Reputation and the “need for enemies”

Maxime Menuet, Patrick Villieu

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Abstract

A reputation of competence in solving a particular problem is useful only if the problem remains in the future. Hence, there is an incentive to keep the "enemy" alive: an agent may do wrong in his or her job precisely because he or she is competent. The paper develops this mechanism in a general career concerns framework and shows that a tradeoff between reputation and the need for enemies emerges. As a result, agents are induced to produce only moderate effort, and only moderately skilled agents are likely to be appointed. Implications of the analysis are discussed in a multitasking environment with incomplete transparency. Some evidence in principal-agent relationships and the political arena is presented to illustrate our theory.

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1. Introduction

"Whoever lives to fight an enemy has an interest in keeping the enemy alive"
F. Nietzsche, *Menschliches Allzumenschliches I, 1878, p.531*.

Sometimes, agents are induced not to solve problems to keep their job. Typical examples involve physicians who may overstate the symptoms of their patients to push new drugs (Evans, 1974), lawyers who exacerbate disputes and engage their clients in unnecessary litigations (Gilson and Mnookin, 1994), mechanics who perform unnecessary and costly automobile maintenance or computer scientists who

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produce software with an uneconomically short useful life (according to the planned obsolescence theory, see Bulow, 1986). In political contexts, office-holders can initiate an international crisis to increase their popular support according to the well-known "rally 'round the flag syndrome" (Baker and Oneal, 2001).

The economic literature has identified numerous explanations of such behavior: exploitation of monopoly rents in imperfectly competitive markets, asymmetric information and moral hazard problems (Dulleck and Kerschbamer, 2006), political opportunism, wrong incentive schemes conducive to cheating, conformism to avoid a bad reputation, or incompetence facing highly uncertain environments or difficult problems.

In this paper, we develop the idea that an agent may not complete his job precisely because he is competent. This is notably the case if the agent values his job and cares about his reputation: by accomplishing those tasks for which he was appointed, he may lose his reputational advantage. Standard career concerns models suggest that reputation induces agents to exert effort. However, a reputation of being competent at a problem is useful only if the problem remains in the future. By doing good today and reducing the amount of the residual problem, the agent reduces the need of his services tomorrow. This issue is particularly significant if the agent has specific abilities because he may lose his comparative advantage over potential challengers by completing his objectives. Hence, there is an incentive to keep the "enemies" (i.e., the problems he tackles with expertise) alive: even if he can solve those problems today, the agent has no interest in doing so because he would not be renewed once the problems are solved. Of course, not doing the job today may affect his reputation and the probability to be renewed. This paper attempts to solve the tradeoff between these two conflicting forces: the need to keep enemies alive and the need to preserve reputation.

To formalize this mechanism, we develop an agency model of career concerns based on the seminal contribution of Holmström (1982, 1999). There are two periods. In the first period, an agent (the incumbent) is hired by a principal to carry out a specific task, namely, to solve a problem, or, in our general multitasking framework, a set of problems that are called "enemies". The incumbent produces some effort to "liquidate" (i.e., to solve or to reform) a part of the problem. At the end of the first period, the principal reappoints the incumbent or selects another agent. In the second period, the agent in office can once again liquidate a part of the remaining problem.

Solving problems directly benefits the principal; thus, it is in his interest that the incumbent makes maximum effort. The incumbent has no intrinsic preferences apart from being reappointed; thus, he strategically chooses the level of effort to maximize his chances to be reappointed, net of the cost of effort. The efficiency of effort depends on his competence, which is a combination of his intrinsic ability and an exogenous random shock. As usual in career concerns frameworks, intrinsic abilities are not observable by the principal and the agent.[1] In addition, the principal does not observe the incumbent's effort but only the overall result of reforms (the part of the problem that was eliminated at the first period). According to this observation, the principal bases his reappointment decision on the incumbent's expected competence through a Bayesian inference.

Our results are threefold.

First, regarding the liquidation of a specific problem, the equilibrium level of effort results from the tradeoff between reputation and the need for enemies. By solving a problem further, the incumbent enjoys better perceived competence that induces him to effort (the reputation channel). Simultaneously, the base on which his competence will be effective narrows, which encourages him to leave the problem unsolved (the need for enemies channel). As a result, the incumbent's effort is lower than the principal's interest. Moreover, this tradeoff leads to hump-shaped relationships between, on the one hand, effort and average competence and, on the other hand, effort and the variance of competence. Thus, we suggest a "Goldilocks theorem" for the incumbent's reappointment probability: to maximize his chances, the realized values of competence must be neither too low nor too high.

Second, when considering a multitasking framework, agents may have different abilities to tackle each issue, generating comparative (dis)advantages in the form of average competence gaps between the incumbent and his challengers. The optimal allocation of the incumbent's effort across the whole set of problems crucially depends on these gaps. Without comparative advantage, the incumbent should allocate his efforts according to his own relative abilities only. In the presence of comparative advantages or disadvantages, however, the motivation to keep the enemy alive reappears: the incumbent spends relatively more effort to kill problems that his opponent could tackle with expertise and relatively less effort in areas where he enjoys a comparative advantage.

Third, there is a bell-shaped relationship between transparency – defined as the degree of information available to the principal on the outcome of the agent's effort – and the equilibrium effort level. Indeed, excessive transparency may discourage

[1]At the time he chooses effort, the incumbent does not know the precise intensity of the future problems he will face or the exact competence of his coworkers. Effectively, an agent in a new position may be ignorant of his precise ability, or his success may depend not only on his individual ability but also on the ability of others working with him (see, e.g., Gehlbach, 2006).

effort by inducing competent agents to keep their enemies alive. This situation produces perverse incentives for the incumbent to make salient those issues in which he benefits from a comparative advantage and to keep secret the others. Furthermore, it is in his interest to remove from his agenda those issues that are likely to experience extreme competence shocks.

This paper is at the confluence of two streams of literature: (i) career concerns models and (ii) strategic electoral games.

(i) Our setup adds to the literature asking whether career concerns and reputational considerations can prevent opportunistic behavior by disciplining incumbents. The first generation models of career concerns (Fama, 1980; Holmström, 1982, 1999) focused on beneficial aspects of reputation, namely, mitigating moral hazard in the principal-agent relationship. More recently, several papers highlighted that career concerns can lead to perverse reputation incentives. In some cases, the building of reputation may result in conformism (Scharfstein and Stein, 1990; Prendergast, 1993) or lead to a form of "political correctness" that induces agents to lie in order to not be suspected of being biased (Morris, 2001). Closely related to this idea, Ely and Välimäki (2003) and Ely et al. (2008) show that a good agent may have incentive to choose inappropriate actions that separate him from bad agents to avoid a bad reputation in the future (analogous to a teacher who issues bad marks to everyone, even good students, in order to be distinguished from permissive teachers who issue good grades to everyone).

In our model, the role of career considerations is ambivalent. Similar to first generation models, career concerns motivate the agent to exert effort, even in the absence of explicit contracts (Holmström, 1982, 1999). What is new in our configuration is that the incumbent's career depends both on his reputation (which encourages effort) and on the need for enemies (which discourages effort in areas where the incumbent is relatively competent). If the incumbent would be unable to signal his abilities, the need-for-enemy effect will fully play: it would be in the incumbent's interest to devote zero effort during the first period to solve the problems for which he has a comparative advantage and devote maximal effort to avoid competition on tasks at which he is not particularly skilled. With reputation-building, however, the efforts devoted to the different problems take (in general) intermediate values. Consequently, without reputation concerns, the incumbent is more aligned with the principal's objective (i.e., fully liquidating the problems) in those areas he is deemed *a priori* less competent. In such areas, the reputation channel is bad from the principal's perspective. In areas where the incumbent is relatively skilled, in contrast, the incumbent's reputation concerns benefit the principal, but the need for enemies induces the agent to deviate.

These features can impair the two essential functions of the reappointment scheme, namely, to discipline the incumbent and to select the most competent candidate. Indeed, the need for enemies works against these two missions: the incumbent is induced to produce only moderate effort on tasks he could most easily address, and only moderately skilled agents are likely to be reappointed because agents who turn competent lose their comparative advantage.[2]

(ii) By applying our theory to politics, our paper can also be related to numerous works in which politicians manipulate their policy choices and act against their electors' preferences. In Milesi-Ferretti (1995), e.g., an inflationary government may advocate Central Bank independence to constrain his future discretionary influence and lighten the weight of his bad reputation. In the same vein, Aghion and Bolton (1990) show that a conservative incumbent has an incentive to excessive accumulation of public debt because he can more credibly commit not to default than his opponent. Taking this line of thought further, Persson and Svensson (1989) and Alesina and Tabellini (1990) highlight that, by bequeathing a high debt burden to his possible successor when he expects to be defeated, an incumbent can force his newly elected challenger to pay the bill and prevent him from carrying out his own policies. Close to our results on transparency, Dellis (2009) shows that an incumbent can attempt to manipulate the choice of (endogenous) salient issues to keep a comparative advantage in a deterministic setup without career concerns.

More recently, some papers have suggested that incumbents can pursue policies that are harmful for their own constituents to entrench themselves in office (Levinson and Sachs, 2015; Saint-Paul et al., 2016) or to keep alive an initial electoral advantage (Fergusson et al., 2016). For example, Fergusson et al. (2015) show that clientelistic parties may have incentives to sustain state fragility to preserve a comparative advantage.

Our paper extends and challenges these findings in three directions.

First, we propose a new theoretical explanation of why politicians have an interest in not meeting the expectations of the public without the presence of asymmetric information or partisan (or ideological) differences between voters and politicians.

Second, by building an endogenous reputation channel, our model extends the abovementioned literature that assumes exogenous politicians' credibility. Com-

[2] In a repeated game setting, Schottmüller (2016) also points out that "too competent" agents are likely to be fired because the risk to be removed due to incompetence is negligible, inducing them to pursue their own goals. In our model, agents who are perceived as very competent can be removed, not because their interests are not aligned with the principal's but because they successfully accomplish the required job.

pared with Fergusson et al. (2016), who first introduce the need for enemies in a formal model, we develop a career concerns framework with imperfect information on the incumbent's competence. This approach produces a novel tradeoff between reputation and the need for enemies. In addition, in Fergusson et al. (2016), the incumbent is *a priori* more competent than the challenger at a particular task. In contrast, in our model, the incumbent can build his reputation even if the challenger has the same (or a higher) initial average competence.

Third, by introducing a multitasking environment, we show that it is in the incumbent's interest to eliminate those tasks for which his opponent has a comparative advantage. Reciprocally, challengers, or the incumbent's rival coworkers, have incentives not to deal with these tasks to become inescapable at the time that the reappointment arises. Such mechanisms can apply to a large set of issues that go beyond political frameworks (see section 6).

The remainder of the paper is organized as follows. Section 2 presents the baseline one-task model. Section 3 generalizes the analysis to a multitasking framework, and section 4 presents additional results regarding transparency and the need for enemies. Section 5 extends the model by considering tasks that solve the problems either permanently or transitorily. Section 6 suggests some evidence on the need for enemies, and section 7 concludes.

2. A career concerns setup

Consider an agency model in which a principal wants to delegate to an agent a specific task. There are two periods ($t = 1, 2$), and a set of N agents. At the beginning of the first period, an agent (called the incumbent) is drawn at random from N and is instructed to liquidate some problem. At the end of the first period, the principal has to decide to renew the relationship with the incumbent or to select another agent. The reappointment decision is based upon a voting procedure, reflecting a wide variety of agency contexts where a set of individuals (a selection committee, a general meeting, a population of electors, etc.), acting as the principal, has to renew or not the tenure of an agent (a professor, a manager, a politician, etc.).

The principal has per-period utility $u(p_t)$, where $p_t \geq 0$ is the amount of the problem at time $t \in \{1, 2\}$, and $u(\cdot)$ is a well-defined decreasing utility function. At time t, the action of the agent in office results in solving (or "liquidating") a part l_t of the pending problem, namely,

$$p_t = (1 - l_t)p_{t-1}, \tag{1}$$

where the initial level p_0 is normalized to unity.[3]

In the first period, the liquidation l_1 depends both on the agent's effort (e) and a noisy signal of his talent (z)

$$l_1 =: l = ze. \tag{2}$$

Following Holmström (1982, 1999), the signal z depends on two terms:

$$z := \epsilon + \eta,$$

where η is the agent's intrinsic competence (or ability), and ϵ is an error term that is assumed to be normally distributed with zero mean, fixed variance V^{ϵ}, independent over time, and independent of η.[4] As usual in career concerns models, the agents and the principal are uncertain about the agents' competence η. The common belief on η has a normal distribution, with mean $\bar{\eta} \in (0,1)$ and variance $V^{\eta} < \bar{\eta}$.[5]

In the second period, the outcome l_2 simply depends on the competence of the agent who will be in place. Competence is assumed to be a permanent feature: the incumbent with competence η in period 1 retains that level of competence in period 2, if renewed. If not, a new agent is appointed with competence following the common belief $\eta \backsim \mathcal{N}(\bar{\eta}, V^{\eta})$. Thus, expected liquidation in period 2 is $\mathbb{E}[l_2|l] = \tilde{\eta}$ if the incumbent is reappointed, where $\tilde{\eta} := \mathbb{E}[\eta|l]$ is the expected incumbent's competence conditional on the first period liquidation, or $\mathbb{E}[l_2] = \bar{\eta}$ if another agent is chosen, where $\bar{\eta}$ is the unconditional expectation of competence.

In this setup, the agent is induced to make effort (e) in the first period to pose as competent. He incurs a cost of effort $c(e)$, where $c(\cdot)$ is a well-defined convex function. Thus, he will choose the level of effort to maximize his chances of keeping his job net of the cost of effort.

[3] In Eq. (1), problems are liquidated once and for all. As it will clearly appear, the need for enemies comes from the fact that problems can be solved permanently. This feature is well captured by our multiplicative setup, but this would also be the case with an additive setup, e.g., $p_t = p_{t-1} - l_t$, without qualitative change in our results. Section 5 addresses the issue of the optimal allocation of effort between tasks that permanently or only transitorily affect the problems.

[4] As highlighted by Bénabou and Tirole (2006), "*normality yields great tractability at the cost of allowing certain variables to take implausible negative values*" (p. 1660). In our model, liquidation is not restricted to take positive values ($l \in \mathbb{R}$). Indeed, in some circumstances, the incumbent can be induced to increase the problem (i.e., $l < 0$), or shocks can result in excess liquidation with respect to the principal's objective (i.e., $l > 1$). However, by assuming small variances, the plausibility of such events can be made as low as possible. In addition, as we will see, the equilibrium effort is such that $\mathbb{E}[l] < 1$.

[5] The principal and the agent have the same information on the equilibrium path. This simplifies the analysis by eliminating the possibility of multiple equilibria, in contrast to signaling approaches. For an extensive discussion, see Martinez (2008). In conformity with footnote 4, we assume throughout the paper that the variance of competence is small (formally, $V^{\eta} < \bar{\eta}$).

The timing of events is as follows.

1. **Period 1.** The incumbent chooses effort e, which is unobserved by the principal, without knowing his own competence η or the noise term ϵ.

2. The incumbent's competence η and the error term ϵ are realized (but not observed by the principal), which together with the incumbent's effort determines the amount of the problem solved in period 1 (which is observed by the principal).

3. The principal decides whether to keep or not the incumbent. If the incumbent is renewed, his competence remains η. In the opposite case, a new agent is appointed whose competence is drawn from distribution $\mathcal{N}(\bar{\eta}, V^{\eta})$.

4. **Period 2.** The newly appointed agent can undertake a second phase of liquidation, and the game ends.

As usual, we look for the perfect Bayesian equilibrium and solve the model by backward induction. The reappointment probability is a random event related to the realization z. Since the incumbent's competence is unknown at the time he chooses effort e, his goal is to maximize the expectation (over z) of his reappointment probability, net of the cost of effort $c(e)$.

2.1. The (re)appointment process

At the end of period 1, the principal bases his reappointment decision on the expected second-period utility, taking into account the observed amount of liquidation (l), the prior average competence of all candidates ($\bar{\eta}$), and psychological factors. Let us assume that the principal is risk neutral, and has a linear per-period utility $u(p_t) = \bar{u} - p_t$, with $\bar{u} \geq 0$ a scale parameter. If the incumbent is reappointed, the principal's expected second-period payoff is

$$\bar{u} - \mathbb{E}[p_2|l] + \theta, \tag{3}$$

where θ is a psychological bias, reflecting the incumbent's "popularity".[6] A positive value of θ implies that the principal has a bias in favor of the incumbent (possibly due to dismissal costs), whereas a negative value means a psychological preference for change. To obtain a simple closed-form solution, we assume θ to be a random variable, constant over time, independent of η and ϵ, and uniformly distributed on

[6] In a political context, θ would reflect the ideological bias of voters, for example.

$[-1/2s, 1/2s]$, with density $s > 0$. As $p_2 = (1 - l_1)(1 - l_2)$, with $l_1 = l$ and $l_2 = \eta$, the payoff (3) is written as

$$\bar{u} - (1 - l)(1 - \tilde{\eta}) + \theta.$$

If the incumbent is replaced, the principal's second-period payoff is simply

$$\bar{u} - (1 - l)(1 - \bar{\eta}).$$

The reappointment probability is then

$$\mu = \mathbb{P}\left\{\bar{u} - (1 - l)(1 - \tilde{\eta}) + \theta > \bar{u} - (1 - l)(1 - \bar{\eta})\right\},$$

hence,[7]

$$\mu = \frac{1}{2} + s(1 - l)(\tilde{\eta} - \bar{\eta}). \tag{4}$$

The reappointment probability depends on the expected level of the problem in the second period, which is proportional to the perception of the incumbent's competence $(\tilde{\eta} - \bar{\eta})$. However, the advantage of being perceived as competent depends on the remaining part of the problem $(1-l)$. Consequently, if the incumbent is viewed as competent $(\tilde{\eta} > \bar{\eta})$, he has no interest to fully solve the problem in the first period. Indeed, if $l = 1$, the reappointment probability is simply $1/2$, and the incumbent will lose the benefit to pose as competent. In this way, engaging in full liquidation would, for the incumbent, be akin to "shoot himself in the foot".[8]

2.2. Bayesian revision

The principal computes the estimate $\tilde{\eta}$ of the incumbent's competence using a two-step process.

In the first step, he formulates a conjecture about the incumbent's strategy.[9] In perfect Bayesian equilibrium, the principal anticipates the incumbent's strategy

[7] There is an interior solution, provided that $s < \bar{s} := 1/2\sigma\bar{\eta}$ (see Appendix A).

[8] This feature arises since problems are assumed to be solved once and for all. Liquidation thus corresponds to "reforms" that attempt to solve problems permanently or structurally. However, our setup can easily be extended to including exogenous shocks that make problems revive in the second period. Suppose, for example, that a random shock (ζ) affects the amount of inherited problem at $t = 2$, namely, Eq. (1) becomes $p_2 = (1 - l_2)(p_1 + \zeta)$. Here, liquidation is no longer permanent: even if $p_1 = 0$, the problem can revive through a positive realization of ζ. In this case, there is an additional gain to solve the problem, as the incumbent can be reappointed even if he has fully accomplished his job, but our analysis (and especially the tradeoff between reputation and the need for enemies) is qualitatively unchanged (see Appendix B).

[9] The incumbent's and principal's strategies can be written as functions of their beliefs. As they are symmetrically informed about competence, their beliefs coincide in equilibrium, as usual in career concerns models.

e, and given this belief, the incumbent will play exactly this strategy. Let the principal's conjecture regarding the incumbent's effort be $\tilde{e} > 0$ (the case $\tilde{e} = 0$ is discussed in Appendix A). Given observed liquidation l, the incumbent can infer the corresponding value of z by

$$\tilde{z} = \eta + \epsilon = \frac{l}{\tilde{e}}. \tag{5}$$

The second step is a standard signal-extraction problem: the incumbent infers the competence η given the noisy signal $\tilde{z}$ and the prior $\eta \sim \mathcal{N}(\bar{\eta}, V^{\eta})$. Under the assumption of normality, the posterior belief will also be normal. Hence, following the standard normal updating formula

$$\eta |\ \tilde{z} \sim \mathcal{N}\left((1-\sigma)\bar{\eta} + \sigma\tilde{z}, 1/V^{\epsilon} + 1/V^{\eta}\right),$$

where $\sigma := V^{\eta}/V^{z}$, and $V^{z} := V^{\epsilon} + V^{\eta}$.

By (5), returning to original notations (since taking expectations conditional on $\tilde{z}$ or l is formally equivalent), the estimate of the incumbent's competence is a weighted-average of the prior ($\bar{\eta}$) and the signal ($\tilde{z}$),

$$\tilde{\eta} = (1-\sigma)\bar{\eta} + \sigma\frac{l}{\tilde{e}}. \tag{6}$$

By reintroducing in Eq. (4), we observe that the first-period liquidation increases the incumbent's perceived competence ($\tilde{\eta}$) but reduces the remaining problem in the second period $(1-l)$. This results in a tradeoff between the reputation and the need for enemies that we detail in the following subsection.

2.3. The tradeoff between reputation and the need for enemies

For the sake of clarity, let us first suppose that the incumbent can directly choose the amount of liquidation l (this is not the case because he can only choose his effort e, but the interpretation is similar, as we will show below).

By (4) and (6), the impact of liquidation on the chances of the incumbent is

$$\left.\frac{\mathrm{d}\mu}{\mathrm{d}l}\right|_{\tilde{e}} = s[\underbrace{(1-l)\frac{\sigma}{\tilde{e}}}_{\mathscr{R}} - \underbrace{(\tilde{\eta}-\bar{\eta})}_{\mathscr{N}}]. \tag{7}$$

When the incumbent solves a problem further, he increases his perceived competence, which is beneficial in proportion to the remaining problem. This is the reputation effect ($\mathscr{R}$). Furthermore, the more a problem is solved, the less the principal cares about the competence gap between candidates, which is bad news for the incumbent if he is more competent than the mean of possible candidates. This is the need for enemies effect ($\mathscr{N}$).

More precisely, the term $\mathscr{R}(l) = \sigma(1-l)/\tilde{e}$ represents the marginal gain from reputation. Through this channel, an increase in liquidation (l) enhances the incumbent's chances ($\mathscr{R}(l) \geq 0$) but reduces the marginal gain ($\mathscr{R}'(l) \leq 0$). Indeed, by liquidating in the first period, the incumbent reduces the residual problem, which is the support of the reputation channel. Clearly, the marginal gain of reputation positively depends on the relative weight of the signal (σ), which increases the potential for manipulation. It also negatively depends on the principal's beliefs about the incumbent's effort ($\tilde{e}$), as an agent who devotes much effort to solve a problem is not expected to be skilled at this task.

The term $\mathscr{N}(l) = \tilde{\eta} - \bar{\eta}$ represents the marginal gain from keeping the enemy alive. If the incumbent is perceived as more competent than average, he will more likely be reappointed to solve the residual problem: the greater the incumbent's competence is, the higher the benefits of keeping problems alive. As $\tilde{\eta} = (1-\sigma)\bar{\eta} + \sigma l/\tilde{e}$, the need for enemies positively depends on the amount of liquidation undertaken before the election.

Figure 1 depicts the tradeoff between reputation and the need for enemies. The amount of reform $\hat{l}$ that maximizes the reappointment probability cancels out (7), at the crossing point of $\mathscr{R}(l)$ and $\mathscr{N}(l)$. There is one interior solution $\hat{l} \in [0,1]$ provided that $\bar{\eta} \in [0, 1/\tilde{e}]$.

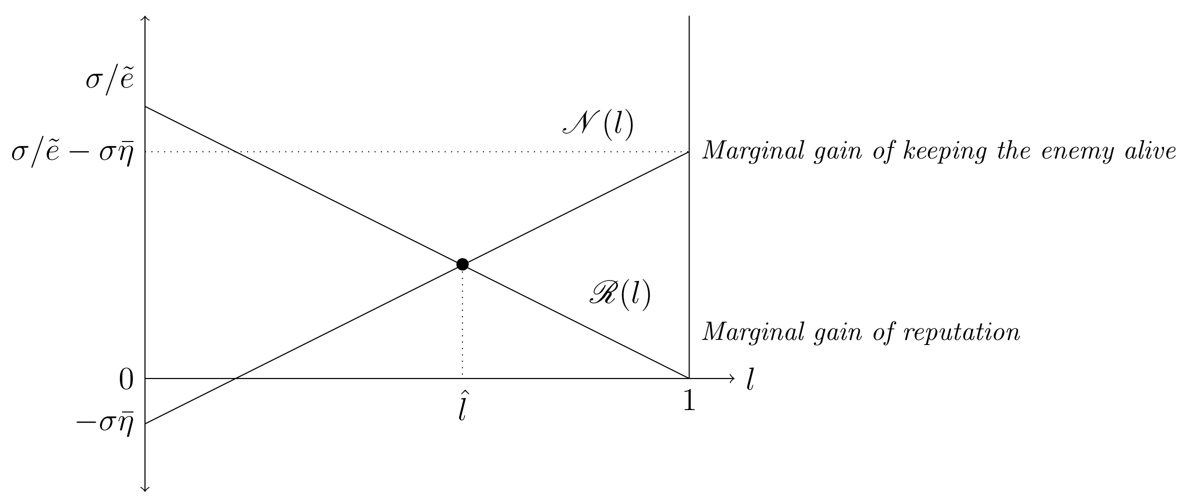

Figure 1: The tradeoff between reputation and the need for enemies

Nevertheless, this analysis is only preliminary, as the incumbent cannot directly choose the actual amount of liquidation l (which depends on the signal z) but only the effort e. Subsection 2.5 determines the optimal choice of effort, while the following subsection assesses the effect of z.

2.4. A "Goldilocks" theorem

According to the above subsection, depending on parameters, partial liquidations ($l \in (0,1)$) are likely to maximize the incumbent's reappointment probability. As liquidation is the product of the incumbent's effort and competence, we can infer that, for being renewed, competence must be neither too small nor too large.

Proposition 1. *("Goldilocks theorem") Ceteris paribus, the chances of the incumbent are maximized when the signal z is neither "too high" nor "too low".*

Proof. Using (4) and (6), since $l = ze$, we compute[10]

$$\frac{1}{\sigma s}\frac{\partial \mu}{\partial z} = e\left\{\frac{1}{\tilde{e}} - 2z\left(\frac{e}{\tilde{e}}\right) + \bar{\eta}\right\} = 0. \tag{8}$$

With $\tilde{e} > 0$, we have $\partial^2\mu/\partial z^2 = -2s\sigma e^2/\tilde{e} < 0$. Therefore, there is a positive critical value $\hat{z}$ that maximizes μ, namely,

$$\hat{z} = \frac{1}{2}\left(\frac{1+\tilde{e}\bar{\eta}}{e}\right). \qquad \square \tag{9}$$

Proposition 1 shows that the principal's interest and the incumbent's objective can diverge. Indeed, the incumbent's chances are maximized for intermediate realizations of z, while liquidation, which benefits the principal, positively depends on z. Furthermore, as the signal z reflects both the incumbent's personal competence (η) and random shocks affecting the efficiency of his efforts (ϵ), proposition 1 also illuminates the role of the random environment facing the incumbent. If the incumbent is perceived as "very skilled" (namely, if $z > \hat{z}$, which is the case if the realization of ϵ is high), the amount of liquidation will be "involuntarily" high, thus reducing his chances. Conversely, if the signal is "low" ($z < \hat{z}$), possibly because the realization of ϵ is small, the actual amount of liquidation will decline, worsening his reputation. In both cases, the chances of the incumbent will be low. Thus, the reappointment probability is maximized when the signal of the competence is neither too high nor to low.

Let us now consider the incumbent's optimal effort decision.

[10] In equilibrium, the incumbent's effort is deterministic. As detailed in the following subsection, equilibrium effort only depends on the expectation of z (namely, $\mathbb{E}[z] = \bar{\eta}$), and not on particular realizations of z. Thus, we can examine how changes in the signal z impact the reappointment probability for a given effort level e.

2.5. Equilibrium effort

In the first period, the incumbent chooses the level of effort that maximizes the expected reappointment probability, net of the cost of effort. His expected payoff is

$$W = \mathbb{E}[\mu] - c(e), \tag{10}$$

where the operator $\mathbb{E}[\cdot]$ is the expectation over the random variable z.

We characterize the incumbent's equilibrium effort by a two-step procedure.

(i) First, the optimal effort strategy (e^*) is computed using the first-order condition of the maximization problem (10), for the conjecture $(\tilde{e})$ used by the principal. The strict concavity of the payoff (W) ensures the uniqueness of the optimal strategy $e^*(\tilde{e})$.

The first-order condition is

$$\frac{\partial \mathbb{E}[\mu]}{\partial e} = s\mathbb{E}[\underbrace{z(1-l)\frac{\sigma}{\tilde{e}}}_{\mathscr{R}} - \underbrace{z(\tilde{\eta} - \bar{\eta})}_{\mathscr{N}}] = c'(e). \tag{11}$$

Eq. (11) is directly comparable to Eq. (7) without endogenous effort choice. The optimal strategy is to equalize the expected net marginal gain of effort with its marginal cost $(c'(e))$. The former is defined, as in optimality condition (7), by the difference between the marginal gain from reputation $(\mathscr{R})$ and the marginal gain from keeping the enemies alive $(\mathscr{N})$, now weighted by the marginal effect of effort on the liquidation amount (z).

(ii) Second, to find the optimal effort strategy, we have to solve a standard fixed-point problem: the conjecture used by the principal $(\tilde{e})$ must coincide with the effort implemented by the incumbent in equilibrium (e), namely, $\tilde{e} = e^*(\tilde{e})$. The following proposition shows that there is a unique fixed point that ensures the existence of a unique equilibrium effort $e^* \in (0, 1/\bar{\eta})$.

Proposition 2. *There is a unique equilibrium effort, which satisfies the following relation*

$$e^* = \frac{s\sigma\bar{\eta}}{\omega + c'(e^*)} < 1/\bar{\eta}, \tag{12}$$

where $\omega := s\sigma\{2\mathbb{E}[z^2] - \bar{\eta}^2\} = s\sigma\{\bar{\eta}^2 + 2V^z\}$.

Proof: See Appendix A.

From Eq. (12), equilibrium effort negatively depends on the marginal cost and on the term ω, which describes the impact of the need-for-enemies channel. This term highlights the dual effect of the signal z, which simultaneously enhances the probability of being perceived as competent and reduces the residual amount of the problem. This dual effect (measured by the second-order moment of z in ω) reduces the marginal gain of effort because the marginal gain from reputation decreases while the marginal gain from keeping enemies alive increases.[11] This effect echoes the "Goldilocks theorem" of subsection 2.4 (the incumbent has little incentive to exert effort when the realizations of z are either very high or very low).

In addition, equilibrium effort increases when performances are relatively more informative (in the sense that the variance of the measurement error decreases relative to the variance of competence, i.e., σ increases), in accordance with the typical finding in moral hazard models (better inference about effort improves incentives for performance). However, two noteworthy features of Eq. (12) deserve to be highlighted, as they are at odds with standard career concerns models. We address these features in the following proposition.

Proposition 3. *The average ($\bar{\eta}$) and the variance (V^η) of the incumbent's competence exert a nonlinear effect on equilibrium effort. Namely, there are critical values $\hat{\eta} > 0$ and $\hat{V}^\eta > 0$, such that*

$$\frac{\partial e^*}{\partial \bar{\eta}} > 0 \Leftrightarrow \bar{\eta} < \hat{\eta} := \sqrt{2V^z + \frac{c'(e^*)}{s\sigma}} \text{ and } \frac{\partial e^*}{\partial V^\eta} > 0 \Leftrightarrow V^\eta < \hat{V}^\eta := \sqrt{\frac{c'(e^*)V^\epsilon}{2s}}.$$

Proof: See Appendix A.

First, there is a bell-shaped curve between average competence and equilibrium effort. Effort is maximal at $\bar{\eta} = \hat{\eta}$, such that the inducement to reform is higher for intermediate values of average competence than for extreme values. This feature corresponds to the "Goldilocks theorem", albeit formulated here in terms of average competence, in place of signal. This nonlinearity contrasts with the finding of multiplicative-normal career concerns models (see, e.g., Dewatripont et al., 1999; Holmström, 1999), in which equilibrium effort positively depends on average talent.[12]

Second, there is also a nonlinear relationship between the variance of the incumbent's competence and the equilibrium effort, with a threshold at $\hat{V}^\eta$. Such a finding conflicts with standard career concerns models, which consider reputation

[11] Effectively, in equilibrium ($e = \tilde{e}$), we find from Eq. (11): $\mathbb{E}[\mathscr{R}] = \sigma\bar{\eta}/\tilde{e} - \sigma\mathbb{E}[z^2]$, and $\mathbb{E}[\mathscr{N}] = \sigma\mathbb{E}[z^2] - \sigma\bar{\eta}^2$.

[12] In additive-normal career concerns models, average reputation has no impact on effort, due to linearity. In multiplicative career concerns specifications, effort positively depends on average competence, except in "strong multiplicative" contexts, possibly associated with multiple equilibrium solutions (Dewatripont et al., 1999).

only. In these models, higher uncertainty on abilities, by increasing the incumbent's opportunities for manipulation, improves his incentive to exert effort; hence, a positive association between the variance of competence and equilibrium effort. In our setup, this mechanism also operates. However, higher uncertainty increases not only the likelihood that the incumbent will be perceived as competent but also the likelihood that he is truly skilled and will effectively destroy many "enemies". This leads to the threshold $\hat{V}^{\eta}$. Below the threshold, the incumbent's willingness to signal his competence prevails, while above the threshold, the desire to keep enough problems alive predominates.

Finally, as a matter of benchmark, we can establish the following result.

Proposition 4. *At equilibrium, the incumbent's effort is lower than the principal's interest.*

Proof. The principal's expected inter-temporal welfare is $U = \mathbb{E}[u(p_1) + u(p_2)] = 2\bar{u} - (1 - \bar{\eta}e) - \mathbb{E}[(1 - ze)(1 - \eta)]$. We can easily derive that $\partial U/\partial e \geq 0$;[13] thus, it is in the principal's interest that the incumbent provides as high effort as possible. If we restrict the expected level of the problem to take positive values (i.e., $\mathbb{E}[l] \leq 1$), the principal's expected utility is maximized for $e = 1/\bar{\eta}$, namely, at $\mathbb{E}[l] = 1$. However, proposition 2 shows that $e^* < 1/\bar{\eta}$; hence, the incumbent never implements the principal's optimum. □

In the lines of proposition 4, the selection procedure is inconsistent with the principal's interest. Indeed, the principal wants to appoint competent agents (as expected liquidation positively depends on average competence),[14] while the appointment process selects moderately competent agents, in accordance with our Goldilocks theorem.

Effort choice is suboptimal for two reasons: (i) the principal does not internalize the agent's effort cost, and (ii) there is a dynamic disincentive due to the need for keeping the enemies alive. Note that, even without cost ($c' = 0$ in Eq. 12), we have $e^* < 1/\bar{\eta}$. In this way, considering an alternative benchmark for social welfare, such that a utilitarian criterion, the suboptimality of the agent's effort, still holds.[15]

Corollary 1. *At equilibrium, the incumbent's effort is lower than the effort implemented by the utilitarian-social-planner.*

[13] We obtain $\partial U/\partial e = 2\bar{\eta} - \mathbb{E}[z\eta] = \bar{\eta}(2 - \bar{\eta}) - V^{\eta} > \bar{\eta}(1 - \bar{\eta}) \geq 0$, as $V^{\eta} < \bar{\eta} \leq 1$.

[14] In equilibrium, $\mathbb{E}[l] = \bar{\eta}e^* = s\sigma\bar{\eta}^2/(\omega + c'(e^*))$, implying that $\partial\mathbb{E}[l]/\partial\bar{\eta} \geq 0$.

[15] We thank an anonymous referee for suggesting this issue.

Proof. The utilitarian-social-planner maximizes the sum of the agent's and principal's expected payoff, namely, $\max_e S$, where $S = U + W$, $U = \mathbb{E}[u(p_1)] + \mathbb{E}[u(p_2)]$, and $W = \mathbb{E}[\mu] - c(e)$. The first-order derivative is $\partial S/\partial e = \partial U/\partial e + \partial W/\partial e$.[16] From proposition 4, we have $\partial U/\partial e = \eta(2 - \bar{\eta}) - V^{\eta} > 0$; hence, $\partial S/\partial e > \partial W/\partial e$. Consequently, the critical point e^{sp} such that $\partial S/\partial e = 0$, must satisfy, using Eq. (C.10),

$$e^{sp} = \frac{s\sigma\bar{\eta}}{\omega + c'(e^{sp}) - \partial U/\partial e}. \tag{13}$$

It follows that $e^{sp} > e^*$. □

The equilibrium solution (Eq. 12) is still characterized by an under-provision of effort compared with the utilitarian-social-planner's perspective. Indeed, the social planner internalizes the principal's payoff, which unambiguously positively depends on effort.

Notice that our setup is implicitly based on a fixed wage contract, which is why the agent simply wants to maximize the reappointment probability. This context corresponds to usual career concern frameworks suggesting that incentive problems can be solved by reputation forces without the need of explicit contracts (Fama, 1980; Holmström, 1999). This feature can reflect many real agency relationships, in which explicit contracts cannot be implemented; for example, voters cannot directly pay the politician in office according to his performance, and doctors are in general not paid according to the health of their patients. However, we can imagine the hypothetical case in which the principal can offer a performance-based contract to the agent, where the remuneration depends on liquidation. In our model, this would mean that the incumbent enjoys an extra bonus at the first period (αl), where α denotes a linear performance bonus. Such a feature would not qualitatively change our results, and the tradeoff between reputation and the need for enemies would still hold. The only change would be that the equilibrium effort would be higher. Indeed, we can deduce that $e^* = s\sigma\bar{\eta}/[\omega + c'(e^*) - \alpha\bar{\eta}]$. In this way, the disincentive to supply high effort levels can be mitigated by sufficiently high performances bonuses. The underprovision of effort compared to the optimal level could even be removed with a very high performance bonus, such that $\alpha\bar{\eta} \geq c'(\cdot)$. However, from the principal's perspective, this kind of contract involves some costs. Finding an optimal bonus that solves the tradeoff between these costs and the agent's extra effort would be

[16] The second-order condition is satisfied since $\partial^2 S/\partial e^2 = \partial U^2/e^2 + \partial^2 W/\partial e^2$, $\partial U^2/\partial e^2 = 0$, and $\partial^2 W/\partial e^2 < 0$.

an interesting exercise that we leave open for future research.

The following section extends our results to a multitasking framework.

3. A multitasking framework

In the analysis above, an anonymous agent is selected among a set of individuals to solve a unique problem. However, many situations involve a competition between different candidates with intrinsic abilities in solving a wide variety of problems. In political contexts, for example, various parties compete in election times, each one having stronger credentials in some policy area in the voter's eyes. In this section, we reassess the tradeoff between reputation and the need for enemies in a multitasking environment. We extend the preceding framework in two directions. First, the principal delegates to an agent the liquidation of k problems (indexed by i). Second, the agents have individual-specific abilities. For the sake of simplicity, we consider only two types of candidates (R and D) and suppose, without loss of generality, that the incumbent has type R and the challenger has type D.

Similar to the preceding section, the incumbent reduces a part $l_{1,i}$ of problem i in the first period. The level of problem i is then, at $t = 1$, $p_{1,i} = 1 - l_{1,i}$, and, at $t = 2$, $p^R_{2,i} = p_{1,i}(1 - l^R_{2,i})$ if the incumbent is renewed or $p^D_{2,i} = p_{1,i}(1 - l^D_{2,i})$ if his challenger is appointed.

The incumbent and the challenger have different abilities η^R_i and η^D_i.[17] By keeping the same notations, the liquidation is, in the first period, $l_i = z_i e_i = (\epsilon_i + \eta^R_i)e_i$, and, in the second period, $l^j_i = \eta^j_i$ if candidate $j \in \{R, D\}$ is appointed. The shocks ϵ_i are i.i.d. Gaussian random variables, independent over problems, with zero mean and variance V^ϵ_i. The common belief about candidate j's competence to solve problem i is still normally distributed, with mean $\bar{\eta}^j_i$ and variance V^η_i. Following the Bayesian revision procedure of section 2 (see Eq. (6)), the principal's expectation over the incumbent's competence is

$$\mathbb{E}[\eta^R_i | l_i] = \tilde{\eta}^R_i = (1 - \sigma_i)\bar{\eta}^R_i + \sigma_i \frac{l_i}{\tilde{e}_i}, \tag{14}$$

where $\tilde{e}_i$ is the principal's conjecture on the incumbent's effort and $\sigma_i := V^\eta_i/(V^\eta_i + V^\epsilon_i) = V^\eta_i/V^z_i$.

Assuming that the principal's utility is linear and additive across problems, namely, $u(p_{t,1}, ..., p_{t,k}) = \sum_{i=1}^k u(p_{t,i})$, with $u(p_{t,i}) = \bar{u} - p_{t,i}$, the reappointment

[17] Our argument is not based on an absolute advantage for an agent in addressing some problem but on the notion of comparative advantage, i.e., it is possible to assume that $\bar{\eta}^R_i \leq \bar{\eta}^D_i$, $\forall i \in \{1, \cdots, k\}$.

probability is written as

$$\mu = \frac{1}{2} + s\sum_{i=1}^{k}(1-l_i)(\tilde{\eta}_i^R - \bar{\eta}_i^D). \tag{15}$$

Let us now detail how the tradeoff between reputation and the need for enemies is amended. As before, we consider as a first step the impact of the liquidation (l_i) on the reappointment probability; then, we compute the optimal incumbent's effort. By (14) and (15), it follows that

$$\left.\frac{\mathrm{d}\mu}{\mathrm{d}l_i}\right|_{\tilde{e}_i} = s[\underbrace{(1-l_i)\frac{\sigma_i}{\tilde{e}_i}}_{\mathscr{R}} - \underbrace{\left(\tilde{\eta}_i^R - \bar{\eta}_i^D\right)}_{\mathscr{N}}]. \tag{16}$$

Compared to the single-tasking framework (7), the marginal gain of reputation is unchanged ($\mathscr{R}(l_i) = (1-l_i)\sigma_i/\tilde{e}_i$). In contrast, the marginal gain from keeping the enemy alive now depends on two effects $\mathscr{N}(l_i) = \left(\tilde{\eta}_i^R - \bar{\eta}_i^D\right) = (\tilde{\eta}_i^R - \bar{\eta}_i^R) + (\bar{\eta}_i^R - \bar{\eta}_i^D)$. By not addressing problems in the first period, the incumbent takes advantage: (i) of being perceived as more competent than average type R agents (provided that $\tilde{\eta}_i^R > \bar{\eta}_i^R$), which induces the principal to retain such a skilled incumbent; and (ii) of the reputation of type R agents to be, on average, more competent than type D agents (if $\bar{\eta}_i^R > \bar{\eta}_i^D$), which reduces the chances of the challenger.[18] The first effect is similar to the previous section, but the second is new: as the agents have individual-specific competence, the incumbent benefits from a comparative advantage or disadvantage in solving problem i ($\Delta_i = \bar{\eta}_i^R - \bar{\eta}_i^D$). This term measures the average competence gap between the incumbent and the opponent in the principal's priors.

The new tradeoff between reputation and the need for enemies is depicted in Figure 2. Without comparative advantage ($\Delta_i = 0$), the tradeoff is unchanged compared to Figure 1. By contrast, the incumbent reduces liquidation (from $\hat{l}$ to $\hat{l}'$) in problems in which he benefits from a comparative advantage ($\Delta_i > 0$), and increases liquidation (from $\hat{l}$ to $\hat{l}''$) in problems in which his challenger enjoys a comparative advantage ($\Delta_i < 0$). As the result, the incumbent is encouraged to undertake more liquidation in areas in which his expertise is relatively low. This feature directly results from the need for enemies.

[18] Of course, these arguments are reversed for problems such that $\tilde{\eta}_i^R < \bar{\eta}_i^R$ or $\bar{\eta}_i^R < \bar{\eta}_i^D$.

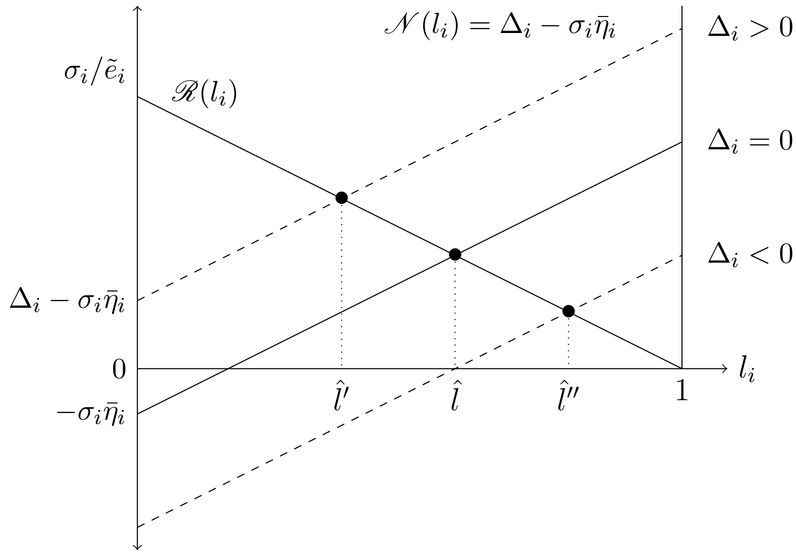

Figure 2: The tradeoff between reputation and the need for enemies with comparative advantages

Regarding the first period equilibrium, in the presence of several tasks, the incumbent has to allocate his total effort ($e = \sum_{i=1}^{k} e_i$) across the different problems. He chooses the set of efforts $\{e_i\}_{i=1}^{k}$ to maximize the expected probability of reappointment, net of the cost of effort, namely,

$$W = \mathbb{E}[\mu] - c(e), \text{ subject to } e := \sum_{i=1}^{k} e_i.$$

The equilibrium strategy follows the two-step procedure described in section 2, as stated in the following proposition.

Proposition 5. *There is a critical level* $\underline{\Delta}_i > 0$*, such that, if* $\Delta_i > -\underline{\Delta}_i$*, there is a unique equilibrium effort* $e_i^* \in (0, 1/\bar{\eta}_i^R)$*.*

Proof. According to the optimality condition (12), Appendix C shows that the equilibrium effort level e_i^* satisfies

$$e_i^* = \frac{s\sigma_i\bar{\eta}_i^R}{\tilde{\omega}_i + c'(e^*)}, \ \forall i \in \{1, \cdots, k\},$$

where $e^* = \sum_{i=1}^{k} e_i^*$, $\tilde{\omega}_i := s\bar{\eta}_i^R\Delta_i + \omega_i$ and $\omega_i = s\sigma_i\{(\bar{\eta}_i^R)^2 + 2V_i^z\}$. □

The equilibrium effort devoted to problem i negatively depends on the marginal cost ($c'(e^*)$), since one unit of effort dedicated to problem i draws off one unit of the total amount of effort, and on the term $\tilde{\omega}_i$ that still describes the need-for-enemies channel. The term $\tilde{\omega}_i$ corresponds to ω in the first-order condition (12) (here indexed by i), adjusted by a factor depending on the comparative advantage (Δ_i). In conformity with the need for keeping the enemies alive, any increase in the challenger's average competence (a decrease in Δ_i) induces the incumbent to devote more effort on problem i.

The optimal allocation of effort crucially depends on the incumbent's comparative advantages, as shown in the following proposition. Let us define the incumbent's perceived relative average competence in solving problem i by $q_i = \sigma_i \bar{\eta}_i^R / \sum_{m=1}^k \sigma_m \bar{\eta}_m^R$, and the relative gain of keeping this problem alive by $\tilde{\omega}_i / \tilde{\omega}$, where $\tilde{\omega} := \sum_{m=1}^k \tilde{\omega}_m / k$.

Corollary 2. *The optimal effort e_i^* is such that: $e_i^* \geq q_i e^* \Leftrightarrow \tilde{\omega}_i \leq \tilde{\omega}$.*

Proof: See Appendix C.

The intuition of this result is straightforward. If the need for enemies was identical for all problems ($\tilde{\omega}_i = \tilde{\omega}$), the incumbent should allocate total effort e^* proportionally to his (perceived) relative competence q_i. This is no longer the case if $\tilde{\omega}_i \neq \tilde{\omega}$. If $\tilde{\omega}_i > \tilde{\omega}$ (resp. $\tilde{\omega}_i < \tilde{\omega}$), the share of total effort devoted to problem i is lower (resp. higher) than q_i. Since $\tilde{\omega}_i$ positively depends on the comparative advantage of the incumbent (Δ_i), the latter is induced to devote most effort in areas in which Δ_i is below average. Consequently, the incumbent will prioritize the liquidation of the problems at which his challenger is relatively more competent. Indeed, the first-period effort, in addition to signaling the incumbent's reputation, also serves the role of killing the opponents' comparative advantages.

So far, we have considered a passive challenger. However our model can be slightly modified to allow the incumbent's rival undertaking actions that affect the size of the different problems. It will be the case, for example, if the incumbent is surrounded by a team including coworkers who can become potential rivals or, in political contexts, if opponents can organize strikes or demonstrations to affect the salience of different issues.

Suppose for example that, in the first period, the challenger undertakes an effort v_i that results in liquidating a part x_i of problem i, such that $x_i = (\eta_i^D + \zeta_i) v_i$ (with $\zeta_i \backsim \mathscr{N}(0, V_i^\epsilon)$, and $\eta_i^D \backsim \mathscr{N}(\bar{\eta}_i^D, V_i^\eta)$).

The actions of both candidates are public information, and the principal infers the competence of each candidate through x_i and l_i, according to a similar Bayesian process as previously. Thus, the incumbent's reappointment probability now is written as

$$\mu = \frac{1}{2} + s(1 - l_i - x_i)(\tilde{\eta}_i^R - \tilde{\eta}_i^D), \tag{17}$$

where $\tilde{\eta}_i^R = \mathbb{E}[\eta_i^R | l_i]$, and $\tilde{\eta}_i^D = \mathbb{E}[\eta_i^D | x_i]$. At the beginning of the first period, the incumbent and the challenger simultaneously choose their efforts to maximize the expected chance to be appointed, net of the cost of effort, namely, $\mathbb{E}[\mu] - c(e_i)$ and $\mathbb{E}[1-\mu] - c(v_i)$, respectively. According to the procedure described above (see Appendix C), the first period equilibrium must satisfy (using linear cost functions $c(e_i) = ce_i$ and $c(v_i) = cv_i$, for the sake of clarity)

$$e_i^* = \frac{s\sigma_i \bar{\eta}_i^R (1 - \bar{\eta}_i^D v_i^*)}{\tilde{\omega}_i + c} \text{ and } v_i^* = \frac{s\sigma_i \bar{\eta}_i^D (1 - \bar{\eta}_i^R e_i^*)}{\tilde{\omega}_i' + c},$$

where $\tilde{\omega}_i'$ is defined symmetrically to $\tilde{\omega}_i$, namely, $\tilde{\omega}_i' = -s\bar{\eta}_i^D \Delta_i + s\sigma_i \{(\bar{\eta}_i^D)^2 + 2V_i^z\}$.

Intuitively, the equilibrium effort of each candidate negatively depends on the opponent's average liquidation. Under mild conditions, Appendix D shows that the fixed-point problem gives rise to a unique pair of positive equilibrium efforts $\{v_i^*, e_i^*\}$, with $de_i^*/d\Delta_i < 0$ and $dv_i^*/d\Delta_i > 0$. Therefore, the challenger, as the incumbent, is induced to make few efforts in the areas in which he has a comparative advantage or, at the limit, to increase difficulties in these areas. By this means, the challenger can cause termination of the incumbent's job and pose as the person who is needed and inescapable when its possible replacement is on the agenda. Many evidences in the political arena illustrate this mechanism, as we will see in section 6.

Up to now, we have supposed that the principal perfectly knew the amount of liquidation implemented in the first period. However, the different tasks the agent tackles can be fuzzy in the principal's eyes due to informational inefficiencies or the incumbent's opportunism. The following section relaxes the assumption that liquidation is transparent.

4. Transparency and the need for enemies

In classical moral hazard principal-agent frameworks, transparency is beneficial to the principal because more information makes the agents more accountable (Holmström, 1979). In this line, recent political economy setups highlighted that inefficiencies related to the voting process could be mitigated by improving transparency.[19] For example, analyzing political budget cycles, Alt and Lassen (2006)

[19] This intuition has been developed in the context of fiscal transparency by Milesi-Ferretti (2004) and Shi and Svensson (2006), among others.

suggest that fiscal transparency is socially desirable because, by making voters better able to distinguish effort from strategic behavior, transparency reduces incentives for pre-electoral increases in public debt. Nevertheless, such findings are somewhat at odds with typical career concerns models that emphasize the role of reputation (Holmström, 1999). In these frameworks, more information about abilities is not likely to be favorable because the incumbent has less incentive to exert efforts to signal his type.

However, beyond information on the agents' type, transparency may also relate to the set of information available to the principal on the outcome of the agent's effort, and to the potential for the incumbent to communicate his actions. Based on this perspective, this section extends our model by relaxing the assumption that the principal observes with certainty the first-period liquidation. In this way, we assume that, in the first period, the principal observes the true level of problem i only with probability $\delta_i \in [0,1]$. This probability defines the degree of transparency and reflects the accessibility of the relevant information available to the principal at the time he decides to renew the relationship with the incumbent.

Let us first consider the case of exogenous transparency. In the case of full transparency ($\delta_i = 1$), as developed above, the principal knows with certainty the liquidation l_i and uses this information to estimate the incumbent's competence (namely, $\tilde{\eta}_i^R = (1-\sigma_i)\bar{\eta}_i^R + \sigma_i l_i/\tilde{e}_i$). Without transparency ($\delta_i = 0$), however, he can only use the unconditional expectation $\bar{\eta}_i^R$. Consequently, the incumbent's expected competence is $\mathbb{E}[\eta_i^R] = \delta_i\tilde{\eta}_i^R + (1-\delta_i)\bar{\eta}_i^R$ and the expected amount of liquidation in the first period is $\tilde{l}_i := \delta_i l_i + (1-\delta_i)\bar{\eta}_i^R\tilde{e}_i$.

Moreover, the principal's beliefs about liquidation in period 2 are

$$\mathbb{E}\left[l_{2,i}^R\right] = \mathbb{E}[\eta_i^R] \quad (\text{resp. } \mathbb{E}[l_{2,i}^D] = \bar{\eta}_i^D), \tag{18}$$

if an agent of type R (resp. type D) is appointed. Following the appointment setup developed in preceding sections, we can rewrite μ as

$$\mu = \frac{1}{2} + s\sum_{i=1}^{k}(1-\tilde{l}_i)\left(\mathbb{E}\left[l_{2,i}^R\right] - \mathbb{E}[l_{2,i}^D]\right),$$

namely, using (18),

$$\mu = \frac{1}{2} + s\sum_{i=1}^{k}\left[1-\delta_i e_i z_i - (1-\delta_i)\tilde{e}_i\bar{\eta}_i^R\right]\left[\delta_i\tilde{\eta}_i^R + (1-\delta_i)\bar{\eta}_i^R - \bar{\eta}_i^D\right]. \tag{19}$$

The relationship between the equilibrium effort (e_i^*) and the degree of transparency (δ_i) is established in the following proposition.

Proposition 6. *For a small marginal cost of effort, there is a threshold*

$$\overline{\delta}_i := \sqrt{c'(e^*)/2s\sigma_i V_i^z} \in (0,1),$$

such that $\partial e_i^*/\partial\delta_i \geq 0 \Leftrightarrow \delta_i \in [0, \overline{\delta}_i]$.
Proof: See Appendix E. In particular, Appendix E shows that

$$e_i^*(\delta_i) = \frac{s\sigma_i\delta_i\bar{\eta}_i^R}{\hat{\omega}_i + c'(e^*)}, \tag{20}$$

where $\hat{\omega}_i := \delta_i\left[\tilde{\omega}_i - 2s\sigma_i(1-\delta_i)V_i^z\right]$, with $\hat{\omega}_i = \tilde{\omega}_i$ if $\delta_i = 1$.

Following proposition 6, two conflicting forces are at work, as transparency affects both the marginal gain of reputation and the marginal gain from keeping the enemies alive. On the reputation side, a higher degree of transparency (δ_i increases) induces the incumbent to additional effort because he can signal his reputation to a more informed principal. On the need-for-enemies side, a more informed principal will better perceive the residual amount of problems in the second period, and the term $\hat{\omega}_i$ increases.

If the degree of transparency is small ($\delta_i < \bar{\delta}_i$), the first effect prevails, and the equilibrium effort increases in δ_i. In contrast, if $\delta_i > \bar{\delta}_i$, the need for enemies dominates, and e_i^* decreases with δ_i. Consequently, above the threshold $\bar{\delta}_i$, revealing more information about the first-period liquidation makes the incumbent's interest less aligned with the principal's interest.

Against this background, transparency, defined as the ability of the principal to perceive the true extent of reforms, may have beneficial or adverse effects. In our model, according to Prat (2005)'s terminology, transparency refers to knowing more about the consequences of the policies implemented by the incumbent (i.e., the liquidation) and not to knowing more about the actions (i.e., the effort) of the incumbent. In Prat (2005), the former is always welfare enhancing, as in most moral hazard frameworks, while only the latter can be counterproductive. Our result is quite different because transparency regarding the consequences of the actions can also be counterproductive, owing to the need for enemies. Notably, according to the categorization suggested by Besley (2005) and Besley and Smart (2007), transparency does not necessarily improve the ability of the principal to sort very skilled candidates (the selection effect) or to offer prospective incentives for the incumbent (the discipline effect).

Effectively, following the intuition of the "Goldilocks theorem", an increase in transparency is not expected to improve sorting, as extremely competent (or incompetent) candidates will be defeated. Regarding the disciplining effect, as we have seen, a high degree of transparency is likely to discourage the incumbent's effort.

Having established the impact of transparency on equilibrium effort, we can now develop the case with endogenous δ_i. Indeed, in many agency relationships (such as in the labor market, corporate governance or politics), the incumbent has incentives to conceal the outcome of his actions. For example, in political contexts, the office-holder can distort the perceptions of voters regarding the salience of public issues (McCombs and Shaw, 1972). According to agenda setting theory, politicians work at capturing media agenda for opportunistic purposes (see, e.g., Besley and Prat, 2006; Gehlbach and Sonin, 2014).

To formalize this argument, we assume that, before determining his effort, the incumbent chooses the level of transparency on each issue (δ_i). In a general setting, the degree of transparency (δ_i) would depend on current shocks, media coverage, political pressures, etc. For simplicity, we assume here that the incumbent can directly control δ_i, owing to a cost (γ_i) of capturing the media agenda.[20] To solve the model, we look for the perfect Bayesian equilibrium. By backward induction, the incumbent first chooses the effort level (20), for a given degree of transparency (δ_i), and then the optimal level of transparency (δ_i^*). The latter is computed in the first-stage program, corresponding to the incumbent's payoff (10), net of the cost of concealment (γ_i), which is assumed to be proportional to the level of dissimulation $(1-\delta_i)$, namely,

$$\max_{\delta_i \in [0,1]} \left\{ W(\delta_i) - \gamma_i(1-\delta_i) \right\}, \text{ where } W(\delta_i) = \mu(e_i^*(\delta_i), \delta_i) - c(e_i^*(\delta_i)).$$

The solution is established in the following proposition.

Proposition 7. *For small γ_i, the degree of transparency $\delta_i^* \in (0,1)$ that maximizes the first-stage payoff is implicitly given by*

$$\delta_i^* e_i^*(\delta_i^*) = \frac{\gamma_i}{2s\sigma_i V_i^z}.$$

In addition, δ_i^* positively depends on Δ_i, and negatively depends on σ_i and V_i^z.

Proof: See Appendix D.

[20]Bribing the media involves costs, either pecuniary for the payment of bribes or transaction costs, such as the time devoted to lobbying or negotiation with news makers to obtain compliant behavior (see the meticulous analysis of Prat and Strömberg, 2011).

From Proposition 7, δ_i^* positively depends on Δ_i. Quite intuitively, the incumbent has an incentive to make salient the issues on which he has a comparative advantage and to keep secret the issues of which he is perceived as less competent. Additionally, the critical degree of transparency δ_i^* negatively depends on σ_i and V_i^z. First, as previously described, a better principal's inference regarding performance (i.e., σ increases) disciplines the incumbent and increases his effort. Since effort is costly, the incumbent views this disciplining device as a threat. This explains why the chosen degree of transparency negatively depends on σ_i. Second, in conformity with the "Goldilocks theorem", problems having a highly uncertain outcome (i.e., with high variance V_i^z) are likely to reduce reappointment probability, hence the incentive for secrecy. Because moderately solved problems will weigh heavily in the principal's eyes, the incumbent's interest is to obscure issues that are expected to provide very bad or very good outcomes.[21] Consequently, he will remove from his agenda those questions that are subject to extreme shocks. In colorful terms, as in the case of Goldilocks' porridge, only the "not-too-cold" and "not-too-hot" issues will be on the table.

So far, we have considered that problems can be solved once and for all (such as, e.g., surgeons who operate on their patients, lawyers who win lawsuits, or officeholders who restore public finance). The incumbent then exerts a "reform" activity that structurally reduces the problem. However, many problems may also be solved by exerting constant attention. Indeed, doctors treat their patients by chronic therapy, mechanics fix cars by repeated inspections, or the government reduces unemployment by implementing daily program of social measures. The following section considers that the incumbent can build his reputation both by solving problems permanently or by exerting a "routine" activity.

5. Acquiring reputation with reform and routine activity

The heart of the mechanism of the need for enemies comes from the permanent effect of effort. Since reputational gains associated with competence lie in the residual amount of the problem, as the incumbent solves it, his advantage is reduced. How is this mechanism challenged if effort is (partly) designed for tasks that do not permanently reduce the problems? Is the incumbent induced to assign more efforts to those tasks? In this section, we explore how the tradeoff between reputation and the need for enemies is amended when the incumbent optimally allocates his effort between reform and routine activities.

[21] Contrasting with Besley and Prat (2006), in our model, the strategy of the incumbent is not only to hide very bad news but also very good news.

For the sake of simplicity, we focus on the one-task specification of section 2, and we henceforth drop i subscripts. The quantity of problem in period t is now $p_t = q_t - \kappa r_t$, where q_t is the outcome of "reform" activity and κr_t the outcome of the "routine" (or "daily") activity r_t, which has efficiency $\kappa \geq 0$.

As in the baseline model of section 2, reform activity results in a permanent reduction of the problem, and q_t is determined by the multiplicative career concerns framework (1)-(2), namely, $q_t = (1-l_t)q_{t-1}$. With q_0 normalized to unity, this results in $q_1 = 1 - l_1$ in the first period (with $l_1 =: l = ze$, $z = \epsilon + \eta$), and $q_2 = (1-l_2)q_1$ in the second period (with $l_2 = \eta$). In contrast, routine activity benefits the principal only in the current period. Hence, we characterize this activity by a standard linear career concerns specification. The outcome of routine activity is then $r_1 = r = z' + a$ in the first period (with $z' = \eta + \zeta$), and $r_2 = \eta$ in the second period, where $\zeta \sim \mathcal{N}(0, V^\zeta)$ is an error term, and a the incumbent's effort.

In this specification, the agent's ability (η) applies both to routine and reform. In other words, the principal values the agents' competence in general. The principal has a per-period utility $u(p_t) = \bar{u} - p_t = \bar{u} - q_t + \kappa r_t$ and infers the incumbent's competence by observing two outcomes in the first period (l and r). Following the selection procedure developed in section 2, the reappointment probability (see Eq. 4) becomes

$$\mu = \frac{1}{2} + s(1 - l + \kappa)(\tilde{\eta} - \bar{\eta}), \tag{21}$$

where $\tilde{\eta} = \mathbb{E}[\eta | l, \lambda]$ is the estimate of the incumbent's competence. Compared with (4), reputational strengths are stronger because the incumbent can benefit from his reputation (if $\tilde{\eta} > \bar{\eta}$) even if $l = 1$.

As detailed in subsection 2.2, we find the equilibrium by a two-step procedure. First, the principal formulates a conjecture on the pair of efforts $(\tilde{e}, \tilde{a})$. In perfect Bayesian equilibrium, optimal efforts will coincide with these beliefs. Given these conjectures and observations l and r, the principal can infer the corresponding values of z and z'

$$\tilde{z} = \eta + \epsilon = \frac{l}{\tilde{e}}, \tag{22}$$

$$\tilde{z}' = \eta + \zeta = r - \tilde{a}. \tag{23}$$

Second, the principal infers η given the set of noisy signals $\{\tilde{z}, \tilde{z}'\}$, and a prior $\eta \sim \mathcal{N}(\bar{\eta}, V^\eta)$, as established in the following theorem.

Lemma 1. *Let $X^\zeta := 1/V^\zeta$, $X^\eta = 1/V^\eta$ and $X^\epsilon = 1/V^\epsilon$ be the precisions of random variables. The estimate of the incumbent talent is a weighted-average of* *the prior and the two signals*

$$\tilde{\eta} := \mathbb{E}[\eta|\, l, r] = (1-\sigma_l-\sigma_r)\bar{\eta} + \sigma_l \left(\frac{l}{\tilde{e}}\right) + \sigma_r\,(r-\tilde{a})\,, \tag{24}$$

where the weights are given by the relative precisions of the shocks ϵ *and* ζ*, namely,* $\sigma_l := X^\epsilon/(X^\zeta + X^\epsilon + X^\eta)$ *and* $\sigma_r := X^\zeta/(X^\zeta + X^\epsilon + X^\eta)$*.*

Proof. We determine the expression of $\mathbb{E}[\eta|\tilde{z},\tilde{z}']$, where $\tilde{z} \sim \mathcal{N}(\bar{\eta}, 1/X^\eta + 1/X^\epsilon)$, and $\tilde{z}' \sim \mathcal{N}(\bar{\eta}, 1/X^\eta + 1/X^\zeta)$. To this end, let us compute the joint distribution of $\{\eta, \tilde{z}, \tilde{z}'\}$. By considering a test function $\varphi : \mathbb{R} \mapsto \mathbb{R}$, we can write

$$\mathbb{E}[\varphi(\eta,\tilde{z},\tilde{z}')] = \int_{\mathbb{R}^3} \varphi(\eta, \eta+\epsilon, \eta+\zeta) f(\eta,\epsilon,\zeta)\; d\eta d\epsilon d\zeta. \tag{25}$$

Using (22) and (23), since η, ϵ and ζ are mutually independent, with $\eta \sim \mathcal{N}(\bar{\eta}, 1/X^\eta)$, $\epsilon \sim \mathcal{N}(0, 1/X^\epsilon)$ and $\zeta \sim \mathcal{N}(0, 1/X^\zeta)$, the joint density is

$$f(\eta,\epsilon,\zeta) = \frac{X^\eta X^\epsilon X^\zeta}{(2\pi)^{3/2}} \exp\left\{-\frac{X^\eta}{2}(\eta-\bar{\eta})^2\right\} \exp\left\{-\frac{X^\epsilon}{2}\epsilon^2\right\} \exp\left\{-\frac{X^\zeta}{2}\zeta^2\right\}.$$

We adopt now the change of variables: $\eta = \eta; x_1 = \eta + \epsilon; x_2 = \eta + \zeta$; hence, the associated Jacobian matrix is

$$\begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}.$$

Therefore, the determinant of the Jacobian matrix is 1, and (25) becomes

$$\mathbb{E}[\varphi(\eta,\tilde{z},\tilde{z}')] = \int_{\mathbb{R}^3} \varphi(\eta, x_1, x_2) f(\eta, x_1, x_2)\; d\eta dx_1 dx_2,$$

where

$$f(\eta,x_1,x_2) = \frac{X^\eta X^\epsilon X^\zeta}{(2\pi)^{3/2}} \exp\left\{-\frac{X^\eta}{2}(\eta-\bar{\eta})^2\right\} \exp\left\{-\frac{X^\epsilon}{2}(x_1-\eta)^2\right\} \exp\left\{-\frac{X^\zeta}{2}(x_2-\eta)^2\right\}.$$

Using $\sigma := X^\epsilon + X^\zeta + X^\eta$, we can write

$$f(\eta,x_1,x_2) = \frac{X^\eta X^\epsilon X^\zeta}{2\pi\sigma} \Phi(x_1,x_2) \frac{\sigma}{\sqrt{2\pi}} \exp\left\{-\frac{\sigma}{2}(\eta-\bar{\eta})^2\right\} \exp\left\{\eta\phi(x_1,x_2)\right\}, \tag{26}$$

with

$$\Phi(x_1, x_2) := \exp\left\{-X^\epsilon \bar{\eta}(x_1 - \bar{\eta})\right\} \exp\left\{-X^\zeta \bar{\eta}(x_2 - \bar{\eta})\right\}, \tag{27}$$

$$\phi(x_1, x_2) := X^\epsilon (x_1 - \bar{\eta}) + X^\zeta (x_2 - \bar{\eta}). \tag{28}$$

Therefore, since f describes a Laplace transform in Eq. (26), we obtain

$$\int_{\mathbb{R}} f(\eta, x_1, x_2) d\eta = \frac{X^\eta X^\epsilon X^\zeta}{2\pi\sigma} \Phi(x_1, x_2) \exp\left\{\bar{\eta}^R \phi(x_1, x_2) + \frac{\phi(x_1, x_2)^2}{2\sigma}\right\}. \tag{29}$$

Finally, by (26) and (29), the density function of $\eta | \{\tilde{z} = x_1, \tilde{z}' = x_2\}$ is

$$\frac{f(\eta, x_1, x_2)}{\int_{\mathbb{R}} f(\eta, x_1, x_2) d\eta} = \frac{\sigma}{\sqrt{2\pi}} \exp\left\{-\frac{\sigma}{2}(\eta - \bar{\eta})^2\right\} \exp\left\{(\eta - \bar{\eta})\phi(x_1, x_2)\right\} \exp\left\{-\frac{1}{2\sigma}\phi(x_1, x_2)^2\right\},$$

hence, after some manipulations

$$\frac{f(\eta, x_1, x_2)}{\int_{\mathbb{R}} f(\eta, x_1, x_2) d\eta} = \frac{\sigma}{\sqrt{2\pi}} \exp\left\{-\frac{\sigma}{2}\left(\eta - \bar{\eta} - \frac{\phi(x_1, x_2)}{\sigma}\right)^2\right\}.$$

Consequently, we have $\mathbb{E}[\eta | \tilde{z}, \tilde{z}'] = \bar{\eta} + \phi(\tilde{z}, \tilde{z}')/\sigma$. By (28), it follows that $\mathbb{E}[\eta | \tilde{z}, \tilde{z}'] = (1 - \sigma_l - \sigma_r)\bar{\eta} + \sigma_l \tilde{z} + \sigma_r \tilde{z}'$. By returning to the original notations, we find Eq. (24). □

Lemma 1 establishes how perceived competence can be inferred from diverse signals. This is different from existing career concerns models with multiple signals (see, e.g., Dewatripont et al., 1999; Bénabou and Tirole, 2006), which associate each signal to one specific competence. In our setup, the incumbent has a global competence, which is inferred by the principal through two noisy signals. The signal-extraction formula (24) shows that the principal uses a weighted-average of the prior and the two signals to compute this global competence. As a result, the incumbent can improve his reputation via the routine activity, independently from permanently solving the problem, and he can increase his perceived competence even if he fully ignores reform activity ($l = 0$).

By introducing Eq. (24) into Eq. (21), the reappointment probability is

$$\mu = \frac{1}{2} + s[1 - l + \kappa]\left[\sigma_l z \frac{e}{\tilde{e}} + \sigma_r (z' + a - \tilde{a}) - (\sigma_l + \sigma_r)\bar{\eta}\right]. \tag{30}$$

The incumbent's program (10) can be rewritten as

$$\max_{(e,a)\in[0,1/\bar{\eta}]\times\mathbb{R}_+^*} \mathbb{E}\left[\mu\right] - c(e+a), \tag{31}$$

and the solution is established in the following proposition.

Proposition 8. *There is a nonempty set of parameters, such that there is a unique set of equilibrium efforts* $(e^*, a^*) \in [0, 1/\bar{\eta}] \times \mathbb{R}_+^*$*, which are given by the following first-order conditions:*

$$s\sigma_r(1-\bar{\eta}e^*) + s\sigma_r\kappa = c'(e^*+a^*), \tag{32}$$

$$e^* = \frac{s\sigma_l\bar{\eta}(1+\kappa)}{\breve{\omega} + c'(e^*+a^*)}, \tag{33}$$

where $\breve{\omega} := s\left\{2\sigma_l\mathbb{E}[z^2] + \sigma_r\mathbb{E}[zz'] - \bar{\eta}^2(\sigma_l+\sigma_r)\right\} = \omega + s\sigma_r(\bar{\eta}^2 + \mathbb{E}[zz'])$.

Proof: See Appendix F.

Two points deserve attention.

First, regarding the optimal effort in reform (33), there are two main differences compared to the equilibrium without routine (see Eq. 12). On the one hand, there is an additional reputation gain linked to routine task κ (the higher the κ is, the more the principal values facing a competent incumbent, and the higher the inducement to manipulate reputation). Thus, the incumbent has higher incentives to pose as competent, which encourages reform effort. On the other hand, there is an additional gain of keeping the enemies alive (since $\breve{\omega} > \omega$). Consequently, the transfer of managerial skills from routine to reform effort is not clear-cut.

Second, regarding the optimal effort in routine (32), the first-order condition means that the marginal cost (the right-hand side) just equals the marginal gain (the left-hand side). This gain depends on two terms. (i) There is a direct effect of routine effort on the perceived competence ($s\sigma_r\kappa$), which depends on the effort efficiency (κ) and the weight of the signal (σ_r). (ii) Furthermore, even if $\kappa = 0$, as competence depends both on reform and routine, there is an indirect effect ($s\sigma_r(1-\bar{\eta}e^*)$) because an increase in routine effort raises the perceived competence in reforming.

Corollary 3. *A rise in* $\breve{\omega}$ *decreases* e^* *and increases* a^**.*

Proof: See Appendix F.

From corollary 2, routine and reform efforts are substitutes. The higher the need for enemies is, the lower the reform effort, the higher the base of the reputation (the unsolved amount of the problem), and the higher the incentive to make routine effort pose as competent. Consequently, the need for enemies provides better incentives to agents to solve problems by exerting constant attention rather than solving them once and for all.

This feature can provide new insights on the lack of structural reforms, e.g., in political contexts. The political economy literature has developed several arguments to explain why politicians fail to implement reforms, including the political cost of changing citizens' habits (Rodrik, 1996), the possible distributional conflicts about reforms' benefits (Drazen and Grilli, 1993), or politicians' incompetence (Haggard and Webb, 1993). Our framework develops an alternative view: the office-holders can strategically care more about everyday politics than about structural reforms in order to keep the enemy alive, especially if they are competent in reforming. This feature could apply in various principal-agent relationships, such that, e.g., mechanics who can undertake minor repairs that keep cars in acceptable conditions but require regular maintenance. Other examples are developed in the following section.

6. Some evidence on the mechanics of the need for enemies

The main implications of our theory are the following: (1) the tradeoff between the need for enemies and reputation induces the agent to not fully solve problems that he can address with competence; (2) the agent is induced to make more transparent those issues on which he benefits from a comparative advantage; (3) the agent will devote effort in solving problems that his challengers would more likely address successfully; and (4) the challengers have no interest to take part in the solving of such problems.

Our model is applicable in a variety of economic situations: physicians, lawyers, professors, secretaries, mechanics, plumbers, politicians, and so on, may have incentives to keep their enemies alive in order to be reappointed. An extreme pathological case may be connected to the "*Munchausen syndrome by proxy*", in which a principal (a parent) causes disorder for an agent (his child), with the goal to attract attention and compassion through the illness of the agent.[22] Let us briefly illustrate three typical areas that have been much discussed in the literature and closely

[22]The term Munchausen syndrome comes from the 18th century tale of Baron Karl Fredrick Von Munchausen and depicts patients who produce false histories and invent physical signs, causing themselves needless medical operations and treatment. The "Munchausen syndrome by proxy" corresponds to a form of child abuse in which a disorder of the child is invented by a parent, generally his or her mother – see **?**. Consequences of the syndrome include painful tests, frequent hospitalizations, potentially harmful treatment, and even death.

relate to our framework: physician- or lawyer-induced demand, management entrenchment in corporate finance, and political opportunism.

(i) Agency models with asymmetric information have long developed the idea that agents may have an interest in not meeting the expectations of their clients to keep their job (model implication 1). Under the physician-induced-demand hypothesis (Evans, 1974; McGuire, 2000), physicians provide care beyond the level that objective clinical judgment and patient preferences would dictate. To create their own demand, inducing physicians might be induced to make their patients believe that they are sicker than they actually are or to prescribe unnecessary drugs. Even if physicians do not seek to make more severe the illness of their patient, an inducing physician may attempt to keep the enemy alive by offering multiple (and maybe inefficient) screening tests or conducting unnecessary visits (Rossiter and Wilensky, 1984).[23] More broadly, a heart surgeon competing with other specialists in a hospital will be induced to practice many heart tests in patients, for resources to be allocated to his service. It is in his interest to magnify the problem rather than to solve it. Welfare implications of such behavior are difficult to assess (as it is a good thing to detect heart diseases, but it takes away resources from other services), but this situation clearly relates to the need for enemies: by generalizing screening tests, the surgeon increases the transparency on the problems where he is the most competent (model implication 2).

Even if its measurement is one of the most contentious issues in health economic (McGuire, 2000), physician-induced demand has been well-evidenced, especially in those areas where competition is tough, such as surgeries, dentist services, laboratory tests or drug prescriptions. Additionally, supplier-induced demand is not unique to the physician profession. Strong competition among lawyers could lead some lawyers to opportunistically induce their clients to bring lawsuits before a court and pose a barrier to the efficient resolution of disputes (Gilson and Mnookin, 1994).[24] Other applications of the supplier-induced demand can be found, e.g., in the auto repair market.

(ii) Our mechanism can also apply to agency relations in corporate finance. According to the entrenchment approach, managers can entrench themselves by

[23] In our context, "liquidation" of the "illness-problem" then would correspond to the difference between the number of recoveries and the number of new detected cases. It is widely publicized that many physicians have agreements with pharmaceutical companies to prescribe drugs, sometimes even for unapproved uses (see, e.g., Evans, 2009).

[24] Kaufman (1988), e.g., argues that attorneys sometimes engage in practices that obstruct the resolution of litigations.

making specific investments that make it costly for shareholders to replace them (Shleifer and Vishny, 1994) or by choosing capital structures as a way to increase their staying power (Novaes, 2003). This approach has been proven to be useful for explaining, e.g., managerial turnover, takeover defenses, debt maturity structures, or accounting manipulations. In our framework, the need for enemies precisely corresponds to a form of an agent's entrenchment: keeping problems alive, especially in those issues I address with expertise, makes me valuable at the appointers' eyes and costly to replace (model implications 1 and 2). This mechanism can apply to any agent that benefits from specific abilities. This feature reflects the ambivalence of reputational strengths that simultaneously induce agents to pose as competent and to leave problems irresolute to entrench themselves.

Compared to usual moral hazard issues underlying the induced demand and entrenchment approaches, our framework does not rely on asymmetric information, as, in our career concerns setup, the agent and the principal share the same beliefs on the agent's abilities. Consequently, in our setup, the need for enemies can arise even if the agent is uncertain about his own competence. In health economics, such a situation in which uncertainty about the consequences of the treatment is shared by both the doctor and the patient refers to "irreducible" uncertainty (Pauly, 1978).

(iii) Our framework also has major implications for politics. Politicians have different abilities, producing comparative advantages in different areas, which induce incumbents not to complete tasks in those areas in which they are particularly competent. Salient historical evidence relates politicians being removed after having completed the job. A classical episode is Winston Churchill, who led Britain to victory as Prime Minister during the Second World War but was immediately removed by the electorate as soon as the war was won in 1945. Of course, one cannot suspect Churchill, who had strong anti-Nazi convictions, to have done less than his best to defeat Germany. However, who needed an anti-Nazi leader once Nazism was defeated?[25] Another prominent example is the failure of Prime Minister Jospin in France, who was ousted from the second round of the 2002 presidential election, in the context of tough competition with President Chirac (during the third French cohabitation regime). The electoral support for Jospin and his Minister of Finances

[25] Very interestingly, in a famous speech in his election campaign (June 4, 1945), Churchill tried to mobilize his electorate by reviving the Nazi enemy: "No Socialist Government conducting the entire life and industry of the country could afford to allow free, sharp, or violently-worded expressions of public discontent. They would have to fall back on some form of *Gestapo*". For some historians and official biographers, "contextualizing the 'Gestapo' (...) does cast considerable light on his electoral strategy. The [speech] needs to be seen as a failed attempt to appeal, in particular, to wavering voters" (Toye, 2010, p. 656).

D. Strauss Kahn (who was called the "best economist of France" in the media), collapsed as the business climate improved. Undoubtedly, the improvement of the economic climate caused him to lose its comparative advantage, to the benefit of his right-wing challenger who emphasized an agenda of security issues.

The above episodes relate occurrences where incumbents were defeated by losing their comparative advantage. In many other situations, the need for enemies may have been used by strategic incumbents to hold on to power. In the Indian state of West Bengal, e.g., Bardhan and Mookherjee (2010), suggest that left-wing parties might have delayed implementations of land reforms for re-election concerns. Similarly, Fergusson et al. (2015) provide interesting evidence showing that the Mexican Institutional Revolutionary Party manipulated the Land Allocation Program in Mexico when politically challenged by opponents. Fergusson et al. (2016) suggest that President Uribe, who was positioned to liquidate the FARC in Columbia, decreased government military activity in places that were electorally salient because his popularity would has been mitigated if he had eliminated the FARC too quickly. Even more strikingly, during the civil war in Sri Lanka (1983-2009), the ancient "fear of invasion" by the Tamil nation was resurrected and recurrently used by successive Sinhalese governments and, in particular, President Jayewardene, to sustain their nationalist objectives.

Closely related to our model implications (3) and (4), history has also demonstrated that politicians sometimes attempted to neutralize issues of which their opponents were perceived as highly skilled. A prominent example is the social policy implemented by Chancellor Otto von Bismarck in Germany in the 1880s to disarm the socialist party with the aim of winning the general election of 1890. In his so-called "State Socialism", Bismarck undertook many social reforms (including insurance against sickness, workplace accidents, and an Old Age Insurance Act), with the objective to destroy the support of the working class for the Social Democratic Party of Germany.[26] In the same vein, opponents can vote against reforms that correspond to their ideology. In 1964, e.g., Republicans in the House voted against the tax legislation of 1964 initiated by Democrat President Lyndon B. Johnson, which was one of three major across-the-board income tax cuts in the 20th century. A more recent episode of policy reversal is related to President Clinton who, facing a

[26] More generally, political reforms are sometimes undertaken by unlikely parties. Rodrik (1993) exhibits many examples in Latin America showing that populist parties implemented market-oriented policies (such as radical trade liberalization or fiscal adjustment). In another context, Cukierman and Tommasi (1998) propose a framework in which the politician who cares most about doing something is the least likely to do it. Moen and Riis (2010) interpret such "policy reversals" as signals that governments send to inform the electorate about the underlying economic and political context.

difficult re-election campaign in 1996, passed the Personal Responsibility and Work Opportunity Reconciliation Act (a largely Republican-drafted bill) despite strong Democrat opposition. This major reform was passed with the acknowledged aim of neutralizing the risky welfare issue from the presidential election. As President Clinton said: "*After I sign my name to this bill, welfare will no longer be a political issue*" (cited in Carcasson, 2006).

7. Concluding remarks

In this paper, we argue that an agent who can increase his reputation by accomplishing a specific task has an incentive not to complete this task. We develop this idea in a general multitasking career concerns framework. Our main message is that career concerns are not only a solution to the incentive issue (by the way of reputation) but also a part of this issue because reputational strengths depend on remaining unsolved problems. In this way, reputation and the need for enemies closely overlap: an agent can enhance his reputation only if there are enough enemies alive, and this agent needs to keep enemies alive only if he is deemed to be skilled. This feature can lead to a very inefficient situation because it undermines the two essential functions of the reappointment scheme (e.g., elections), namely, to discipline the incumbent, who is not induced to provide much effort, and to select talented agents, as high-performing candidates will be removed.

Our setup may lead to interesting prospects for future research. A key extension would be to consider a repeated-game framework. The possibility for the agent and the principal to interact repeatedly would raise the question of learning to assess how the principal can learn more about the agent's actions and how he can send more precise signals concerning his needs. In macroeconomics, the need-for-enemy effect

could be useful to explain the persistence of unemployment, inflation, or public deficit (Menuet et al., 2017), in connection with re-election concerns. The need for enemies may also have interesting applications in the area of institutional design in democratic constitutions, for the definition of endogenous term limits, for example.

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Supplementary Material for online publication only

Appendix A. Equilibrium effort

Expression of the reappointment probability. According to our distributional assumption about θ, the reappointment probability μ is written as

$$\mu = \begin{cases} 1 & \text{if } l \in \left\{l | x(l) > \frac{1}{2s}\right\}, \\ \frac{1}{2} + s(1-l)(\tilde{\eta} - \bar{\eta}) & \text{if } l \in \left\{l | -\frac{1}{2s} \leq x(l) \leq \frac{1}{2s}\right\}, \\ 0 & \text{if } l \in \left\{l | x(l) < -\frac{1}{2s}\right\}, \end{cases}$$

where, from (6), $x(l) := (1-l)(\tilde{\eta} - \bar{\eta}) = \sigma(1-l)\left(\frac{l}{\tilde{e}} - \bar{\eta}\right)$.

(i) Consider the case $x(l) < -1/2s$. The reappointment probability is zero, irrespective of effort. Thus, the incumbent is induced to produce zero effort (because effort is costly); hence, liquidation is zero ($l = 0$). Consequently, this case exists only if $x(0) < -1/2s$, i.e. $s > \bar{s} := 1/2\sigma\bar{\eta}$.

(ii) Consider the case $x(l) > 1/2s$. The reappointment probability is one, irrespective of effort. Thus, the incumbent is induced to produce zero effort; hence, liquidation is zero ($l = 0$). Consequently, this case exists only if $x(0) > 1/2s$. However, $x(0) = -\sigma\bar{\eta} < 0$, hence a contradiction.

Consequently, $s < \bar{s}$ is a sufficient condition to ensure an interior solution. Thus, in the main text, we consider Eq. (4).

Proof of Proposition 2. We find the equilibrium effort through a two-step proof. The first step computes the incumbent's optimal strategy, for a given principal's conjecture. The second step solves the fixed-point problem and shows the existence and the uniqueness of equilibrium effort.

Step 1. Optimal strategy. As defined in Eq. (10), the incumbent's payoff is $W(e) := \mathbb{E}[\mu] - c(e)$. Using (4) and (6), we have

$$W(e) = \frac{1}{2} + s\sigma\mathbb{E}\left[(1-ze)\left(\frac{ze}{\tilde{e}} - \bar{\eta}\right)\right] - c(e). \tag{A.1}$$

As $z = \eta + \epsilon$, with $\mathbb{E}[\epsilon] = 0$, it follows that $\mathbb{E}[z] = \bar{\eta}$; hence,

$$W(e) = \frac{1}{2} + s\sigma\left(\frac{\bar{\eta}e}{\tilde{e}} - \bar{\eta} - \frac{e^2}{\tilde{e}}\mathbb{E}[z^2] + \bar{\eta}^2 e\right) - c(e), \tag{A.2}$$

where $\mathbb{E}[z^2] = \bar{\eta}^2 + V^z$.

As $\tilde{e} > 0$, W is continuous.[27] By differentiating, we obtain

$$W'(e) = s\sigma\left(\frac{\bar{\eta}}{\tilde{e}} - \frac{2e}{\tilde{e}}\mathbb{E}[z^2] + \bar{\eta}^2\right) - c'(e) =: F(e, \tilde{e}), \tag{A.3}$$

$$W''(e) = -\frac{2s\sigma e}{\tilde{e}}\mathbb{E}[z^2] - c''(e) < 0.$$

Consequently, as $c'' \geq 0$, $W(\cdot)$ is strictly concave: if there is a critical point, it defines the unique global maximum.

Step 2. Existence of Equilibrium. The first-order condition (A.3) is given by $F(e, \tilde{e}) = 0$. Since the second-order condition is satisfied, for a given voters' conjecture $\tilde{e}$, the incumbent chooses to implement the effort level e, such that $F(e, \tilde{e}) = 0$.

To characterize the equilibrium effort e^*, we need to solve a fixed-point problem: the conjecture used by the principal ($\tilde{e}$) must coincide with the unique effort level determined by the first-order condition (A.3), namely, we have to find e^* such that (i) $F(e^*, e^*) = 0$, and (ii) $e^* \in [0, 1/\bar{\eta}]$.

To this end, if $e = \tilde{e} =: \hat{e}$, (A.3) becomes $F(\hat{e}, \hat{e}) =: \varphi(\hat{e}) = 0$, where

$$\varphi(\hat{e}) := s\sigma\left(\frac{\bar{\eta}}{\hat{e}} - 2\mathbb{E}[z^2] + \bar{\eta}^2\right) - c'(\hat{e}). \tag{A.4}$$

First, as $c'' \geq 0$, $\varphi(\cdot)$ is continuous and decreasing on $(0, +\infty)$, because $\varphi'(\hat{e}) = -s\sigma\bar{\eta}/\hat{e}^2 - c''(\hat{e}) < 0$. Second, we have $\lim_{u\to 0^+}\varphi(u) = +\infty$, since $c'(\cdot) < +\infty$, and $\varphi(1/\bar{\eta}) = -2s\sigma V^z - c'(1/\bar{\eta}) < 0$.

Consequently, according to the Intermediate Value Theorem, there is a unique point $\check{e} \in (0, 1/\bar{\eta})$, such that $\varphi(\check{e}) = 0$, namely, $F(\check{e}, \check{e}) = 0$. Since the second-order condition is satisfied, $\check{e}$ is the unique fixed-point on $(0, 1/\bar{\eta})$ that maximizes the incumbent's payoff. In this respect, $\check{e} = e^*$ is the unique equilibrium effort level, such that

$$e^* = \frac{s\sigma\bar{\eta}}{\omega + c'(e^*)}, \tag{A.5}$$

where $\omega := s\sigma\{2\mathbb{E}[z^2] - \bar{\eta}^2\}$. □

Proof of Proposition 3. By applying the Implicit Function Theorem, we compute from Eq. (A.5),

$$\frac{\partial e^*}{\partial \bar{\eta}} \geq 0 \Leftrightarrow \bar{\eta} < \hat{\eta} := \sqrt{\frac{2s\sigma V^z + c'(e^*)}{s\sigma}}.$$

[27] $\sigma > 0$ is a sufficient condition to ensure that the equilibrium effort is strictly positive (see Eq. (A.5) below).

As $\sigma = V^\eta/V^z$ and $V^z = V^\eta + V^\epsilon$, we have

$$\frac{\partial e^*}{\partial V^\eta} \geq 0 \Leftrightarrow \ V^\eta < \hat{V}^\eta := \sqrt{\frac{c'(e^*)V^\epsilon}{2s}}.$$

□

Appendix B. The case of problem revival

Suppose that, in the second period, a random shock (ζ) affects the amount of the inherited problem, namely, from Eq. (1)

$$p_2 = (1 - l_2)(p_1 + \zeta),$$

where ζ is independent of η and ϵ, with mean $\mathbb{E}[\zeta] = \bar{\zeta} < +\infty$, and $p_1 = 1 - l$.

The estimate of the incumbent's competence is still determined by $\tilde{\eta}$ in Eq. (6). Under rational expectations ($\mathbb{E}[\zeta] = \bar{\zeta}$), the expected amount of the problem in period 2 is $\mathbb{E}[p_2|l] = (p_1 + \bar{\zeta})(1 - \tilde{\eta})$ if the incumbent is renewed, or $(p_1 + \bar{\zeta})(1 - \bar{\eta})$ if another agent is appointed. The re-election probability (4) then becomes

$$\mu = \frac{1}{2} + s(p_1 + \bar{\zeta})(\tilde{\eta} - \bar{\eta}).$$

In contrast to Eq. (4), if $\bar{\zeta} > 0$, the incumbent can take advantage of being perceived as competent (if $\tilde{\eta} > \bar{\eta}$) even if the inherited problem has been fully liquidated ($p_1 = 0$). Using (6), the first-order condition on effort is

$$\frac{\partial \mathbb{E}[\mu]}{\partial e} = s\mathbb{E}[\underbrace{z(1 - l + \bar{\zeta})\frac{\sigma}{\tilde{e}}}_{\hat{\mathscr{R}}} - \underbrace{z\,(\tilde{\eta} - \bar{\eta})}_{\mathscr{N}}] = c'(e). \tag{B.1}$$

Compared to Eq. (11), the marginal gain from keeping the enemies alive ($\mathscr{N}$) is unchanged, while the marginal gain from reputation is now $\hat{\mathscr{R}} = \mathscr{R} + \bar{\zeta}\sigma z/\tilde{e}$. If $\bar{\zeta} > 0$, the problem is expected to revive with some positive probability, and the reputation channel is more effective ($\hat{\mathscr{R}} > \mathscr{R}$). Following the method of section 2, the new tradeoff between reputation ($\hat{\mathscr{R}}$) and the need for enemies ($\mathscr{N}$) leads to

$$e^* = \frac{s\sigma\bar{\eta}}{\breve{\omega} + c'(e^*)}, \forall i \in \{1, \cdots, k\}, \tag{B.2}$$

where $\breve{\omega} := \omega - s\sigma\bar{\eta}\bar{\zeta}$. If problems are expected to revive ($\bar{\zeta} > 0$), there is an additional gain of reputation. Compared to Eq. (12), the equilibrium effort is now higher because $\breve{\omega} < \omega$. Notwithstanding this change, the tradeoff between reputation and the need for enemies remains the heart of the model.

Appendix C. The multitasking framework

We follow the two-step proof of Appendix A.

Step 1. Optimal strategy. In the multitasking framework, the incumbent's problem becomes

$$\max_{(e_i,e)\in\mathscr{C}} W(e_i,e), \;\; \mathscr{C} := [0, 1/\bar{\eta}_i] \times \left[0, \sum_{m=1}^{k} 1/\bar{\eta}_m\right], \; \forall i \in \{1, \cdots, k\},$$

where $e = \sum_{m=1}^{k} e_m$, and, using (14) and (15)

$$W(e_i, e) = \frac{1}{2} + s \sum_{m=1}^{k} \mathbb{E}\left[\Lambda(e_m)\right] - c\left(e\right), \tag{C.1}$$

where

$$\mathbb{E}[\Lambda(e_i)] = \frac{\sigma_i \bar{\eta}_i^R e_i}{\tilde{e}_i} + (1 - \bar{\eta}_i^R e_i)(\Delta_i - \sigma_i \bar{\eta}_i^R) - \frac{\sigma_i \mathbb{E}[z_i^2] e_i^2}{\tilde{e}_i},$$

with $\Delta_i := \bar{\eta}_i^R - \bar{\eta}_i^D$. As $\tilde{e}_i > 0$, W is continuous.[28] Therefore, the Lagrange function $\mathcal{L}$ related to the incumbent's program is with $\lambda > 0$ the Lagrange multiplier of the effort constraint

$$\mathcal{L}(e_i, e, \lambda) = W(e_i, e) + \lambda \left[e - \sum_{m=1}^{k} e_m\right]. \tag{C.2}$$

By (C.1), the FOCs are

$$\frac{\partial \mathcal{L}}{\partial e} = -c'(e) + \lambda = 0, \tag{C.3}$$

$$\frac{\partial \mathcal{L}}{\partial e_i} = s \left\{ \frac{\sigma_i \bar{\eta}_i^R}{\tilde{e}_i} - \bar{\eta}_i^R (\Delta_i - \sigma_i \bar{\eta}_i^R) - \frac{2\sigma_i e_i \mathbb{E}[z_i^2]}{\tilde{e}_i} \right\} - \lambda = 0, \tag{C.4}$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = e - \sum_{m=1}^{k} e_m = 0. \tag{C.5}$$

Eqs. (C.3), (C.4) and (C.5) directly imply that

$$\frac{\partial^2 \mathcal{L}}{\partial e^2} = -c''(e) < 0, \;\; \frac{\partial^2 \mathcal{L}}{\partial e \partial e_i} = 0, \tag{C.6}$$

$$\frac{\partial^2 \mathcal{L}}{\partial e_i^2} = -\frac{2s\sigma_i \mathbb{E}[z_i^2]}{\tilde{e}_i} < 0, \tag{C.7}$$

$$\frac{\partial^2 \mathcal{L}}{\partial \lambda^2} = 0, \text{ and, } \frac{\partial^2 \mathcal{L}}{\partial \lambda \partial e} = -\frac{\partial^2 \mathcal{L}}{\partial \lambda \partial e_i} = 1. \tag{C.8}$$

[28] As in Appendix A, $\sigma_i > 0$ is a sufficient condition to ensure that $e_i^* > 0$.

Let $\mathbf{H}$ define the Hessian matrix of $\mathcal{L}$. Since $c'' \geq 0$, we obtain by (C.6), (C.7), and (C.8), $\det(\mathbf{H}) = c''(e) + 2s\sigma_i \mathbb{E}[z_i^2]/\tilde{e}_i > 0$, and $\mathrm{tr}(\mathbf{H}) = -\det(\mathbf{H}) < 0$, $\forall i \in \{1, \cdots, k\}$. Consequently, $\mathcal{L}$ is strictly concave: if there is a critical point, it defines the unique global maximum.

Step 2. Existence of Equilibrium. By substituting Eq. (C.5) from Eq. (C.3), the FOC (C.4) can be written as $G(e_i, \tilde{e}_i) = 0$, where,

$$G(e_i, \tilde{e}_i) := s \left\{ \frac{\sigma_i \bar{\eta}_i^R}{\tilde{e}_i} - \bar{\eta}_i^R(\Delta_i - \sigma_i \bar{\eta}_i^R) - \frac{2\sigma_i e_i \mathbb{E}[z_i^2]}{\tilde{e}_i} \right\} - c' \left(\sum_{m=1}^{k} e_m \right). \tag{C.9}$$

Since the second-order condition is satisfied, for a given voters' conjecture $\tilde{e}_i$, the incumbent chooses to implement the effort level e_i, such that $G(e_i, \tilde{e}_i) = 0$.

Following Appendix A, we characterize the equilibrium effort e_i^* by solving a fixed-point problem: the principal's conjecture ($\tilde{e}_i$) must coincide with the unique effort level determined by the FOC (C.9). Thus, we have to find e_i^* such that (i) $G(e_i^*, e_i^*) = 0$, and (ii) $e_i^* \in [0, 1/\bar{\eta}_i^R]$.

By so doing, if $e_i = \tilde{e}_i =: \hat{e}_i$, (C.9) becomes $G(\hat{e}_i, \hat{e}_i) =: \phi(\hat{e}_i) = 0$, where

$$\phi(\hat{e}_i) = s \left\{ \frac{\sigma_i \bar{\eta}_i^R}{\hat{e}_i} - \bar{\eta}_i^R(\Delta_i - \sigma \bar{\eta}_i^R) - 2\sigma_i \mathbb{E}[z_i^2] \right\} - c' \left(\hat{e}_i + \sum_{m=1, m \neq i}^{k} e_m \right). \tag{C.10}$$

Let us consider problem i and fix the set of efforts for all other problems $\{e_m,\ m \neq i\}$. First, $\phi(\cdot)$ is continuous and decreasing on $(0, +\infty)$ because $\phi'(\hat{e}_i) = -c''(\hat{e}_i + \sum_{m=1, m\neq i}^{k} e_m) - s\sigma_i \bar{\eta}_i^R / \hat{e}_i^2 < 0$. Second, we have $\lim_{u \to 0^+} \phi(u) = +\infty$, since $c'(\cdot) < +\infty$. Third, as c is convex, and $\mathbb{E}[z_i^2] = V_i^z + (\bar{\eta}_i^R)^2$, it follows that $\phi(1/\bar{\eta}_i^R) < 0$ if[29]

$$-s\bar{\eta}_i^R \Delta_i - 2s\sigma_i \mathbb{E}[z_i^2] - c'(1/\bar{\eta}_i^R) < 0 \Leftrightarrow \Delta_i > -\frac{1}{s\bar{\eta}_i^R}[2s\sigma_i \mathbb{E}[z_i^2] + c'(1/\bar{\eta}_i^R)] =: -\underline{\Delta}_i.$$

Therefore, there is a critical level $\underline{\Delta}_i > 0$, such that if $\Delta_i > -\underline{\Delta}_i$, $\phi(1/\bar{\eta}_i^R) < 0$.

Consequently, according to the Intermediate Value Theorem, there is a unique point $\check{e}_i \in (0, 1/\bar{\eta}_i^R)$, such that $\phi(\check{e}_i) = 0$, i.e., $G(\check{e}_i, \check{e}_i) = 0$. As we have seen, the second-order condition is satisfied, hence $\check{e}_i$ is the unique maximum on $(0, 1/\bar{\eta}_i^R)$. Thus, $\check{e}_i = e_i^*$ is the unique equilibrium effort level, for all $i \in \{1, \cdots, k\}$, leading to proposition 5.

To compute e_i^*, we rewrite (C.4) as

$$\frac{s\sigma_i \bar{\eta}_i^R}{e_i^*} - \tilde{\omega}_i - \lambda = 0, \tag{C.11}$$

[29] Indeed, $-c'(1/\bar{\eta}_i^R + \sum_{m=1, m\neq i}^{k} e_m) < -c'(1/\bar{\eta}_i^R)$.

where $\lambda = c'\left(\sum_{m=1}^{k} e_m^*\right) = c'(e^*)$, and $\tilde{\omega}_i := s\bar{\eta}_i^R \Delta_i + \omega_i$ with $\omega_i = s\sigma_i\left(2\mathbb{E}[z_i^2] - \left(\bar{\eta}_i^R\right)^2\right)$.

By (C.11), the total effort e^* is determined by the following implicit relation

$$e^* = \sum_{m=1}^{k} e_m^* = \sum_{m=1}^{k} \frac{s\sigma_m \bar{\eta}_m^R}{\tilde{\omega}_m + c'(e^*)}. \tag{C.12}$$

Now, we examine the values of $\tilde{\omega}_i$. On the one hand, if $\tilde{\omega}_i = \bar{\omega} := \sum_{m=1}^{k} \tilde{\omega}_m / k$, Eq. (C.11) implies that $e_i^* = s\sigma_i \bar{\eta}_i^R/(\bar{\omega} + \lambda)$. Using (C.12), we find that $\bar{\omega} + \lambda = \sum_{m=1}^{k} s\sigma_m \bar{\eta}_m^R / e^*$. Consequently, we have $e_i^* = e^* q_i$, where $q_i := \bar{\eta}_i^R / \sum_{m=1}^{k} \bar{\eta}_m^R$, $\forall i \in \{1, \cdots, k\}$. On the other hand, by (C.4), we can establish that $\omega_i > \bar{\omega} \Leftrightarrow e_i^* = s\sigma_i \bar{\eta}_i^R/(\lambda + \bar{\omega}) < s\sigma_i \bar{\eta}_i^R/\lambda = e^* q_i$, hence the result of corollary 1.

Appendix D. The case of an active challenger

At the beginning of the first period, the incumbent and the challenger choose at the same time the amount of effort e_i and v_i to maximize $\mathbb{E}[\mu] - ce_i$ and $\mathbb{E}[1-\mu] - cv_i$, respectively. Using Eq. (17), the best response functions are

$$e_i^*(v_i^*) = \frac{s\sigma_i \bar{\eta}_i^R (1 - \bar{\eta}_i^D v_i^*)}{\tilde{\omega}_i + c}, \tag{D.1}$$

$$v_i^*(e_i^*) = \frac{s\sigma_i \bar{\eta}_i^D (1 - \bar{\eta}_i^R e_i^*)}{\tilde{\omega}_i' + c}, \tag{D.2}$$

where $\tilde{\omega}_i := s\bar{\eta}_i^R \Delta_i + s\sigma_i\left(2V_i^z + \left(\bar{\eta}_i^R\right)^2\right)$, and $\tilde{\omega}_i' = -s\bar{\eta}_i^D \Delta_i + s\sigma_i\left(2V_i^z + \left(\bar{\eta}_i^D\right)^2\right)$.

To find the equilibrium, we have to solve the system (D.1)-(D.2). After some manipulation, we obtain

$$e_i^* = \frac{s\sigma_i(\bar{\eta}_i^R)^2 - \frac{(s\sigma_i \bar{\eta}_i^R \bar{\eta}_i^D)^2}{\tilde{\omega}_i' + c}}{\bar{\eta}_i^R \left\{\tilde{\omega}_i + c - \frac{(s\sigma_i \bar{\eta}_i^R \bar{\eta}_i^D)^2}{\tilde{\omega}_i' + c}\right\}} =: e_i^*(\tilde{\omega}_i, \tilde{\omega}_i'),$$

$$v_i^* = \frac{s\sigma_i(\bar{\eta}_i^D)^2 - \frac{(s\sigma_i \bar{\eta}_i^R \bar{\eta}_i^D)^2}{\tilde{\omega}_i + c}}{\bar{\eta}_i^D \left\{\tilde{\omega}_i' + c - \frac{(s\sigma_i \bar{\eta}_i^R \bar{\eta}_i^D)^2}{\tilde{\omega}_i + c}\right\}} =: v_i^*(\tilde{\omega}_i, \tilde{\omega}_i').$$

Consequently, under the condition that $\Delta_i \in I := \left(-\frac{c + 2s\sigma_i V_i^z}{s(1+\sigma_i)\bar{\eta}_i^R}, \frac{c + 2s\sigma_i V_i^z}{s(1+\sigma_i)\bar{\eta}_i^D}\right)$, there is a unique pair of positive efforts $\{e_i^*, v_i^*\}$ that solves the fixed-point problem, defining the equilibrium. In addition, we can show that $\partial e_i^*/\partial \Delta_i < 0$ and $\partial v_i^*/\partial \Delta_i > 0$. Indeed, $\frac{de_i^*}{d\Delta_i} = \frac{\partial e_i^*}{\partial \tilde{\omega}_i}\frac{\partial \tilde{\omega}_i}{\partial \Delta_i} + \frac{\partial e_i^*}{\partial \tilde{\omega}_i'}\frac{\partial \tilde{\omega}_i'}{\partial \Delta_i} < 0$ and $\frac{dv_i^*}{d\Delta_i} = \frac{\partial v_i^*}{\partial \tilde{\omega}_i}\frac{\partial \tilde{\omega}_i}{\partial \Delta_i} + \frac{\partial v_i^*}{\partial \tilde{\omega}_i'}\frac{\partial \tilde{\omega}_i'}{\partial \Delta_i} > 0$, because $\frac{\partial e_i^*}{\partial \tilde{\omega}_i}\frac{\partial \tilde{\omega}_i}{\partial \Delta_i} < 0$, $\frac{\partial v_i^*}{\partial \tilde{\omega}_i'}\frac{\partial \tilde{\omega}_i'}{\partial \Delta_i} > 0$; and $\frac{\partial e_i^*}{\partial \tilde{\omega}_i'}\frac{\partial \tilde{\omega}_i'}{\partial \Delta_i} < 0$, $\frac{\partial v_i^*}{\partial \tilde{\omega}_i}\frac{\partial \tilde{\omega}_i}{\partial \Delta_i} > 0$ if $\Delta_i \in I$.

Appendix E. Transparency and the need for enemies

Proof of Proposition 6. The proof follows Appendix C by replacing in Eq. (C.1) the term $\Lambda(e_i)$ with the term $\hat{\Lambda}(e_i)$, where from Eq. (19)

$$\hat{\Lambda}(e_i) := \left[1 - \delta_i e_i z_i - (1-\delta_i)\tilde{e}_i \bar{\eta}_i^R\right]\left[\delta_i \tilde{\eta}_i^R + (1-\delta_i)\bar{\eta}_i^R - \bar{\eta}_i^D\right], \tag{E.1}$$

where $z_i = \epsilon_i + \eta_i^R$. The expected value is then

$$\begin{aligned}\mathbb{E}[\hat{\Lambda}(e_i)] =& \delta_i \mathbb{E}[\tilde{\eta}_i^R][1-(1-\delta_i)\tilde{e}_i\bar{\eta}_i^R] + (1-\delta_i)\bar{\eta}_i^R - \bar{\eta}_i^D - \delta_i^2 e_i \mathbb{E}[z_i^R \tilde{\eta}_i^R] \\ &+ \bar{\eta}_i^R[\bar{\eta}_i^D - (1-\delta_i)\bar{\eta}_i^R][(1-\delta_i)\tilde{e}_i + \delta_i e_i].\end{aligned}$$

By (6), we have $\mathbb{E}[\tilde{\eta}_i^R] = \bar{\eta}_i^R[1-\sigma_i+\sigma_i(e_i/\tilde{e}_i)]$ and $\mathbb{E}[z_i\tilde{\eta}_i^R] = (\bar{\eta}_i^R)^2[1-\sigma_i+\sigma_i(e_i/\tilde{e}_i)] + \sigma_i(e_i/\tilde{e}_i)V_i^z$. Hence,

$$\begin{aligned}\mathbb{E}[\hat{\Lambda}(e_i)] =& \delta_i\bar{\eta}_i^R\left[1-\sigma_i+\sigma_i\frac{e_i}{\tilde{e}_i}\right]\left[1-(1-\delta_i)\tilde{e}_i\bar{\eta}_i^R - \delta_i\bar{\eta}_i^R e_i\right] - \sigma_i\delta_i^2\frac{e_i^2}{\tilde{e}_i}V_i^z \\ &+ (1-\delta_i)\bar{\eta}_i^R - \bar{\eta}_i^D + \bar{\eta}_i^R[\bar{\eta}_i^D - (1-\delta_i)\bar{\eta}_i^R][(1-\delta_i)\tilde{e}_i + \delta_i e_i].\end{aligned}$$

Using a Lagrange function similar to (C.2), Eqs. (C.3) and (C.5) are unchanged, while (C.4) becomes

$$\begin{aligned}\frac{\partial\mathcal{L}}{\partial e_i} = s\delta_i\Bigg\{&\frac{\bar{\eta}_i^R\sigma_i}{\tilde{e}_i}\left[1-(1-\delta_i)\tilde{e}_i\bar{\eta}_i^R - \delta_i\bar{\eta}_i^R e_i\right] - \delta_i(\bar{\eta}_i^R)^2\left[1-\sigma_i+\sigma_i\frac{e_i}{\tilde{e}_i}\right] \\ &- 2\delta_i\sigma_i\frac{e_i}{\tilde{e}_i}V_i^z - \bar{\eta}_i^R[\bar{\eta}_i^R(1-\delta_i) - \bar{\eta}_i^D]\Bigg\} + \lambda = 0,\end{aligned} \tag{E.2}$$

which implies that $\partial^2\mathcal{L}/\partial e_i^2 = -2s\sigma_i\delta_i^2\mathbb{E}[z_i^2]/\tilde{e}_i < 0$. Therefore, as (C.6) and (C.8) are unchanged, the second-order condition is verified. Moreover, in equilibrium ($e_i = \tilde{e}_i$), (E.2) becomes (with $\lambda = c'(e^*)$ in (C.3))

$$e_i^* = \frac{s\sigma_i\delta_i\bar{\eta}_i^R}{\hat{\omega}_i + c'(e^*)}, \tag{E.3}$$

where $\hat{\omega}_i := \delta_i\left[\tilde{\omega}_i - 2s\sigma_i(1-\delta_i)V_i^z\right]$, corresponding to Eq. (20) in the main text, with e^* implicitly defined in

$$e^* = \sum_{m=1}^{k} e_m^* = \sum_{m=1}^{k}\frac{s\sigma_m\delta_m\bar{\eta}_m^R}{\hat{\omega}_m + c'(e^*)}.$$

Following Appendix C, to ensure that $e_i^* \in [0, 1/\bar{\eta}_i^R]$, we assume that the gap Δ_i is above a critical level $-\underline{\hat{\Delta}}_i < 0$ (to be computed).

Finally, differentiating (E.3) with respect to δ_i, we can establish that

$$\frac{\partial e_i^*}{\partial \delta_i} \geq 0 \Leftrightarrow c'(e^*) - 2s\sigma_i V_i^z \delta_i^2 \geq 0 \Leftrightarrow \delta_i < \overline{\delta}_i, \tag{E.4}$$

where $\overline{\delta}_i := \sqrt{c'(e^*)/2s\sigma_i V_i^z}$. Besides, we have $\overline{\delta}_i < 1$ if $c'(e^*) < 2s\sigma_i V_i^z$. □

Proof of Proposition 7. We solve the extended game by backward induction. The incumbent chooses effort in the first step (for a given δ_i) and the optimal degree of transparency in the second step. The first step gives rise to the equilibrium effort (E.3), and the incumbent's objective in the second step is, taking into account the cost of concealment (γ_i),

$$\max_{\delta_i \geq 0} \hat{W}(\delta_i), \text{ where } \hat{W}(\delta_i) := W(\delta_i) - \gamma_i(1 - \delta_i),$$

and $W(\delta_i) := \mathbb{E}[\mu(e_i^*(\delta_i), \delta_i)] - c'(e^*(\delta_i))$. Thus, by (E.1),

$$\mu(e_i^*(\delta_i), \delta_i) = \frac{1}{2} + s \sum_{i=1}^{k} \left[1 - \delta_i e_i^*(\delta_i) z_i - (1 - \delta_i) e_i^*(\delta_i) \bar{\eta}_i^R\right] \left[\delta_i \tilde{\eta}_i^R + (1 - \delta_i)\bar{\eta}_i^R - \bar{\eta}_i^D\right], \tag{E.5}$$

Taking the derivative with respect to δ_i, and according to the Leibniz rule, we obtain

$$\hat{W}'(\delta_i) = \mathbb{E}\left[\frac{\partial e_i^*}{\partial \delta_i}\left(\frac{\partial \mu}{\partial e_i^*} - c'(e^*)\right) + \frac{\partial \mu}{\partial \delta_i}\right] + \gamma_i. \tag{E.6}$$

Since e_i^* is the equilibrium effort level, it satisfies the FOC: $\mathbb{E}[\partial \mu / \partial e_i^*] - c'(e^*) = 0$; hence, $W'(\delta_i) = \mathbb{E}\left[\partial \mu / \partial \delta_i\right] + \gamma_i$. Using Eq. (E.5), we obtain

$$\frac{1}{s}\frac{\partial \mu}{\partial \delta_i} = e_i^*[\bar{\eta}_i^R - z_i][\delta_i \tilde{\eta}_i^R + (1 - \delta_i)\bar{\eta}_i^R - \bar{\eta}_i^D] + (\tilde{\eta}_i^R - \bar{\eta}_i^R)[1 - \delta_i e_i^* z_i - (1 - \delta_i) e_i^* \bar{\eta}_i^R]. \tag{E.7}$$

In equilibrium ($\tilde{e}_i = e_i^*$), since $\tilde{\eta}_i^R = (1 - \sigma_i)\bar{\eta}_i^R + \sigma_i z_i$, the FOC becomes

$$\hat{W}'(\delta_i) = \mathbb{E}\left[\frac{\partial \mu}{\partial \delta_i}\right] + \gamma_i = \gamma_i - 2s\delta_i \sigma_i e_i^* V_i^z = 0, \tag{E.8}$$

and hence, the optimal degree of transparency δ_i^* must satisfy

$$\delta_i^* e_i^* = \frac{\gamma_i}{2s\sigma_i V_i^z}. \tag{E.9}$$

Regarding the second-order condition, differentiating Eq. (E.8) with respect to δ_i, we obtain

$$\hat{W}''(\delta_i^*) = -2s\sigma_i V_i^z \left[e_i^* + \delta_i^* \left.\frac{\partial e_i^*}{\partial \delta_i}\right|_{\delta_i=\delta_i^*} \right].$$

By (E.4), we have $\partial e_i^*/\partial\delta_i \geq 0$ for $\delta_i \leq \bar{\delta}_i$. Therefore, using Eq. (E.9): $\exists \varepsilon > 0$; $\forall \gamma_i \leq \varepsilon$; $\delta_i \leq \bar{\delta}_i$ and $\hat{W}''(\delta_i^*) < 0$. Consequently, for small γ_i, δ_i^* is the unique critical point $(0, \bar{\delta}_i)$ that maximizes the objective function of the incumbent $(\hat{W})$.

Let us now study the effect of parameters. The FOC (E.9) can be written as $H_i(\cdot) := \sigma_i V_i^z \delta_i^* e_i^* - \frac{\gamma_i}{2s} = 0$, namely, using Eq. (E.3) and assuming a linear cost function ($c(e) = ce$),

$$H_i(\delta_i^*, \sigma_i, V_i^z, \Delta_i) = \frac{s\bar{\eta}_i^R V_i^z (\sigma_i \delta_i^*)^2}{\hat{\omega}_i + c} - \frac{\gamma_i}{2s}.$$

Thus, we compute

$$H_i(\delta_i^*, \sigma_i, V_i^z, \Delta_i) = \frac{s\bar{\eta}_i^R V_i^z \sigma_i^2}{\frac{s\bar{\eta}_i^R}{\delta_i^*}(\Delta_i + \bar{\eta}_i^R \sigma_i) + \frac{c}{(\delta_i^*)^2} + 2s\sigma_i V_i^z} - \frac{\gamma_i}{2s}.$$

Hence, $\partial_1 H_i(\delta_i^*, \cdot) > 0$, $\partial_3 H_i(\delta_i^*, \cdot) > 0$ and $\partial_4 H_i(\delta_i^*, \cdot) < 0$, under the sufficient condition that $s\bar{\eta}_i^R \delta_i^*(\Delta_i + \bar{\eta}_i^R \sigma_i) + 2c > 0$, namely, if $\gamma_i < \bar{\gamma}_i^1 := s\sigma_i \bar{\eta}_i^R$. In addition, $\partial_2 H_i(\delta_i^*, \cdot) > 0$ under the sufficient condition that $\gamma_i < \bar{\gamma}_i^2 := 4s\sigma_i\bar{\eta}_i^R[2 + (\bar{\eta}_i^R)^2/\delta_i V_i^z]^{-1}$. Thus, according to the Implicit Function Theorem, if γ_i is small enough, i.e., $\gamma_i < \min\{\bar{\gamma}_i^2, \bar{\gamma}_i^2\}$, it follows that

$$\frac{\partial \delta_i^*}{\partial \sigma_i} = -\frac{\partial_2 H_i(\delta_i^*, \cdot)}{\partial_1 H_i(\delta_i^*, \cdot)} < 0, \; \frac{\partial \delta_i^*}{\partial V_i^z} = -\frac{\partial_3 H_i(\delta_i^*, \cdot)}{\partial_1 H_i(\delta_i^*, \cdot)} < 0, \text{ and } \frac{\partial \delta_i^*}{\partial \Delta_i} = -\frac{\partial_4 H_i(\delta_i^*, \cdot)}{\partial_1 H_i(\delta_i^*, \cdot)} > 0.$$

Appendix F. Reform versus routine

Proof of Proposition 8. To determine the equilibrium, we follow the two-step procedure of the proof of proposition 2. The first step computes the first-order conditions relative to the incumbent's program (31), for a given principal's conjecture, and the second step solves the fixed-point problem.

Step 1. For a given principal's conjecture $\{\tilde{e}, \tilde{a}\}$, by taking expectation of Eq. (30), the incumbent maximizes

$$\begin{aligned} W(e,a) = \frac{1}{2} &+ s(1+\kappa)\left(\sigma_l \bar{\eta}\frac{e}{\tilde{e}} + \sigma_r(\bar{\eta} + a - \tilde{a}) - (\sigma_l + \sigma_r)\bar{\eta}\right) \\ &- se\left(\sigma_l \mathbb{E}[z^2]\frac{e}{\tilde{e}} + \sigma_r \mathbb{E}[zz'] + \sigma_r\bar{\eta}(a - \tilde{a}) - (\sigma_l + \sigma_r)\bar{\eta}^2\right) - c(e+a). \quad \text{(F.1)} \end{aligned}$$

The first-order conditions are

$$\frac{\partial W(e,a)}{\partial e} = \frac{s(1+\kappa)\sigma_l\bar{\eta}}{\tilde{e}} - s\left(\sigma_l\mathbb{E}[z^2]\frac{e}{\tilde{e}} + \sigma_r\mathbb{E}[zz'] + \bar{\eta}\sigma_r(a-\tilde{a}) - (\sigma_l+\sigma_r)\bar{\eta}^2\right) - \frac{s\sigma_l\mathbb{E}[z^2]e}{\tilde{e}} - c'(e+a) = 0, \quad \text{(F.2)}$$

$$\frac{\partial W(e,a)}{\partial a} = s\sigma_r(1+\kappa) - s\bar{\eta}\sigma_r e - c'(e+a) = 0, \quad \text{(F.3)}$$

hence;

$$\frac{\partial^2}{\partial e^2}W(e,a) = -\frac{2s\sigma_l}{\tilde{e}}\mathbb{E}[z^2] - c''(e+a), \quad \text{(F.4)}$$

$$\frac{\partial^2}{\partial e\,\partial a}W(e,a) = -s\bar{\eta}\sigma_r - c''(e+a), \quad \text{(F.5)}$$

$$\frac{\partial^2}{\partial a^2}W(e,a) = -c''(e+a). \quad \text{(F.6)}$$

Let $\mathbf{H}(e,a)$ define the Hessian matrix of W. Since $c(\cdot)$ is convex, we obtain, by (F.4), (F.5), and (F.6), $\text{tr}(\mathbf{H}(e,a)) = -2s\sigma_l\mathbb{E}[z^2]/\tilde{e} - 2c''(e+a) < 0$, and

$$\det(\mathbf{H}(e,a)) = \frac{2s\sigma_l\mathbb{E}[z^2]c''(e+a)}{\tilde{e}} - (s\bar{\eta}\sigma_r)^2 - 2s\bar{\eta}\sigma_r c''(e+a) \quad \text{(F.7)}$$

Consequently, if $\det(\mathbf{H}(e,a)) > 0$, the Hessian is a negative-definite matrix at (e,a).

Step 2. At equilibrium, the conjecture has to be equal to effort levels determined by the first-order conditions, namely, we have to find the levels e^* and a^* such that: (i) $e = \tilde{e} = e^*$, $a = \tilde{a} = a^*$; (ii) $\partial W(e^*,a^*)/\partial e = 0$, $\partial W(e^*,a^*)/\partial a = 0$; (iii) $\det(\mathbf{H}(e^*,a^*)) > 0$; and (iv) $(e^*,a^*) \in [0,1/\bar{\eta}] \times \mathbb{R}_+^*$.

To this end, let us fix the points $e = \tilde{e} =: \check{e}$ and $a = \tilde{a} =: \check{a}$.

The FOCs (F.2) and (F.3) lead to an implicit relation $\psi(\check{e}) = 0$, where, using $\check{\omega} := s\left\{2\sigma_l\mathbb{E}[z^2] + \sigma_r\mathbb{E}[zz'] - \bar{\eta}^2(\sigma_l+\sigma_r)\right\} = s\left\{\sigma_l\bar{\eta}^2 + 2\sigma_l(V^\eta + V^\epsilon) + \sigma_r V^\eta\right\} > 0$,[30]

$$\psi(\check{e}) := \frac{s(1+\kappa)\sigma_l\bar{\eta}}{\check{e}} - \check{\omega} - s\sigma_r(1+\kappa) + s\bar{\eta}\sigma_r\check{e} = 0, \quad \text{(F.8)}$$

and

$$\psi'(\check{e}) = -\frac{s(1+\kappa)\sigma_l\bar{\eta}}{\check{e}^2} + s\bar{\eta}\sigma_r.$$

Thus, $\psi'(e) > 0 \Leftrightarrow e > \bar{e} := \sqrt{(1+\kappa)\sigma_l/\sigma_r}$ and $\psi'(e) \leq 0 \Leftrightarrow e \leq \bar{e}$. In addition, we have $\psi(0^+) = +\infty$, and $\psi(1/\bar{\eta}) = s(1+\kappa)\sigma_l\bar{\eta}^2 - \check{\omega} - s\sigma_r\kappa = s\kappa(\sigma_l\bar{\eta}^2 - \sigma_r) - s\left\{2\sigma_l(V^\eta + V^\epsilon) + \sigma_r V^\eta\right\}$. Thus, if $\psi(1/\bar{\eta}) < 0$, there is a unique reform effort level

[30] We use $\mathbb{E}[z^2] = V^\eta + V^\epsilon + \bar{\eta}^2$, and $\mathbb{E}[zz'] = \mathbb{E}[\eta^2] = V^\eta + \bar{\eta}^2$.

$e^* \in (0, 1/\bar{\eta})$, such that $\psi(e^*) = 0$.

Let us now focus on the optimal effort of routine. Given the reform effort e^*, the FOC (F.3) can be written as $\Psi(\breve{a}) = 0$, where

$$\Psi(\breve{a}) := s\sigma_r(1 - \bar{\eta}e^*) + s\sigma_r\kappa - c'(e^* + \breve{a}). \tag{F.9}$$

Clearly, Ψ is a continuous decreasing function, where $\Psi(+\infty) = -\infty$ and $\Psi(0) = s\sigma_r(1 - \bar{\eta}e^*) + s\sigma_r\kappa - c'(e^*) > s\sigma_r\kappa - c'(1/\bar{\eta})$, since $e^* < 1/\bar{\eta}$. Using a quadratic cost function ($c(u) = c_0u^2/2$), if $c_0 < \bar{c}_0 := s\sigma_r\kappa\bar{\eta}$, there is a unique critical level $a^* > 0$ such that $\Psi(a^*) = 0$.

Finally, the second-order condition is satisfied iff $\det(\mathbf{H}(e^*, a^*)) > 0$. By (F.7), since $e^* < 1/\bar{\eta}$, we can write

$$\det(\mathbf{H}(e^*, a^*)) = \frac{2s\sigma_l\mathbb{E}[z^2]c_0}{e^*} - (s\bar{\eta}\sigma_r)^2 - 2s\bar{\eta}\sigma_r c_0 > 2s\bar{\eta}c_0(\sigma_l\mathbb{E}[z^2] - \sigma_r) - (s\bar{\eta}\sigma_r)^2$$

Consequently, there is a set of parameters $\mathscr{C}$ for which conditions $\psi(1/\bar{\eta}) < 0$, $\Psi(0) > 0$ and $\det(\mathbf{H}(e^*, a^*)) > 0$ hold, such that there is a unique pair of equilibrium efforts $\{e^*, a^*\}$. The set $\mathscr{C}$ is nonempty. Indeed, if we consider (i) $\bar{\eta}^2 < \sigma_r/\sigma_l < V^\eta + V^\epsilon + \bar{\eta}^2$, and (ii) $c_0 \in (\underline{c}_0, \bar{c}_0)$, with $\underline{c}_0 := s\bar{\eta}\sigma_r^2/[2(\sigma_l\mathbb{E}[z^2] - \sigma_r)]$, conditions $\psi(1/\bar{\eta}) < 0$, $\Psi(0) > 0$ and $\det(\mathbf{H}(e^*, a^*)) > 0$ are satisfied together.

$\square$

Proof of Corollary 2. First, by (F.8), we prove that $\partial e^*/\partial\breve{w} < 0$, as $\partial\psi/\partial e < 0$ at $e = e^*$, and $\partial\psi/\partial\breve{\omega} < 0$. Second, by (F.9), we prove that $\partial a^*/\partial e^* < 0$, as $\partial\Psi/\partial e < 0$ and $\partial\Psi/\partial a < 0$ at $(e, a) = (e^*, a^*)$. Consequently, it follows that $\partial a^*/\partial\breve{\omega} = (\partial a^*/\partial e^*)(\partial e^*/\partial\breve{\omega}) > 0$.