I've got the power:

Granting bureaucrats discretion

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Abstract

We compare the traditional system of bureaucratic oversight by complaints and investigations with a system of bureaucratic discretion in which bureaucrats are accorded the freedom to manage a budget or quota without external interference. We find that more pro-social agents – ie, those most likely to overspend when managed by complaints and investigations – should be granted discretion to manage their own budgets. On the other hand, the less pro-social should be managed by oversight. We show that the limits of bureaucratic efficiency highlighted by Prendergast (2003) can be exceeded by allowing certain bureaucrats more discretion. We show that it is possible to screen between bureaucrats of different levels of pro-social motivation, so that bureaucrats choose the system of bureaucratic management best suited for their type.

1 Introduction

Since 1990, generalist doctors in the UK (known as General Practitioners or GPs) have been delegated some responsibility[1] for managing budgets to treat their patients. Facing a fixed budget, they have had to make trade-offs between patients with differing needs. Is the patient they see in front of them in more need of treatment than the patient they might see tomorrow?

This model of granting discretion to public servants to decide on how resources should best be used has been championed by the current conservative government in the UK. In their 2010 manifesto, they vowed to expand this model beyond healthcare, and to make compulsory local budget holding for doctors who previously could opt in or out of budget holding.

> Giving public sector workers ownership of the services they deliver is a powerful way to drive efficiency, so we will support co-operatives and mutualisation as a way of transferring public assets and revenue streams to public sector workers. We will encourage them to come together to form employee-led co-operatives and bid to take over the services they run. This will empower millions of public sector workers to become their own boss and help them to deliver better services

Conservative Manifesto, 2010

There are now over 100 so called "public service mutuals" – organisations that consist of former public servants, now controlling their own organisation, still delivering public services – in social care, youth services, probation services and adult education.

But putting power into the hands of civil servants to manage budgets for themselves is a relatively new development. For much longer, bureaucrats have been governed by command and control. Prendergast (2003) alleges that one of the defining characteristic of a bureaucracy is that it is defined by eligibility rules – rules about who is allowed a visa, who is

[1]For more information on how this responsibility has evolved over time, see section 7

entitled to social housing, who should be arrested – to take but a few examples. In his model of bureaucracy, bureaucrats are charged with making decisions on whether a particular citizen should be allowed a good (eg, a medical treatment), and the social planner occasionally samples the bureaucrat's decisions to make sure that his decisions are in line with the rules.

Should we expect putting power into the hands of civil servants – and the accompanying responsibility to respect budget limits – to achieve better results than the traditional model of retaining tight control through defining and ensuring compliance with eligibility rules? In this paper, we provide a theoretical model which allows us to compare the effectiveness of these two models of disciplining bureaucrats – *bureaucratic oversight*, characterised by complaints and investigations, and *bureaucratic discretion* – characterised by the absence of monitoring and the devolved management of a budget. When bureaucrats are motivated by social gains, but fail to internalise the full cost to the taxpayer of intervening, we obtain a clear answer: more motivated bureaucrats should be managed by discretion, and less motivated agents by oversight.

The intuition is as follows. In our model, some recipients of bureaucrat's actions are deserving – social benefits net of costs are positive – and others are undeserving – social benefits net of costs are negative. We assume that in contrast to the planner, bureaucrats care about social benefits, but not about social costs. When the social benefits from giving out the good are positive yet social benefits net of costs are negative, there is a conflict between the planner and the bureaucrat. The more pro-socially motivated the bureaucrat, the more inclined they are to give out the good to consumers that the planner sees as undeserving – or the more monitoring is needed to prevent them giving it out. However, when bureaucrats are given a budget or a quota to manage, the more pro-social the agent, the worse the threat of not having the budget to grant the good to a deserving recipient in the future – and the less inclined they are to grant the good to the undeserving consumer in front of them.

The result that the choice of contract depends on motivation puts us in conflict with the precautionary principal espoused by Hume (1742):

> In contriving any system of government, every man ought be supposed to be a knave and to have no other end, in all his actions, than private interest. By this interest we must govern him, and by means of it, make him, notwithstanding his insatiable avarice and ambition, cooperate to the public good.

Hume (1742)[2]

One might dispute the usefulness of our criteria, based on motivation, given the inherent difficulty of divining something so elusive. In response, we show that, for sufficiently impatient bureaucrats, it is possible to design a screening contract which drives the most motivated to select discretion and the less motivated into oversight.

Our results thus respect the criterion of Le Grand, who argues that incentive structures should be robust to heterogeneity in bureaucrat's motivations – in his terminology, that they should cater to both knights and knaves, to the pro-social, and to the purely self-interested. (Le Grand, 2010)

The remainder of this paper is structured as follows. In section 2, we position our paper relative to other contributions in public organisation. In section 3 , we present justification for the assumptions that we will make about bureaucrats in bureaucracy in the sections to follow. In section 4, we present the model, defining and examining bureaucratic discretion in section 4.1, and defining and examining bureaucratic oversight in section 4.2. We compare the two means of managing bureaucrats in section 4.3. In section 5, we show that we can screen between bureaucrats of different pro-social motivation. In section 6 we discuss informally the contracts we have not considered in the main body of the article. In section 7, we relate our results to examples of bureaucratic management styles in practice. Section 8 concludes.

[2] cited in Hume (1875). Hume himself recognised that this prescription, that he draws from other political writers, is problematic, stating that: "It is, therefore, a just political maxim, that every man must be supposed a knave... Though at the same time, it appears somewhat strange, that a maxim should be true in politics, which is false in fact"

2 Related Literature

Our paper is most closely related to Prendergast (2003). This paper shows that, when bureaucrats are monitored by a system of complaints and investigations, monitoring needs to be distorted from its efficient level in order to induce the bureaucrat to truthfully reveal whether the consumer's case is deserving. He shows that when bureaucracy is preferred to consumer choice (when consumers cannot be trusted to make the right allocation decision themselves) bureaucracies are necessarily inefficient. We reach the same qualitative conclusion as Prendergast – that bureaucracies are necessarily inefficient – but we demonstrate that introducing bureaucratic discretion can reduce the magnitude of these inefficiencies by tailoring bureaucratic management to agent motivation.

In a similar vein, Banerjee (1997) shows that bureaucracies are inefficient when a social welfare maximising principal engages a self-interested bureaucrat. He can induce the efficient allocation only through allowing the bureaucrat to put consumers through unnecessary red tape. Whereas Prendergast (2003) notes that bureaucracies often refrain from charging consumers for reasons of incomplete insurance, Banerjee (1997) allows the bureaucrat to set a price for the good. Our model is in line with Prendergast's, in which the good is given at no cost to the consumer when indeed it is allocated.

Prendergast (2003) assumes that his bureaucrats were not motivated by social concerns; Banerjee shows that red tape arises only with selfish bureaucrats. However, the evidence that bureaucrats are more pro-social than their private sector counterparts, and are heterogeneous in their motivation, drives our assumptions, which are in line with those in recent theoretical contributions about public servants and corruption in developing economies such as Machievello (2008), Jaimovich and Rud (2014), and Dhillon and Nicolo (2014).

Auriol and Brilon (2010) and Prendergast (2007) study settings where agents may be biased against the interests of the principal – in the first case, in the not for profit sector creates opportunities to exploit beneficiaries – in the second case, because bureaucrats may sometimes favour consumer interests which are in conflict with social goals. In this contribution, we rule out the possibility of bureaucrats who actively want to go against the planner's priorities. We restrict attention to the case where the bureaucrat and the planner agree on the ordering of cases – ie that some consumers are more deserving than others – but we allow them to disagree on the weightings that they put on each case.

This allows us to focus on curtailing the "excess" motivation of public sector workers – ie, their desire to spend more money than the planner would choose. Despite the evidence, that we will outline in section 3, that bureaucrats are often more concerned with their intrinsic payoffs than with the use of public money, we are not aware of any contributions which explicitly study this problem. Further, whilst Machievello (2008), Jaimovich and Rud (2014) and Dhillon and Nicolo (2014) are concerned with the selection of motivated bureaucrats, they do not consider the possibility of screening contracts.

Prendergast (2007, 2008) explores the optimal bias of bureaucrats towards consumer interests, and but shows that in the presence of asymmetric information, it may be optimal for bureaucrats to be more or less biased towards consumer interests than the planner. There, however, the system of management is always bureaucratic oversight and the implications of bureaucratic discretion are not considered.

Our paper is also related to the literature on discretion in principal-agent relationships. Aghion and Tirole (1997) consider the optimal allocation of decision rights between and agent and a principal. Part of their argument for granting an agent decision-making rights is that it increases initiative: the agent's search for profitable projects. Here, our rationale for delegation is different as bureaucrats do not need to work to create demand for the goods consumers seek, and is based instead on the excessive costs of oversight and the disciplinary effects of discretion.

Like Epstein and O'Halloran (1999) and Martimort and Hiriart (2012), Aghion and Tirole (1997) find that the agent should be granted more discretion when the preferences of principals and agents are more closely matched. Besley and Ghatak (2013) study discretion in the context of an enterprise that can take the form of a non-profit, a for-profit or a social enterprise. When the founder decides to create a social enterprise, he essentially delegates the decision about whether to choose profit or "purpose" to the entrepreneur – a decision he only takes if their preferences are sufficiently similar. This is somewhat different from our argument, in which motivation can work for or against the principal, depending on whether he chooses to manage bureaucrats by discretion or oversight.

Finally, this paper is related to the literature on reform of public services in the UK; for a survey, see Le Grand (2003). Dusheiko *et al.* (2006) present a basic model of family doctor utility under fundholding (where doctors are granted discretion to manage a budget) and non-fundholding regimes. Surprisingly, their model does not capture explicitly the trade-offs that such doctors have to make *between* patients under fundholding.

3 Justification of model's assumptions

In this section, we provide a context for the key assumptions that underlie our results. These assumptions are stated here in informal terms; their precise mathematical statements are to be found in the section .

Bureaucrats informed about social payoffs

We assume that bureaucrats, by virtue of their client proximity, knows whether a consumers' case is "deserving" or "undeserving" – that is to say, whether from the planner's perspective, the social benefits of giving out the good are worth the cost. The assumption that bureaucrats have an informational advantage over their superiors is common to other contributions, including Prendergast (2003, 2007) and Besley and Ghatak (2012, 2013). Though bureaucracies may try to specify eligibility rules to control disbursements, in practice the nature of the problems bureaucracies are designed to address means that these rules are open to a great deal of interpretation, as Hasenfield and Steinmetz (1981) explain:

> The existence of discretion in client-official encounters is inevitable in social service agencies exactly because these organisations are mandated to respond to

> human needs. Human needs such as mental illness cannot always be defined explicitly, nor can they always be fully objectified. Moreover, clients display vast variations in characteristics and circumstances which shape their needs in a way that defies readily available categories and prescribed procedures.

Bureaucrats pro-social

Evidence that pro-social motivation is an important feature of the public sector workforce is accumulating. Self-reported measures — such as response to the Perry Public Sector motivation inventory, which measures attraction to public policy making, commitment to civic duty and the public interest, compassion and self-sacrifice, show that those employed in the public sector show greater scores on these measures (for a survey see Perry *et al.* (2010)).

Behavioural evidence is consistent with these self-reported measures. Dur and Zoutenbier (2011), using cross-country data, show that those who score highly on measures of altruism and express trust in political parties are more likely to select into government jobs. Banuri and Keefer (2013), using experimental evidence from Indonesia, show that students who have selected studies that lead to public sector careers give more to charity in dictator games than comparable students destined for the private sector. Those who choose to given more to in this first task also exert higher effort on tasks earning for charity and are more likely to select tasks that earn for charity rather than themselves.

Bureaucrats do not internalise social costs

Studies of social workers show that they are a group more concerned with client welfare than with costs. Peabody (1964), in a US -based study notes that "by far the most dominant organizational goal perceived as important ... is service to clientele", where 83 percent of survey respondents view such service as important, compared to only 9 percent who see "obligation to taxpayers or "assistance to the public in general" as important decision-making criteria".

According to Lipsky (1981), who refers to bureaucrats as "advocates":

> The organisation hoards resources; the advocate seeks their dispersal to clients. The organisation imposes tight control over resource dispersion if it can; the advocate seeks to utilise loopholes and discretionary provisions to gain client benefits... The organisation acts as if available resource categories had fixed limits... the advocate acts as if resources were limitless.

Heterogeneous pro-social orientation

It seems implausible that public sector workers are homogenous in their pro-sociality. The public administration literature has long recognised this: Downs (1967) classified bureaucrats into five types, two purely self-interested: climbers and conservors, and three with some degree of public service orientation: zealots, advocates and statesmen. Whilst doing good motivates some, there are many reasons to take a public sector job; including the attractions of job security and shorter working hours (Clark and Postel-Vinay (2004), Postel-Vinay and Turon (2007)).

4 Model

A social planner wishes to use public funds to disburse a good to deserving recipients, where, by "deserving", we mean that the social benefits of providing the good to a consumer outweigh the social costs.[3] The good generates both private and external benefits. The private benefits are such that a consumer's preferences are uninformative about whether the consumer merits the good: either all consumers wish to be granted the good (an example might be a visa or welfare benefits) or wish to be denied it (a parking ticket or prison sentence).

We define the state $\tau \in \{\gamma, 1\}$ with $\gamma < 1$, to be such that the total social benefits

[3] We use "deserving" as short-hand. Whilst in many cases governments are concerned about net social benefits, in other cases, due to an absence of perfect data, or for political economy reasons, governments often make assessment of whom is deserving on the basis of ideology or to gain favour with certain groups of voter. Note that, as long as bureaucrats agree with the government on the ordering of one type of consumer's claim to the good over the other, bureaucratic discretion can be used to induce the planner's preferred allocation.

(including the consumer's utility) from allocating the good are τb. The cost of the good is always c. When the case is "deserving", which occurs with probability h, net social benefits when the good is allocated, are positive, ie $b - c > 0$ whereas, with probability $1 - h$, net social benefits are negative $\gamma b - c < 0$ – we say the case is undeserving. Let $\overline{\gamma} = h + (1 - h)\gamma$.

The bureaucrat's decision to allocate or withhold the good is publicly observable. We write $D = 1$ when the good is distributed and $D = 0$ when it is withheld.

We assume that the bureaucrat, by virtue of his client proximity, costlessly knows τ. By virtue of sitting in the benefits office, the doctor's consulting room, or by interrogating a potential witness, the bureaucrat can assess whether someone claiming welfare really is destitute, whether a patient needs an expensive treatment, or whether the case against a suspect is strong enough to be referred to prosecutors. Those who manage them — in our model in a social planner, but in practice perhaps another more desk-based bureaucrat – are either uninformed or can get information at a cost.

The bureaucrat is pro-socially motivated, so that his payoff from allocating the good is $v(\alpha, \tau, c)$ where α is his pro-social motivation. We assume that the bureaucrat experiences no direct disutility from spending public money, so that $v_3 = 0$, so from now on v will be written as a function of the first two arguments. We will assume that $v(\alpha, \gamma) > 0$ for all α, so that all bureaucrats want to give out good in the undeserving case. This, together with $\gamma b - c < 0$, gives rise to an agency problem for the planner: how can he set incentives to induce the bureaucrat to refuse a case when $\tau = \gamma$, otherwise put, how can he induce the bureaucrat to truthfully reveal his information on τ?

We will assume that $v_1(\alpha, 1) > 0$ so that more pro-social agents value the benefits to deserving consumers more than their less pro-social counterparts. We do not as yet specify the sign of $v_1(\alpha, \gamma)$. If it is positive, then in the undeserving case, more pro-social agents value granting the good than their less pro-social counterparts. This is plausibly the case much of the time for bureaucrats who value social gains but do not internalise the social costs. An example would be prescribing an expensive cancer drug to a patient who has only a minimal chance of survival: the intervention increases the patient's chance of survival so the doctor is keen (though the planner who also counts costs is not), and a more pro-social doctor would be a doctor who valued the patient's increased chance of survival when treated more highly. For example, suppose the payoffs of the bureaucrat are given by $v(\alpha, \tau) = \alpha\tau b$, so that the bureaucrat internalises a share of social payoffs, with this share increasing in his motivation α. Then $v_1(\alpha, \gamma) > 0 \iff \gamma > 0$.

However, it is also possible that as pro-social motivation goes up, the bureaucrat is less willing to grant the good in the undeserving case, even when the bureaucrat does not take into account social costs. An example would be prescribing antibiotics in the case of viral infections. Here, although the intervention does not directly harm the patient, the fact that it contributes to antibiotic resistance might mean that more motivated bureaucrats are less willing to prescribe antibiotics than less motivated bureaucrats, even when they do not bear social costs. Supposing that $v(\alpha, \tau) = \alpha\tau b$, then $v_1(\alpha, \gamma) < 0$ corresponds to $\gamma < 0$, ie social benefits in the undeserving states are negative. We will demonstrate that for most of our results, we will require $v_1(\alpha, \gamma) > 0$.

Bureaucrats are heterogeneous in their level of pro-social motivation, which is drawn from a distribution whose support is a subset of $[\underline{\alpha}, \overline{\alpha}]$. Whilst for the early part of the paper, we concentrate on a single bureaucrat of type α, later in the paper, we will focus on a particular discrete distribution function in order to show that we can screen between bureaucrats with different α. Specifically, we will focus on a distribution with a fraction f_H of bureaucrats with high pro-social motivation α_H, and the remaining $f_L = 1 - f_H$ have pro-social motivation where $\alpha_L < \alpha_H$.

We allow for bureaucrats to have a second informational advantage over their superiors; they know more about their own motivation than those managing it; as Besley and Ghatak (2012) put it, "observing motivation is next to impossible: there is always bound to be a residual component of uncertainty surrounding human nature." This means that, in order to make sure that the good is only given out in deserving cases, it is important for the planner to have a way of elucidating the bureaucrat's motivation, because, as we will show, the optimal contract will depend on α.

In the absence of such a screening contract, the planner would be forced to decide between two undesirable options. Suppose that the planner deals with two types: then in the absence of a screening contract he either he chooses a contract which gets only one of the two types to behave, leaving the other type to mis-allocate the good; or he chooses a high monitoring or tight budget contract, which gets both types to behave but at a significant cost.

We will study two alternative means of managing bureaucrats in this paper, *bureaucratic discretion* and *bureaucratic oversight*. The first is characterised by a bureaucrat receiving funding or a quota according to a rule, to be specified, and allowed to grant cases as he pleases with no monitoring or interference from the planner. The second – which is in the spirit of Prendergast (2003, 2007), is characterised by the planner allowing the bureaucrat as much funding as he requests to grant cases – but also by the planner monitoring and punishing the bureaucrat for over-allocation. This method of managing bureaucrats was used by Prendergast (2003) in which he derives some limits on bureaucratic efficiency. We will show that, by using discretion, these limits can be exceeded.

4.1 Bureaucratic discretion

In this section, we introduce the means of managing bureaucrats that we refer to as bureaucratic discretion. We use the terminology "discretion" to contrast with the monitoring that characterises bureaucratic oversight, which we define in the next section. In practice, it corresponds to the social planner delegating a binding budget or quota for the bureaucrat to manage, without his decisions being systematically checked.

Rather than study a budget or quota[4] that can be spent over a set time period, we study a related constraint on bureaucratic spending: a funding rule which says whether or not the

[4] Although we can think of the bureaucrat holding a budget, we could equally well think of him as managing a quota, with the funds never passing through his hands but through the hands of a superior — thus reducing the possibility that a possibly corrupt bureaucrat, who prefers to have the funds for himself than to have the intrinsic payoffs associated with giving out the good, appropriates the funds for himself.

bureaucrat receives more funding tomorrow, conditional on his spending today. In appendix 8, we show that our refunding rule and managing a fixed budget for a set time period share the important properties that allow us to prove our main results. Further, studying this funding rule has two advantages over studying a fixed budget: firstly, it admits a stationary solution; secondly, it prevents bureaucrats wastfully spending savings on undeserving cases just before the budget is due to expire.

The funding rule that we study is as follows. At $t = 0$ the bureaucrat is granted c to cover the costs of granting the good once. If the bureaucrat grants the good, then he is refunded with probability q in the next period. Otherwise he carries over his savings c into the next period. After any period without funding, he receives c for the next the period. We assume that the bureaucrat cannot be fired for allocating the good. Given the similar properties of a budget or quota and the refunding rule q that we study, we will refer to q as the budget or quota.

Thus he plays a game with the following timing convention.

First the planner contracts with the bureaucrat by offering a per period wage of $(1-\beta)w$ and a re-funding rule q. At t=1,the bureaucrat starts with funding c. Then:

1. A consumer makes a demand to the bureaucrat at time t

2. Conditional on the funding/quota available to him, and his observation of τ, the bureaucrat makes an allocation decision. The allocation decision is publicly observed.

3. The planner re-allocates c to the bureaucrat with probability q if the bureaucrat allocated the good. If the bureaucrat has not allocated the good, he keeps c for the next time period. If the bureaucrat had no funds at t, he is given c for time period $t + 1$

4. Return to 1., setting $t = t + 1$

We seek a subgame-perfect equilibrium of the game described by the timing convention above. First we note the circumstances under which we can find some q such that the bureaucrat can be induced to make the right allocation decision.

Proposition 1 *A q that induces the bureaucrat to only distribute the good to deserving cases exists only if bureaucrats and the planner share the same ordering of cases: $v(\alpha, 1) > v(\alpha, \gamma)$, and if h exceeds some threshold $\underline{h}$.*

A proof of this as well as most subsequent results can be found in the appendix.

We show that bureaucratic discretion can only work if bureaucrat and planner share the same ordering of cases; otherwise, the effect of the funding constraint would be to induce the bureaucrat to withhold funding from those that the planner sees as deserving to use towards those that the planner sees as undeserving.

Planner and bureaucrats will often share the same ordering of cases, if for example, bureaucrats care about consumers payoffs, and the people who desire a service most are the ones who merit it most. For example, a more seriously ill patient is more likely to want a heart operation than a less seriously ill patient, and a doctor will often champion the former's interest more than the latter. Or, if the police care about protecting the public, they will be keener to arrest more serious offenders than petty criminals.

However, the converse is also possible. Suppose that the good is a prosecution for criminality. Corrupt policemen may prefer to punish petty criminals and let off gang lords. Suppose that the good is placement of children in care with a host family. Paedophile social workers may prefer to keep the most vulnerable closest to them in order to abuse them, letting the more robust benefit from a family environment. Bureaucratic discretion is not a suitable means of managing such bureaucrats for the simple fact that they will abuse such discretion.

Henceforth restrict our attention to the case where bureaucrats and the planner share the same ordering of cases, ie we assume the following:

Assumption 1 *The bureaucrat and the planner share the same ordering of cases:*

$$v(\alpha, 1) > v(\alpha, \gamma) \tag{1}$$

It is also necessary for bureaucratic discretion to induce the right allocation that the probability of a deserving case h is sufficiently high. For bureaucratic discretion to work, the bureaucrat must worry sufficiently about denying deserving cases in the future if he spends on an undeserving case today. Otherwise, a bureaucrat expects to see a string of similar undeserving cases in future periods, and given his discount factor would prefer to give out the good to the undeserving the case in front of him.

We now study the downsides of bureaucratic discretion, and notice how q depends on pro-social motivation α.

Corollary 1 *Then the maximum q that is consistent with a bureaucrat of pro-social motivation α correctly allocating the good in state γ, $q(\alpha)$, is defined by:*

$$\frac{\beta h(1-q(\alpha))}{1+\beta h(1-q(\alpha))} = \frac{v(\gamma,\alpha)}{v(1,\alpha)} \tag{2}$$

Such q also ensures that the bureaucrat always allocates the good in the deserving case when funding is available. Further:

- $v(\gamma,\alpha) > 0$ *implies that* $q(\alpha) < 1$, *ie there is a strictly positive probability of a deserving case being refused on account of lack of funding.*
- $q(\alpha)$ *is increasing in* α *only if* v *is more elastic in* α *for more deserving cases:* $q'(\alpha) > 0 \iff$

$$\frac{\partial}{\partial\alpha}\frac{v(\alpha,\gamma)}{v(\alpha,1)} < 0 \iff \frac{v_1(\alpha,1)\alpha}{v(\alpha,1)} > \frac{v_1(\alpha,\gamma)\alpha}{v(\alpha,\gamma)}$$

- *If v is more elastic in α for more deserving cases, then the payoff of the planner under bureaucratic discretion is increasing in α.*

Equation (19) shows that $1-q > 0$, that is to say that the cost of inducing the correct allocation when the case is undeserving is introducing the possibility that a deserving case has to be refused in the future. In the case where the consumer always prefers to have the good – eg, he prefers to be granted a visa than not – bureaucratic discretion implies that some people that the planner would be happy to see enter the country will have to be denied visas. In the case when the consumer does not want the good – eg, to be arrested, $1-q>0$ implies that a police officer will be obliged not to arrest an egregious offender. Introducing type II errors in order to avoid type I errors sounds undesirable, but we will see that such a distortion may be preferred to others, namely the monitoring costs under bureaucratic oversight.

It also shows, however, that under reasonable assumptions about $v(\alpha, .)$, more motivated agents are can be given higher q and still only grant the good in deserving cases. On the left hand side of (19), we have an increasing function of the the expected discounted probability of having to refuse a deserving case tomorrow, conditional on having accepted a case today $\beta h(1-q)$. On the right hand side, we have in the numerator the net payoff to the bureaucrat of accepting an undeserving case in the denominator; in the denominator the net payoff to the bureaucrat of accepting a deserving case.

If the RHS of (19) is decreasing in α, then more intrinsically motivated bureaucrats distinguish more keenly between a deserving and undeserving cases, and the least intrinsically motivated agents see undeserving and deserving cases as roughly equivalent. This condition seems like a reasonable characterisation of intrinsic motivation, thus from now on we make the assumption:

Assumption 2 $\frac{\partial}{\partial\alpha}\frac{v(\alpha,\gamma)}{v(\alpha,1)} < 0 \iff \frac{\partial}{\partial\tau}\frac{v_1(\alpha,\tau)\alpha}{v(\alpha,\tau)} > 0$

Although we state this as an assumption here, this can also be derived as a consequence of fundamental payoffs in a richer model. In this richer model, outlined in appendix B, a buresaucrat of motivation α internalises a share α of social benefits τb in each state of the world. Further, the bureaucrat needs to exert effort to learn τ. Under these circumstances, we can show that the Assumption 2 arises endogeneously and does not need to be imposed as we do here – see Lemma 7.

Corollary 2 *Consider the minimum h necessary for bureaucratic discretion to work, $\underline{h}$*

- *The minimum h needed to make discretion work is decreasing in α, ie, $\frac{\partial \underline{h}}{\partial \alpha} < 0$*

- *In order that $\underline{h} < 1$, ie, for some h to exist for which discretion works, then $\alpha \geq \alpha^{MIN}$.*

Notice that given assumption 2, the more intrinsically motivated the bureaucrat, the more that they can be prevailed upon to refuse undeserving cases even when deserving cases are less common – an intuitive consequence of our assumption that more motivated agents put a relatively higher weight on deserving cases compared to undeserving cases.

Discretion does not work in all cases, however. It can only induce the bureaucrat to make the right allocation decision if and only if equation (19) yields a solution $q(\alpha) \geq 0$ – that is to say that the lower bound on $h, h \geq \underline{h}(\alpha)$ is respected. If α is sufficiently low, then there is no h for which discretion can induce the bureaucrat to make the right allocation decisions.

From now on we assume that:

Assumption 3 $\underline{\alpha} \geq \alpha^{MIN}$, $1 > h \geq \underline{h}(\underline{\alpha})$

4.2 Bureaucratic oversight

We now focus on bureaucratic oversight, in which the bureaucrat faces no budget constraint – so could in theory choose to fund all cases – but the bureaucrat is disciplined by the threat of investigations. After the bureaucrat's decision, the planner monitors the bureaucrat's decision by investing in a signal of the state τ. At cost $\kappa(\rho)$, where $\kappa' > 0, \kappa'' > 0$, the planner, in the event of the agent distributing the good to a undeserving consumer, learns that the agent has misallocated the good with probability ρ. If such a signal is observed, then the planner penalises the agent Δ.

Thus the planner and the bureaucrat play a game with the following timing convention. The planner contracts with the bureaucrat, offering a per period wage of $w(1-\beta)$, then:

1. A consumer makes a demand for the good; the bureaucrat observes the state τ.

2. The bureaucrat makes an allocation decision and, if positive, the consumer receives the good. The allocation decision is publicly observed.

3. The planner, given the allocation decisions, may investigate the bureaucrat's decision – ie, obtain a signal of the underlying state, correctly detection misallocation with probability ρ_D

4. Payments between the planner and bureaucrat are made.

5. Return to 1.

We seek a subgame perfect Nash equilibrium of this game that induces the bureaucrat to withhold the good from undeserving consumers.

Lemma 3 *A subgame perfect Nash equilibrium in which the bureaucrat correctly withholds the group in state γ must correspond to an equilibrium of the stage game outlined in steps 1-4 above repeated infinitely. The minimum level of monitoring required to get the bureaucrat to make the right decision is defined by:*

$$\rho = \frac{v(\alpha,\gamma)}{\Delta} \tag{3}$$

It is increasing in α if and only if $v_1(\alpha,\gamma) > 0$, in which case the planner's payoff is also decreasing in α.

Bureaucrats who value social gains but not social costs have intrinsic payoff $v(\alpha,\gamma)$ in state γ. If social gains by themselves are positive then, as discussed in section 4, $v_1(\alpha,\gamma) > 0$ and more motivated agents need more monitoring. If, taking into account only social gains more motivated agents have lower intrinsic payoffs from allocating the good – as could be the case if the bureaucrat worries about negative externalities from giving out the good – then more motivated agents need less monitoring.

Whilst we do not deny that the latter case can arise – for example, there are negative externalities in the form of antibiotic resistances from prescribing antibiotics in the case of viral infections. However, when social costs are ignored there are likely many things that consumer-oriented bureaucrats would like to do when they are not forced to take account of costs, as highlighted in section 3.

4.3 Comparison of bureaucratic discretion and bureaucratic oversight

In this section we will concentrate on a bureaucrat of a single type determined solely by his motivation $\alpha \in [\underline{\alpha}.\overline{\alpha}]$, and on the principal's decision on how to manage him.

In the previous sections, we established that the payoff of the planner was increasing in α under bureaucratic discretion, and decreasing in α under bureaucratic oversight. This gives rise to the following result:

Proposition 2 *Suppose that $v_1(\alpha, \gamma) > 0$ and let:*

1. *Assumption 2 hold, so that more motivated bureaucrats fear turning down deserving cases relatively more;*
2. *Assumption 3 so that bureaucratic discretion can be used to govern the bureaucrat's behaviour*

Then, supposing that the upper bound on the distribution of α, $\overline{\alpha}$, satisfies:

$$\kappa\left(\frac{v(\overline{\alpha}, \gamma)}{\Delta}\right) \geq V(1, c)\frac{v(\overline{\alpha}, \gamma)}{v(\overline{\alpha}, 1)} \tag{4}$$

there exists $\tilde{\alpha} \in [\underline{\alpha}, \overline{\alpha}]$ such that for sufficiently motivated agents, ie $\alpha \geq \tilde{\alpha}$, the planner chooses bureaucratic discretion over bureaucratic oversight.

The result, at first glance, seems counterintuitive. The bureaucrats who need the most monitoring under bureaucratic oversight (given $v_1(\alpha, \gamma) > 0$) should be given discretion to manage their own budget. Why should such freedom be allocated to those who have the greatest tendency to overspend under oversight? This comes from the dynamic tradeoffs bureaucrats are forced to make under discretion. Under discretion, faced with an undeserving case today, assumption 2 implies that the threat of having to deny a deserving case would impose on them a greater loss than their less intrinsically motivated counterparts.

The condition in the proposition (4) simply ensures that bureaucratic discretion is preferred for the largest possible level of bureaucratic motivation.

In a web appendix, we show that this basic intuition can be carried over to a richer version of the model, corresponding exactly to that of Prendergast (2003), in which the bureaucrat exerts effort which determines the accuracy of his information about the consumer's case – ie, with probability $e \geq \frac{1}{2}$ his information is correct, and with probability $1 - e$ his information is incorrect, where higher e requires a higher effort cost. Thus we show that the limits of bureaucratic efficiency determined by Prendergast (2003) can sometimes be exceeded by moving away from bureaucratic oversight and granting bureaucrats discretion.

5 Screening

Given that bureaucrats of different levels of pro-social motivation should be managed differently, in this section we address the following question: is it possible to get bureaucrats of different levels of pro-social motivation to select the contract that manages them best?

We return to the case where there is heterogeneity in α and distinguish three classes of screening contract that the planner might find useful:

1. A screening contract in which both α_L and α_H types are managed by bureaucratic oversight;

2. A screening contract with less motivated types managed by oversight, more motivated types by discretion; and

3. A screening contract with both types managed by discretion.

Though the middle case is of the most practical interest, in order to understand how to design it a good understanding of contracts 1 and 3 is necessary. We will find that it is possible to design screening contracts in all three cases. However, only in the final case – when both types are managed by discretion – does the screening contract resemble a standard screening contract composed of two elements with the principal offering a pair (w_i, q_i) where w_i is the fixed wage intended for $\alpha_i \in \{\alpha_L, \alpha_H\}$ and q_i is the refunding rule. The workings of this contract will give us an insight into how to design a more complex screening contract for cases 1 and 2.

In all the subsections that follow, we maintain assumptions 1-3.

5.1 Screening and bureaucratic discretion

In order to gain insight as to why we can use q to screen between different levels of pro-social motivation, we need to understand the payoffs of a type α for all q – not only his payoff when he chooses the contract intended for him.

Lemma 4 *The expected discounted discounted payoff of the bureaucrat when he chooses a contract consisting of a fixed wage and a refunding rule (w, q) is:*

$$\pi_D(q, \alpha, h) \equiv \begin{cases} \frac{1}{1-\beta}\left(\frac{hv(\alpha,1)}{1+\beta h(1-q)}\right) + w & \text{if} \quad q \leq q(\alpha) \\ \frac{1}{1-\beta}\left(\frac{hv(\alpha,1)+(1-h)v(\alpha,\gamma)}{1+\beta(1-q)}\right) + w & \text{if} \quad q > q(\alpha) \end{cases} \tag{5}$$

which is continuous in q and differentiable except at $q(\alpha)$, where the right derivative is greater than the left derivative. We obtain, all else being equal:

1. *More motivated bureaucrats obtain higher payoffs:* $\frac{\partial \pi_D(q,\alpha,h)}{\partial \alpha} > 0$
2. *Higher budgets or quotas increase payoffs:* $\frac{\partial \pi_D(q,\alpha,h)}{\partial q} > 0$
3. *More motivated bureaucrats value a marginal increase in q more:* $\frac{\partial^2 \pi_D(q,\alpha,h)}{\partial q \partial \alpha} > 0$

The fact that $\frac{\partial^2 \pi_D(\alpha,q)}{\partial q \partial \alpha} > 0$ captures the intuitive idea that more pro-socially oriented agents prefer higher q more than their less pro-social counterparts, as they are able to use them to obtain higher social payoffs. This supermodularity condition allows us to obtain a screening contract.

In order to derive the specifics of the screening contract, we start by setting out the truth-telling constraints. We require that $q_i \leq q(\alpha_i)$ so that a bureaucrat of type i would make the right decision in state γ if he chooses the contract intended for his type. Suppose also that $q_H > q_L$. Then the contract pair (w_i, q_i) is screens between L and H types if:

$$\begin{array}{rcl} w_H + \frac{hv(\alpha_H,1)}{1+\beta h(1-q_H)} & \geq & w_L + \frac{hv(\alpha_H,1)}{1+\beta h(1-q_L)} \\ w_L + \frac{hv(\alpha_L,1)}{1+\beta h(1-q_L)}) & \geq & w_H + \frac{hv(\alpha_L,1)+(1-h)v(\alpha_L,\gamma)}{1+\beta(1-q_H)} \end{array} \tag{6}$$

As $q_H > q_L \geq q(\alpha_L)$ the more pro-socially motivated type will choose the correct allocation if he chooses the contract intended for the less motivated type, whereas the less motivated type will choose to always allocate the good when he chooses the contract intended for the more motivated type.

Rearranging (6) we find that:

$$\begin{aligned} &\left(\tfrac{1}{1+\beta h(1-q_H)} - \tfrac{1}{1+\beta h(1-q_L)}\right) hv(\alpha_H, 1) \\ &\geq w_L - w_H \geq \\ &\underbrace{\left(\frac{1}{1+\beta h(1-q_H)} - \frac{1}{1+\beta h(1-q_L)}\right) hv(\alpha_L, 1)}_{\text{Term 1}} \\ &+ \underbrace{\left(\frac{hv(\alpha_L,1) + (1-h)v(\alpha_L,\gamma)}{(1+\beta(1-q_H))} - \frac{hv(\alpha_L,1)}{1+\beta h(1-q_H)}\right)}_{\text{Term 2}} \end{aligned} \tag{7}$$

If the payoff function of a bureaucrat was not kinked at $q(\alpha)$, then the term 2 above would not feature. If that were the case, (7) would automatically define a non-empty interval of $w_H - w_L$.

Term 1 would represent the utility gap between the H and L contract for the α_L type, were he to only grant the good in deserving cases. However, as we have seen, when the α_L type deviates, he starts granting the good in undeserving cases. Term 2 thus represents the utility over and above his payoff from only granting the good when $\tau = 1$ that the α_L type would get from giving out the good for all τ when he chooses the contract intended for the α_H type. It can be verified that it is positive for all $q_H \geq q(\alpha_L)$, since, without a sufficiently strict quota, the low type always gives out the good.

This extra term implies that in order to design a screening contract we need to make sure that the following constraint is satisfied:

$$\begin{aligned} &\left(\tfrac{1}{1+\beta h(1-q_H)} - \tfrac{1}{1+\beta h(1-q_L)}\right) h(v(\alpha_H,1) - v(\alpha_L,1) \\ &\geq \left(\tfrac{hv(\alpha_L,1)+(1-h)v(\alpha_L,\gamma)}{(1+\beta(1-q_H))} - \tfrac{hv(\alpha_L,1)}{1+\beta h(1-q_H)}\right) \end{aligned} \tag{8}$$

The participation constraints of the two types are:

$$\begin{aligned} w_H + \tfrac{hv(\alpha_H,1)}{1+\beta h(1-q_H)} &\geq \underline{u} \\ w_L + \tfrac{hv(\alpha_L,1)}{1+\beta h(1-q_L)} &\geq \underline{u} \end{aligned} \tag{9}$$

The incentive compatibility and participation constraints give rise to the following optimal screening contract:

Proposition 3 *There exists a screening contract* $(w_i, q_i), i \in \{L, H\}$ *such that:*

1. $w_L > w_H$ *with the first inequality of (7) satisfied with equality.*

2. *More motivated agents get a more generous refunding rule:* $q_H > q_L$*, satisfying (8) with equality.*

3. $q_i \leq q(\alpha_i)$*,* $i \in \{L, H\}$[5]

[5]The contract involves a slight adjustment to the standard properties of a screening contract, since the additional term on the far right hand side of (7) means that the equation is is not trivially satisfied. As well as $q_L \neq q(\alpha_L)$, we may have $q_H \neq q(\alpha_H)$

4. The participation constraint of the L type binds.

The contract to take a form which conforms to the basic intuition of Besley and Ghatak (2005). More motivated agents receive higher intrinsic payoffs from any given q, and so they need lower fixed payments to satisfy their participation constraint.

A contract of this form can screen, since less motivated agents value the higher q less, and so they can be drawn towards a contract tailored to their lower level of motivation, as long as it has a higher fixed payment than the other contract. This higher fixed payment can be chosen so that it does not attract the more pro-social type, because it is not enough to compensate him for the loss of the intrinsic payoffs that comes with lower q.

Now we turn our attention to contracts that seek to induce one or more types of bureaucrats into selecting into bureaucratic oversight. We will show that the fact that more motivated agents value lower monitoring more than less motivated agents causes problems for standard screening contracts, which will force us to turn to alternatives in order to ensure that agents select into the desired contract.

5.2 One or more types selects oversight

In this section, we will show that it is possible to construct a screening contract in which at the α_L type chooses a contract managed by oversight. However, as we will see, this contract will not take the standard form of a wage offer and one other parameter (ρ or q). Rather, in order to obtain a screening contract, we will need to design a contract in which each type selects a contract that looks like the screening contract in Proposition 3 for the first few periods in order to get them to reveal their type, and then reverts to the contract the planner wants to implement. We commence by demonstrating the following:

Lemma 5 *There exists no screening contract with each contract involving bureaucratic oversight, $(w_L, \rho_L), (w_H, \rho_H)$, for which each type α_i chooses the contract (w_i, ρ_i), where $\rho_H > \rho_L$, $\rho_i \geq \rho(\alpha_i)$.*

Intutively, the high type favours lower monitoring more than the low type, since for $\rho_L \in [\rho(\alpha_L), \rho(\alpha_H))$, the high type values the intrinsic gains that he can get from granting the case in the undeserving case more highly. This means that to induce the high type to take the contract intended for him, that the high type will need a high fixed payment to overcome his loss from higher monitoring. However, this payment would need to be so high that the low type would also take the contract intended for the high type.

When we want to screen between one agent who should choose an oversight contract, and another who should choose discretion, a similar issue arises with screening contracts which aim at getting one contract to choose oversight and another to choose discretion.

Lemma 6 *There does not exist a screening contract in which the α_L agent chooses an oversight contract (w_L, ρ_L) and the α_H agent chooses a discretion contract (w_H, q_H)*

The intuition for why we cannot create a standard screening contract where there is a choice between oversight and discretion is similar to the intuition for why we cannot create a standard screening contract with both types choosing oversight (with the extent of oversight varying with their type). Oversight never involves turning down deserving cases; with discretion this happens with positive probability. Both types are bothered by this, but more motivated agents care more. Thus they would need to be paid so much to take on a discretion contract that the low type would want to take it on too.

We have spoken of "standard" screening contracts – contracts that involve a pair, either of a wage w and q or w and a monitoring probability ρ and shown that these contracts cannot screen. Though the results of lemmas 5 and 6 are unpromising, the result of Lemma 4 gives us an insight into how to generate a screening contract that has the desired properties.

We need extra traction in order to get the high types to renounce the higher payoffs from oversight, something that will appeal to the high type more than the low type in order to overcome the tendency that we have identified for high type contracts to involve so much w that low types are tempted to take the contract themselves. We do this by making high and low contracts decide upon a "test" case. That is to say, the planner requires the bureaucrat to make a decision on a randomly chosen case (this might be a series of cases in practice), and if he accepts the case, he is given one contract. If he refuses the case, he is granted another contract. The more motivated agent rationally anticipates that if he grants the case, he will be given a discretion contract, which in the absence of the test case he would not take. However, his impatience combined with his intrinsic motivation means that he cannot resist the temptation to help the client in front of him today, even if it means helping a bit less in the future. On the other hand, the less motivated agents are not tempted to grant the test case today. We can think of this contract as offering a one period budget of 1 case to the high type, and a one period budget of zero for the lower type. Hence the rationale for designing the contract like this is similar to the rationale for the contract in 3.

This gives rise to the following screening contracts:

Proposition 4 Screening with both types managed by oversight

For all $\beta < 1$ the following screening contracts exist:

1. *Suppose that (α_H, α_L) are such that $v(\alpha_H, \gamma) \geq v(\alpha_L, 1)$. There exists a screening contract for which:*
   - *α_L types choose to refuse a case and, afterwards receive a fixed payment $(1-\beta)w_L$ per period with a monitoring probability of ρ_L satisfying $\rho(\alpha_L) \leq \rho_L < \rho(\alpha_H)$; and*
   - *α_H types choose to grant a case and, afterwards receive a fixed payment $(1-\beta)w_H$ per period with a monitoring probability of $\rho_H \geq \rho(\alpha_H)$.*
2. *For all (α_L, α_H) there exists a "semi-screening" contract such that:*
   - *α_L types choose to refuse a case regardless of τ and, afterwards receive a fixed payment $(1-\beta)w_L$ per period with a monitoring probability of $\rho(\alpha_L)$ satisfying $\rho(\alpha_L) \leq \rho_L < \rho(\alpha_H)$; and*
   - *When α_H types are faced with a deserving test case, they choose a contract with fixed payment $(1-\beta)w_H$ per period with a monitoring probability of $\rho_H \geq \rho(\alpha_H)$;*

when they are faced with an undeserving test case, they refuse the case and choose the contract (w_L, ρ_L) *intended for the* L *type.*

If $v(\alpha_H, \gamma) > v(\alpha_L, 1)$ then the high type agent can be counted on to take the contract intended for him whether or not the test case is deserving or undeserving, and the low type can be counted upon to refuse the case whether or not it is undeserving. If, on the other hand, the above inequality does not hold, the payoffs in the undeserving case are not high enough for the α_H agent to reveal his type; the rewards of being able to grant undeserving cases in the long run are too high. Faced with a deserving case, however, he is ready to help the person in front of him today at the expense of his future payoffs – hence a "semi-screening" contract exists.

A similar proposition applies for the case when we would like the more pro-socially motivated agent to select oversight and the less pro-socially oriented bureaucrat to choose oversight:

Proposition 5 Screening with both types managed by discretion

1. *Suppose that* (α_H, α_L) *are such that* $v(\alpha_H, \gamma) \geq v(\alpha_L, 1)$*. Then there exists* β^* *such that for all* $\beta \leq \beta^*$ *there exists a screening contract for which:*

   - α_L *types choose to refuse a case and, afterwards receive a fixed payment* $(1-\beta)w_L$ *per period with a monitoring probability of* ρ_L *satisfying* $\rho(\alpha_L) \leq \rho_L < \rho(\alpha_H)$*; ie, they choose a contract involving oversight; and*

   - α_H *types choose to grant a case and, afterwards receive a fixed payment* $(1-\beta)w_H$ *per period and a refunding rule* q_H *with* $q_H \leq q(\alpha_H)$*; ie, they choose a contract involving discretion.*

2. *For all* (α_L, α_H) *there* β^{**} *such that for* $\beta \leq \beta^{**}$ *there exists a "semi-screening" contract such that:*

- *α_L types choose to refuse a case regardless of τ and, afterwards receive a fixed payment $(1-\beta)w_L$ per period with a monitoring probability of $\rho(\alpha_L)$ satisfying $\rho(\alpha_L) \leq \rho_L < \rho(\alpha_H)$; and*
- *When α_H types are faced with a deserving test case, they choose a contract with fixed payment $(1-\beta)w_H$ per period with a refunding rule q_H with $q_H \leq q(\alpha_H)$; when they are faced with an undeserving test case, they refuse the case and choose the contract (w_L, ρ_L) intended for the L type.*

Whilst we can show that it is possible to generate a screening contract for which the low type chooses oversight and the high type chooses discretion, we cannot reach a conclusion on whether the planner should choose this screening contract or stick with a pooling contract which involves a single means of bureaucratic oversight. It is usually possible to make such a comparison when the screening contract is of the standard form with no distortion at the top. However, in this setting, the kink in $\pi(\alpha, q)$ at $q(\alpha)$ introduces an additional constraint to the optimisation problem – a constraint that says that the incentive compatibility constraints of the high and low types are compatible. This introduces distortions with $\rho_L \neq \rho(\alpha_L)$ and $q_H \neq q(\alpha_H)$ in general, which makes it more difficult to make the comparison of payoffs between screening and pooling contracts.

6 Alternative contracts

Up until now, we have focused our attention on two means of bureaucratic management which have often been observed in practice: oversight and discretion.

Here, we turn our attention briefly to some alternative contracts and note why either these have similar properties to the contracts we have focused on, or may have limited relevance.

One alternative contract is managing bureaucrats by punishing them for exceeding a certain rate of decisions to grant the good. This contract is most suitable for situations where bureaucrats deal with a large number of cases; otherwise the target rate h of granting the good may diverge considerably from the actual number of cases that are deserving in a small sample. When this contract is used, however, it resembles the oversight contract in most important respects when $v_1(\alpha, \gamma) > 0$

1. More intrinsically motivated agents will need higher penalties for exceeding the target rate in order to induce them to withhold the good in undeserving cases;

2. If monitoring is costly to the principal and/or and punishing the bureaucrat is costly, then the principal prefers less motivated bureaucrats; and

3. A so-called standard screening contract, in the sense of section 5, will not work because more motivated bureaucrats value lower monitoring more.

Another alternative contract is a contract where either the bureaucrat is offered a payment for disclosing that a case is undeserving, or the bureaucrat must meet part of the costs of granting the good.

These contracts are equivalent in the sense that they introduce an opportunity cost to the bureaucrat of granting the case. In the first case, a payment of $v(\alpha, \gamma) + \epsilon$ to refuse a case would induce the bureaucrat to take the right decision; in the second, the bureaucrat should give $v(\alpha, \gamma) + \epsilon$ towards the cost of the good in order for him to take the right decision. Notice that, as above, for $v_1(\alpha, \gamma) > 0$, more motivated bureaucrats need to be paid (or to pay) more in order to induce them to withhold the good in the undeserving cases. Thus, as above with the contract that punishes excessive allocations, the contract where the bureaucrat is paid for refusals has properties 1-3 above.

The case where the transfer comes from the bureaucrat, in the form of a co-payment towards the cost of the good is slightly different, in that the planner would prefer the more motivated bureaucrats who would make the larger transfer. One might speculate that such a co-payment contract it is infeasible in practice, as a result of bureaucratic limited liability, for example. Notice additionally that it cannot screen, as all agents prefer to make lower co-payments more, and the more motivated prefer this more than the less motivated as it also gives them the chance to grant the good in the undeserving case.

7 Discussion: bureaucratic discretion in practice

In this section, we discuss examples of bureaucratic discretion that exist in practice and review the evidence that compares it to bureaucratic oversight. Recall that although we use a stationary refunding rule q in this paper, defined in section 4, we show in Appendix C that a fixed budget or quota shares with q all the key properties that generate our results.

Although our analysis in this paper is essentially normative, it generates positive predictions, in so far as it is credible that the principal in a bureaucracy is a social welfare maximiser.

There are several examples of bureaucrats being left to manage a budget that forces them to choose between cases; notably in the British and German public health & social care systems. In the United Kingdom, the Conservative government in the 1990s introduced "fundholding" where family doctors, who have always acted as gate-keepers to more specialised medical interventions, were made responsible for a fixed budget for non-emergency care. Such a system has been in place for the majority of the time since, though with a movement to several practices of doctors sharing the same budget (Le Grand, 2003). In Germany, family doctors are faced with a fixed budget for prescription costs, and must use their own funds to cover any excesses at end of quarter (The Commonwealth Health Fund, 2010).

A temporary end to fundholding in the UK in 1999 after a change of government (the scheme was later reintroduced) — provided the opportunity to study its effects. Dusheiko *et al.* (2006) show, using the end of fundholding as a natural experiment, to show that for doctors who were fundholders prior to the reform, hospital admission rates for elective procedures increased by between 3.5% and 5% post 1999. We can interpret this as evidence of doctors being part of the group of motivated agents that are better governed by bureaucratic discretion than by bureaucratic oversight. A related study on the same sample, Dusheiko *et al.* (2007), shows that patient satisfaction was lower for fundholders than for other GP practices (groups of family doctors working together), though they scored more highly on objective measures of care; this is consistent with the idea that fundholding doctors correctly withheld benefits from some patients that were given out incorrectly before fundholding.

It is interesting to speculate why discretion seems to be more prevalent in healthcare settings. A possible explanation lies with the degree of expertise that doctors have about the seriousness of their patient's conditions. In order for the planner to get precise information that would allow them to monitor doctor's decisions, they need to employ another expert healthcare professional to review the case, adding considerably to the costs of oversight. In other areas of bureaucratic activity, the bureaucrat's information may be more easily verified. For example, visa applications often require that the applicant provide the bureaucrat with certain documents. These can be kept on file, allowing for a superior to audit decisions at relatively low cost.[6]

Discretion has not always led to good outcomes in health and social care. The UK government recently implemented what has been referred to as a "de-facto" quota-based system[7] for disability benefits at the same time as taking fitness-for-work assessments out of the hands of doctors and putting them in the hands of a private firm, Atos. The scheme was widely hailed as a failure, including by those within Atos. The Work and Pensions select committee, an oversight body for the government department administering the scheme, said that the scheme was "damaging public confidence" and causing "real distress" to disabled people. According to a spokesman for Atos, the contract wasn't working for "claimants, for the DWP (Department for Work and Pensions) or for Atos Healthcare" (Guardian, 2014b).

[6]With thanks to Julian Le Grand for the interesting discussion in May 2014, and from whom these insights originate.

[7]The company and government department managing the scheme admitted to the existence of "statistical norms" used to manage individual case-worker performance. Though not binding, the fact that the company had a short-term contract with the government to manage this scheme means that there was pressure for the company to meet the norms or lose the contract. (Guardian, 2013)

The damage to Atos' reputation led them to end the contract a year early in March 2014, paying the DWP substantial financial compensation. (The Guardian, 2014c)

The key to understanding the failure of this scheme is in noting that the statistical norms for allocation, assumed to function as quotas, were introduced at the same time as taking the task out of the hands of presumably intrinsically motivated agents and putting them into the hands of people who had limited experience and, one might speculate, little commitment to the welfare of disabled people. Whilst there are clear difficulties imputing something as intangible as motivation to individuals, the evidence points to Atos' healthcare's limited commitment to the welfare of disabled people: a government-commissioned independent review of the work assessment process found that it was "impersonal, mechanistic and lacking in clarity" and found that there was a need for more empathy on the part of assessors (Harrington, 2010). An opinion piece in the British Medical Journal questioned, given assessors' limited training and the time constraints involved, whether Atos' assessors (some of whom are doctors) could be considered to be fulfilling their professional duties as embodied in the Hippocratic Oath (McCartney, 2011). Thus in agreement with our predictions extremely tight quotas have been chosen: 65% of cases were expected to be denied and caseworkers had the capacity to grant long-term incapacity status to just 2.5% of all applicants. According to the think-tank the Centre for Welfare Reform, these norms have no basis in statistical analysis of the merits of applications for benefits. The evidence suggest that deserving cases were rejected: one in three appeals lodged result in benefits being granted (Franklin, 2013).

While the move to put decisions in the hands of a different group of professionals seems to have been motivated by a sense that benefits were being over-allocated (Franklin, 2013), this paper suggests that better results would have been obtained in putting quotas in the hands of the original group more intrinsically motivated assessors; less stringent quotas would have been needed and fewer deserving cases would have needed to be denied.

Quotas and budgets may be held at a higher level than by a single bureaucrat. The UK government recently voted into law an annual cap on welfare spending (BBC news, 2014).

In Sweden and Denmark health budgets are capped at a sub-national and national level respectively (The Commonwealth Health Fund, 2010). Although these caps do not apply directly to "street-level bureaucrats" we might expect to see them passed down to them through local budgets, and if these bureaucrats have an element of public goods motivation, they might be mindful of the effect of their decisions on the consumers that their colleagues work with.

8 Conclusion

We have shown that choosing the right means of managing bureaucrats who do not directly bear the social costs of intervention depends on knowing their pro-social motivation. When more motivated bureaucrats value social benefits more highly when faced with an undeserving case, we show that more pro-socially motivated bureaucrats, who require the most monitoring under oversight, should be granted discretion to manage a budget or quota. Further, we provide the means of determining their pro-social motivation through a screening contract where more motivated bureaucrats accepts lower fixed payments for larger budgets/quotas to disperse goods to consumers.

We have outlined the use of quotas and budgets on an individual and agency-level in health and social care systems in the UK and Germany, and shown that allowing GP practices to expand in response to patient demand necessitates the use of tighter budgets or quotas.

Appendix A: Proofs

Proof of Proposition 1

We consider a bureaucrat of type α's value function $z(\tau, D, C, \alpha)$, which depends on the state τ, his allocation decision D, whether he has the funds to make the allocation $C \in \{0, c\}$ and his type α. We seek a Markov-perfect equilibrium of the dynamic allocation game. We denote his allocation decision on the equilibrium path by $D(\tau, C)$ (given that the refunding rule does not depend on the entire history of the game, but only the behaviour in the last period, the subgame perfect equilibrium is consequently Markov-perfect).

Note first that

$$z(\tau, 0, c, \alpha) = \beta E_\tau z(\tau, D(\tau, c), c, \alpha) \tag{10}$$

since he cannot allocate the good if he does not have the funds, but his funds are always reallocated in the next period. Thus $D(\tau, 0) = 0$.

Suppose he faces a case of type 1 and $C = c$. He allocates the good if the case is deserving ($\tau = 1$) if:

$$\underbrace{v(\alpha, 1) + \beta\Big((1-q)E_\tau z(\tau, 0, 0, \alpha) + qE_\tau(\tau, D(\tau, c), c, \alpha)\Big)}_{z(1,1,c,\alpha)} \geq \underbrace{\beta E_\tau z(\tau, D(\tau, c), c, \alpha)}_{z(1,0,c,\alpha)} \tag{11}$$

Suppose that he faces a case of type γ and $C = c$. He withholds the good if the case is undeserving if:

$$\underbrace{v(\alpha, \gamma) + \beta\Big((1-q)E_\tau z(\tau, 0, 0, \alpha) + qE_\tau z(\tau, D(\tau, c), c, \alpha)\Big)}_{z(\gamma,1,c,\alpha)} \leq \underbrace{\beta E_\tau z(\tau, D(\tau, c), c, \alpha)}_{z(\gamma,0,c,\alpha)} \tag{12}$$

Thus $D(1,c) = 1$ and $D(\gamma, c) = 0$ iff:

$$v(\alpha, 1) \geq \beta(1-q)\Big(E_\tau z(\tau, D(\tau, c), c, \alpha) - z(\tau, 0, 0, \alpha)\Big) \geq v(\alpha, \gamma) \tag{13}$$

From now on, we will assume that (13) is satisfied and hence we will drop the $D(.)$ and α components from the value functions, referrring simply to $z(\gamma, c), z(1, c)$, $E_\tau z(\tau, c)$ and $E_\tau z(\tau, 0)$.

Now if the bureaucrat correctly allocates the good in state $\tau = 1$, then:

$$z(1,c) - E_\tau z(\tau, 0) = v(\alpha, 1 - (1-\beta)E_\tau z(\tau, 0) + \beta q\Big(E_\tau z(\tau, c) - E_\tau z(\tau, 0)\Big) \tag{14}$$

whereas

$$z(\gamma, c) - E_\tau z(\tau, 0) = 0 \tag{15}$$

This yields:

$$E_\tau z(\tau, c) - E_\tau z(\tau, 0) = hv(\alpha, 1) - h(1-\beta)E_\tau z(\tau, 0) + \beta hq\Big(E_\tau z(\tau, c) - E_\tau z(\tau, 0)\Big) \tag{16}$$

We substitute for $(1-\beta)E_\tau z(\tau, 0)$ noting that $E_\tau z(\tau, 0) = \beta E_\tau z(\tau, c)$ implies that:

$$(1-\beta)E_\tau z(\tau, 0) = \beta\Big(E_\tau z(\tau, c) - E_\tau z(\tau, 0)\Big) \tag{17}$$

Combining (16)and (17) we have:

$$\begin{aligned} &(1 + \beta h(1-q))\left(E_\tau(z(\tau, c) - E_\tau z(\tau, 0)\right) \\ &= hv(\alpha, 1) \end{aligned} \tag{18}$$

which, together with the ICC in for a γ case yields:

$$\frac{\beta h(1-q(\alpha))}{1+\beta h(1-q(\alpha))} = \frac{v(\gamma,\alpha)}{v(1,\alpha)} \tag{19}$$

As the left hand side is less than 1, we require that the right hand side is less that 1 also, ie, that $v(\alpha,\gamma) < v(\alpha,1)$.

Next, notice that, in order for a $q \in (0,1)$ to exist, we require that:

$$\begin{array}{rrcll} & \frac{\beta h}{1+\beta h} & \geq & \frac{v(\alpha,\gamma)}{v(\alpha,1)} & \\ \iff & h & \geq & \underline{h} & \equiv \frac{v(\alpha,\gamma)}{\beta(v(\alpha,1)-v(\alpha,\gamma))} \end{array} \tag{20}$$

$\square$

Proof of Corollary 1

(19) implies that $1-q(\alpha) > 0 \iff v(\alpha,\gamma) > 0$.

Differentiating (19) with respect to α, we find that

$$\frac{\partial(1-q)}{\partial\alpha}\frac{\beta h}{(1+\beta h(1-q))^2} = \frac{v(\alpha,\gamma)}{v(\alpha,1)}\left(\frac{v_1(\alpha,\gamma)}{v(\alpha,\gamma)} - \frac{v_1(\alpha,1)}{v(\alpha,1)}\right) \tag{21}$$

Hence $\frac{\partial q}{\partial\alpha} \geq 0 \iff \frac{\alpha v_1(\alpha,1)}{v(\alpha,1)} \geq \frac{\alpha v_1(\alpha,\gamma)}{v(\alpha,\gamma)}$. If this is true for all γ, then $\frac{\partial}{\partial\tau}\frac{v_1(\alpha,\tau)\alpha}{v(\alpha,\tau)} > 0$ To show that the payoff of the planner is increasing in α if $\frac{\partial}{\partial\tau}\frac{v_1(\alpha,\tau)\alpha}{v(\alpha,\tau)} > 0$, it is necessary to compute the planner's value functions on the equilibrium path, which we will denote by $Z(\tau, C)$. These value functions satisfy the following equations:

$$\begin{aligned} Z(1,c) &= b - c + \beta q E_\tau Z(\tau,c) + \beta(1-q)Z(0) \\ Z(\gamma,c) &= \beta E_\tau Z(\tau,c) \\ Z(0) &= \beta E_\tau Z(\tau,c) \end{aligned} \tag{22}$$

We subtract the third line from previous two. Then noting that

$h(Z(1,c) - Z(0)) = E_\tau Z(\tau, c) - Z(0)$ we obtain:

$$E_\tau Z(\tau, c) - Z(0) = h(b-c) - (1-\beta)Z(0) + \beta(1-h+hq)(E_\tau Z(\tau, c) - Z(0)) \tag{23}$$

We note that the third line of (22) implies that $(1-\beta)Z(0) = \beta(E_\tau Z(\tau, c) - Z(0))$. Substituting into (23) we obtain:

$$(1-\beta)E_\tau Z(\tau, c) \quad = \quad \tfrac{h(b-c)}{1+\beta h(1-q)} \tag{24}$$

Because at $t = 1$ the bureaucrat always has funding, his expected intrinsic payoff on accepting the contract is $E_\tau Z(\tau, c)$. Plugging in $q(\alpha)$ we find that the payoff of the planner when q takes the maximum value that permits incentive compatibility, we find that the payoff of the planner is:

$$\Pi_D(\alpha) = \frac{(v(\alpha,1) - v(\alpha,\gamma))}{(1-\beta)v(\alpha,\gamma)} h(b-c) \tag{25}$$

Differentiating with respect to α we obtain that:

$$\Pi'_D(\alpha) = \frac{v(\alpha,\gamma)}{(1-\beta)v(\alpha,1)} \left(\frac{v_1(\alpha,1)}{v(\alpha,1)} - \frac{v_1(\alpha,\gamma)}{v(\alpha,\gamma)} \right) h(b-c) \tag{26}$$

which given assumption 2 is positive. $\square$

Proof of Corollary 2

Differentiating $\underline{h}$ as given in as defined in (20), with respect to α we find that:

$$\frac{\partial \underline{h}}{\partial \alpha} = \frac{v(\alpha,1)v(\alpha,\gamma)}{(v(\alpha_1) - v(\alpha,\gamma))^2} \left(\frac{v_1(\alpha,\gamma)}{v(\alpha,\gamma)} - \frac{v_1(\alpha,1)}{v(\alpha,1} \right) \tag{27}$$

which is less than zero under Assumption 2. Finally, we note that for $\underline{h} < 1$ we require that:

$$\frac{v(\alpha,\gamma)}{v(\alpha,1)} \leq \frac{\beta}{1+\beta} \tag{28}$$

Or, given assumption 2, $\alpha \geq \alpha^{MIN}$ for some α^{MIN}. $\square$

Proof of Lemma 3 A subgame perfect Nash equilibrium in which the bureaucrat correctly withholds the group in state γ must correspond to an equilibrium of the stage game outlined in steps 1-4 above repeated infinitely, since, given that the bureaucrat behaves in all periods, his payoff is independent of the monitoring probability.

We consider the bureaucrat's incentive compatibility constraint in state γ:

$$\underbrace{0}_{\text{Payoff from refusing}} \geq \overbrace{v(\alpha,\gamma)}^{\text{Intrinsic payoff from accepting}} - \underbrace{\rho\Delta}_{\text{Expected loss from monitoring}} \tag{29}$$

Differentiating equation 3 yields the second part of the result. The planner's payoff is:

$$\Pi_D(\alpha) = h(b-c) - \kappa\left(\frac{v(\alpha,\gamma)}{\Delta}\right) \tag{30}$$

Differentiating with respect to α we obtain:

$$\Pi_D'(\alpha) = -\frac{v_1(\alpha,\gamma)}{\Delta}\kappa'\left(\frac{v(\alpha,\gamma)}{\Delta}\right) \tag{31}$$

$\square$

Proof of Proposition 2 We compare the payoffs in (25) and (30)and find that bureaucratic discretion is preferred to bureaucratic oversight if and only if:

$$\kappa\left(\frac{v(\alpha,\gamma)}{\Delta}\right) \geq V(1,c)\frac{v(\alpha,\gamma)}{v(\alpha,1)} \tag{32}$$

Under the assumptions in the proposition, the left hand side is increasing in α and the right hand side is decreasing in α. Hence, by the intermediate value theorem, for sufficiently high α, bureaucratic oversight is preferred to bureaucratic discretion.

Notice that neither $\Pi_D(\alpha)$ or $\Pi_O(\alpha)$ included the bureaucrat's wage (which would be chosen to satisfy the bureaucrat's participation constraint). This is in line with Prendergast (2003) (see equation 7 of the paper to note the planner's payoff's independence of w). Implicitely, this means that we are considering a situation in which the marginal cost of public funds is zero. $\square$

Proof of Lemma 4

The proof proceeds as for Corollary 1. The value functions, when the bureaucrat only grants the good in deserving cases, is:

$$\begin{aligned} Z(1,c) &= v(\alpha,1)+\beta(1-h+hq)E_\tau Z(\tau,c)+\beta h(1-q)Z(0) \\ Z(\gamma,c) &= \beta E_\tau Z(\tau,c) \\ Z(0) &= \beta E_\tau Z(\tau,c) \end{aligned} \tag{33}$$

we obtain the payoff in this case by going through the same steps as in the proof of Proposition 1

When the bureaucrat always grants the good regardless of the state τ, the value functions become

$$\begin{aligned} E_\tau Z(\tau,c) &= hv(\alpha,1)+(1-h)v(\alpha,\gamma)+\beta(1-q)E_\tau Z(\tau,c)+\beta qZ(0) \\ Z(0) &= \beta E_\tau Z(\tau,c) \end{aligned} \tag{34}$$

Subtracting the second equation from the first and using that $(1-\beta)Z(0)=\beta E_\tau Z(\tau,c)$ we obtain:

$$(E_\tau Z(\tau,c)-Z(0))(1+\beta-\beta(1-q)) = hv(\alpha,1)+(1-h)v(\alpha,\gamma)$$

which gives rise to the payoff in the second line of 5.

Comparing the two possible payoffs of the bureaucrat in (5), we note that at $q(\alpha)$, the two payoffs are equal. This is because the bureaucrat grants the good in both cases, and $q(\alpha)$ is chosen to make the bureaucrat of type α indifferent between granting and denying the good in deserving cases.

Now we differentiate $\pi_D(q,\alpha)$ and we obtain that:

$$\frac{\partial \pi_D(q,\alpha)}{\partial q} = \begin{cases} \frac{1}{1-\beta}\left(\frac{h^2\beta v(\alpha,1)}{(1+\beta h(1-q))^2}\right) & \text{if} \quad q < q(\alpha) \\ \frac{1}{1-\beta}\left(\frac{h\beta v(\alpha,1)+(1-h)\beta v(\alpha,\gamma)}{(1+\beta(1-q))^2}\right) & \text{if} \quad q > q(\alpha) \end{cases} \tag{35}$$

Notice that the derivatives exist everywhere but at $q = q(\alpha)$ where the left and right derivatives are not the same.

$$\frac{\partial \pi_D(q,\alpha)}{\partial \alpha} = \begin{cases} \frac{1}{1-\beta}\left(\frac{hv_1(\alpha,1)}{1+\beta h(1-q)}\right) & \text{if} \quad q < q(\alpha) \\ \frac{1}{1-\beta}\left(\frac{hv_1(\alpha,1)+(1-h)v_1(\alpha,\gamma)}{1+\beta(1-q)}\right) & \text{if} \quad q > q(\alpha) \end{cases} \tag{36}$$

$$\frac{\partial^2 \pi_D(q,\alpha)}{\partial q \partial \alpha} = \begin{cases} \frac{1}{1-\beta}\left(\frac{h^2\beta v_1(\alpha,1)}{(1+\beta h(1-q))^2}\right) & \text{if} \quad q < q(\alpha) \\ \frac{1}{1-\beta}\left(\frac{h\beta v_1(\alpha,1)+(1-h)\beta v_1(\alpha,\gamma)}{(1+\beta(1-q))^2}\right) & \text{if} \quad q > q(\alpha) \end{cases} \tag{37}$$

□

Proof of Proposition 3

By the standard argument, when the participation constraint of the α_L types holds, and the incentive compatibility constraints (6) hold, the participation constraint of the α_H type also holds.

We define $x_i \equiv \frac{1}{1+\beta h(1-q_i)}$ for $i \in \{L, H\}$ and we note that $\frac{1}{1+\beta(1-q_i)} = \frac{hx_i}{1-(1-h)x_i}$. We rewrite the limits $q_H \geq q(\alpha_H)$ and $q_L \geq q(\alpha_L)$ as:

$$\begin{aligned} x_L \leq x_L^* &= \tfrac{v(\alpha_L,1)-v(\alpha_L,\gamma)}{v(\alpha_L,1)} \\ x_H \leq x_H^* &= \tfrac{v(\alpha_H,1)-v(\alpha_H,\gamma)}{v(\alpha_H,1)} \end{aligned} \tag{38}$$

Defining $\overline{v}(\alpha,\tau) = hv(\alpha,1) + (1-h)v(\alpha,\gamma)$, equation (7) can be rewritten as follows:

$$hv(\alpha_H,1)(x_H - x_L) \geq w_L - w_H \geq \frac{hx_H\overline{v}(\alpha_L,\tau)}{1-(1-h)x_H} - hv(\alpha_L,1)x_L \tag{39}$$

In figures 1 and 2, the shaded area in grey represents the area defined by the two inequalities in (38) and the inequality (7). In the first, (42) is satisfied, in the second it is violated.

The optimisation problem is thus to maximise:

$$(f_Hx_H + f_Lx_L)h(b-c) \tag{40}$$

subject to (38), (39) and the participation constraint for the low type $w_L + h(\alpha_H b + a) \geq u$. Although in this model, the w_is are pure transfers between the planner and the bureaucrat, and hence do not affect social welfare, we assume that the planner chooses to minimise w_L and $w_L - w_H$, as he would in the familiar screening contracts in which w_i directly affects his payoffs.

We note immediately that the participation constraint defines a lower bound on w_L, which should bind when (40) is maximised: $w_L = \underline{u} - hv(\alpha_L,1)x_L$. Similarly, let

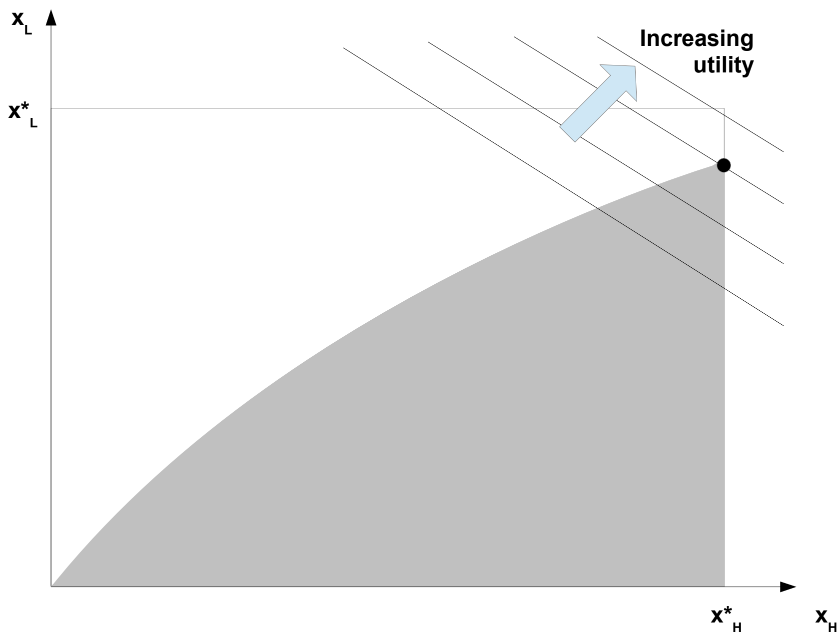
$w_L - w_H = hv(\alpha_H,1)(x_H - x_L)$.

subject to a condition which says that both inequalities in (39) can be satisfied:

$$x_L \leq \frac{x_Hv(\alpha_H,1) - \frac{\overline{v}(\alpha_L,\tau)x_H}{1-(1-h)x_H}}{v(\alpha_H,1) - v(\alpha_L,1)} \tag{41}$$

When this is satisfied with equality, x_L is a concave function of x_H which is increasing in

Figure 1: Feasible and optimal contracts, (42) satisfied



x_H for $v(\alpha_H, 1) - \frac{\overline{v}(\alpha_L,\tau)}{(1-(1-h)x_H)^2} > 0$. It is increasing for all $x_H \leq x_H^*$ if:

$$\overline{v}(\alpha_L, \tau) \leq \overline{v}(\alpha_H, \tau)\frac{\overline{v}(\alpha_H, \tau)}{v(\alpha_H, 1)} \tag{42}$$

Provided that $\frac{f_H}{f_L} \leq \frac{\frac{\overline{v}(\alpha_L,\tau)}{(1-(1-h)x_H^*)^2} - v(\alpha_H,1)}{h(v(\alpha_H,1)-v(\alpha_L,1))}$, this gives rise to an interior solution for both x_H and x_L when (42) is violated at:

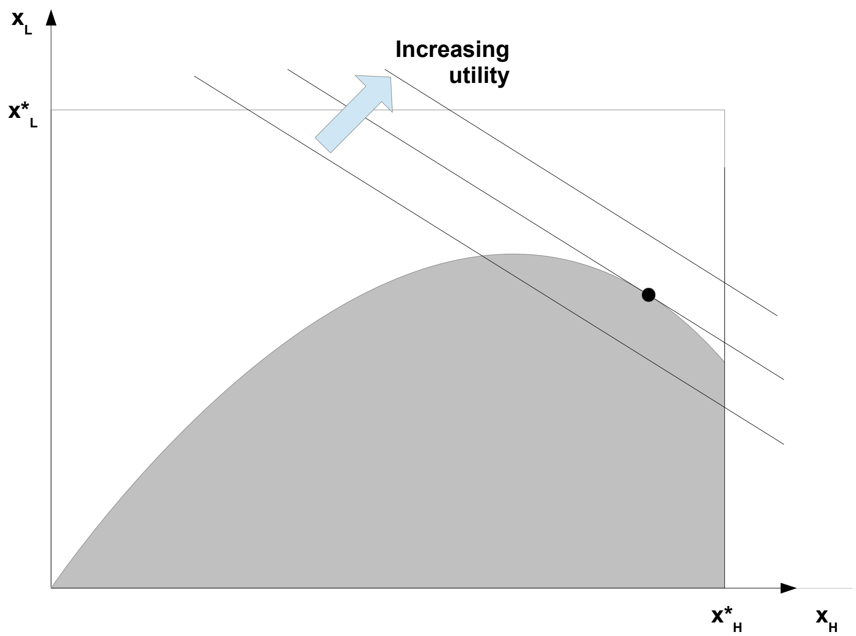
$$\frac{f_H}{f_L} = \frac{\frac{\overline{v}(\alpha_L,\tau)}{(1-(1-h)x_H)^2} - v(\alpha_H, 1)}{h(v(\alpha_H, 1) - v(\alpha_L, 1))} \tag{43}$$

as depicted in Figure 2. x_L is defined by (41) holding with equality.

Otherwise, when (42) holds, the solution is given by $x_H = x_H^*$ and $x_L = \max\left(x_L^*, \frac{x_H^* v(\alpha_H,1) - \frac{\overline{v}(\alpha_L,\tau)x_H^*}{1-(1-h)x_H^*}}{v(\alpha_H,1)-v(\alpha_L,1)}\right)$ as depicted in Figure 1. $\square$

Proof of Lemma 5 In order for the contract to be screening and not pooling,

Figure 2: Feasible and optimal contracts, (42) violated



$\rho_L < \rho(\alpha_H) = \frac{v(\alpha_H,1)}{\Delta}$. This implies that the H type grants the good in the undeserving case in the event that he chooses the contract intended for the L type. Hence, the truthtelling constraints take the following form:

$$\begin{aligned} w_H + hv(\alpha_H, 1) &\geq w_L + hv(\alpha_H, 1) + (1-h)v(\alpha_H, \gamma) - (1-h)\rho_L \Delta \\ w_L + hv(\alpha_L, 1) &\geq w_H + hv(\alpha_L, 1) \end{aligned} \tag{44}$$

These two constraints are only compatible with each other if:

$$(1-h)(\rho_L \Delta - v(\alpha_H, \gamma)) \geq w_L - w_H \geq 0 \tag{45}$$

But this implies $\rho_L > \rho(\alpha_H)$, contrary to out assumption! $\square$

Proof of Lemma 6 We will consider the following cases, and in each case rule out the existence of a screening contract by showing the the two incentive compatibility constraints are not compatible. These cases are as follows:

1. $\rho_L < \rho(\alpha_H)$ and $q_H > q(\alpha_L)$

2. $\rho_L > \rho(\alpha_H)$ and $q_H > q(\alpha_L)$

3. $\rho_L < \rho(\alpha_H)$ and $q_H < q(\alpha_L)$

4. $\rho_L > \rho(\alpha_H)$ and $q_H < q(\alpha_L)$

Given these assumptions in case 1., the truthtelling constraints for(w_H, q_H) and (w_L, ρ_L) are:

$$\begin{aligned} w_H + \tfrac{hv(\alpha_H,1)}{1+\beta h(1-q_H)} &\geq w_L + hv(\alpha_H, 1) + (1-h)v(\alpha_H, \gamma) - (1-h)\rho_L\Delta \\ w_L + hv(\alpha_L, 1) &\geq w_H + \tfrac{hv(\alpha_L,1)+(1-h)v(\alpha_L,\gamma)}{1+\beta(1-q_H)} \end{aligned} \tag{46}$$

These constraints are only compatible if:

$$\begin{aligned} (1-h)(\rho_L\Delta - v(\alpha_H, \gamma)) \geq\ & \tfrac{\beta h(1-q_H)}{1+\beta h(1-q_H)} h(v(\alpha_H, 1) - v(\alpha_L, 1)) \\ & + \left(\tfrac{hv(\alpha_L,1)+(1-h)v(\alpha_L,1)}{1+\beta(1-q_H)} - \tfrac{hv(\alpha_L,1)}{1+\beta h(1-q_H)}\right) \end{aligned} \tag{47}$$

Both terms on the right hand side are strictly positive. But this implies that $\rho_L \geq \frac{v(\alpha_H,1)}{\Delta} = \rho(\alpha_H)$ in contradiction with our assumption that the contract is not a pooling contract.

Consider now case 2. Then the truthtelling constraints become:

$$\begin{aligned} w_H + \tfrac{hv(\alpha_H,1)}{1+\beta h(1-q_H)} &\geq hv(\alpha_H, 1) \\ w_L + hv(\alpha_L, 1) &\geq w_H + \tfrac{hv(\alpha_L,1)+(1-h)v(\alpha_L,\gamma)}{1+\beta(1-q_H)} \end{aligned} \tag{48}$$

and these constraints are only compatible if and only if:

$$\begin{aligned} 0 \geq\ & \tfrac{\beta h(1-q_H)}{1+\beta h(1-q_H)} h(v(\alpha_H, 1) - v(\alpha_L, 1)) \\ & + \left(\tfrac{hv(\alpha_L,1)+(1-h)v(\alpha_L,1)}{1+\beta(1-q_H)} - \tfrac{hv(\alpha_L,1)}{1+\beta h(1-q_H)}\right) \end{aligned} \tag{49}$$

This can never hold, since both terms on the right hand side are positive, the first because $v(\alpha, 1)$ is increasing in α, in the second case because $q_H > q(\alpha_L)$. This is a contradiction. Now we turn our attention to case 3. In this case the truthtelling constraints are only compatible if:

$$(1-h)(\rho_L \Delta - v(\alpha_H, \gamma) \quad \geq \quad \tfrac{\beta h(1-q_H)}{1+\beta h(1-q_H)} h(v(\alpha_H, 1) - v(\alpha_L, 1)) \tag{50}$$

for which the first cannot hold for $\rho_L < \rho(\alpha_H)$, in contradiction with our assumption that the contract is not a pooling contract.

In case 4, the truthtelling constraints can only be compatible for:

$$0 \geq \frac{\beta h(1-q_H)}{1+\beta h(1-q_H)} h(v(\alpha_H, 1) - v(\alpha_L, 1)) \tag{51}$$

which never holds for $q_H < 1$. These 4 cases rule out a screening contract of the type specified in the statement of the lemma. □

Proof of Proposition 4 Consider first part 1. of the proposition. The truthtelling constraints in (44) become:

$$\begin{aligned} \beta w_H + v(\alpha, \gamma) + \tfrac{\beta}{1-\beta} h v(\alpha_H, 1) \quad &\geq \quad \beta w_L + \tfrac{\beta}{1-\beta} \left(\overline{v}(\alpha_H, \tau) - (1-h)\rho_L \Delta\right) \\ \beta w_L + \tfrac{\beta}{1-\beta} h v(\alpha_L, 1) \quad &\geq \quad \beta w_H + v(\alpha_L, 1) + \tfrac{\beta}{1-\beta} h v(\alpha_L, 1) \end{aligned} \tag{52}$$

There exists $w_L - w_H$ satisfying these equations if:

$$\begin{aligned} (1-\beta)(v(\alpha_H, \gamma) - v(\alpha_L, 1)) \quad &\geq \quad \beta(1-h)(v(\alpha_H, \gamma) - \rho_L \Delta) \\ \iff \qquad \rho_L \quad &\geq \quad \rho(\alpha_H) - \tfrac{1-\beta}{\beta(1-h)}(v(\alpha_H, \gamma) - v(\alpha_L, \gamma)) \end{aligned} \tag{53}$$

We maximise

$$f_H(b - c - \kappa(\rho_H)) + f_L(b - c - \kappa(\rho_L)) \tag{54}$$

subject to (53) and:

$$\begin{array}{rcl} \beta(w_L - w_H) & \geq & v(\alpha_L, 1) \\ \beta w_L + \frac{\beta}{1-\beta} hv(\alpha_L, 1)) & \geq & \underline{u} \\ \rho_L & \geq & \frac{v(\alpha_L,\gamma)}{\Delta} \\ \rho_H & \geq & \frac{v(\alpha_H,\gamma)}{\Delta} \end{array} \tag{55}$$

which gives rise to a solution:

$$\begin{array}{rcl} w_L & = & \frac{\underline{u}}{\beta} - \frac{hv(\alpha_L,1)}{1-\beta} \\ w_H & = & w_L - \frac{1}{\beta} v(\alpha_L, 1) \\ \rho_H & = & \rho(\alpha_H) \\ \rho_L & = & \max\left(\rho(\alpha_L), \rho(\alpha_H) - \frac{(1-\beta)(v(\alpha_H,\gamma)-v(\alpha_L,1))}{\beta(1-h)}\right) \end{array} \tag{56}$$

Now consider the second part of the proposition. We now only require that the high type accept the contract intended for him when the test case is deserving. Thus the truthtelling constraints are:

$$\begin{array}{rcl} \beta w_H + v(\alpha, 1) + \frac{\beta}{1-\beta} hv(\alpha_H, 1) & \geq & \beta w_L + \frac{\beta}{1-\beta}\left(\overline{v}(\alpha_H, \tau) - (1-h)\rho_L \Delta\right) \\ \beta w_L + \frac{\beta}{1-\beta} hv(\alpha_L, 1) & \geq & \beta w_H + v(\alpha_L, 1) + \frac{\beta}{1-\beta} hv(\alpha_L, 1) \end{array} \tag{57}$$

There exists $w_L - w_H$ satisfying these equations if:

$$\begin{array}{rrcl} & (1-\beta)(v(\alpha_H, 1) - v(\alpha_L, 1)) & \geq & \beta(1-h)(v(\alpha_H, \gamma) - \rho_L \Delta) \\ \Longleftrightarrow & \rho_L & \geq & \rho(\alpha_H) - \frac{1-\beta}{\beta(1-h)}(v(\alpha_H, 1 - v(\alpha_L, 1)) \end{array} \tag{58}$$

This allows for a $\rho_L < \rho(\alpha_H)$ and the maximisation problem involves maximising:

$$f_H\left(h(b-c) - \kappa(\rho_H)\right) + (1-h)(\overline{\gamma} b - c - \kappa(\rho_L)) + f_L h(b - c - \kappa(\rho_L)) \tag{59}$$

subject to (55) and (58), which gives rise to a solution:

$$\begin{aligned}
w_L &= \frac{\underline{\underline{u}}}{\beta} - \frac{hv(\alpha_L,1)}{1-\beta} \\
w_H &= w_L - \frac{1}{\beta}v(\alpha_L,1) \\
\rho_H &= \rho(\alpha_H) \\
\rho_L &= \max\Big(\rho(\alpha_L), \rho(\alpha_H) - \frac{1-\beta}{\beta(1-h)}(v(\alpha_H, 1 - v(\alpha_L,1))\Big)
\end{aligned} \tag{60}$$

□

Proof of Proposition 5 As before define $x_H \equiv \frac{1}{1+\beta h(1-q_H)}$

Consider the first part of the proposition. The incentive compatibility constraints become:

$$v(\alpha_H,\gamma) + \frac{\beta}{1-\beta}\Big(w_H(1-\beta) + hv(\alpha_H,1)x_H\Big) \;\geq\; \frac{\beta}{1-\beta}\Big(w_L(1-\beta) + \overline{v}(\alpha_H,\tau) - (1-h)\Delta\rho_L\Big) \tag{61}$$

$$\frac{\beta}{1-\beta}\Big(w_L(1-\beta) + hv(\alpha_L,1)\Big) \;\geq\; v(\alpha_L,1) + \frac{\beta}{1-\beta}\Big((1-\beta)w_H + \frac{hx_H}{1-(1-h)x_H}\overline{v}(\alpha_L,\tau)\Big) \tag{62}$$

These two constraints are compatible if:

$$\begin{aligned}
&v(\alpha_H,\gamma) - v(\alpha_L,1) + \overbrace{\frac{\beta}{1-\beta}(1-h)(\rho_L\Delta - v(\alpha_H,\gamma))}^{\text{Term1}} \\
&\geq \frac{\beta}{1-\beta}(1-x_H)h(v(\alpha_H,1) - v(\alpha_L,1)) + \frac{\beta}{1-\beta}\left(\underbrace{\frac{hx_H\overline{v}(\alpha_L,\tau)}{1-(1-h)x_H} - hv(\alpha_L,1)x_H}_{\text{Term2}}\right)
\end{aligned} \tag{63}$$

Notice that as $\rho_L \uparrow \rho(\alpha_H)$, term 1 $\uparrow 0$, and that as $x_H \downarrow x(\alpha_L)$, term 2 $\downarrow 0$. Thus there exists some solution to 63 with $\rho(\alpha_H) - \epsilon = \rho_L$ and $x_H - x(\alpha_L) = \delta$ for some small and positive δ, ϵ, as long as:

$$v(\alpha_H, \gamma) - v(\alpha_L, 1) \quad \geq \quad \tfrac{\beta}{1-\beta}(1 - x(\alpha_L))h(v(\alpha_H, 1) - v(\alpha_L, 1)) \tag{64}$$

ie, iff and only if:

$$\beta^* \equiv \frac{v(\alpha_L, 1)(v(\alpha_H, \gamma) - v(\alpha_L, 1))}{v(\alpha_L, 1)(v(\alpha_H, \gamma) - v(\alpha_L, 1)) + hv(\alpha_L, \gamma)(v(\alpha_H, 1) - v(\alpha_L, 1)} \geq \beta \tag{65}$$

Then the constraint space is non-empty and there exists a solution to the optimisation problem:

$$f_H\Big(hx_H(b - c) + (1 - h)(\overline{\gamma}b - c - \kappa(\rho_L))\Big) + f_L h(b - c - \kappa(\rho_L)) \tag{66}$$

subject to $\rho_L < \rho(\alpha_H)$, $x_H \geq x(\alpha_L)$, constraints (61) and (62) and the participation constraint of the low type,

$$\beta w_L + \frac{\beta}{1-\beta} hv(\alpha_L, 1) \geq \underline{u} \tag{67}$$

Such a solution could consist, for example, of ρ_L and x_H such that 63 satisfied with equality; then (61) and (62) imply a unique solution for $w_L - w_H$, and we define w_L by the participation constraint of the low type.

Consider the second part of the proposition. The two incentive compatibility constraints become:

$$v(\alpha_H, 1) + \frac{\beta}{1-\beta}\Big(w_H(1-\beta) + hv(\alpha_H, 1)x_H\Big) \geq \frac{\beta}{1-\beta}\Big(w_L(1-\beta) + \overline{v}(\alpha_H, \tau) - (1-h)\Delta\rho_L\Big) \tag{68}$$

$$\frac{\beta}{1-\beta}\Big(w_L(1-\beta) + hv(\alpha_L, 1)\Big) \geq v(\alpha_L, 1) + \frac{\beta}{1-\beta}\Big((1-\beta)w_H + \frac{hx_H}{1-(1-h)x_H}\overline{v}(\alpha_L, \tau)\Big) \tag{69}$$

These two equations are compatible if:

$$\begin{aligned}&v(\alpha_H,1)-v(\alpha_L,1)+\overbrace{\frac{\beta}{1-\beta}(1-h)(\rho_L\Delta-v(\alpha_H,\gamma))}^{\text{Term1}}\\&\geq \tfrac{\beta}{1-\beta}(1-x_H)h(v(\alpha_H,1)-v(\alpha_L,1))+\tfrac{\beta}{1-\beta}\left(\underbrace{\frac{hx_H\overline{v}(\alpha_L,\tau)}{1-(1-h)x_H}-hv(\alpha_L,1)x_H}_{\text{Term2}}\right)\end{aligned} \tag{70}$$

In order to prove the existence of the screening contract it suffices to show that there exists $x_H > x(\alpha_L)$ and $\rho_L < \rho(\alpha_H)$ such that equation (70) holds. Notice that as $\rho_L \uparrow \rho(\alpha_H)$, term $1 \uparrow 0$, and that as $x_H \downarrow x(\alpha_L)$, term $2 \downarrow 0$. Then (70) is satisfied for some $\rho_L < \rho(\alpha_H)$ and $x_H \geq x(\alpha_L)$ as long as

$$\begin{array}{rrcl} & \left(1-\tfrac{\beta}{1-\beta}(1-x(\alpha_L))\right)h(v(\alpha_H,1)-v(\alpha_L,1)) & \geq & 0 \\ \iff & \beta^{**}\equiv\frac{v(\alpha_L,1)}{v(\alpha_L,1)+v(\alpha_L,\gamma)} & \geq & \beta \end{array} \tag{71}$$

Then the constraint space is non-empty and there exists a solution to the optimisation problem:

$$f_Hx_H(b-c)+f_Lh(b-c-\kappa(\rho_L)) \tag{72}$$

subject to $\rho_L < \rho(\alpha_H)$, $x_H \geq x(\alpha_L)$, constraints (68) and (69) and the participation constraint of the low type,

$$\beta w_L+\frac{\beta}{1-\beta}hv(\alpha_L,1)\geq \underline{u} \tag{73}$$

Such a solution could consist, for example, of ρ_L and x_H such that 70 satisfied with equality; then (68) and (69) imply a unique solution for w_L-w_H, and we define w_L by the participation constraint of the low type. $\square$

Appendix B: Full comparison to Prendergast (2003)

We now allow for two possible choices of bureaucratic effort $\underline{e}, \overline{e}$ with $\overline{e} > \underline{e} \geq \frac{1}{2}$ and the cost of exerting effort $\underline{e}$ being zero, whereas the cost of exerting effort $\overline{e}$ being f.

We will prove an extension of Proposition 2, showing that some additional parameter restrictions are necessary, in particular on h, the probability that any given case is deserving.

We focus on a particular form of payoffs for the bureaucrat: we assume his flow payoff from granting the good in state τ is $\alpha\tau b$, where α is his pro-social motivation. We will assume $\gamma > 0$.

We consider the effect of bureaucratic effort first on payoffs and the planner's optimisation problem in the case of bureaucratic discretion.

Bureaucratic discretion

Given the method adopted in the proof of Proposition 1, it straightforward to show that, given bureaucratic effort e, and supposing that the bureaucrat's truthtelling constraint in state γ is satisfied, his value function becomes:

$$E_\tau V(\tau, c) - V(0) = \frac{1}{1-\beta} \frac{\big(eh + (1-e)(1-h)\gamma\big)\alpha b - f\mathbf{1}(e = \overline{e})}{1 + \beta(1-q)(eh + (1-e)(1-h))} \tag{74}$$

Note that $eh + (1-e)(1-h)$ is the probability that the the bureaucrat grants the good, given that he truthfully follows his signal; thus in the denominator, $1 + \beta h(1-q)$ is replaced by $1 + \beta(1-q)(eh + (1-e)(1-h))$. The expected per-period return to the agent given that he has funding and he follows his signal is $(he + (1-h)(1-e)\gamma)\alpha b$, which replaces $hv(\alpha, 1) = h\alpha b$ in the no-effort case. The effort cost is included only if the bureaucrat has funding and if the EICC is satisfied: otherwise there is no interest in exerting bureaucratic effort.

This tends to the value function in the case with no bureaucratic discretion as $e \to 1$ and

$f \to 0$.

The truthtelling constraint in state γ can be written as:

$$\beta(1-q)\left(E_\tau V(\tau,c) - V(0)\right) \geq \Big(e\gamma + (1-e)\Big)\alpha b \tag{75}$$

which implies that, if $\frac{h}{1-h} \geq \frac{(1-e)^2}{e^2}$, there is a minimum $(1-q(e))$ defined by:

$$\beta(1-q(e)) \geq \frac{e\gamma + (1-e)}{(1-\gamma)(he^2 - (1-h)(1-e)^2)} \tag{76}$$

or equivalently:

$$x(e) \equiv \frac{1}{1+\beta(1-q(e))(eh+(1-e)(1-h))} \geq 1 - \frac{e\gamma+1-e}{\hat{\gamma}(e)} \tag{77}$$

where $\hat{\gamma}(e) = \frac{eh+(1-e)(1-h)\gamma}{eh+(1-e)(1-h)}$. As $e \to 1$ we obtain the truthtelling constraint in the case of no bureaucratic effort.

Differentiating the right hand side of (77) with respect to e weobtain:

$$\frac{\partial x(e)}{\partial e} \leq 0 \tag{78}$$

which implies that $q(e)$ is an increasing function of e.

Next we consider the effort incentive compatibility constraint (EICC). The planner is only interested in satisfying this should the bureaucrat truthfully reveal his information. Thus, given that the truthtelling constraint in state γ is satisifed, the EICC can be written as follows:

$$(\overline{e} - \underline{e})\left(h\alpha b - (1-h)\gamma\alpha b + \beta(1-2h)(1-q)(E_\tau V(\tau,c) - V(0))\right) \geq f \tag{79}$$

Lemma 7 *Under bureaucratic discretion, when the truthtelling constraint in state γ is satisfied, the return to effort is increasing in α. This implies, fixing incentives, that the* *minimum $1-q$ required to induce a bureaucrat to withhold the good in state γ is smaller for higher α.*

Proof of Lemma 7

Substituting in (74) with $e = \overline{e}$ we require that:

$$\begin{aligned}&h\alpha b-(1-h)\gamma\alpha b+\beta(1-q)h\alpha b+(\overline{e}h+1(1-\overline{e})(1-h)+(1-2h)\overline{e})\\&-\beta(1-q)(1-h)\gamma\alpha b((\overline{e}h+1(1-\overline{e})(1-h)-(1-2h)(1-\overline{e})\\&\geq\tfrac{f}{(\overline{e}-\underline{e})}(1+\beta(1-q)(eh+(1-e)(1-h))\end{aligned}\tag{80}$$

which becomes:

$$\begin{aligned}&h\alpha b(1+\beta(1-q)(1-h))-(1-h)\gamma\alpha b(1+\beta h(1-q))\\&\geq\tfrac{f}{(\overline{e}-\underline{e})}(1+\beta(1-q))(eh+(1-e)(1-h))\end{aligned}\tag{81}$$

Differentiating the LHS of (81) with respect to α, we obtain that the derviative is positive as long as:

$$h(1-h)\beta(1-q)(1-\gamma)\geq(1-h)\gamma-h\tag{82}$$

Notice that the truthtelling constraint in state γ implies that $\beta(1-q)>\frac{\gamma}{(1-\gamma)h}$. Combining the observation with (82), we find that whenever $(1-q)$ is large enough to enduce truthtelling, incentives to exert effort are increasing in α.

Given this, fixing incentives, the higher α, the higher (weakly higher) the effort chosen. Referring to 78, this implies that the higher alpha, the higher the maximum q compatible with truthtelling in state γ. $\square$

As in Corollary 1, the planner's payoff can be derived, and is found to be:

$$\frac{h(b-c)}{(1-\beta)(1+\beta(1-q)(eh+(1-e)(1-h)))}\tag{83}$$

He maximises this payoff subject to:

- The truthtelling constraint (76) with $e = \underline{e}$ only
- The truthtelling constraint (76) with $e = \overline{e}$ and the effort incentive compatibility constraint (81)

Lemma 8 *The payoff of the planner under bureaucratic discretion, with bureaucratic effort $e \in \{\underline{e}, \overline{e}\}$, is increasing in α*

Proof of Lemma 8 We consider the two cases outlined above, firstly $e = \underline{e}$ and secondly $e = \overline{e}$. The proof is an application of the constrained envelope theorem.

In the first case, by a similar argument to the no bureaucratic effort case, we have that the payoff of the planner is

$$\Pi_D(\alpha, \underline{e}) = \max\left(\overline{\gamma}b - c, h(b-c)\left(1 - \frac{(\underline{e}h + (1-\underline{e})(1-h))(\underline{e}\gamma + 1 - \underline{e})}{\underline{e}h + (1-\underline{e})(1-h)\gamma}\right)\right) \tag{84}$$

which is independent of α

In the second case, we note that the Langrangian of the planner's problem is:

$$\begin{aligned}
\Pi_D(\alpha, \overline{e}) \quad &= \quad \max\Big(\overline{\gamma}b - c, \max_{x(\overline{e})} \mathcal{L}(x(\overline{e}))\Big) \\
\max_{x(\overline{e})} \mathcal{L}(x(\overline{e})) \quad &= \quad h(b-c)x(\overline{e}) - \lambda_1\left(1 - \tfrac{(eh+(1-e)(1-h))(e\gamma+1-e)}{eh+(1-e)(1-h)\gamma\alpha b+a)} - x(\overline{e})\right) \\
&\quad -\lambda_2\Big(\tfrac{fx(e)^{-1}}{\overline{e}-\underline{e}} - h\alpha + (1-h)\gamma\alpha b \\
&\quad -h(1-h)\beta(1-q)(1-\gamma)\Big)
\end{aligned} \tag{85}$$

where $x(e) \equiv \frac{1}{1+\beta(1-q)(he+(1-h)(1-e))}$ Applying the envelope theorem to the case where Π_D depends on α we obtain:

$$\tfrac{\partial \Pi_D(\alpha, \overline{e})}{\partial \alpha} = \lambda_2\Big(h - (1-h)\gamma + \beta(1-q)h(1-h)\Big) \tag{86}$$

Hence, given the result of Lemma 7, the planner's payoff is increasing in α for all α. $\square$

Bureaucratic oversight

Under bureaucratic oversight the planner has three instruments to affect effort and truth-telling. These are the monitoring probabilities ρ_D and the punishment that the bureaucrat suffers should he be found to be making a mistake X.

Prendergast's insight is that the inefficiency of bureaucracy, when synonymous with bureaucratic oversight, has two sources. The first is that, supposing that consumers always want the good (an assumption that we will make from now on), they make complaints when they have been wrongly withheld the good, but not when they have been incorrectly allocated it. The planner is thus unable to target investigations into the bureaucrat's decisions in the same way that he would if the consumer always complained when the allocation decision were socially sub-optimal. A second source of inefficiency comes from the fact that, as in our model with bureaucratic discretion, the bureaucrat, when imperfectly informed of the state of the world, has to be incentivised to divulge his private information on τ: the bureaucrat may prefer to give out the good when his signal states that it is not merited in order to avoid an investigation of his decision. In order to get the bureaucrat to tell the truth, the planner must distort the probabilities he investigates the bureaucrat's decisions from the first best monitoring probabilities. To achieve this, he under-investigates consumers complaints, and over-investigates the decision that a bureaucrat makes to allocate the good. Intuitively, since $v_1(\alpha, \gamma) = \gamma b > 0$,this distortion is magnified as α increases, since the bureaucrat now has an additional motive to distort the monitoring decision.

Introducing intrinsic motivation into Prendergast's model, we find that the truthtelling constraint in state γ given e is:

$$-(1-e)\rho_0(X - \epsilon\gamma\alpha b) \geq (e\gamma + (1-e))\alpha b - e\rho_1(X - \delta\gamma\alpha b) \tag{87}$$

where ϵ is the retraction probability if an improper withdrawal has occurred, and δ is a retraction probability if an improper allowance has occurred. Hence:

$$\rho_1 e(X + \delta(\gamma\alpha b + a)) \geq \rho_0(1-e)(X - \epsilon(\alpha b + a)) + (e\gamma + (1-e))\alpha b + a \tag{88}$$

The effort incentive compatibility constraint, given that truthtelling in state γ is satisfied, is:

$$\begin{aligned} &\overline{e}h\alpha b + (1-\overline{e})(1-h)\gamma\alpha b - (1-h)\rho_1(X + \delta\gamma\alpha) - h\rho_0(X - \epsilon\alpha b) - f \\ &\geq \underline{e}h\alpha b + (1-\underline{e})(1-h)\gamma\alpha b - (1-h)\rho_1(X + \delta\gamma\alpha b) - h\rho_0(X - \epsilon\alpha b) \end{aligned} \tag{89}$$

This becomes:

$$\begin{aligned} &(\overline{e} - \underline{e})\Big(h(\alpha b + a) - (1-h)(\gamma\alpha b + a) + h\rho_0(X - \epsilon(\alpha b + a)) + (1-h)\rho_1(X + \delta(\gamma\alpha b + a)\Big) \\ &\geq f \end{aligned} \tag{90}$$

For any ρ_0, ρ_1, some X can be chosen to satisfy the above constraint. As the principal is a planner, X does not enter into his objective function, as it is a transfer. Let the minimum X satisfying the EICC be $X(e, \alpha)$.

However, the planner may choose not to satisfy the EICC, since the choice of e determines the monitoring probabilities, and the higher e, the larger the potential distortion (see Prendergast (2003) for an elaboration of this intuition).

Lemma 9 *For $h < \frac{\gamma}{1+\gamma}$, and $\delta = \epsilon = 0$, the planner's payoff from bureaucratic oversight is decreasing in α.*

Proof of Lemma 9

Given that the planner can always satisfy the incentive compatibility constraint, the planner's problem is to solve:

$$\begin{aligned}
\max\nolimits_{e\in\{\underline{e},\bar{e}\}} \Pi_O(e,\alpha) &= \\
\max\nolimits_{e\in\{\underline{e},\bar{e}\}} \max\nolimits_{\rho_0,\rho_1,X} \mathcal{L} &= eh(b-c)+(1-e)h\rho_0(b-c)+e(1-h)0 \\
&\quad +(1-e)(1-h)(1-\rho_1)(\gamma b-c) \\
&\quad -(1-e)h\kappa(\rho_0)-(eh+(1-e)(1-h))\kappa(\rho_1) \\
&\quad -\lambda_t\Big((\rho_0(1-e)(X-\epsilon(\gamma\alpha b+a))+(e\gamma+(1-e))\alpha b+a)- \\
&\quad e\rho_1(X+\delta(\gamma\alpha b+a))\Big)+\lambda_e(X-X(e,\alpha))
\end{aligned} \tag{91}$$

Applying the constrained envelope theorem to the case e, we obtain that:

$$\frac{\partial \Pi_O(\underline{e},\alpha)}{\partial \alpha} = -\lambda_t\Big((\underline{e}\gamma+(1-\underline{e}))b-\rho_0\epsilon(1-\underline{e})\gamma b+\underline{e}\rho_1\delta\gamma b\Big)-\lambda_e\frac{\partial X}{\partial \alpha} \tag{92}$$

$\lambda_t, \lambda_e \geq 0$ is implied by the way we have set up the Kuhn Tucker problem. If ϵ and δ are zero, $\frac{\partial X}{\partial \alpha} \geq 0 \iff (1-h)\gamma \geq h$. Suppose $\delta = \epsilon = 0$, ie, the bureaucrat's decisions are irrevocable once made and $h \leq \frac{\gamma}{1+\gamma}$. Hence, when the planner chooses not to implement high effort, the planner's payoff is decreasing in α. □

Given the results of Lemmas and 9, we obtain:

Proposition 6 *Suppose that $\delta = \gamma = 0$ and $1-\gamma \geq \frac{h}{1-h} \geq \left(\frac{1-\underline{e}}{\underline{e}}\right)^2$, and suppose that for $\forall \tau \in \{\gamma, 1\}$, the consumer wants the good. Then the planner's payoff from oversight is decreasing in α, and his payoff from discretion is increasing in α. Thus, the more motivated the agent is, the greater the advantage from choosing bureaucratic discretion. Thus the limits of bureaucratic efficiency, when bureaucracy is synoymous with oversight, derived by Prendergast (2003), can be weakly exceeded when the planner can choose to manage bureaucrats by granting discretion.*

Appendix C

Comparison of a fixed budget/quota to a stationary scheme with refunding rule q

In this section we study a simple model in which a bureaucrat considers a sequence of three cases. The principal decides on the budget b that he gives him for this fixed time period. He can decide to give funding so that all three cases can be funded, ie $b = 3$, to grant a budget b to fund two out of the three cases he will decide upon $b = 2$, or only to give enough funding to cover the costs of intervening in one case, $b = 1$. We will show that, given that $\frac{v(\alpha,\gamma)}{v(\alpha,1)}$ is decreasing in α:

- For any given budget, more pro-social agents are more likely to withhold the good from an undeserving recipient
- More pro-social agents are allocated higher budgets by the social planner

These results corresponds to the result of Proposition 1 and Corollary 1. These two results in turn give rise to our main propositions 2 and 3

We begin by considering the bureaucrat's optimal strategy, working by backward induction, in the case that he faces a limited budget ($b < 3$). If $b = 3$, he always grants the good. As in the main body of the paper, we make assumption 2, which implies that $\frac{v(\alpha,\gamma)}{v(\alpha,1)}$ is a decreasing function of α

We define b_t to be the remaining budget at the the beginning of time period t. At $t = 3$, the bureaucrat grants the good if the remaining budget b_3 is greater than or equal to one. At $t = 2$, there are two possibilities. Either $b_2 = 2$ in which case the bureaucrat can afford to, and hence will, grant the good at $t = 2$ and $t = 3$, or $b_2 = 1$, in which case the bureaucrat has to choose between granting the good at $t = 2$ or $t = 3$. He will grant the good in a deserving case if $v(\alpha, 1) \geq \beta\overline{v}(\alpha, \tau)$, that is to say, always, and he will withhold the good in an undeserving case iff:

$$\begin{aligned} \beta\overline{v}(\alpha,\tau) &\geq v(\alpha,\gamma) \\ \Longleftrightarrow \qquad \tfrac{v(\alpha,1)}{v(\alpha,\gamma)} &\geq \tfrac{1-\beta(1-h)}{\beta h} \end{aligned} \tag{93}$$

ie, if and only if $\alpha \geq \alpha_2^*$ where $\frac{v(\alpha_2^*,1)}{v(\alpha_2^*,\gamma)} = \frac{1-\beta(1-h)}{\beta h}$ defines α_2.

Now we consider the decision of the bureaucrat at $t = 1$. If $b_1 = 3$, then the bureaucrat can grant all three cases. Now suppose that $b_1 = 2$. We consider first the case $\alpha \geq \alpha_2^*$. Then the bureaucrat withholds the good from an undeserving case at $t = 1$ if and only if:

$$\begin{aligned} (1+\beta)\overline{v}(\alpha,\tau) &\geq v(\alpha,\gamma) + \beta(hv(\alpha,1) + (1-h)\beta\overline{v}(\alpha,\tau)) \\ \tfrac{v(\alpha,1)}{v(\alpha,\gamma)} &\geq \tfrac{1-\beta(1-h)(1+\beta h)}{\beta^2 h^2} \end{aligned} \tag{94}$$

Since $\frac{1-\beta(1-h)(1+\beta h)}{\beta^2 h^2} \geq \frac{1-\beta(1-h)}{\beta h}$ we find that a bureaucrat with motivation $\alpha \geq \alpha_2^*$ and $b_1 = 2$ withholds the good at $t = 1$ from an undeserving case if and only if $\alpha \geq \alpha_1^*$ with $\alpha_1^* > \alpha_2^*$.

We continue to consider $b_1 = 2$ but now suppose that $\alpha < \alpha_2^*$. The bureaucrat withholds the good at $t = 1$ from an undeserving case if and only if:

$$\begin{aligned} \beta(1+\beta)\overline{v}(\alpha,\tau) &\geq v(\alpha,\gamma) + \beta\overline{v}(\alpha,\tau) \\ \tfrac{v(\alpha,1)}{v(\alpha,\gamma)} &\geq \tfrac{1-\beta^2(1-h)}{\beta^2 h} \end{aligned} \tag{95}$$

But this last equation never holds, since we have assumed that $\frac{v(\alpha_2,1)}{v(\alpha_2,\gamma)} \leq \frac{v(\alpha,1)}{v(\alpha,\gamma)}$. Thus if $\alpha < \alpha_2^*$ the bureaucrat grants undeserving cases at $t = 1$,$b_1 = 2$ and $t = 2$, $b_2 = 1$.

We now consider the case where $b_1 = 1$. Let $\alpha \geq \alpha_2^*$. Then the bureaucrat withholds the good from an undeserving case at $t = 1$ if and only if:

$$\begin{aligned} \beta(hv(\alpha,1) + (1-h)\beta\overline{v}(\alpha,\tau) &\geq v(\alpha,\gamma) \\ \tfrac{v(\alpha,1)}{v(\alpha,\gamma)} &\geq \tfrac{1-\beta^2(1-h)^2}{\beta h(1+\beta(1-h)} = \tfrac{1-\beta(1-h)}{\beta h} \end{aligned} \tag{96}$$

in other words, the bureaucrat with $\alpha \geq \alpha_2^*$ always withholds the good in an undeserving case at $t = 1$. Now consider $b_1 = 1$ with $\alpha \leq \alpha_2^*$. The bureaucrat withholds the good from an undeserving case at $t = 1$ if and and only if:

$$\beta\overline{v}(\alpha, \tau) \quad \geq \quad v(\alpha, \gamma) \tag{97}$$

ie, given the definition of α_2, never.

We can thus summarize the behaviour of bureaucrats at time t in state γ given the remaining budget b_t as follows:

	$\alpha < \alpha_2^*$	$\alpha \in (\alpha_1^*, \alpha_2^*)$	$\alpha \geq \alpha_1^*$
$b_2 = 2$	grants	grants	withholds
$b_2 = 1$ or $b_1 = 1$	grants	withholds	withholds

(98)

This allows us to calculate the payoffs for the planner for each type and each possible budget choice. Recall that $\overline{\gamma} = h + (1-h)\gamma$. Then:

	$\alpha < \alpha_2^*$	$\alpha \in (\alpha_2^*, \alpha_1^*)$	$\alpha \geq \alpha_1^*$
$b = 2$	$(1+\beta)(\overline{\gamma}b - c)$	$\overline{\gamma}b - c + \beta\Big(h(b-c) + \beta(1-h)(\overline{\gamma}b - c)\Big)$	$h\Big((b-c) + \beta(h(b-c) + (1-h)\beta(\overline{\gamma}b - c))\Big) + (1-h)\beta(1+\beta)(\overline{\gamma}b - c)$
$b = 1$	$\overline{\gamma}b - c$	$h(b-c) + \beta(1-h)\Big(h(b-c) + (1-h)\beta(\overline{\gamma}b - c)\Big)$	$h(b-c) + \beta(1-h)\Big(h(b-c) + (1-h)\beta(\overline{\gamma}b - c)\Big)$

(99)

Proposition 7 *Suppose that $b_1 < 3$ so that the planner intends to induce $D = 0$ in state γ. Then the optimal budget $b(\alpha)$ for the three time periods is weakly increasing in α*

Proof of Proposition 7 In order to proof the proposition, we require the results of the following Lemma:

Lemma 10 *The principal always has a higher payoff when the bureaucrat decides not to grant the underserving case when* $b_t = 1$*. Further, the bureaucrat always has a higher payoff when the bureaucrat chooses not to grant he undeserving case when* $b_1 = 2$*.*

Proof Note that the principal prefers the bureaucrat to withhold the good in state γ when $b_2 = 1$ if

$$\gamma b - c \leq \beta(\overline{\gamma} b - c)$$

or equivalently,

$$b - c \geq \frac{1 - \beta(1-h)}{\beta h}(\gamma b - c)$$

which always holds since the right hand side is negative and the left hand side is positive. Now consider the principal's payoff when $b_1 = 1$. He is always better off when the bureacrat withholds the good in an undeserving case if $\gamma b - c \leq \beta(\overline{\gamma} b - c)$ as above, and additionally:

$$\begin{aligned} \gamma b - c &< \beta\left(h(b-c) + \beta(\overline{\gamma} b - c)\right) \\ \iff \quad b - c &> \tfrac{1-\beta^2(1-h)}{\beta h(1+\beta)}(\gamma b - c) \end{aligned}$$

which again always holds.

The principal prefers the bureacurat not to grant the undeserving case at $t = 2$ when $b_1 = 2$ if and only if:

$$\beta(1+\beta)(\overline{\gamma} b - c) \geq \gamma b - c + \beta(h(b-c) + \beta(1-h)(\overline{\gamma} b - c)) \tag{100}$$

which is true if and only if:

$$b - c \geq \frac{1 - \beta(1-h)(1+\beta h)}{\beta^2 h^2}(\gamma b - c) \tag{101}$$

which always holds. $\square$

Now returning to the proof of Proposition 7, we notice that

$$h(b - c + \beta(\overline{\gamma}b - c)) > \overline{\gamma}b - c \tag{102}$$

Denoting $\Pi(\alpha, b)$ by the planner's payoff when the bureaucrat has pro-social motivation α and budget b. Then examining table (99) in conjunction with (102) we note that:

$$\frac{\Pi(\alpha, 2) - \Pi(\alpha, 1)}{\partial\alpha} \geq 0 \tag{103}$$

$\square$

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