

Making a Difference in Bureaucratic Environments

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Abstract

Effort by public servants is sometimes driven by the desire to 'make a difference.' How does the working environment influence this voluntary provision of effort? We study the power relationship between an *agency* (e.g. university department, NGO, health trust), where workers care to some degree about the result of their work, and a *bureaucrat*, who supports the agency, but has opportunity costs in doing so (e.g. Dean of faculty, corrupt representative, government agency). We find that marginal changes in the balance of power eventually have dramatic effects on voluntarily provided effort. We also characterize when empowering the agency increases voluntary effort.

Keywords: donated labor, intrinsic motivation, non-profit organizations, power within organizations

JEL-Codes: L30, M50, H10, H40

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1 Introduction

Many workers do not only care about their wage and effort but also about the results of their work;¹ they are ‘motivated agents’ in the sense of Besley and Ghatak (2005). This is of particular importance to the public sector for which it has been argued that ‘public service motivation’ (Francois, 2000) leads to considerable performance despite essentially flat incentives (Delfgaauw and Dur, 2008). However, effort by these workers alone does often not suffice for a good result. Instead, the input of someone with differing interests, say a bureaucrat, is required. Examples abound: nurses and doctors may be interested in healing patients and providing them and their families with emotional support, but the hospitals they work for are facing budget cuts pushing them to spend less time on any given patient; people working for aid organizations are notoriously complaining about insufficient equipment and lacking support by the governments of the countries they try to help; teachers often see themselves confronted with lacking teaching materials, unheated classrooms, etc. In many of these cases, the response of effort seems to be particularly sensitive. For example, a new manager or a shift of responsibilities may trigger a collapse of morale. In this paper, we consider an agency where workers care to some degree about results of their work and examine how motivation by these workers is affected by changes in the bureaucratic context. We show that a small shift in the power relationship between the agency and the bureaucrat leads to a discontinuous response of voluntarily provided effort. We also identify when this shift leads to more and when to less voluntary effort.

For a more specific example, consider the case of the Federal Emergency Management Agency (FEMA). FEMA coordinates relief work and helps in

¹For an interesting experiment supporting this claim see Ariely et al. (2008).

cases of natural disasters, catastrophes, and other emergencies 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 has been a showcase of quick and efficient emergency response at least until 2001.² Only a few years later, 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 When the extent of the failure became apparent, the director of FEMA, Michael Brown, had to resign. Indeed, the breakdown of FEMA's capabilities to deal with disaster had been predicted by Brown himself. Two years before hurricane Katrina, he warned in a letter to the Secretary of the Department of Homeland Security (DHS) that changes, which reduced the role of FEMA within the DHS, would shatter agency morale.⁴ The observed collapse is in line with our central finding that a small shift in the power balance between agency and bureaucrat can have a strong effect on voluntarily provided effort.

Our finding rests on three relatively generic characteristics. First, some input is controlled by a bureaucrat, i.e., from outside the agency. FEMA, for example, has to rely on the support of the DHS. Second, there are informal and costly ways to overturn the bureaucrat's decisions by appealing to

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."

⁴Letter from Michael Brown to Tom Ridge (Sept. 15, 2003)

a higher authority. FEMA's director, Mr. Brown, has –for example– used his contacts to President Bush in order to try to undermine decisions by the Secretary of the DHS. Third, the authority's interests differ from that of the bureaucrat. For example, the authority may be more willing to support (and perhaps more anxious to be seen to support) voluntary effort at the agency than the bureaucrat. As we will argue later (Section 4), these characteristics are common to many different settings (universities, NGOs, aid organizations, charities).

Given these characteristics, a marginal change in the environment may lead to a drastic response because it can affect whether the agency's threat to overturn a decision is credible and thus shift the nature of incentives. The bureaucrat has two potential motives to support the agency: (i) the desire to avoid appeal and hence potential overruling and (ii) her personal interest in the project's result, which could stem from its prestige. Generally, the bureaucrat's reaction to more voluntary effort depends on which motive dominates. If it is the looming threat of appeal, she may increase support to avert this threat. If the dominating motive is the project's result, then a greater supply of voluntary effort allows the bureaucrat to cut down on support. As a result, voluntary effort no longer 'makes a difference.' Which of the two motives determines the bureaucrat's decision depends on her power. A gradual increase of this power could mean that she is no longer restricted by the threat of appeal but free to reduce input. Then, incentives at the agency shift dramatically from a setting where voluntary effort makes a difference to a setting where it only helps the bureaucrat. Accordingly, voluntary effort is crowded out.⁵

⁵For a very different model in which marginal changes trigger drastic responses see Lindbeck et al. (1999).

The findings also generate two comparative static predictions. First, the power of an agency in a bureaucratic environment should affect effort provision at this agency. Second, this effect should depend on whose support responds more to an increase in effort: that of the immediately involved bureaucrat or that of the authority to which the agency can appeal. If the authority's support increases more in effort, more agency power leads to a crowding in. Conversely, if the bureaucrat's support increases more, more agency power leads to crowding out.

Our findings contribute to the growing literature on incentives when agents are intrinsically motivated. This literature asks how to attract such agents (Besley and Ghatak, 2005; Delfgaauw and Dur, 2007), how to structure an organization in the presence of such agents (Easley and O'Hara, 1983; Francois, 2000, 2007; Glaeser and Shleifer, 2001), and whether to provide explicit incentives to them.⁶ Our paper is particularly close to Francois (2000) as well as Glaeser and Shleifer (2001) who observe that non-profit status protects the interests of employees and thereby ensures that they remain motivated. It also relates to Francois (2007) who shows that performance pay can induce free riding amongst workers who care about the outcome of their work. In contrast to these models, we take the analysis beyond the bounds of the organization. Our analysis shows that the environment of an agency has interesting repercussions for the motivation within that agency.

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. In Section 4 the model is applied to some examples. Fi-

⁶For examples see Gneezy and Rustichini (2000), Bénabou and Tirole (2003), Falk and Kosfeld (2006), Friebe and Schnedler (2007), Schnedler and Vadovic (2007), Sliwka (2007), or Ellingsen and Johannesson (2008).

nally, Section 5 concludes with a discussion of key assumptions and some implications.

2 Model and notation

The key ingredients to the model are a worker who is employed by an agency and willing to exert effort if this improves the agency's output, a bureaucrat who can support the agency but could use resources differently, and the possibility for the agency to appeal to some authority who responds differently to effort than the bureaucrat. This section explains the details of this model and establishes how the bureaucrat behaves in absence of appeals as a benchmark. It also formalizes the meaning of authority and bureaucrat 'responding differently to effort.'

2.1 Model assumptions

The worker (he) is hired by an agency at wage w to produce an output, which depends on the worker's effort and on the support of the bureaucrat (she).

Effort and support. The worker'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 of effort and support, e and s , which cannot be implemented by contracts. Effort e is costly to the worker and comes from a compact interval. Effort costs c are convex and increase in e while $c'(0) = 0$. Likewise, support s entails opportunity costs $k(s)$ for the bureaucrat that are increasing and non-concave in s with $k'(0) = 0$.

Value of the agency's output. Effort and support both strictly increase the value of the output produced at the agency, v . On the other hand, a

higher wage w decreases this value because it reduces available resources. Overall, v is a function of effort, support and wage, $v(e, s, w)$, which we assume to be jointly concave. The specifics of how effort, support, and wage interact are not crucial for our results. In particular, effort and support may be substitutes or complements.

Worker's utility. The worker in our model does not only care about effort costs c and his wage w but also about the output's value v . This genuine interest in the result of his work may be due to other-regarding preferences, ideals, or professional attitude. His utility amounts to: $\alpha v(e, s, w) - c(e) + w$, where $\alpha > 0$ measures the degree to which the worker cares about the value. Despite effort costs, the worker may thus exert effort. We want to focus on the case in which the worker donates his labor rather than his money. Accordingly, we assume that the effect of a reduction in wage on the value is limited ($|\frac{\partial v(e, s, w)}{\partial w}| < \eta$) and too small in relation to the foregone earnings ($\alpha < \frac{1}{\eta}$). If the worker decides not to work for the agency, he has an outside opportunity that yields a utility level of \underline{u} .

Bureaucrat's utility. Let the bureaucrat's utility be: $\beta v(e, s, w) - k(s)$ with $\beta > 0$. The particular form is chosen to simplify the exposition. It features, however, two important aspects.

First, the bureaucrat cares to some degree about the output's value. This interest could be motivated by altruism or idealism but may also be driven by her desire to maintain her standing or because the output bestows prestige on her. If the bureaucrat did not care at all, she would use all resources for herself. Under these circumstances, an appeal can do no harm and the question of whether to appeal to the authority becomes trivial. Formally, all that is required is that the (unrestricted) maximization problem of the

bureaucrat's utility has an inner solution.⁷

Second, the support that maximizes the bureaucrat's utility is continuous in effort. This ensures that any discontinuity results from the structure of the game and is not due to ill-behaved fundamentals.

Agency. To close our model, we need a player who negotiates with the worker 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 maximizing the value v .

Appeal. While the agency wants as much support as possible, support is 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 authority. If the appeal is successful, the authority sets support to a strictly positive level $s^A(e)$. This support $s^A(e)$ could be modeled endogenously by introducing the 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 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

⁷Alternatively, we could impose any other utility function with this property. For example, the bureaucrat could be promoted if production is successful while the gains from promotion exceed the opportunity costs of giving no support.

costs are represented in the model by assuming that the waiting time until the authority overturns the decision, τ , is Poisson distribution with arrival rate θ and that the agency discounts delays in support exponentially with $1 - e^{-r\tau}$, where r represents the patience of the agency, i.e., how urgently support is needed. The arrival rate, θ , can be conveniently interpreted as the agency's negotiation or lobbying skills or more generally as its power to overturn the bureaucrat's decision. As will become clear later, these assumptions ensure that the expected support after appeal is a simple continuous function of agency's power and effort.⁸ In order to break ties, we assume that the agency accepts any offer that is at least as good as her outside option.

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

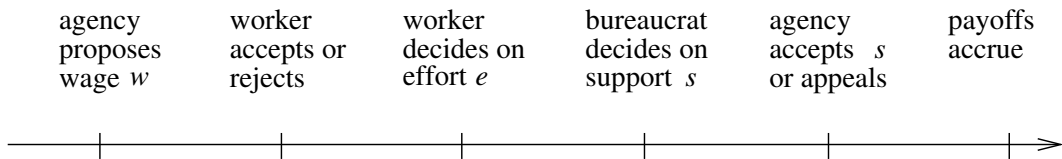


Figure 1: Sequence of events

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

$$s^B(e) := \operatorname{argmax}_q \beta v(e, s, w) - k(s). \quad (1)$$

⁸Alternatively, one could directly impose the expected support after appeal to be $\delta(\theta)s^A(e)$, where δ is a continuous and increasing function of θ .

Note that $s^B(e)$ is positive because the model assumptions, in particular $\beta > 0$, ensure that there is an inner solution to this problem.

We thus have two benchmarks. While s^A describes the (exogenous) support by the 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 authority s^A is below the unfettered bureaucrat's support s^B , there is no point in appealing to the authority. In the following, we hence restrict attention to the case where $s^A > s^B$.

2.3 Elasticity of support

The 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. One possibility is that the bureaucrat reduces support when the worker increases effort. At the same time, the authority may want to reward greater effort with more support. This is just one of many ways how the response by authority and bureaucrat could differ. In order to structure some of these responses, the following definition is helpful.

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

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

Conversely, the bureaucrat's support is more elastic if

$$\frac{ds^B(e)}{de} \frac{e}{s^B(e)} > \frac{ds^A(e)}{de} \frac{e}{s^A(e)} \text{ for all } e > 0.^9$$

⁹In both cases, the ratios are well-defined because $s^A(e) > 0$ and $s^B(e) > 0$.

The above example, where the bureaucrat's support falls in effort while the authority's support increases, is a special case in which the authority's support is more elastic than that of the bureaucrat (the left-hand side of the inequality in the definition is positive while the right hand side is negative). Generally, a more elastic support by the authority seems a reasonable description for all those settings in which the authority rewards effort relatively more than the bureaucrat. In some applications the bureaucrat's support may be more elastic than that of the authority. We report results for both cases, while we use a more elastic support by the authority as the leading example.

3 Behavior in equilibrium

As a solution concept, we employ the subgame-perfect equilibrium and solve the game in four steps using backward induction. First, we determine when the agency accepts the support offered by the bureaucrat or appeals to the authority. Second, we analyze the bureaucrat's decision as to how much to support the agency. Then, we examine the behavior of the worker. Finally, we deal with wage adjustments.

3.1 Decision of agency

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:

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

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

3.2 Support by bureaucrat

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

Accordingly, the bureaucrat will offer a support in equilibrium 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 $s^B(e) < \delta(\theta)s^A(e)$, then she settles for the smallest possible support that prevents an appeal: $\delta(\theta) \cdot s^A(e)$.¹⁰ So in this case, the constraint binds. Overall, the support by the bureaucrat is $s^B(e)$ if $s^B(e) \geq \delta(\theta)s^A(e)$ and $\delta(\theta)s^A(e)$ else. More succinctly:

$$s(e) := \max\{\delta(\theta)s^A(e), s^B(e)\}. \quad (2)$$

Notice that the support $s(e)$ depends on the worker's effort. The worker's effort 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 ($\theta = 0$). Then, the appeal has no value and the bureaucrat has dictatorial power. Since the bureaucrat is unfettered, support is $s(e) = s^B(e)$ for any effort level. Second, the agency's appeal is immediately successful ($\theta = \infty$). Then, the bureaucrat has no power and the authority determines support, so that $s(e) = s^A(e)$ for any effort level. At intermediary power levels, the bureaucrat may be limited

¹⁰The 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 $\delta s^A(e)$.

for some effort e while she is unfettered for another effort e' :

$$\delta(\theta)s^A(e) \geq s^B(e) \text{ and } \delta(\theta)s^A(e') \leq s^B(e') \text{ for some } e, e'. \quad (3)$$

Given such regime shifts, it is reasonable to ask for what efforts 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 the appendix.

Proposition 1 (Effort and the threat to appeal). *Consider a power level θ such that (3) holds. If the authority's support, s^A , is more elastic than 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:*

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

If s^B is more elastic than s^A , the converse holds.¹¹

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 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 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

¹¹That means, there is a unique effort \tilde{e} such that $s^B(e) < \delta(\theta)s^A(e)$ for $e < \tilde{e}$ and $s^B(e) > \delta(\theta)s^A(e)$ for $e > \tilde{e}$.

by the worker 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 worker's effort choice.

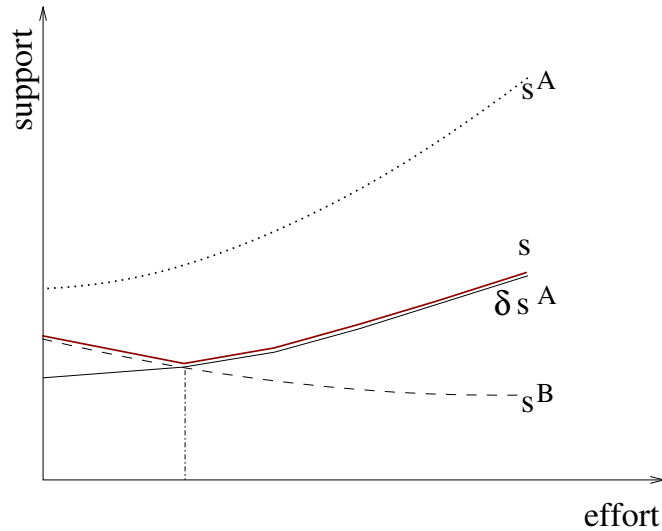


Figure 2: Example for a shift in the nature of support s . For low effort, the bureaucrat is unfettered, $s = s^B$; for high effort, she contributes just enough to avert appeal, $s = \delta s^A$.

3.3 Worker's effort

Since the worker cares about the result of his work, his utility depends on the level of support. It is useful to distinguish between the worker's utility if support is determined by the threat of appeal, u^A , and if support comes from an unfettered bureaucrat, u^B . Formally,

$$u_\theta^A(e, w) := \alpha v(e, \delta(\theta) s^A(e), w) - c(e) \text{ and}$$

$$u^B(e, w) := \alpha v(e, s^B(e), w) - c(e).$$

Each of these utility functions is maximized by some effort choice.¹² Denote the (smallest) maximizers of the two problems by e_θ^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 the threat of appeal by (2), the worker's utility becomes:

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

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

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

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

Next, we examine the effect of worker's choice on the type of support and its re-percussion on his utility. Consider an intermediary power level and suppose that the 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 worker's utility is described by $u^B(e, w)$ and for high efforts by $u_\theta^A(e, w)$. The worker can now either exert high effort and force the bureaucrat to supply $\delta(\theta)s^A$ or exert little effort and obtain s^B . Which of these options is more attractive depends on the agency's power. The larger 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 worker

¹²Since $\delta(\theta)s^A$ as well as s^B are continuous functions of e and e comes from a compact interval, the maximizer exists.

is exactly indifferent between the two options. The following proposition asserts that such a critical power exists.

Proposition 2 (Critical power). *Holding the wage w constant, there is a critical power θ^* for which the worker is indifferent between the effort that maximizes his utility when the bureaucrat is unfettered and the respective effort when the bureaucrat is restricted:*

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

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

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

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

Theorem 1 (Discontinuity of effort). *Hold the wage w constant. If the authority's support, $s^A(e)$, is more elastic than the unfettered bureaucrat's support, $s^B(e)$, a marginal decrease of the agency's power beyond a critical value, θ^* , leads to a discontinuous decrease in effort.¹³*

¹³In formulas, let e_{θ} be the optimal effort choice of the worker given θ . Then, there is an $\epsilon > 0$ for arbitrary small $\delta > 0$ and power levels θ_1, θ_2 with $\theta^* - \delta < \theta_1 < \theta^* < \theta_2 < \theta^* + \delta$ such that $e_{\theta_2} - e_{\theta_1} > \epsilon$.

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 worker cares about support and the two types of support respond differently to effort, the marginal effect of effort on the worker'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.

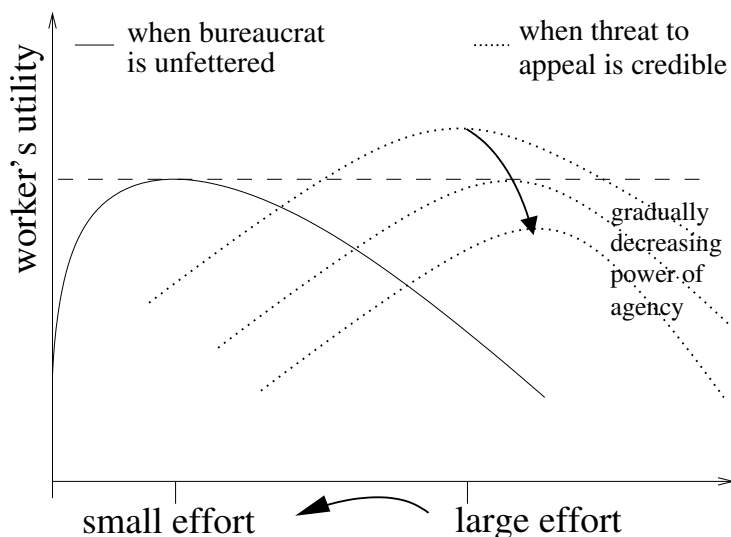


Figure 3: Drop in effort provision when agency loses power

The core message of the theorem is that the worker eventually responds abruptly to seemingly irrelevant changes in the bureaucratic context. Consider the case of support imposed by the authority being more elastic than those by the unfettered bureaucrat. Then, a sequence of small alterations that prompt seemingly insignificant reductions in the bargaining stance of the agency will at some point drastically erode motivation. Notice that the alterations may initially even have a positive effect on effort (see Figure 3.3).

3.4 Adjusting wages

Our preceding analysis has been partial in the sense that we did not allow wages to adjust to changes in agency's power—although this power can affect the utility of the worker and hence wage negotiations and renegotiations. The purpose of this section is to show that wage adjustments do not alter the main conclusions drawn from the constant wage case. Let us begin with the observation that a change in power still affects effort and type of support.

Theorem 2 (Regime shift with wage adjustments). *A small decrease in agency power at the critical point θ^* does not affect the wage and leads to an effort level that leaves the bureaucrat unfettered. Conversely, an increase in agency power implies a lower wage and leads to an effort that restricts the bureaucrat.*

The theorem confirms that a lower agency power also leads to a shift from a restricted to an unrestricted bureaucrat when wages adjust. The basic idea is that while wages influence the absolute level of the worker's utility, they do not alter the difference between the worker's utility given that the bureaucrat is restricted, u_θ^A , and unrestricted, u^B . In the eyes of the worker, a higher agency power increases the attractiveness of restricting the bureaucrat rather than leaving her unrestricted.

For the message of Theorem 1 to fully apply when wages adjust, the worker's effort choice associated with the shift from a restricted to an unrestricted bureaucrat must be distinctly different. Since wage adjustments are continuous in the power level, the marginal effects of effort on worker's utility are close to those before the wage adjustment. The difference between the marginal effect of effort on the utility when the bureaucrat is restricted and unfettered remains. Therefore even if wages adjust, the earlier intuition

carries over: the utility maximizing efforts given a restricted and an unrestricted bureaucrat lie apart. Adapting the proof of Theorem 1, thus gives us the following corollary.

Corollary 1 (Discontinuous effort with wage adjustments). *Suppose that the authority's support, $s^A(e)$, is more elastic than the unfettered bureaucrat's, $s^B(e)$. Then, a rise in agency power leads to a discontinuous increase in effort. Conversely, if $s^B(e)$ is more elastic than $s^A(e)$, a rise in agency power leads to a discontinuous fall in effort.*

The central message of this section is that our main findings are not affected when wages adjust. Small changes in the bureaucratic context of the agency eventually lead to abrupt changes in worker's behavior. The direction of these changes depends on the elasticity of the different types of support in the same way as before.

4 Applications

Our results rely on a few relatively generic ingredients: workers at an agency who (potentially) donate labor, a bureaucrat who then decides whether to support the agency but forgoes opportunities by doing so, the possibility of costly appeal to an authority that curbs the bureaucrat's discretion, and a difference in how bureaucrat's and authority's support responds to voluntary effort. These features arise in various contexts. Some examples and the respective implications are discussed in this section.

As already argued in the introduction, 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 an 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 and with it potential labor donations occur 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. In the specific case of FEMA, there was a rift between FEMA's director and his superior, the DHS secretary. At the same time the director entertained good relations with the secretary's superior, the President of the United States. The President was probably more willing to support effort than the secretary of the DHS. In terms of our model, this means that the authority's support is more elastic than that of the bureaucrat. Given this assumption, the shift in power from FEMA to the DHS and the associated reduction in 'morale' at FEMA is consistent with our model.

As another more stylized example with the same features, consider a university department that puts in effort to improve its quality, e.g., by setting up a research center. Once the center is running, the department depends on the cooperation of the Dean of the Faculty for various resources. On the other hand, the department can try to undermine the Dean's resource allocation, e.g., by lobbying the President of the University. Whether more power to the Dean increases or decreases voluntary effort depends on how

willing the Dean is to match voluntary effort in relation to the President. The Dean may face pressures from other departments in her sphere and may find these hard to resist whereas the President may find it easier to back successful departments and offer support without having to face the daily pressures from other departments. In this case the Dean may be less willing to match voluntary effort than the President and so more power to the Dean would stifle voluntary effort. Conversely, more power to a Dean who is more favourable to the department in question than the President would stimulate voluntary effort.

As another example, consider a non-governmental organization (NGO) working on the ground in a developing country. The workers at the NGO can invest time and effort in the project, before it 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 benefit 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 in operating within the bureaucratic structure of the international organization. In this example, the international organization's willingness to provide resources is likely to increase stronger in voluntary effort than that of the bureaucrat. Consequently, more power to the corrupt representative would suppress voluntary effort.

Identical features also arise in the following apparently very different set-

ting where a market takes the role of authority and the competitiveness on this market defines the agency's power. Consider a non-profit organization producing an item of variable quality for a potential customer, e.g., the government, a foundation, a health trust, or some other party that is then willing to contribute to this organization. If the non-profit organization finds support unsatisfactory, it can seek out another prospective customer, play off the two customers, and obtain higher contributions. However, it is not certain when and whether this alternative can be found. If voluntary effort and contributions are substitutes, the first customer's contributions are less elastic than those determined by the market. If there is more competition between customers, i.e., a higher arrival rate, this increases the bargaining power of the non-profit organization and voluntary effort at this organization becomes more attractive.

5 Discussion and conclusion

When do workers, who care about the results of their work, provide voluntary effort? Previous contributions have pointed out that the inner structure of an organization matters (see e.g. Francois, 2000, 2007 or Glaeser and Shleifer, 2001). Our analysis extends beyond the inner structure and shows that the bureaucratic environment has an important influence on worker's behavior. While workers' preferences remain the same, the environment affects to what degree workers can make a difference and thus their incentives to exert effort.

The above mentioned literature on organization structure has considered two polar cases: for-profit and non-for profit status. The two extremes 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 worker’s voluntary effort through higher dividends. This case arises in our model if all negotiation power lies with a bureaucrat who gains from higher effort by cutting down support. Conversely, the non-for-profit organization protects the voluntary effort by the worker just as it is protected if the bureaucrat has no power and the authority ensures that higher effort is met by larger support. From this perspective, the main result can be interpreted followingly: the type of incentives for voluntary effort are essentially dichotomous even if the organizational structure changes gradually.

The fundamental assumption driving results is that of a contractual incompleteness. If voluntary 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 voluntary effort. Similar incompleteness assumptions are typically evoked in the context of non-profit organizations,¹⁴ in the incomplete contract literature,¹⁵ and in principal-agent models.¹⁶ The problem of non-verifiable inputs and outputs is also at the heart of Wilson’s monograph on governmental agencies (1989); using his terminology, our setup describes a ‘coping organization.’ The contractual incompleteness almost naturally leads to the more specific assumptions of the model. First, contractual incompleteness implies a certain discretion on behalf of the involved parties. Second, it often leads to a hierarchical organization with appeal procedures in order to curtail this discretion. Third, there

¹⁴See Hansmann (1980), Easley and O’Hara (1983), Francois (2000), and Glaeser and Shleifer (2001).

¹⁵See Klein et al. (1978), Holmström (1999), Grout (1984), Grossman and Hart (1986), or Hart (1995).

¹⁶See Holmström (1979; 1982), Shavell (1979), and Holmström and Milgrom (1991; 1994).

is typically one party that has to invest first and this party's interests are protected by the appeals procedure. Finally, it is crucial that authority and bureaucrat respond differently to voluntary effort. If they reacted in exactly the same way, the nature of incentives to voluntarily exert effort would no longer shift. In other words, the player benefiting from discretion (here: the bureaucrat) and the party curbing this discretion (here: the authority) have to pursue different goals. Appeal procedures themselves are an indication for such differences because appeal only makes sense if bureaucrat and authority have differing objectives.

The key parameter affecting incentives to provide voluntary effort in this paper is the bureaucrat's power in relation to the agency at which this effort is exerted. Whether increasing this power stimulates or stifles voluntary effort depends on whether the bureaucrat's or authority's support decision is more sensitive to voluntary effort. Suppose a policy maker is interested in providing ideal conditions for voluntary effort and can influence the bureaucrat's power in relation to the agency. How should this policy maker allocate power? If the authority responds more favorably to voluntary effort, shifting power away from the bureaucrat renders it easier for the agency's workers to 'make a difference.' Conversely, a more sensitive response by the bureaucrat leads to the (seemingly counter-intuitive) result that shifting power to the bureaucrat creates an environment at this agency that is conducive to voluntary 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),¹⁷ 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 voluntary effort: it may reduce marginal incentives to provide effort because it becomes more difficult for workers to make a difference when their organization is weakened.

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¹⁷See Schnedler (2008) and Ratto and Schnedler (2008) for two recent contributions dealing with this problem.

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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 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 $u_\theta^A(e_\theta^A, w)$ is a continuous increasing function in θ by Lemma 5—for this and other auxiliary results consult the end of the appendix. Next, we examine the relationship between $u_\theta^A(e_\theta^A, w)$ and $u^B(e, w)$ for two values of θ . For $\theta = 0$, we get $u_\theta^A(e, w) \leq u^B(e, w)$ by Lemma 4. This implies that $u_\theta^A(e_\theta^A, w) \leq u^B(e_\theta^A, w) \leq u^B(e^B, w)$. For large θ , we get $u_\theta^A(e, w) \geq u^B(e, w)$ by Lemma 3. This implies that $u_\theta^A(e_\theta^A, w) \geq u^A(e^B, w) \geq u^B(e^B, w)$. Since $u_\theta^A(e_\theta^A, w)$ is continuous and increasing in θ , there is a unique θ^* such that $u_{\theta^*}^A(e_{\theta^*}^A, w) = u^B(e^B, w)$. \square

Proof of Theorem 1. Again, the proof focuses on the case that support imposed by the 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_θ^A and e^B . By Proposition 2, there is a critical power level θ^* with $u^B(e^B, w) = u_{\theta^*}^A(e_{\theta^*}^A, w)$. This in turn means that equation (3) is met. To see this, set $e = e^B$, $e' = e_{\theta^*}^A$ and observe that $s^B(e) \geq \delta(\theta^*)s^A(e)$ and

$$s^B(e') \leq \delta(\theta^*)s^A(e'). \quad (4)$$

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 $u_{\theta^*}^A(e, w)$ and $u^B(e, w)$ only differ in terms of support, we get $u^B(e, w) > u_{\theta^*}^A(e, w)$ for all $e < \tilde{e}$. With inequality (4), it follows that $e_{\theta^*}^A \geq \tilde{e}$. Completely analogously, we get $e^B \leq \tilde{e}$. In the final step of the proof, we want to rule out that $e^B = e_{\theta^*}^A = \tilde{e}$. Suppose this would be the case. Then, $u^B(e^B, w) = u_{\theta^*}^A(e_{\theta^*}^A, w)$ together with the monotonicity of v in s implies that

$$\delta(\theta^*)s^A(e_{\theta^*}^A) = s^B(e^B) =: \tilde{q}. \quad (5)$$

Recall that e_θ^A and e^B are inner solutions, so that the derivative of u^B and $u_{\theta^*}^A$ with respect to e and evaluated at \tilde{e} and \tilde{q} have to be zero and thus identical. The derivatives of $u_{\theta^*}^A$ is $\frac{\partial u}{\partial e} + \frac{\partial u}{\partial q} \cdot \frac{d(\delta(\theta^*)s^A)}{de}$ and that of u^B is $\frac{\partial u}{\partial e} + \frac{\partial u}{\partial q} \cdot \frac{ds^B}{de}$. For the two terms to be identical, it must hold that $\frac{d(\delta(\theta^*)s^A)}{de} = \frac{ds^B}{de}$ at \tilde{e} . Using equation (5), 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 $e^B = e_{\theta^*}^A$ must be wrong. Since $e_{\theta^*}^A \geq \tilde{e} \geq e^B$, this implies: $e_{\theta^*}^A > e^B$. \square

Proof of Theorem 2. In equilibrium, the agency pushes the wage to the smallest possible value that is still acceptable for the worker. Denoting the equilibrium values for effort and wage by (e_{θ^*}, w^*) if the power level is θ^* and by $(e_{\tilde{\theta}}, \tilde{w})$ if it is $\tilde{\theta}$, we get:

$$u_{\theta^*}(e_{\theta^*}, w^*) = u_{\tilde{\theta}}(e_{\tilde{\theta}}, \tilde{w}) = \underline{u}, \quad (6)$$

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

Case 1: $\tilde{\theta} < \theta^$.* Suppose the wage increases: $\tilde{w} > w^*$. Then, the worker 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 (6). Thus, $w^* \geq \tilde{w}$. Suppose the wage decreases: $\tilde{w} < w^*$. Then, $u_{\tilde{\theta}}^A(\tilde{e}^A, \tilde{w}) < \underline{u}$ because $u_{\tilde{\theta}}^A$ falls in the power level (see Lemma 5) and the wage. Likewise, u^B falls in the wage so that $u^B(\tilde{e}^B, \tilde{w}) < \underline{u}$. Irrespective of whether the bureaucrat is restricted or not, the worker will have less than \underline{u} , which contradicts once more equation (6). Overall, $\tilde{w} = w^*$. Finally, we examine the effort choice under $\tilde{\theta}$. Since the wage stays constant ($w^* = \tilde{w}$) and the power level has dropped, $u_{\tilde{\theta}}^A(\tilde{e}^A, \tilde{w}) < u_{\theta^*}^A(e_{\theta^*}^A, w^*) = \underline{u}$. On the other hand, $u^B(e^B, \tilde{w}) = u^B(e^B, w^*) = \underline{u}$. So, the worker's utility is maximized at e^B in the case of $\tilde{\theta} < \theta^*$.

Case 2: $\theta^ < \tilde{\theta}$.* Suppose $\tilde{w} \geq w^*$. Then, $u_{\tilde{\theta}}^A(e_{\tilde{\theta}}^A, \tilde{w}) \geq u_{\theta^*}^A(e_{\theta^*}^A, w^*)$. Moreover, $u_{\tilde{\theta}}^A(e_{\tilde{\theta}}^A, \tilde{w}) > u_{\theta^*}^A(e_{\theta^*}^A, \tilde{w})$ because $\delta(\tilde{\theta})s^A > \delta(\theta^*)s^A$. Overall, $u_{\tilde{\theta}}^A(e_{\tilde{\theta}}^A, \tilde{w}) > u_{\theta^*}^A(e_{\theta^*}^A, w^*) = \underline{u}$. Consequently, $e_{\tilde{\theta}}^A$ yields the worker a utility strictly above \underline{u} . This, however, contradicts (6). Thus, $\tilde{w} < w^*$. Next, we examine the effort choice. Suppose that the effort choice leaves the bureaucrat unrestricted. Then, the worker obtains $u^B(\tilde{e}^B, \tilde{w}) < u^B(e^B, w^*) = \underline{u}$ because of $\tilde{w} < w^*$. Once more, we have a contradiction to (6). This implies that the worker chooses effort $e_{\tilde{\theta}}^A$. \square

Auxiliary results

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

Proof. The proof works by contradiction. Suppose the bureaucrat offers a support that is not accepted: $s < \delta(\theta)s^A(e)$. Such an offer is strictly dominated by offering the support $s^B(e)$ if $s^B(e) \geq \delta(\theta)s^A$. Next, we deal with the case that $s^B(e) < \delta(\theta)s^A(e)$. 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 $\delta(\theta)s^A(e)$. \square

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

Proof. Proof by contradiction: say, the optimal effort level is e and neither maximizes $u_\theta^A(e, w)$ or $u^B(e, w)$. First, take the case that $\delta(\theta)s^A(e) \geq s^B(e)$. Then, the resulting utility is $u_\theta^A(e, w)$ and a deviation to the maximizer of u_θ^A is profitable because it yields at least $u_\theta^A(e_\theta^A, w)$ and even more if $u^B(e_\theta^A, w) > u_\theta^A(e_\theta^A, w)$. The case $\delta(\theta)s^A(e) \geq s^B(e)$ can be proven perfectly analogously. \square

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

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

Proof. If $\delta = 1$, the support imposed by the authority is equal to its certainty equivalent for the agency: $\delta(\theta)s^A(e) = s^A(e)$. 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 worker's utility is described by u^A and the worker chooses e_θ^A . Similarly, no negotiation power (a low arrival rate) implies that the worker's utility amounts to u^B .

Lemma 4. For $\theta = 0$ (or $\delta = 0$), $u^A(e, 0, w) < u^B(e)$ for all efforts e .

Proof. If $\theta = 0$, the required support $\delta(\theta)s^A$ is zero and hence smaller than s^B for all effort levels. Accordingly, $u_0^A(e, w) < u^B(e, w)$. \square

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

Lemma 5. $u_\theta^A(e_\theta^A, w)$ is continuously differentiable and increasing in θ .

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