

Collapsing Morale in Bureaucratic Environments

Paul Grout*
Department of Economics
University of Bristol

Wendelin Schnedler**
Department of Economics
University of Heidelberg

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Abstract

Almost a defining feature of bureaucracies is their hierarchical structure, which arbitrates between competing claims. A common characteristic of bureaucratic environments is that employees' effort can be particularly fragile. Seemingly irrelevant changes (a new manager or a shift of responsibilities) can trigger a collapse of morale or lead to a positive step change in commitment. This paper provides an explanation for this phenomenon. We model employee motivation and effort in a bureaucratic environment, show that discontinuities of effort are almost ubiquitous in such environments and identify conditions that lead to discontinuous increase or decrease in effort.

Keywords: bureaucracy, hierarchy, collapse of morale, power within organizations

JEL-Codes: H42, M52, L30, J32

*Centre for Market and Public Organisation, University of Bristol 2 Priory Road, Bristol, BS8 1TX, UK. (p.a.grout@bristol.ac.uk).

**corresponding author: Universität Heidelberg, Alfred-Weber-Institut, Bergheimer Straße 58, 69115 Heidelberg, Germany. (wendelin.schnedler@awi.uni-heidelberg.de). tel: +49 6221 542922, fax: +49 6221 543630.

1 Introduction

Employees, whether providing public services or private goods, frequently operate in environments in which they benefit from the support of a bureaucrat. For example, people working for aid organizations rely on equipment provided by the governments of the countries they try to help; nurses and doctors are more effective if hospitals are better equipped; teaching becomes difficult if there is a shortage of teaching materials, unheated classrooms, etc. Bureaucracies are typically characterized by a hierarchical structure where bureaucrats at one level defer to those above. Or as Crozier puts it in his classic volume *The Bureaucratic Phenomenon*: ‘it is necessary that a hierarchical order and an institutional structure impose discipline on the different individuals and groups, and arbitrate between their claims’ (Crozier, 1964). A common characteristic of such environments is that employees’ effort can be particularly sensitive. Seemingly irrelevant changes (a new manager or a shift of responsibilities) can trigger a collapse of morale or galvanize a team and lead to a step change in attitudes and commitment. This paper provides an explanation for this phenomenon. We model employee motivation and effort in a bureaucratic environment and show that discontinuities of effort are almost ubiquitous.¹

The main result of the paper is quite generic and naturally arises from the hierarchical structure of bureaucratic environments. Later in the paper, we discuss situations to which our results apply and provide examples. As a foretaste that may help motivate the analysis, consider the case of the Federal Emergency Management Agency (FEMA). FEMA coordinates relief work and helps in cases of natural disasters, catastrophes, and other emergen-

¹As will become clear, the discontinuity will not manifest following any change but it is latent.

cies throughout the United States. Dealing with and preparing for disasters involves many unforeseen contingencies, so that respective efforts are notoriously difficult to stipulate in contracts. Nevertheless, FEMA had been a showcase of quick and efficient emergency response at least until 2001.² Only a few years later, however, hurricane Katrina devastated large parts of the South-East of the United States and FEMA's dealing with the situation was deemed a complete failure.³ A year before FEMA's failure, its director foretold that a comparatively small shift in power balance within the Department of Homeland Security (DHS) and away from FEMA would shatter agency morale.

The finding that a small change in the bureaucratic environment triggers strong behavioral responses is derived in the following framework. An employee (he) offers some input and his welfare is affected by this input and the level of support that he receives. The level of support is determined by a bureaucrat (she). The bureaucrat will typically have opportunity costs associated with supporting the employee and may face different pressures and incentives. The bureaucrat's preferences will hence not necessarily be aligned with that of the employee. In our model, we have two levels in the bureaucracy, the bureaucrat who directly determines the support and an individual at a higher level within the bureaucracy (we term this person 'higher au-

²A Congressional hearing appraised FEMA's reaction to the Midwestern floods in 1993, local officials declared to be very satisfied with its response to the Oklahoma city bombing in 1995, and more than 80% of disaster victims approved of the way the agency was doing its job. FEMA also played a leading role in coordinating rescue efforts in 2001; its urban search and rescue teams were mobilized and deployed within minutes after the first hijacked plane hit the World Trade Center.

³The report of the Select Committee Hearing came to the conclusion that 'the readiness of FEMA's national emergency response teams was inadequate and reduced the effectiveness of the federal response.'

thority') who if called upon by the employee may be willing to provide some pressure on the bureaucrat to increase support. Appealing to the higher authority is not costless (e.g., it can be time consuming, use up goodwill, etc.). The bureaucrat's power is thus curbed by the quality of the relationship between the employee and the higher authority. We show that small changes in this relationship can have discontinuous effects on employee effort unless both levels of the bureaucracy perfectly agree on how to support effort.

The discontinuity arises because the bureaucrat's choice may or may not be restricted by the desire to avoid appeal (and hence a potential overruling). Under the looming threat of a credible appeal, the bureaucrat may have to respond to greater effort from the employee by increasing support to avert the threat. In contrast, when the threat does not restrict the bureaucrat, a greater supply of effort allows her to cut down on her support. Whether the threat to appeal is credible depends on the bureaucrat's power and thus on the relationship between employee and higher authority. A small increase in her relative power may mean that she is no longer restricted by the threat of appeal and hence free to reduce support if she wishes. Incentives can thus dramatically change with marginal changes in relative power; from a setting where effort leads to more support to one where it leads to less support. Hence, the employee's incentives shift from effort being 'crowded in' to being 'crowded out' and as a result supplied effort changes discontinuously.

The fundamental assumptions driving the results are those of contractual incompleteness, the bureaucratic hierarchical structure and differences between the bureaucrat and the higher authority on how effort should be supported. Before moving to the model it is worth discussing how these things relate to each other. If effort, support, or the result of these inputs could be stipulated in contracts, then neither the organization structure nor

its context would matter for incentives to provide effort. However, rather than simply proposing that incompleteness is an interesting and common feature worthy of consideration in the context of bureaucracy, we suggest that the incomplete nature of contracts, the bureaucratic structure, and the differing interests between bureaucrat and higher authority are almost inextricably intertwined. For example, the problem of non-verifiable inputs and outputs is at the heart of Wilson's monograph on government bureaucracies (1989).⁴ Contractual incompleteness implies potential freedom of action on the part of the involved parties. Hence, contractual incompleteness calls for some form of resolution process, leading naturally, albeit not uniquely, to a hierarchical organization with implicit or explicit appeal procedures in order to curtail this discretion. A hierarchical structure is a central component of, indeed almost the definition of, bureaucracy. Hierarchical structure has been seen as one of the central defining features of a bureaucracy from Weber onwards ('each individual has a clearly defined competence within a hierarchical division of labor and is answerable for its performance to a superior,' Beetham, 1991), and a hierarchical structure and bureaucracy are frequently seen as synonymous (see e.g. Jaques, 1991). For the discontinuity to arise, higher authority and bureaucrat must respond differently to effort; formally, their *elasticities of support* with respect to effort must differ. If they reacted in exactly the same way, the nature of incentives to exert effort would not shift. In other words, the player benefiting from discretion (the bureaucrat) and the party curbing this discretion (the higher authority) cannot pursue identical goals. Again, we can take this as almost definitional within a bureaucracy since, as the Crozier quote above makes clear, the need

⁴Wilson uses the terminology 'coping organizations' to refer to bureaucracies dealing with this problem of non-verifiability.

for hierarchy arises from the different claims and the hierarchy's ability to resolve these competing claims. Hence, we see contractual incompleteness, bureaucracy and differences in elasticity of supply as natural bedfellows that benefit from analysis as a combined entity.⁵

The remainder of the paper is organized as follows. The next section introduces the model. In Section 3, we analyze this model and present the formal results. Finally, Section 4 concludes with a discussion of key assumptions, applications, and implications.

2 Model and Notation

The key ingredients to the model are an employee who benefits from support, a bureaucrat who can provide this support but could use resources differently, and the possibility to appeal to some higher authority who responds differently to effort than the bureaucrat. This section explains the details of this model and establishes as a benchmark how the bureaucrat behaves in absence of appeals. It also formalizes what we mean by higher authority and bureaucrat 'responding differently to effort.'

2.1 Model Assumptions

The employee is hired by an agency at wage w to produce an output, which depends on his effort and on the support of a bureaucrat.

Effort and support. The employee's effort and the bureaucrat's support may have aspects that can be stipulated in contracts. We assume that such contracts are used wherever this is possible, and focus our analysis on the part

⁵Our paper focuses on the hierarchical feature of bureaucracies and the consequences that arise from this. There are other features of bureaucracies that we do not address.

of effort and support, e and s , which cannot be implemented by contracts, where effort e comes from some compact interval.

Employee's utility. The employee in our model prefers more to less support s . In addition, the employee's utility depends on e and increases in wages w : $u(e, s, w)$, where u increases in support s and wages w and is continuously differentiable and jointly concave in e and s . The utility may be initially decreasing or increasing in e , capturing both selfish preferences and intrinsic motivation. If the employee decides not to work for the agency, he has an outside opportunity that yields a utility level of \underline{u} .

Bureaucrat's utility. The bureaucrat's utility may be affected by effort and wages but most importantly, the bureaucrat has some motive to set a positive (possibly small) level of support. The motive could be altruism or idealism but may also be driven by her desire to maintain her standing or because support increases the agency's output, which bestows prestige on her. If the bureaucrat would never support the employee, an appeal can do no harm and the question of whether to appeal to the higher authority becomes trivial. Formally, the bureaucrat's utility is a concave function in support s with a unique positive maximizer (for any e and w): $v(e, s, w)$. In order to ensure that any discontinuity results from the structure of the game and is not due to ill-behaved fundamentals, we assume that the utility is continuously differentiable in effort, support, and wage.

Agency. To close our model, we need a player who negotiates with the employee about the wage and the bureaucrat about support: the agency. The agency is interested in maximizing resources for production, i.e., it wants a low wage and a high (expected) support. The reason could be that the agency's manager profits from these resources in form of perks, private benefits, etc. Alternatively, she may be interested in a large output value.

Appeal to higher authority. While the agency wants as much support as possible, support is eventually costly to the bureaucrat. Interests of the agency and the bureaucrat are thus conflicting and we need to specify how this conflict is resolved. In line with the initial example, the bureaucrat decides on support but her power is curbed. If the agency considers support to be too low, it can try to overturn the bureaucrat's decision by appealing to some higher authority. If the appeal is successful, the higher authority sets support to a strictly positive level $s^A(e)$. This support $s^A(e)$ could be modeled endogenously by introducing the higher authority as a player with an objective function of which $s^A(e)$ is the maximizer. Being interested in the consequences of $s^A(e)$ rather than its origin and avoiding the complication of another player, we do not model the higher authority explicitly and take $s^A(e)$ to be given exogenously. This also allows us to maintain more generality with respect to $s^A(e)$.

Costs of appeal. Waiting or lobbying for more support entails costs. These costs are represented in the model by assuming that the waiting time until the higher authority overturns the decision, denoted by τ , is Poisson distributed with an arrival rate of $\frac{1}{\beta}$ and that the agency discounts delays in support exponentially with $1 - e^{-r\tau}$, where r represents the agency's patience, e.g., how urgently support is needed. The arrival rate can be conveniently interpreted as the agency's negotiation or lobbying skills, while its inverse, β , can be interpreted as the bureaucrat's power. As will become clear later, these assumptions ensure that the expected support after appeal is a simple continuous function of β .⁶ In order to break ties, we assume that the agency accepts any offer that is at least as good as her outside option.

⁶Alternatively, one could directly impose the expected support after appeal to be $\delta(\beta)s^A(e)$, where δ is a continuous and decreasing function of β .

Figure 1 gives an overview about the timing of the moves by agency, employee, and bureaucrat.

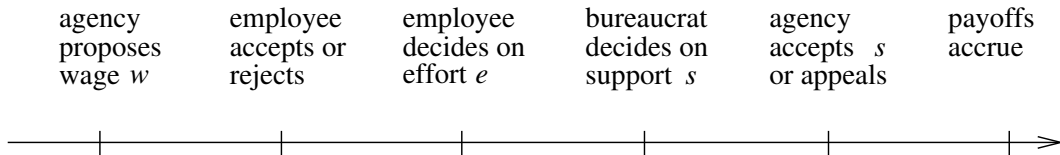


Figure 1: Sequence of events

2.2 Support by an Unfettered Bureaucrat

The key idea of our model is that the bureaucrat's discretion is limited. Still, it is useful to consider the benchmark case in which the bureaucrat's power is unlimited. In this case, she simply maximizes her utility in support. Denote the respective support level by

$$s^B(e) := \operatorname{argmax}_s v(e, s, w), \quad (1)$$

where this inner solution is positive by assumption.

We thus have two benchmarks. While s^A describes the (exogenous) support by the higher authority after a successful appeal, s^B stands for the support if the bureaucrat had full power. Later, we will derive the actual support s as a function of these two benchmarks.

If the support imposed by the higher authority s^A is below the unfettered bureaucrat's support s^B , there is no point in appealing to the higher authority. In the following, we hence restrict attention to the case where $s^A > s^B$.

2.3 Elasticity of Support

The higher authority's support in case of a successful appeal, s^A , has deliberately been left general in order to capture a variety of situations. Still, there is one aspect of this support that turns out to be crucial: how it responds to effort in relation to the unfettered bureaucrat's support. For example, the bureaucrat may reduce support when the employee increases effort, while the higher authority rewards greater effort with more support. This is just one of many ways how the response by higher authority and bureaucrat could differ. The following definition gives structure to these responses.

Definition 1 (Elasticity of support). *The higher authority's support is more elastic than that of the bureaucrat if*

$$\frac{ds^A(e)}{de} \frac{e}{s^A(e)} > \frac{ds^B(e)}{de} \frac{e}{s^B(e)} \text{ for all } e > 0. \quad (2)$$

Conversely, the bureaucrat's support is more elastic if

$$\frac{ds^B(e)}{de} \frac{e}{s^B(e)} > \frac{ds^A(e)}{de} \frac{e}{s^A(e)} \text{ for all } e > 0.^7$$

In the example, where the bureaucrat's support falls while the higher authority's support increases in effort, the higher authority's support is more elastic than that of the bureaucrat (the left-hand side of inequality (2) is positive while the right hand side is negative). Often a more elastic support by the higher authority seems a reasonable description. In some applications, however, the bureaucrat's support may be more elastic than that of the higher authority. We analyze both cases, while we use a more elastic support by the higher authority as the leading example.

⁷In both cases, the ratios are well-defined because $s^A(e) > 0$ and $s^B(e) > 0$.

3 Behavior in Equilibrium

As a solution concept, we employ the subgame-perfect equilibrium and solve the game in three steps using backward induction. First, we determine whether the agency accepts the support offered by the bureaucrat or appeals to the higher authority. Second, we analyze the bureaucrat's decision as to how much to support the agency. Finally, we examine the behavior of the employee.

3.1 Appeal Decision

The agency has to decide whether to accept the proposal s by the bureaucrat or whether to lobby for higher support s^A . Given our assumptions about the Poisson distributed waiting times and the exponential discounting, the certainty equivalent from appealing amounts to:

$$\int_0^\infty e^{-r\tau} s^A(e) e^{-\frac{1}{\beta}\tau} \frac{1}{\beta} d\tau = \frac{\frac{1}{\beta}}{r + \frac{1}{\beta}} \cdot s^A(e) = \delta(\beta) \cdot s^A(e), \text{ with } \delta(\beta) := \frac{1}{\beta r + 1}.$$

The agency thus accepts any support s that is equal to $\delta(\beta) \cdot s^A(e)$ or larger and refuses the proposed support s , otherwise.

3.2 Bureaucrat's Support

The bureaucrat foresees the decision of the agency. She thus knows that she can avoid appeal by offering a support $s \geq \delta(\beta)s^A(e)$. Indeed, it is optimal for her to offer at least $\delta(\beta)s^A(e)$ and prevent appeal (see Lemma 1 in Appendix B).

In equilibrium, the bureaucrat will hence offer a support that maximizes her utility while ensuring immediate agreement. If her support while being unfettered, $s^B(e)$, leads to an immediate settlement, then she chooses

this support. If contributing $s^B(e)$ is not enough to prevent appeal because $s^B(e) < \delta(\beta)s^A(e)$, then she settles for the smallest possible support that prevents an appeal: $\delta(\beta) \cdot s^A(e)$.⁸ So in this case, the constraint binds. Overall, the support by the bureaucrat is $\delta(\beta)s^A(e)$ if $\delta(\beta)s^A(e) \geq s^B(e)$ and $s^B(e)$ else. More succinctly:

$$s(e) := \max\{\delta(\beta)s^A(e), s^B(e)\}. \quad (3)$$

Notice that the support $s(e)$ depends on the employee's effort. The employee's effort choice may hence influence whether the bureaucrat is unfettered or restricted. There are, however, two important exceptions. First, the opportunity to overturn the offer by the bureaucrat may never arise. Then, the appeal has no value and the bureaucrat has dictatorial power ($\beta \rightarrow \infty$). Since the bureaucrat is unfettered, support is $s(e) = s^B(e)$ for any effort level. Second, the agency's appeal is immediately successful. Then, the bureaucrat has no power ($\beta = 0$) and the higher authority determines support, so that $s(e) = s^A(e)$ for any effort level. At intermediary power levels, the bureaucrat may be limited for some effort e while she is unfettered for another effort e' :

$$\delta(\beta)s^A(e) \geq s^B(e) \text{ and } \delta(\beta)s^A(e') \leq s^B(e') \text{ for some } e, e'. \quad (4)$$

Given such regime shifts, it is reasonable to ask for which effort levels the threat to appeal restricts the bureaucrat. The answer is given in the next proposition; the proof for this and all other results can be found in Appendix A.

Proposition 1 (Effort and the Threat to Appeal). *Consider a power level β such that (4) holds. If the higher authority's support, s^A , is more elastic than*

⁸The bureaucrat's utility is concave, so that it is falling at any s with $s > s^B(e)$. In particular, it is falling at any s with $s \geq \delta s^A(e) > s^B(e)$, and hence maximal at $\delta s^A(e)$.

the unfettered bureaucrat's support, s^B , then there is a unique effort level \tilde{e} such that the bureaucrat is unfettered below this level and restricted above it:

$$\delta(\beta)s^A(e) < s^B(e) \text{ for } e < \tilde{e} \quad \text{and} \quad \delta(\beta)s^A(e) \geq s^B(e) \text{ for } e \geq \tilde{e}.$$

If s^B is more elastic than s^A , the converse holds.⁹

The proposition is based on the idea that the agency appeals and thus restricts the bureaucrat whenever there is enough to gain from an appeal. Consider the case that the higher authority's support is more elastic than the unfettered bureaucrat's support. Then, s^A has a larger growth rate in effort than s^B . Since the value of appeal $\delta s^A(e)$ is proportional to the higher authority's support, it grows more than the unfettered bureaucrat's support. Initially, the bureaucrat is unrestricted and chooses her preferred support $s = s^B$. Eventually, the value δs^A exceeds the support s^B , the threat to appeal starts to bind, and the bureaucrat provides just enough support s to prevent appeal (see Figure 2). Overall, low efforts lead to s^B and high efforts to δs^A . Using an analogous argument in the case that s^B is more elastic, we find that low efforts lead to δs^A and high efforts to s^B . In both cases, low effort by the employee yields support of a different nature than high effort. In the next section, we examine how the effect of effort on support impinges on the employee's effort choice.

3.3 Employee's Effort

Since the employee's utility depends on the level of support, it is useful to distinguish between the employee's utility if support is determined by the

⁹That means, there is a unique effort \tilde{e} such that $s^B(e) \leq \delta(\beta)s^A(e)$ for $e \leq \tilde{e}$ and $s^B(e) > \delta(\beta)s^A(e)$ for $e > \tilde{e}$.

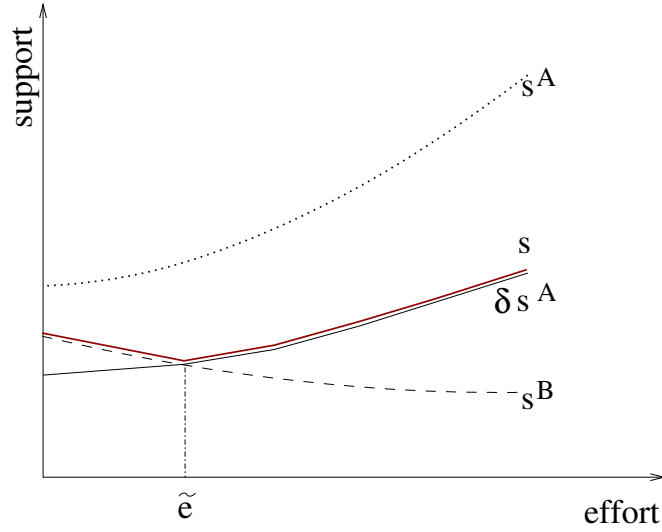


Figure 2: Example for a shift in the nature of support s . For low effort, $e < \tilde{e}$, the bureaucrat is unfettered, $s = s^B$; for high effort, $e \geq \tilde{e}$, she contributes just enough to avert appeal, $s = \delta s^A$.

threat of appeal, u_β^A , and if support comes from an unfettered bureaucrat, u^B . Formally,

$$u_\beta^A(e, w) := u(e, \delta(\beta)s^A(e), w) \text{ and}$$

$$u^B(e, w) := u(e, s^B(e), w).$$

Each of these utility functions is maximized by some effort choice.¹⁰ Denote the (smallest) maximizers of the two problems by e_β^A and e^B .

Given this notation and using that the actual support is equal to that of an unfettered bureaucrat whenever this is larger than that determined by

¹⁰Since $\delta(\beta)s^A$ as well as s^B are continuous functions of e and e comes from a compact interval, the maximizer exists.

the threat of appeal, $s(e) = \delta(\beta)s^A$, the employee's utility becomes:

$$u_\beta(e, w) = \begin{cases} u_\beta^A(e, w) & \text{if } \delta(\beta)s^A(e) > s^B(e) \\ u_\beta^A(e, w) = u^B(e, w) & \text{if } \delta(\beta)s^A(e) = s^B(e) \\ u^B(e, w) & \text{if } \delta(\beta)s^A(e) < s^B(e). \end{cases}$$

Observe that u_β^A and u^B only differ with respect to the type of support. Since they are also monotonically increasing in support, the employee's utility can be succinctly written as:

$$u_\beta(e, w) = \max\{u_\beta^A(e, w), u^B(e, w)\}.$$

This representation reveals that the employee's utility is continuous in effort and attains a maximum at e_β^A or at e^B —for a formal proof see Lemma 2 in Appendix B.

Next, we examine the effect of employee's choice on the type of support and its re-percussion on his utility. Consider an intermediary power level and suppose that the higher authority's support is more elastic. Then, the bureaucrat is unfettered for low effort levels and restricted for high effort by Proposition 1. So, for low efforts the employee's utility is described by $u^B(e, w)$ and for high efforts by $u_\beta^A(e, w)$. The employee can now either exert high effort and force the bureaucrat to supply $\delta(\beta)s^A$ or exert little effort and obtain s^B . Which of these options is more attractive depends on the bureaucrat's power. The smaller this power, the more attractive becomes the option to exert high effort. It seems intuitive that there is some critical power level such that the employee is exactly indifferent between the two options. The following proposition asserts that such a critical level exists.

Proposition 2 (Critical Power). *Suppose the wage w is constant. Then, there is a critical power β^* for which the employee is indifferent between the*

effort that maximizes his utility when the bureaucrat is unfettered and the respective effort when the bureaucrat is restricted:

$$u_{\beta^*}^A(e_{\beta^*}^A, w) = u^B(e^B, w).$$

For a lower power ($\beta < \beta^*$), the employee's effort choice restricts the bureaucrat and for a higher power ($\beta > \beta^*$), the employee's effort choice leaves the bureaucrat unfettered.

The logic behind this proposition is simple: the existence of the critical power, β^* , is guaranteed by the continuity of $u_{\beta}^A(e_{\beta}^A, w)$ in β and the intermediate value theorem.

Proposition 1 has introduced the possibility that the employee affects the nature of support by choosing either high or low effort. Proposition 2 ensures that this regime shift actually occurs. If the bureaucrat's power attains the critical value, the employee's decision changes and with it the type of support. The next result informs us about the effort choices by the employee associated with the regime shift.

Theorem 1 (Discontinuity of Effort). *Let the wage be constant and assume that the employee exerts effort under some circumstances.¹¹ Then, the following holds.*

¹¹Formally, the assumption is that $\max\{e_{\beta^*}^A, e^B\} > 0$. In terms of fundamentals, this assumption is met if the employee's utility initially increases in effort under some regime:

$$\frac{\partial u}{\partial e} + \frac{\partial u}{\partial s} \max \left\{ \frac{ds^B}{de}, \frac{s^B}{s^A} \frac{ds^A}{de} \right\} \Big|_{e=0} > 0,$$

which holds, for example, if the employee is sufficiently intrinsically motivated ($\frac{\partial u}{\partial e}$ large) or alternatively if the employee sufficiently benefits from support ($\frac{\partial u}{\partial s}$ large) and either the bureaucrat or the higher authority rewards effort with support ($\frac{ds^B}{de} > 0$ or $\frac{ds^A}{de} > 0$). For the last case, recall that $s^B(e) > 0$, so that $\frac{s^B}{s^A} \frac{ds^A}{de} > 0$ if $\frac{ds^A}{de} > 0$.

If the higher authority's support, $s^A(e)$, is more elastic than the unfettered bureaucrat's support, $s^B(e)$, a marginal increase of the bureaucrat's power beyond a critical value, β^* , leads to a discontinuous reduction in effort.¹²

Conversely, if $s^B(e)$ is more elastic than $s^A(e)$, the marginal decrease leads to a discontinuous increase in effort.

The basic intuition for the proof is simple. Since the employee cares about support and the two types of support respond differently to effort, the marginal effect of effort on the employee's utility differs and the maximizing effort choices lie apart. Consequently, the shift in restriction caused by a power change (see Proposition 2) translates into discrete change of effort.

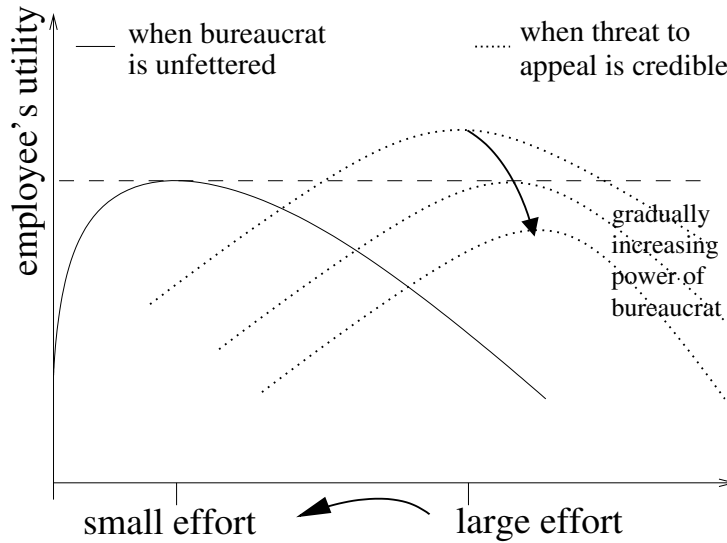


Figure 3: Drop in effort provision when bureaucrat gains power

The core message of the theorem is that the employee eventually responds abruptly to seemingly irrelevant changes in the bureaucratic context.

¹²Formally, let e_β be the optimal effort choice of the employee given β . Then, there is an $\epsilon > 0$ for arbitrary small $\delta > 0$ and power levels β_1, β_2 with $\delta^* - \delta < \delta_1 < \delta^* < \delta_2 < \delta^* + \delta$ such that $e_{\delta_2} - e_{\delta_1} > \epsilon$.

Of particular interest is the case when the support imposed by the higher authority is more elastic than those by the unfettered bureaucrat. Then, a sequence of small alterations that prompt seemingly insignificant increases in the bargaining stance of the bureaucrat will at some point drastically erode motivation (see Figure 3). Notice that the alterations may initially even have a positive effect on effort.

4 Discussion and Conclusion

The previous section provides a model in a generic setting explaining why employees' motivation collapses as a response to small changes in the bureaucratic environment. This section provides extensions of the basic model, discusses examples, applies the model to intrinsically motivated agents, and concludes with some comments.

Extensions

There are two extensions to the basic model from the previous section that we note here and elaborate further in Appendix B.

First, the basic model assumes that the employee knows precisely which effort choices lead to appeal. However, the discontinuous reaction of effort to changes in the power balance does not crucially depend on whether this is the case or not. For example, the employee may be uncertain about whether a specific effort induces appeal, where the probability of appeal is some smooth and increasing function of effort. Then, the employee's utility function no longer discretely switches at a specific effort level. Instead, it becomes continuously differentiable in effort. However, this does not mean that effort itself is continuous in the bureaucrat's power. Figure 4 depicts a respective

example. The employee's utility smoothly changes in power and effort. Still, a marginal decrease in the bureaucrat's power (moving from the thick to the thin line) induces the employee to switch from no effort to a strictly positive level (near 1.9). A formal analysis of this example is given in Proposition 4 in Appendix B.

Second, the analysis of Section 3 has been partial in the sense that it does not allow wages to adjust to changes in the bureaucrat's power. This may appear to be a concern since this change in power can affect the utility of the employee and hence wage negotiations and renegotiations. However, the discontinuous jump also occurs if wages adjust. The basic reason is that, while wages influence the absolute level of the employee's utility, they do not alter the difference between the employee's utility when the bureaucrat is restricted and when she is unrestricted. Formally, we first need to establish that marginally more power to the bureaucrat still leads to a regime shift. This somewhat technical step has been relegated to Proposition 3 in Appendix B. Once this analogue to Proposition 2 is in place, it is straightforward to show that the regime shift entails a discontinuous effect on effort identical to that in Theorem 1 (see Corollary 1 in Appendix B).

Applications

In his book 'The Bureaucratic Phenomenon,' Wilson (1989) gives various examples of bureaucracies in which seemingly small changes dramatically affect employee's morale. In order to illustrate how such changes can affect behavior, we flesh out the rather abstract assumptions and results of our model in three different environments. Then, we provide a more specific real-world example in which dramatic transformations arose from minor changes and which is discussed in detail by Wilson. Finally, we take up in more detail

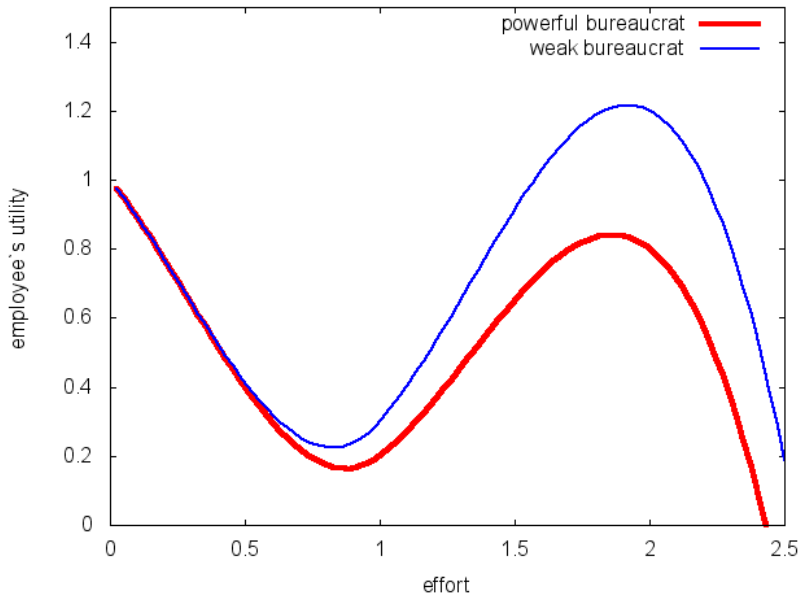


Figure 4: Smooth Utility but Discontinuous Optimal Effort

the FEMA example from the introduction.

For our first environment, consider an academic arena where a group of university professors can apply for external funding to set up a research center in their university. Suppose the members of the group do not like wasting time on drafting research proposals but they like teaching even less. They obtain a promise from the Dean of the Faculty that teaching relief and other benefits will flow if the center is running and deemed to be successful. This promise, however, is vague and not contractible given the uncertainty surrounding future teaching requirements, the academic job market, the definition of success for the center, etc. The Dean may face pressures from other departments in her sphere and at times may find these hard to resist (hence may be tempted to ‘renege’ on the promises in some situations). In contrast, the University’s President may find it easier and preferable to back successful members of the university, particularly given that she can offer

support without having to face the daily pressures and consequences from other departments. In this case the Dean may be less willing to match effort than the President and so the successful professors may have an incentive to try to undermine the Dean's decision by lobbying the President of the University. Now suppose that the head of the research group changes and that the new head is marginally less effective at dealing with the President than the predecessor. Then, the Dean becomes more powerful and, at the critical point, this leads to a shift from research success being supported to one where the Dean can afford to renege on the promised benefit. The incentives of the staff to supply effort then change radically and hence a marginal change in leader of the group can lead to a discontinuous decline on morale and effort.

This university environment exhibits incomplete contracts and a bureaucratic structure. It illustrates the discontinuity when employees are purely self interested. The next environment suggests that the problem also arises naturally when employees are intrinsically motivated.

Consider a non-governmental organization (NGO) working on the ground in a developing country. The workers at the NGO care about the results of their work and invest time and effort before the project is locally implemented with the support from an international organization. Imagine that a corrupt local representative distributes resources on behalf of the international organization. This representative may care about the help provided by the NGO but also benefits from diverting some resources away from their intended purpose (e.g. to another village to which she has closer ties). The workers in the NGO, who prefer that resources are sent where they are most needed, may be able to bring some pressure to bear on the representative by lobbying and complaining to the international organization. So, how much

the representative diverts may depend on the NGO's effectiveness within the bureaucratic structure of the international organization. The international organization's willingness to provide resources is likely to increase more in effort than that of the bureaucrat. Hence, more relative power to the corrupt representative suppresses effort.

The university and the NGO environment both have a clear bureaucracy in the form of an organization. However, the model also describes the apparently very different setting where an alternative customer takes the role of higher authority and the competitiveness on this market limits the bureaucrat's power. The following environment illustrates this.

Consider a non-profit organization producing an item of variable quality for a potential customer, e.g., the government, a foundation, or some other party that is then willing to contribute to this organization. If the non-profit organization finds the contribution (price) offered by the potential customer for a given amount of effort to be unsatisfactory, it can seek out another prospective customer and, if it finds one, play the two customers off against each other, i.e., set up a bidding war to obtain higher contributions. However, it is not certain when and whether this alternative can be found. Suppose effort and contributions are substitutes. If no competitor is found then the first customer, now a monopsonist, would prefer to cut its contribution as effort increases (since they are substitutes). However, if there is a competitor then, since higher effort increases the quality of the item, higher effort will increase contributions (i.e., the contribution/price extracted in the bidding war goes up as effort rises). Here, the arrival of a competitor shifts the situation from one where effort is offset by lower contributions to one where effort leads to higher contributions. So the difficulty of finding a competitor is the power of the initial customer (the bureaucrat in this context) relative to

the non-profit organization. In this environment, there will be a critical point where a marginal increase in the probability of arrival of a competitor will begin to constrain the initial customer. At this point, when effort increases the customer will have to increase contributions to fend off the search for another customer. Hence, more effort now leads to more as opposed to less support.

The small alteration that leads to the discontinuous response may be a change in personnel or in organizational architecture. These alterations may at first glance appear very different but our model suggests that they are essentially two sides of the same coin because they both affect the balance of power. We close with two real examples that illustrate the effects of a change in personnel and organizational architecture, respectively.

Our first example concerns a single change in personnel at Carver High School in Atlanta, which dramatically affected morale in a positive way. Sara Lightfoot (1981) reports that the school was in such a desolate state that the superintendent was ready to close it. Wilson summarizes Lightfoot's findings as: 'Teachers were demoralized, and understandably so. The school hallways were dirty and much of the equipment was broken' (Wilson, 1989, p.9). In a final attempt to save the school, a new principal was appointed. This principal, Norris Hogans, succeeded in 'turning around' Carver. When Sara Lightfoot arrived on the scene a few years later, it 'had become a highly disciplined school, proud of its consistently high attendance rates' (Lightfoot, 1986, p.16). Lightfoot (1981) characterizes the principal as a skillful negotiator who uses his ties with the superintendent to obtain required resources from central office. Her article begins with a vivid account of how Hogans organized in a time span of only ten minutes busses to shuttle the school band to a rehearsal, leaving the young music teacher 'dazed and overwhelmed.' It

is particularly interesting in the light of our results that Lightfoot specifically focuses on greater support for staff (buses for the school band in this case) in this example.

Wilson's discussion of Carver emphasizes two important points. One, that the relevant changes at Carver were small and two, that there are other similar examples: 'At Carver no new buildings were erected, there was not much of an increase in per pupil expenditures, and the average number of children in the classroom did not change. But something must have changed at Carver and at other schools like Carver. Whatever it was, it is not easily explained in surveys of the objective features of the school' (Wilson, 1989). Wilson's observation is consistent with our view that a small shift in the power relationship, which shifts support, boosts morale.¹³

For a change in organizational structure, let us return to the Federal Emergency Management Agency (FEMA) example from the introduction.

¹³The theme that employee morale changes dramatically as a result of apparent small changes can be found in many different spheres. For example, the Texas Department of Correction under George Beto in the 1970s operated under the so-called 'control model,' which basically shifts power from prisoners to prison administration. As long as Beto was in power, 'Officers had a sense of a mission, an esprit de corps' (DiIulio, 1987). Although Beto's somewhat less charismatic successors tried to maintain the control model, power shifted away from guards and the guards' willingness to put themselves 'on the line' was undermined. The change at the Texas Department of Correction is one of Wilson's leading examples (1989) and well documented by DiIulio (1987) but there is also various anecdotal evidence. For example, consumer websites claim that employees' morale at Borders was 'crushed' when they were asked to push copies of a particular book (which appears in itself to be a small issue but may be a signal of change in power between employees and those responsible for defining their role). In another case, popular press articles document that the morale of the UK's Inland Revenue was 'in free fall' after the collapse of a few specialist legal cases (which could be interpreted as lack of support within the hierarchy for the work of the employees on the ground who are chasing tax evaders).

FEMA had a strong record for coordinating relief work before hurricane Katrina exposed it as paralyzed and ineffective. The work of an emergency management agency, such as FEMA, is rife with contractual incompleteness. While there are emergency routines for the public and lower-level employees, the singularity of each emergency requires considerable flexibility on the management level. FEMA as well as supporting federal agencies enjoy such flexibility but are of course ultimately answerable to democratic institutions, which limit their power. Accordingly, the example features discretion as well as a higher authority to which an appeal can be directed. Moreover, preparation is key for emergency management (as reflected in FEMA's motto: 'a nation prepared'). This means that a considerable amount of work occurs before the emergency. On the other hand, it is often not clear in advance which resources will be needed and where, so that federal and state level institutions are reluctant to commit to supply resources before an emergency occurs. Thus, the support from these institutions is decided after effort has been exerted and can adjust. FEMA thus seems to exhibit the essential features of our model. Moreover, the dismal performance of FEMA during Katrina was preceded by an organizational change that affected FEMA's power within the Department of Homeland Security (DHS).¹⁴ FEMA's director and DHS undersecretary Michael D. Brown, wrote a seven-page memo to his supervisor, DHS secretary Tom Ridge, in which he predicted that the organizational changes would 'break longstanding, effective, and tested relationships', 'shatter agency morale' and finally lead to 'an ineffective and uncoordinated response.' Brown also tried to use his contacts to White House officials to overturn Ridge's plan. These attempts failed, the changes were implemented, and morale at FEMA dropped; in a survey of large agencies,

¹⁴The organizational change diverted funds and shifted responsibility away from FEMA.

it occupied the last rank with respect to worker satisfaction.¹⁵ The collapse in ‘morale’ at FEMA following the shift in power is consistent with our model and it is interesting that Brown specifically attributed the shattering of agency morale to the organizational changes.

Intrinsically motivated employees

It is crucial for our model that employees like being supported and are willing to exert effort under some circumstances. Both assumptions follow naturally if employees care about the results of their work and if support improves these results. Our results are thus particularly relevant when employees are intrinsically motivated, even if such motivation is not essential. Our findings hence contribute to the growing literature on ‘devoted workers’ and ‘motivated agents.’ This literature asks how to attract such agents (Besley and Ghatak, 2005; Delfgaauw and Dur, 2007), how to structure an organization and mitigate inefficiencies in their presence, (Easley and O’Hara, 1983; Francois, 2000, 2007; Glaeser and Shleifer, 2001; Glazer, 2004), and whether to provide explicit incentives to them (Gneezy and Rustichini, 2000; Bénabou and Tirole, 2003; Falk and Kosfeld, 2006; Sliwka, 2007; Ellingsen and Johannesson, 2008; Schnedler, 2011; Friebe and Schnedler, forthcoming; Schnedler and Vadovic, forthcoming).

From this literature, Glazer’s interesting work on devoted employees (2004) is possibly the closest to our paper. Glazer considers an employer who can withdraw capital investments and examines how this affects the effort provision of devoted employees. By committing ex-ante to a level of investment, employers can assure devoted employees that their input makes a difference,

¹⁵See *Brown’s Turf Wars Sapped FEMA’s Strength* by Michael Grunwald and Susan Glasser in the Washington Post, Friday December 23, 2005.

which leads to more effort. Glazer identifies several contractual arrangements based on the produced output that enable employers to engage in such a commitment. In contrast, we assume that output is not contractible and that employee's effort is (imperfectly) protected by the bureaucratic structure. The nature of this bureaucratic structure then drives the discontinuity in effort.

Another non-contractual approach to ensure that intrinsically motivated employees donate labor is based on the inner structure of an organization, namely whether it has profit or non-for-profit status (see e.g. Francois, 2000, 2007 or Glaeser and Shleifer, 2001). Our analysis emphasizes that the bureaucratic context of an organization is also relevant. As seen in the NGO example, a powerful bureaucrat outside a non-profit organization may stifle effort provision although this organization has non-profit status. Moreover, a small reduction in this bureaucrat's power may galvanize employees.

Moreover, the two extremes (for-profit and not-for profit) can be regarded as special cases of our model. The crucial feature of the for-profit organization is that the residual claimant is a shareholder who can 'expropriate' the employee's voluntary effort through higher dividends. This case arises in our model if all negotiation power lies with a bureaucrat and she prefers to cut support when effort increases. Conversely, the non-profit status protects voluntary effort by the employee just as it is protected if a powerless bureaucrat is overruled by a higher authority who ensures that high effort is met by larger support. From this perspective, our main result can be interpreted as follows. Incentives to induce voluntary effort are essentially dichotomous even if changes to the organizational structure are only gradual.

Concluding comments

The key parameter affecting incentives to provide effort in this paper is the bureaucrat's power. Whether increasing this power stimulates or stifles effort depends on whether the bureaucrat's or the higher authority's support decision is more sensitive to effort. Suppose a policy maker is interested in providing ideal conditions for effort and can influence the bureaucrat's power. How should this policy maker allocate power? If the higher authority responds more favorably to effort, shifting power away from the bureaucrat renders it more attractive for the employees to supply effort. Conversely, a more sensitive response by the bureaucrat leads to the (seemingly counter-intuitive) result that shifting power to the bureaucrat creates an environment that is more conducive to effort.

The finding also has some wider policy implications. It has been argued by Dixit (2002) that the attempt to provide stronger incentives within organizations in the public sector may fail due to the difficulties in describing inputs and outputs of the products typically produced, e.g. security, health, etc. But public sector reform also concerns the context of organizations. For example, the Blair government in the UK pushed for quantifiable targets and holding organizations in the public sector (such as the NHS) accountable for meeting these targets. Apart from the well-known difficulty in formulating quantifiable targets that do not fall foul of the multi-tasking problems in the sense of Holmström and Milgrom (1991), the present paper points to another potential pitfall with this approach. If holding organizations responsible weakens their bargaining positions in negotiations, rents to these organizations are squeezed. While this seems attractive because it reduces costs, it also has an impact on effort by motivated employees:¹⁶ It may re-

¹⁶Francois (2000) assumes that public employees exhibit 'public service motivation' and

duce marginal incentives to provide effort because it becomes more difficult for employees to make a difference when their organization is weakened.

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A Proofs for Main Results

Proof of Proposition 1. We focus on the case that s^A is more elastic (the case that s^B is more elastic can be proven completely analogously). Note that the support by an unfettered bureaucrat as well as that imposed by the higher authority are continuous in e . Because $s^B(e) \geq \delta s^A(e)$ for some e and $s^B(e') \leq \delta s^A(e')$ for some e' , there is some \tilde{e} such that $s^B(\tilde{e}) = \delta s^A(\tilde{e})$. Since $s^A(e)$ is more elastic, $\frac{s^B(e)}{s^A(e)} \frac{d}{de} s^A(e) > \frac{d}{de} s^B(e)$. Evaluated at any \tilde{e} , this becomes $\delta \frac{d}{de} s^A(\tilde{e}) > \frac{d}{de} s^B(\tilde{e})$. So at any intersection of δs^A and s^B , the derivative of the former in effort is larger than that of the latter: $\frac{d}{de} \delta s^A(\tilde{e}) > \frac{d}{de} s^B(\tilde{e})$. This implies for the neighborhood of \tilde{e} that $\delta s^A(e) < s^B(e)$ for $e < \tilde{e}$ and $\delta s^A(e) > s^B(e)$ for $e > \tilde{e}$. To show that these inequalities hold generally and that there is only one intersection, suppose there would be an effort $\hat{e} \neq \tilde{e}$ such that $s^B(\hat{e}) = \delta s^A(\hat{e})$; in case that there exist several such effort levels let \tilde{e} be the smallest effort level and \hat{e} the smallest level that is larger than \tilde{e} . Then, we get $\frac{d}{de} \delta s^A(\hat{e}) > \frac{d}{de} s^B(\hat{e})$. This implies that at both intersections $\delta s^A(e)$ crosses $s^B(e)$ from below, and contradicts that $\delta s^A(e)$ and $s^B(e)$ are continuously differentiable functions of effort. Consequently, we cannot maintain that there is more than one effort level such that $s^B(e) = \delta s^A(e)$. \square

Proof of Proposition 2. The proof is based on the intermediate value theorem. First, note that $u_\beta^A(e_\beta^A, w)$ is a continuously decreasing function in β by Lemma 5—for this and other auxiliary results consult Appendix C. Next, we examine the relationship between $u_\beta^A(e_\beta^A, w)$ and $u^B(e, w)$ for two values of β . For $\beta \rightarrow \infty$, we get $u_\beta^A(e, w) \leq u^B(e, w)$ by Lemma 4. This implies that $u_\beta^A(e_\beta^A, w) \leq u^B(e_\beta^A, w) \leq u^B(e^B, w)$. For $\beta = 0$, we get $u_\beta^A(e, w) \geq u^B(e, w)$ by Lemma 3. This implies that $u_\beta^A(e_\beta^A, w) \geq u^A(e^B, w) \geq u^B(e^B, w)$. Since $u_\beta^A(e_\beta^A, w)$ is continuous and increasing in β , there is a unique β^* such that

$$u_{\beta^*}^A(e_{\beta^*}^A, w) = u^B(e^B, w). \quad \square$$

Proof of Theorem 1. Again, the proof focuses on the case that support imposed by the higher authority are more elastic than those by an unfettered bureaucrat. Proving the other case is completely analogous. By Lemma 2, the only candidates for a maximizer are e_{β}^A and e^B . By Proposition 2, there is a critical power level β^* with $u^B(e^B, w) = u_{\beta^*}^A(e_{\beta^*}^A, w)$. This in turn means that equation (4) is met. To see this, set $e = e^B$, $e' = e_{\beta^*}^A$ and observe that $s^B(e) \geq \delta(\beta^*)s^A(e)$ and

$$s^B(e') \leq \delta(\beta^*)s^A(e'). \quad (5)$$

Using that s^A is more elastic than s^B and applying Proposition 1 yields a unique \tilde{e} such that $s^B > \delta s^A$ for all $e < \tilde{e}$. Since $u_{\beta^*}^A(e, w)$ and $u^B(e, w)$ only differ in terms of support, we get $u^B(e, w) > u_{\beta^*}^A(e, w)$ for all $e < \tilde{e}$. With inequality (5), it follows that $e_{\beta^*}^A \geq \tilde{e}$. Completely analogously, we get $e^B \leq \tilde{e}$. In the final step of the proof, we want to rule out that $e^B = e_{\beta^*}^A = \tilde{e}$. First, consider the case that one of the two effort levels is zero, then they cannot be identical because $\max\{e_{\beta^*}^A, e^B\} > 0$. Now examine the case, where both effort levels are different from zero, i.e., e^B are inner solutions and $e_{\beta^*}^A = e^B$. Then, it holds for β^* that $u^B(e^B, w) = u_{\beta^*}^A(e^B, w)$ and hence $u(e^B, \delta(\beta^*)s^A, w) = u(e^B, s^B, w)$, which directly implies that

$$\delta(\beta^*)s^A(e^B) = s^B(e^B) =: \tilde{s}. \quad (6)$$

Moreover, the derivative of u^B and $u_{\beta^*}^A$ with respect to e and evaluated at \tilde{e} and \tilde{s} have to be zero and thus identical. The derivative of $u_{\beta^*}^A$ is $\frac{\partial u}{\partial e} + \frac{\partial u}{\partial s} \cdot \frac{d(\delta(\beta^*)s^A)}{de}$ and that of u^B is $\frac{\partial u}{\partial e} + \frac{\partial u}{\partial s} \cdot \frac{ds^B}{de}$. For the two terms to be identical, it must hold that $\frac{d(\delta(\beta^*)s^A)}{de} = \frac{ds^B}{de}$ at \tilde{e} . Using equation (6), the equality becomes $\frac{s^B(\tilde{e})}{s^A(\tilde{e})} \frac{ds^A}{de} = \frac{ds^B}{de}$. This, however, contradicts the assumption that s^A is more

elastic than s^B . Consequently, the assumption $e^B = e_{\beta^*}^A$ must be wrong. Since $e_{\beta^*}^A \geq \tilde{e} \geq e^B$, this implies: $e_{\beta^*}^A > e^B$. \square

B Additional results

Proposition 3 (Regime Shift when Wages Adjust). *A small increase in the bureaucrat's power at the critical point δ^* does not affect the wage and leads to an effort level that leaves the bureaucrat unfettered. Conversely, a decrease in the bureaucrat's power implies a lower wage and leads to an effort that restricts the bureaucrat.*

Proof. In equilibrium, the agency pushes the wage to the smallest possible value that is still acceptable for the employee. Denoting the equilibrium values for effort and wage by (e_{β^*}, w^*) if the power level is δ^* and by $(e_{\tilde{\beta}}, \tilde{w})$ if it is $\tilde{\beta}$, we get:

$$u_{\beta^*}(e_{\beta^*}, w^*) = u_{\tilde{\beta}}(e_{\tilde{\beta}}, \tilde{w}) = \underline{u}, \quad (7)$$

where \underline{u} was the employee's utility if he rejects the offered wage. Based on this equation, we first study the effect of a decrease of the power, $\tilde{\beta} < \beta^*$ and then that of an increase, $\tilde{\beta} > \beta^*$.

Case 1: $\tilde{\beta} > \beta^$.* Suppose the wage increases: $\tilde{w} > w^*$. Then, the employee can exert e^B and as the utility increases in the wage, he obtains at least $u^B(e^B, \tilde{w}) > u^B(e^B, w^*) = \underline{u}$. This violates equation (7). Thus, $w^* \geq \tilde{w}$. Suppose this inequality were strict: $\tilde{w} < w^*$. Then, $u_{\tilde{\beta}}^A(\tilde{e}^A, \tilde{w}) < \underline{u}$ because $u_{\tilde{\beta}}^A$ falls in the power level (see Lemma 5) and increases in the wage. Likewise, u^B increases in the wage so that $u^B(\tilde{e}^B, \tilde{w}) < \underline{u}$. Irrespective of whether the bureaucrat is restricted or not, the employee will have less than \underline{u} , which contradicts once more equation (7). Overall, $\tilde{w} = w^*$. Finally, we examine the effort choice under $\tilde{\beta}$. Since the wage stays constant ($w^* = \tilde{w}$) and the

bureaucrat is more powerful, $u_{\tilde{\beta}}^A(\tilde{e}^A, \tilde{w}) < u_{\beta^*}^A(e_{\beta^*}^A, w^*) = \underline{u}$. On the other hand, $u^B(e^B, \tilde{w}) = u^B(e^B, w^*) = \underline{u}$. So, the employee's utility is maximized at e^B in the case of $\tilde{\beta} > \beta^*$.

Case 2: $\beta^ > \tilde{\beta}$.* Suppose $\tilde{w} \geq w^*$. Then, $u_{\beta^*}^A(e_{\beta^*}^A, \tilde{w}) \geq u_{\beta^*}^A(e_{\beta^*}^A, w^*)$. Moreover, $u_{\tilde{\beta}}^A(e_{\beta^*}^A, \tilde{w}) > u_{\beta^*}^A(e_{\beta^*}^A, \tilde{w})$ because $\delta(\tilde{\beta})s^A > \delta(\beta^*)s^A$. Overall, $u_{\tilde{\beta}}^A(e_{\beta^*}^A, \tilde{w}) > u_{\beta^*}^A(e_{\beta^*}^A, w^*) = \underline{u}$. Consequently, $e_{\beta^*}^A$ yields the employee a utility strictly above \underline{u} . This, however, contradicts (7). Thus, $\tilde{w} < w^*$. Next, we examine the effort choice. Suppose that the effort choice leaves the bureaucrat unrestricted. Then, the employee obtains $u^B(\tilde{e}^B, \tilde{w}) < u^B(e^B, w^*) = \bar{u}$ because of $\tilde{w} < w^*$. Once more, we have a contradiction to (7). This implies that the employee chooses effort $e_{\tilde{\beta}}^A$. \square

Proposition 3 can be used to prove the following corollary to Theorem 1. The only difference to the situation without wage changes is that optimal effort may adjust to these changes. Since the wage change is marginal, and the optimal choice is continuous in it, the new respective effort level under both regimes is close to the old one. The discontinuity between effort choices given a fettered and unfettered bureaucrat thus remains.

Corollary 1 (Discontinuous Effort when Wages Adjust). *Suppose that the higher authority's support, $s^A(e)$, is more elastic than the unfettered bureaucrat's, $s^B(e)$. Then, a marginal increase in the bureaucrat's power leads to a discontinuous decrease in effort. Conversely, if $s^B(e)$ is more elastic than $s^A(e)$, a marginal increase in the bureaucrat's power leads to a discontinuous increase in effort.*

Proposition 4 (Effort discontinuity with imperfectly informed employee). *Let $P(e)$ be the probability that an appeal occurs after effort $e \in [0, 2]$ is exerted, where the effect of effort on the probability is strongest at intermediate*

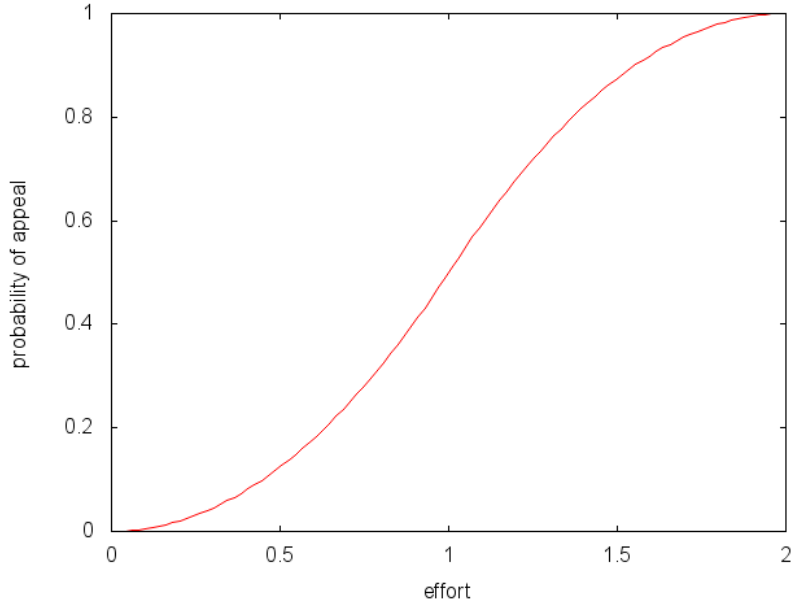


Figure 5: Cumulative distribution function in Proposition 4

effort levels (see Figure 5):

$$P(e) = \begin{cases} \frac{1}{2}e^2 & \text{if } e \in [0, 1] \\ 1 - \frac{(2-e)^2}{2} & \text{if } e \in [1, 2]. \end{cases}$$

Suppose the employee's utility is $u(e, s) = s - \frac{1}{2}e^2$ and $s^A(e) = 2e$ and $s^B(e) = 1 - e$. Then, the employee's effort is discontinuous in the bureaucrat's power β .

Proof. As a preliminary, compute the first derivative of $P(e)$:

$$P'(e) = \begin{cases} e & \text{if } e \leq 1 \\ 2 - e & \text{if } e \geq 1. \end{cases} \quad (8)$$

With probability $P(e)$, there is an appeal (given effort e) and the employee gains additional support $(\delta(\beta)2e - (1 - e))$. The employee's expected utility thus amounts to:

$$P(e)(\delta 2e - (1 - e)) + (1 - e) - \frac{1}{2}e^2.$$

The marginal expected utility is hence:

$$P'(e)(e(2\delta + 1) - 1) + P(e)(\delta 2 + 1) - 1 - e.$$

Evaluated at $e = 0$, this term becomes -1 , so that the marginal expected utility initially falls and any maximizer is either $e = 0$ or strictly bounded away from zero. For $\delta = 0$ (or $\beta \rightarrow \infty$), there will never be an appeal and the marginal expected utility is negative for all e . Then, the maximizer is at zero and the employee exerts no effort. For $\delta = 1$ (or $\beta = 0$), the utility at $e = 2$ exceeds that $e = 0$ and the employee exerts strictly positive effort. For some intermediate value δ^* , the employee is indifferent between $e^B = 0$ and an $e_{\delta^*}^A$, which is strictly bounded away from zero.

□

C Auxiliary Results

Lemma 1. *In equilibrium, the bureaucrat suggests a support $s \geq \delta(\beta)s^A$.*

Proof. The proof works by contradiction. Suppose the bureaucrat offers a support that is not accepted: $s < \delta(\beta)s^A(e)$. Such an offer is strictly dominated by offering the support $s^B(e)$ if $s^B(e) \geq \delta(\beta)s^A$. Next, we deal with the case that $s^B(e) < \delta(\beta)s^A(e)$. Recall that the utility of the bureaucrat is concave in s . Thus, the utility falls in s for $s > s^B(e)$ and hence it is strictly smaller at $s^A(e)$ than at $\delta(\beta)s^A(e)$. □

Lemma 2. *The optimal choice of the employee either maximizes $u_{\beta}^A(e, w)$ or $u^B(e, w)$.*

Proof. Proof by contradiction: say, the optimal effort level is e and neither maximizes $u_{\beta}^A(e, w)$ or $u^B(e, w)$. First, take the case that $\delta(\beta)s^A(e) \geq s^B(e)$.

Then, the resulting utility is $u_\beta^A(e, w)$ and a deviation to the maximizer of u_β^A is profitable because it yields at least $u_\beta^A(e_\beta^A, w)$ and even more if $u^B(e_\beta^A, w) > u_\beta^A(e_\beta^A, w)$. The case $\delta(\beta)s^A(e) \leq s^B(e)$ can be proven perfectly analogously. \square

Using this lemma, we can focus attention on the maximizers of the two utility functions u_β^A and u^B . Because the utility when support is imposed by the higher authority increases in the power level, a particularly simple situation occurs if the power level is either particularly high or low.

Lemma 3. *For $\beta = 0$ (or $\delta = 1$), $u_\beta^A(e, w) > u^B(e, w)$ for all efforts e .*

Proof. If $\delta = 1$, the support imposed by the higher authority is equal to its certainty equivalent for the agency: $\delta(\beta)s^A(e) = s^A(e)$. By assumption, this support exceeds the support by the unfettered bureaucrat $s^B(e)$. Accordingly, $u^A(e, w) > u^B(e, w)$. \square

So for a high power level, the employee's utility is described by u^A and the employee chooses e_β^A . Similarly, no negotiation power (a low arrival rate) implies that the employee's utility amounts to u^B .

Lemma 4. *For $\beta \rightarrow \infty$ (or $\delta = 0$), $u_\beta^A(e, w) < u^B(e, w)$ for all efforts e .*

Proof. If $\delta = 0$, the required support $\delta(\beta)s^A$ is zero and hence smaller than s^B for all effort levels. Accordingly, $u_\beta^A(e, w) < u^B(e, w)$. \square

So when the bureaucrat has dictatorial power, the employee chooses a maximizer e^B . But how is the relationship between u_β^A and u^B affected by changes in θ ? In order to answer this question, we study the behavior of u_β^A in the power level.

Lemma 5. *$u_\beta^A(e_\beta^A, w)$ is continuously differentiable and decreasing in β .*

Proof. Observe that $\delta(\beta)s^A(e)$ is a continuous differentiable function in β . Consequently, $u_\beta^A(e, w) \equiv u(e, \delta(\beta)s^A(e), w)$ is a continuously differentiable function in β for fixed e . Moreover, e_β^A is also a continuously differentiable function in β . Overall, $u_\beta^A(e_\beta^A, w)$ is continuously differentiable and we can apply the envelope theorem to find its derivative: $\frac{d}{d\beta}u_\beta^A(e_\beta^A, w) = \frac{\partial}{\partial\beta}u_\beta^A(e_\beta^A, w) < 0$. □