)B - k/e_1 = \check{u}(e_1,e_2)$ which is equivalent to $e_1 \geq \frac{k}{(1-e_2)B-u_{IG}} \geq \frac{k}{(1-e_2)B}$. When IG bribes the Agent, the Agent chooses $(a_1=0, a_2=1)$ if, and only if, $e_2 B - k \geq 0$. Note that $1-\frac{k}{e_2 B} \geq e_1 \geq \frac{k}{(1-e_2)B}$ implies $e_2 B - k \geq 0$.
We now derive the conditions under which it is sequentially rational for the Principal to use the moderate retention rule given that the Principal believes that the

Agent and IG are best-responding to such a retention strategy. To understand the construction of the beliefs, remember that the Principal is uncertain about the value u_{IG} that IG attaches to policy failure and that u_{IG} is drawn from a distribution function $F(\cdot)$ with full support on the non-negative real line $\mathbb{R}_+$. It follows that the Principal expects the following action profile: with probability $F(\check{u}(e_1, e_2)) \in (0, 1)$ IG does not to bribe the Agent who chooses $(a_1 = 1, a_2 = 1)$, while with probability $(1 - F(\check{u}(e_1, e_2)))$ IG bribes the Agent who then chooses $(a_1 = 0, a_2 = 1)$. We denote $(\mathring{a}_1^F, \mathring{a}_2 = 1)$ these expectations of the Principal about the Agent's actions. We thus have

$$
\begin{aligned}
Pr(\theta &= \theta_H | (o_1 = s, o_2 = s); (\mathring{a}_1^F, \mathring{a}_2 = 1)) = \frac{F(\check{u}(e_1, e_2)) e_1^H e_2^H \pi}{F(\check{u}(e_1, e_2)) e_1^H e_2^H \pi + F(\check{u}(e_1, e_2)) e_1^L e_2^L \pi}, \\
Pr(\theta &= \theta_H | (o_1 = f, o_2 = f); (\mathring{a}_1^F, \mathring{a}_2 = 1)) \\
&= \frac{\left[(1 - e_2^H)(1 - e_1^H F(\check{u}(e_1, e_2)))\right] \pi}{\left[(1 - e_2^H)(1 - e_1^H F(\check{u}(e_1, e_2)))\right] \pi + \left[(1 - e_2^L)(1 - e_1^L F(\check{u}(e_1, e_2)))\right] (1 - \pi)}, \\
Pr(\theta &= \theta_H | (o_1 = s, o_2 = f); (\mathring{a}_1^F, \mathring{a}_2 = 1)) \\
&= \frac{F(\check{u}(e_1, e_2)) e_1^H (1 - e_2^H) \pi}{F(\check{u}(e_1, e_2)) e_1^H (1 - e_2^H) \pi + F(\check{u}(e_1, e_2)) e_1^L (1 - e_2^L) \pi}, \\
Pr(\theta &= \theta_H | (o_1 = f, o_2 = s); (\mathring{a}_1^F, \mathring{a}_2 = 1)) \\
&= \frac{\left[e_2^H - F(\check{u}(e_1, e_2)) e_1^H e_2^H\right] \pi}{\left[e_2^H - F(\check{u}(e_1, e_2)) e_1^H e_2^H\right] \pi + \left[e_2^L - F(\check{u}(e_1, e_2)) e_1^L e_2^L\right] (1 - \pi)}.
\end{aligned}
$$

As in the baseline model, the Principal updates favorably on the type of the Agent upon observing success on both tasks, and negatively upon observing failure on both tasks. Indeed, we have $Pr(\theta = \theta_H | (o_1 = s, o_2 = s); (\mathring{a}_1^F, \mathring{a}_2 = 1)) > \pi$ and $Pr(\theta = \theta_H | (o_1 = f, o_2 = f); (\mathring{a}_1^F, \mathring{a}_2 = 1)) < \pi$, because $e_i^H > e_i^L$ for all $i = 1, 2$. But, the conditions under which the Principal updates favorably upon observing success on one task and failure on another differ from those of the baseline model. While, as in the baseline model, $Pr(\theta = \theta_H | (o_1 = s, o_2 = f); (\mathring{a}_1^F, \mathring{a}_2 = 1)) \geq \pi$ if, and only if, $e_1^H(1 - e_2^H) \geq e_1^L(1 - e_2^L)$, we have $Pr(\theta = \theta_H | (o_1 = f, o_2 = s); (\mathring{a}_1^F, \mathring{a}_2 = 1)) \geq \pi$ if, and only if, $e_2^H(1 - e_1^H F(\check{u}(e_1, e_2))) \geq e_1^L(1 - e_2^L F(\check{u}(e_1, e_2)))$.

2. Suppose the Principal retains if, and only if, $o_1 = s$. The Agent then chooses $(a_1 = 1, a_2 = 0)$ if, and only if, $e_1 B - k \geq 0$ and IG did not bribe the Agent. From Lemma 3, IG, in turn, does not bribe the Agent if, and only if, $u_{IG} \leq B - k/e_1$ which is equivalent to $e_1 \geq \frac{k}{B - u_{IG}} \geq \frac{k}{B}$. The conditions under which it is sequentially rational for the Principal to choose to retain if, and only if, $o_1 = s$ are not altered by the possibility of IG influence. The derivation is similar to the one found in the proof of Lemma 1.

3. Follows directly from Lemmata 1 and 2.

4. (a) Follows directly from Lemmata 1 and 2 and the previous steps in the present

proof.

(b) Suppose the Principal retains the Agent if, and only if, $(o_1 = s, o_2 = s)$, which requires $e_i^H(1-e_j^H) \le e_i^L(1-e_j^L)$ for all $i = 1, 2$, and suppose that $e_1 < \frac{2k}{e_2 B - u_{IG}}$. Then IG bribes the Agent who, consequently, does not exert effort on task 1. But then, as the Principal retains if, and only if, $(o_1 = s, o_2 = s)$, the expected utility to the Agent of exerting effort on task 2 is $-k$. Hence, the Agent does not exert any effort at all.

□

Corollary 2. *From Part 1. (b) of Proposition 13, we get* $\mathcal{M}_{IG} = \{x \in \mathcal{X} | 1 - \frac{k}{e_2 B} \ge e_i \ge \frac{k}{(1-e_2)B}, e_1^H(1-e_2^H) \ge e_1^L(1-e_2^L), e_2^H(1-e_1^H F(\check{u}(e_1,e_2))) \ge e_2^L(1-e_1^L F(\check{u}(e_1,e_2)))\}$.

Proof of Proposition 5. 1. Follows directly from Propositions 1 and 13.

2. Follows directly from Propositions 1 and 13.

3. Remember that from corollary 1, we have $\mathcal{M} = \{x \in \mathcal{X} | 1 - \frac{k}{e_j B} \ge e_i \ge \frac{k}{(1-e_j)B}, e_i^H(1-e_j^H) \ge e_i^L(1-e_j^L)$ for all $i = 1, 2\}$. From corollary 2, we have $\mathcal{M}_{IG} = \{x \in \mathcal{X} | 1 - \frac{k}{e_2 B} \ge e_i \ge \frac{k}{(1-e_2)B}, e_1^H(1-e_2^H) \ge e_1^L(1-e_2^L), e_2^H(1-e_1^H F(\check{u}(e_1,e_2))) \ge e_2^L(1-e_1^L F(\check{u}(e_1,e_2)))\}$. It is easy to see that, because $F(\check{u}(e_1,e_2)) \in (0,1)$ for all (e_1,e_2), $e_2^H(1-e_1^H) \ge e_2^L(1-e_1^L)$ implies $e_2^H(1-e_1^H F(\check{u}(e_1,e_2))) > e_2^L(1-e_1^L F(\check{u}(e_1,e_2)))$. The other conditions in the definition of $\mathcal{M}$ and $\mathcal{M}_{IG}$ are identical. Hence, if $x \in \mathcal{M}$ then $x \in \mathcal{M}_{IG}$ and $\mathcal{M} \subseteq \mathcal{M}_{IG}$.

□

Proof of Proposition 6. 1. Follows directly from arguments given in the text.

2. We first derive $\mathcal{M}_{IG}^T$. By Lemma 2 exerting effort on both tasks is a best response to the moderate retention rule if, and only if, $1 - \frac{k}{e_2 B} \ge e_1 \ge \frac{k}{(1-e_2)B}$. Note also that for any (e_1, e_2) such that this last condition is satisfied there exists $\check{u}_{IG}(e_1,e_2) \ge 0$ such that for all $u_{IG} \le \check{u}_{IG}(e_1,e_2)$ IG does not bribe the Agent. Moreover, by Lemma 1, the Principal uses the moderate retention rule upon observing $(a_1 = 1, a_2 = 1)$ if, and only if, $e_i^H(1-e_j^H) \ge e_i^L(1-e_j^L)$ for all $i = 1, 2, j \ne i$. It follows that $\mathcal{M}_{IG}^T = \{x \in \mathcal{X} | 1 - \frac{k}{e_j B} \ge e_i \ge \frac{k}{(1-e_j)B}, e_i^H(1-e_j^H) \ge e_i^L(1-e_j^L)$ for all $i = 1, 2, j \ne i\}$. Hence, following the steps in the proof of Proposition 5, we have $\mathcal{M}_{IG}^T \subset \mathcal{M}_{IG}$.

□

Proof of Proposition 7. The proof follows from the argument given in the text and the following considerations: Suppose $e_1 B_1 - k \ge 0$. If IG offers A_1 b_u, IG receives a payoff of $u_{IG} - b_u = u_{IG} - e_1 B_1 + k$. If IG offers A_1 $b = 0$, IG receives an expected payoff of $(1-e_1)u_{IG}$. Hence, IG offers b_u if, and only if, $u_{IG} \ge B_1 - k/e_1$. □

Proof of Proposition 8. 1. From subsection 4.2, we know that if $e_1 \ge \frac{e_2 k}{e_2(B-u_{IG})-k}$, there exists (B_1, B_2) such that effort on both tasks can be sustained under unbundling. We now show that if $B > 2k + u_{IG}$, we have $\frac{2k}{e_2 B - u_{IG}} > \frac{e_2 k}{e_2(B-u_{IG})-k}$ for all $e_2 \in \left[\frac{2k+u_{IG}}{B}, 1\right]$. Note that $\frac{2k}{e_2 B - u_{IG}} > \frac{e_2 k}{e_2(B-u_{IG})-k}$ if, and only if, $Q(e_2) := e_2^2 B - e_2(2B - u_{IG}) + 2k < 0$. $\frac{dQ}{de_2} = 2e_2 B - (2B - u_{IG})$. Hence, $Q(e_2)$ is decreasing on $\left[0, 1 - \frac{u_{IG}}{2B}\right]$ and increasing on $\left[1 - \frac{u_{IG}}{2B}, 1\right]$. It follows that the maximum of $Q(e_2)$ on $\left[\frac{2k+u_IG}{B}, 1\right]$ is reached at $e_2 = \frac{2k+u_{IG}}{B}$ or at $e_2 = 1$. Simple algebra shows that, if $B > 2k + u_{IG}$, then $Q(e_2 = \frac{2k+u_{IG}}{B}), Q(e_2 = 1) < 0$. It follows that there does not exist $(e_1^H, e_1^L, e_2^H, e_2^L, \pi, k, B, u_{IG})$ such that effort is exerted on both tasks under bundling and strict incentives, yet effort is not exerted on both tasks under unbundling.

Now choose any $x \in \mathcal{S}$. This requires, in particular, that $1 \geq e_1 \geq \frac{2k}{e_2 B}$. Note that we established in the proof of Proposition 4 that $\frac{2k}{e_2 B} > \frac{e_2 k}{e_2 B - k}$ for all $e_2 \in \left[\frac{2k}{B}, 1\right]$. Hence, there exists (B_1, B_2) such that effort is exerted on both tasks under unbundling for any $x \in \mathcal{S}$. It is easy to see that there exist $\underline{u}_{IG}(e_1, e_2), \overline{u}_{IG}(e_1, e_2) \in [0, e_2 B)$ such that $1 \geq e_1 = \frac{2k}{e_2 B - \underline{u}_{IG}(e_1,e_2)}$ and $1 \geq e_1 = \frac{e_2 k}{e_2(B - \overline{u}_{IG}(e_1,e_2)) - k}$. Because, whenever $B > 2k + u_{IG}$, $\frac{2k}{e_2 B - u_{IG}} > \frac{e_2 k}{e_2(B-u_{IG})-k}$ for all $e_2 \in \left[\frac{2k+u_{IG}}{B}, 1\right]$, we have $\overline{u}_{IG}(e_1, e_2) > \underline{u}_{IG}(e_1, e_2)$. Moreover, as $\frac{2k}{e_2 B - u_{IG}}$ is increasing on $[0, e_2 B]$, we have $e_1 < \frac{2k}{e_2 B - u_{IG}}$ for all $u_{IG} > \underline{u}_{IG}(e_1, e_2)$, which implies that the Agent does not exert effort on both tasks under bundling when $u_{IG} > \underline{u}_{IG}(e_1, e_2)$. Similarly, as $\frac{e_2 k}{e_2(B-u_{IG})-k}$ is increasing in u_{IG}, we have $e_1 \geq \frac{e_2 k}{e_2(B-u_{IG})-k}$ for all $u_{IG} \leq \overline{u}_{IG}(e_1, e_2)$ and effort is exerted on both tasks under unbundling.

2. Assume $x \in \mathcal{M} \cap \mathcal{U}$. Then, by Proposition 13 if the Agent is bribed under bundling he exerts effort on task 2. Hence, for the expected effort to be (weakly) higher on task 2 under unbundling, we need $e_2 B_2 - k \geq 0$, or equivalently $B_2 \geq k/e_2$. By Proposition 7 the bribe that IG needs to pay to A_1 to contract failure is $b_u = e_1 B_1 - k$. The allocation that maximizes b_u, while sustaining $a_2 = 1$ under unbundling is thus $(B_1 = B - k/e_2, B_2 = k/e_2)$. We then have $b_u = e_1(B - k/e_2) - k$. If the Principal uses the moderate retention rule, we have $b = e_1(1 - e_2)B - k$ (see Lemma 3). Simple algebra establishes that $b \geq b_u$ if, and only if, $e_2 \leq \frac{\sqrt{k}}{\sqrt{B}}$. Hence, if $e_2 \geq \frac{\sqrt{k}}{\sqrt{B}}$ and $(B_1 = B - k/e_2, B_2 = k/e_2)$, then IG bribes the Agent either (1) under neither institution, or (2) under both, or (3) under bundling but not under unbundling, which implies that expected effort on task 1 is strictly higher under unbundling. This establishes part 2. (b) of Proposition 8. Now suppose $e_2 < \frac{\sqrt{k}}{\sqrt{B}}$. Then, if $B_2 \geq k/e_2$ IG bribes the Agent either (1) under neither institution, or (2) under both, or (3) under unbundling but not under bundling, which implies that expected effort on task 1 is strictly higher under bundling. If $B_2 < k/e_2$, Agent A_2 does not exert effort on task 2, and expected effort on task 2 is strictly higher under bundling. This establishes part 2. (a) of Proposition 8.

3. Follows from the proofs of propositions 4 and 5.

□

Proof of Proposition 9. Follows from arguments given in the text. □

Proof of Proposition 10. Let e_2^U solve $\frac{e_2 B}{B-u_{IG}} = \frac{e_2\gamma k}{e_2(B-u_{IG})-\gamma k}$. We have $e_2^U = \frac{\gamma k(2B-u_{IG})}{B(B-u_{IG})}$. For all $e_2 < e_2^U$, we have $\frac{e_2 B}{B-u_{IG}} < \frac{e_2\gamma k}{e_2(B-u_{IG})-\gamma k}$. Therefore, for all (e_1, e_2) such that $e_1 = \frac{e_2 B}{B-u_{IG}}$ and $e_2 < e_2^U$ $(a_1 = 1, a_2 = 1)$ cannot be sustained in equilibrium under unbundling. Now let e_2^L and e_2^H be the solutions to $1 - \frac{k(2\gamma-1)}{e_2 B} = \frac{k(2\gamma-1)}{(1-e_2)B-u_{IG}}$. We have

$$e_2^L = \frac{B(B-u_{IG}) - \sqrt{B^2(B-u_{IG})^2 - 4B^2k(2\gamma-1)(B-u_{IG})}}{2B^2}$$

and

$$e_2^H = \frac{B(B-u_{IG}) + \sqrt{B^2(B-u_{IG})^2 - 4B^2k(2\gamma-1)(B-u_{IG})}}{2B^2}.$$

Notice that if $\gamma < \frac{B-u_{IG}}{8k} + \frac{1}{2}$, we have $e_2^L < e_2^H$. Simple algebra also establishes that e_2^L and e_2^H also solve $\frac{e_2 B}{B-u_{IG}} = 1 - \frac{k(2\gamma-1)}{e_2 B}$ and, consequently, $\frac{e_2 B}{B-u_{IG}} = \frac{k(2\gamma-1)}{(1-e_2)B-u_{IG}}$ and that $1 - \frac{k(2\gamma-1)}{e_2 B} > \frac{e_2 B}{B-u_{IG}} > \frac{k(2\gamma-1)}{(1-e_2)B-u_{IG}}$ for all $e_2 \in (e_2^L, e_2^H)$. Hence, for all (e_1, e_2) such that $e_1 = \frac{e_2 B}{B-u_{IG}}$ and $e_2 \in \left[e_2^L, e_2^H\right]$, there exists, following arguments given in the proof of Proposition 4, infinitely many vectors $(e_1^H, e_1^L, e_2^H, e_2^L, \pi)$ for which $(a_1 = 1, a_2 = 1)$ can be sustained in equilibrium under bundling with the Principal using the moderate retention rule.

Simple algebra shows that if $\gamma = 1$ and $B > 4k + u_{IG}$, then $e_2^L < e_2^U$. It follows that if $\gamma = 1$ and $B > 4k + u_{IG}$, there exists infinitely many vectors (e_1, e_2) such that $e_1 = \frac{e_2 B}{B-u_{IG}}$ and $e_2 \in \left[e_2^L, e_2^U\right)$, and for which, therefore, $(a_1 = 1, a_2 = 1)$ can be sustained in equilibrium under bundling, but not under unbundling. Now note that e_2^L and e_2^H are well defined, continuous functions of γ if, and only if, $B^2(B-u_{IG})^2 - 4B^2k(2\gamma-1)(B-u_{IG}) > 0$, i.e. if, and only if, $\gamma < \frac{B-u_{IG}}{8k} + \frac{1}{2}$. Moreover, if $B > 4k + u_{IG}$, we have $\frac{B-u_{IG}}{8k} + \frac{1}{2} > 1$. e_2^U is also a continuous function of γ. By continuity, there exists $\overline{\gamma} > 1$, such that for all $\gamma < \overline{\gamma}$, $e_2^L < e_2^H$ and $e_2^L < e_2^U$, which establishes the result. □

Proof of Proposition 11. Remember that for an equilibrium to exist in which the Agent exerts effort on both tasks under bundling, it must either (1) be the case that $1 - \frac{k(2\gamma-1)}{e_2 B} \geq e_1 \geq \frac{k(2\gamma-1)}{(1-e_2)B-u_{IG}}$ or (2) the case that $e_1 \geq \frac{2\gamma k}{e_2 B-u_{IG}}$. As shown in the proof of Proposition 10, if $\gamma > \frac{B-u_{IG}}{8k} + \frac{1}{2}$ the first case cannot occur. In turn, $(a_1 = 1, a_2 = 1)$ can be sustained in equilibrium under unbundling if, and only if, $1 \geq e_1 \geq \frac{e_2\gamma k}{e_2(B-u_{IG})-\gamma k}$. Notice that $e_1 \geq \frac{2\gamma k}{e_2 B-u_{IG}}$ and $1 \geq e_1 \geq \frac{e_2\gamma k}{e_2(B-u_{IG})-\gamma k}$ can be satisfied if, and only if, $\gamma < \frac{B-u_{IG}}{2k}$. Proceeding as in the proof of Proposition 4, we can show that for all values of (e_1, e_2) such that $1 \geq e_1 \geq \frac{2\gamma k}{e_2 B-u_{IG}}$, we have $\frac{e_2\gamma k}{e_2(B-u_{IG})-\gamma k} < \frac{2\gamma k}{e_2 B-u_{IG}}$ and therefore $1 \geq e_1 > \frac{e_2\gamma k}{e_2(B-u_{IG})-\gamma k}$. Finally, notice that if $B > 2k + u_{IG}$, we have $\frac{B-u_{IG}}{8k} + \frac{1}{2} < \frac{B-u_{IG}}{2k}$. □

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