Essays in agent motivation

A thesis submitted to the Department of Economics

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Declaration

I certify that the thesis I have presented for examination for the MPhil/PhD degree of the London School of Economics and Political Science is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it).

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I confirm that parts of my thesis were copy edited for conventions of language, spelling and grammar by Inna Grinis and Matthew Skellern. Inna and Matthew also proof-read the equations to ensure subscripts and brackets were correctly placed.

Dedication

À Michael

> Tout ce que j'ai pu écrire, je l'ai puissé à l'encre de ces yeux....c'était ton sourire qui me l'a dicté

– Francis Cabrel

(*To Michael, "All that I was able to write was penned with the ink of your eyes; with your smile you bestowed upon me the words"– Francis Cabrel)*

To my father Christopher, for sharing with me his passion for mathematics.

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Abstract

This thesis studies the production of public goods by economic agents that are not only motivated by monetary incentives, but also by intrinsic or altruistic concerns. Each of the three chapters has conflict over social goals at their heart. In the first paper the conflict is between two donors, in the second between an NGO and its donors, in the last between a social planner and a bureaucrat. The conflicts have diverse but overlapping origins. It identifies policy solutions adapted to the context.

In the first chapter, we conclude that the more motivated bureaucrats are by social gains, the less they should be subject to monitoring and the more discretion they should be given to manage a budget or quota themselves. We show that contracts using discretion can screen between more and less pro-socially motivated bureaucrats. We show that the limits of bureaucratic efficiency highlighted by Prendergast (2003) can be exceeded when the planner can choose to grant bureaucrats discretion.

In chapter two, we study mission conflict between donors and recipients and provide an explanation as to why it may take place. We show that the Busan declaration's recommendation that the aid recipient's mission should be chosen, regardless of donor preferences, can sometimes lower social welfare, as it can distort donation levels and entry decisions.

In the third chapter we identify fixed costs, mission uncontractibilities and income inequality as driving an inefficiently fragmented charitable sector. We demonstrate that, in the absence of granting a donor unilateral control over a mission, either progressive tax incentives for giving or covering the fixed costs of charities through taxation can make the second best achievable.

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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

According to Light (1993), governments "limit bureaucratic discretion through tightly drawn rules and regulations." Prendergast (2003) goes further and asserts that failing to use discretion in the appropriate way is a "defining characteristic" of bureaucracies. But bureaucracies are evolving, and with them, new models of bureaucratic management are emerging.

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 constraint has an important incentive effect: as Wilson (1989) comments, "why scrimp and save unless you can keep the results of your frugality?"

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 and above all managing their own budget, still delivering public services – in social care, youth services, probation services and adult education.[2]

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

[2] See Besley and Ghatak (2001) for a discussion of the advantages of putting assets in the hands of groups of motivated agents such as bureaucrats.

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 (to some greater or lesser degree) 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 is the threat of not having the budget to grant the good to a deserving recipient in the future – and the less inclined he or she is to grant the good to the undeserving consumer in front of them.

The result that the choice of contract depends on bureaucratic motivation puts us in conflict with the precautionary principal espoused by Hume (1742), which recommends that bureaucratic management caters to the least public-spirited:

> 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)[3]

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, a key figure in the reform of public services in the UK, 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) Indeed, in doing so, we show that we can exceed the known limits of bureaucratic efficiency derived by Prendergast (2003).

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 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

[3]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"

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 4.

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.[4] 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 (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.[5] 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

[4]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.

[5]In an extension in Appendix B we suppose that the bureaucrat has to exert some effort to know τ.

$\gamma b - c < 0$, 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[6] that can be spent over a set time period, we study

[6] Although we can think of the bureaucrat holding a budget, we could equally well think of him as managing

a related constraint on bureaucratic spending: a funding rule which says whether or not the 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.

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.

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:*

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

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 5)

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 may not do so in practice as he 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. If $D = 1$, the planner may investigate the bureaucrat's decision – ie, obtain a signal of the underlying state, correctly detection misallocation with probability ρ

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 1 *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:

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

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 on $\overline{\alpha}$ 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 2 *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:*

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

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 and takes the contract intended for the high type, 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 $q_H > q(\alpha_L)$, 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:

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

The participation constraints of the two types are:

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

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. *$q_i \leq q(\alpha_i)$, $i \in \{L, H\}$*[7]
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

[7]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 $q_H \neq q(\alpha_H)$

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 3 *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 (the low type is indifferent between monitoring levels in this range, since he always withholds the good in the undeserving case). 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 4 *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 3 and 4 are unpromising, the result of Lemma 2 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 test 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 test 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 test 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 test 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 test 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 test 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 have limited relevance.

One alternative contract is managing bureaucrats by punishing them for exceeding a certain rate of positive allocations. 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 $v_1(\alpha, \gamma) > 0$, since:

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 that whenever the good is granted, the bureaucrat must meet part of the costs (this second case is studied in Besley and Ghatak (2012)).

These two contracts are similar in the sense that they introduce an opportunity cost to the bureaucrat of granting the case. In the first case, a payment to the bureaucrat of $v(\alpha, \gamma) + \epsilon$ (where ϵ is small), to refuse a case would induce him or her to take the right decision; in the second, the bureaucrat should always contribute $v(\alpha, \gamma) + \epsilon$ towards the cost of the good in order for him or her to take the right decision. Notice that 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. If transactions costs are low, the planner would prefer the more motivated bureaucrats who would make the larger transfers. 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

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.[8]

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[9] 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). 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

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

[9]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)

for allocation, assumed to function as quotas,[10] 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

[10] notice that the incentive effect of being fired for allocating the good and the effect of funding being withheld are similar

work with.

8 Conclusion

We have shown that the right means of managing bureaucrats who do not directly bear the social costs of intervention depends on their pro-social motivation. Under reasonable assumptions about bureaucratic motivation, 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, whereas the less pro-socially oriented should be managed by oversight. Tailoring the system of management to bureaucratic management to motivation allows us to surpass the limits of bureaucratic efficiency determined by Prendergast (2003). Further, for sufficiently impatient bureaucrats, we provide the means of determining their pro-social motivation through a screening contract where more motivated bureaucrats choose discretion and less motivated agents choose oversight.

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:

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

□

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:

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

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. □

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}. □

Proof of Lemma 1 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:

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

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. However, if the marginal cost of public funds λ is positive, we still obtain the same result, although the link between the intuition and the result is slightly less tight. Note that the participation constraints of the bureaucrat under discretion and oversight, are, respectively:

$$\begin{aligned} w_D + \tfrac{hv(\alpha,1)}{1+\beta h(1-q(\alpha))} &\geq \underline{u} \\ w_O + hv(\alpha,1) &\geq \underline{u} \end{aligned} \tag{33}$$

Then the difference between the payoffs of the planner under oversight and discretion is:

$$\Pi_D(\alpha) - \Pi_O(\alpha) - \lambda hv(\alpha,1)\left(\frac{\beta h(1-q(\alpha))}{1+\beta h(1-q(\alpha))}\right) \tag{34}$$

which is strictly increasing in α for all $\lambda > 0$. Intuitively, the wage under oversight is independent of ρ but the wage under discretion depends on q – the lower $q(\alpha)$ the more wage compensation is needed.$\square$

Proof of Lemma 2

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

$$\begin{aligned} Z(1,c) &= v(\alpha,1) + \beta(1-h+hq)E_\tau Z(\tau,c) + \beta h(1-q)Z(0) \\ Z(\gamma,c) &= \beta E_\tau Z(\tau,c) \\ Z(0) &= \beta E_\tau Z(\tau,c) \end{aligned} \tag{35}$$

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

$$\begin{aligned} E_\tau Z(\tau,c) &= hv(\alpha,1) + (1-h)v(\alpha,\gamma) + \beta(1-q)E_\tau Z(\tau,c) + \beta q Z(0) \\ Z(0) &= \beta E_\tau Z(\tau,c) \end{aligned} \tag{36}$$

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:

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

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

$$\frac{\partial \pi_D(q,\alpha)}{\partial \alpha} = \begin{cases} \frac{1}{1-\beta}\left(\frac{hv_1(\alpha,1)}{1+\beta h(1-q)}\right) & \text{if} \quad q < q(\alpha) \\ \frac{1}{1-\beta}\left(\frac{hv_1(\alpha,1)+(1-h)v_1(\alpha,\gamma)}{1+\beta(1-q)}\right) & \text{if} \quad q > q(\alpha) \end{cases} \tag{38}$$

$$\frac{\partial^2 \pi_D(q,\alpha)}{\partial q \partial \alpha} = \begin{cases} \frac{1}{1-\beta}\left(\frac{h^2\beta v_1(\alpha,1)}{(1+\beta h(1-q))^2}\right) & \text{if} \quad q < q(\alpha) \\ \frac{1}{1-\beta}\left(\frac{h\beta v_1(\alpha,1)+(1-h)\beta v_1(\alpha,\gamma)}{(1+\beta(1-q))^2}\right) & \text{if} \quad q > q(\alpha) \end{cases} \tag{39}$$

□

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:

$$\begin{aligned} x_L \leq x_L^* &= \frac{v(\alpha_L,1)-v(\alpha_L,\gamma)}{v(\alpha_L,1)} \\ x_H \leq x_H^* &= \frac{v(\alpha_H,1)-v(\alpha_H,\gamma)}{v(\alpha_H,1)} \end{aligned} \tag{40}$$

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

$$hv(\alpha_H,1)(x_H - x_L) \geq w_L - w_H \geq \frac{hx_H\overline{v}(\alpha_L,\tau)}{1-(1-h)x_H} - hv(\alpha_L,1)x_L \tag{41}$$

In figures 1 and 2, the shaded area in grey represents the area defined by the two inequalities in (40) and the inequality (7). In the first, (44) is satisfied, in the second it is violated.

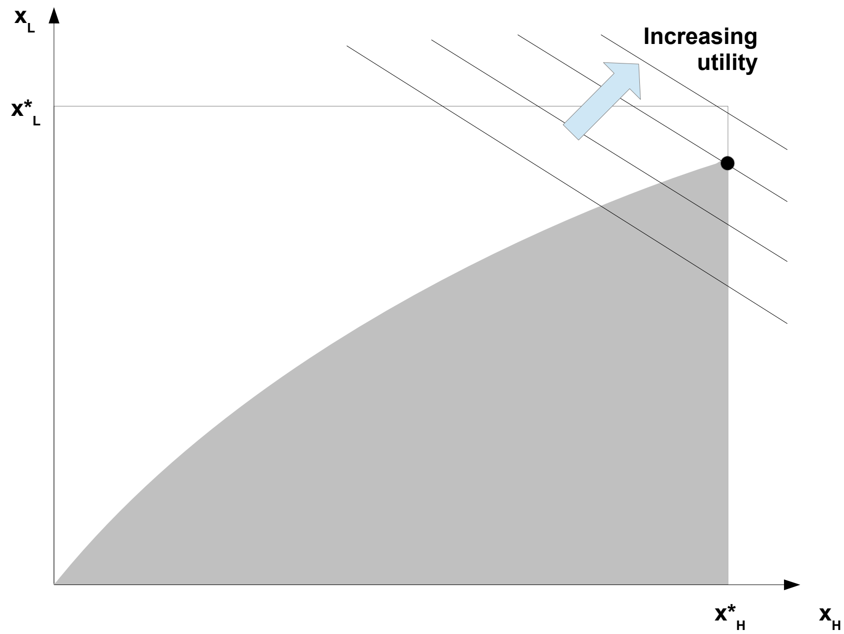
The optimisation problem is thus to maximise:

$$(f_H x_H + f_L x_L)h(b-c) \tag{42}$$

subject to (40), (41) 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 (42) is maximised: $w_L = \underline{u} - hv(\alpha_L,1)x_L$. Similarly, let $w_L - w_H = hv(\alpha_H,1)(x_H - x_L)$.

Figure 1: Feasible and optimal contracts, (44) satisfied



subject to a condition which says that both inequalities in (41) can be satisfied:

$$x_L \leq \frac{x_H v(\alpha_H, 1) - \frac{\overline{v}(\alpha_L,\tau)x_H}{1-(1-h)x_H}}{v(\alpha_H, 1) - v(\alpha_L, 1)} \tag{43}$$

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

$$\overline{v}(\alpha_L, \tau) \leq \overline{v}(\alpha_H, \tau)\frac{\overline{v}(\alpha_H, \tau)}{v(\alpha_H, 1)} \tag{44}$$

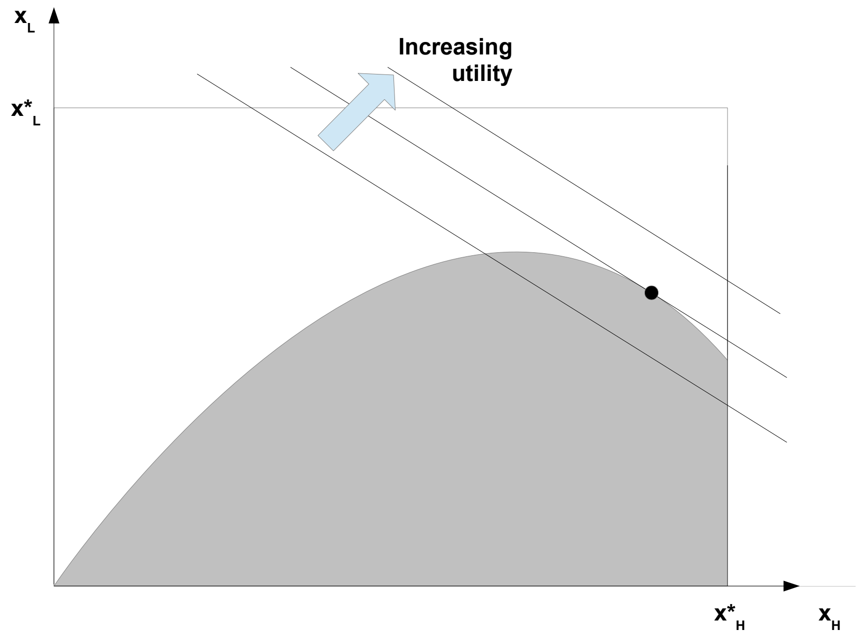
Provided that $\frac{f_H}{f_L} \leq \frac{\frac{\overline{v}(\alpha_L,\tau)}{(1-(1-h)x_H^*)^2} - v(\alpha_H,1)}{h(v(\alpha_H,1)-v(\alpha_L,1))}$, this gives rise to an interior solution for both x_H and x_L when (44) is violated at:

$$\frac{f_H}{f_L} = \frac{\frac{\overline{v}(\alpha_L,\tau)}{(1-(1-h)x_H)^2} - v(\alpha_H, 1)}{h(v(\alpha_H, 1) - v(\alpha_L, 1))} \tag{45}$$

as depicted in Figure 2. x_L is defined by (43) holding with equality.

Otherwise, when (44) holds, the solution is given by $x_H = x_H^*$ and

Figure 2: Feasible and optimal contracts, (44) violated



$x_L = \max\left(x_L^*, \frac{x_H^* v(\alpha_H,1) - \frac{\overline{v}(\alpha_L,\tau)x_H^*}{1-(1-h)x_H^*}}{v(\alpha_H,1)-v(\alpha_L,1)}\right)$ as depicted in Figure 1. $\square$

Proof of Lemma 3 In order for the contract to be screening and not pooling, $\rho_L < \rho(\alpha_H) = \frac{v(\alpha_H,1)}{\Delta}$. 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:

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

These two constraints are only compatible with each other if:

$$(1-h)(\rho_L\Delta - v(\alpha_H, \gamma)) \geq w_L - w_H \geq 0 \tag{47}$$

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

Proof of Lemma 4 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:

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

These constraints are only compatible if:

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

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:

$$\begin{aligned} w_H + \tfrac{hv(\alpha_H,1)}{1+\beta h(1-q_H)} &\geq hv(\alpha_H, 1) \\ w_L + hv(\alpha_L, 1) &\geq w_H + \tfrac{hv(\alpha_L,1)+(1-h)v(\alpha_L,\gamma)}{1+\beta(1-q_H)} \end{aligned} \tag{50}$$

and these constraints are only compatible if and only if:

$$\begin{aligned} 0 \geq & \tfrac{\beta h(1-q_H)}{1+\beta h(1-q_H)} h(v(\alpha_H, 1) - v(\alpha_L, 1)) \\ & + \left(\tfrac{hv(\alpha_L,1)+(1-h)v(\alpha_L,1)}{1+\beta(1-q_H)} - \tfrac{hv(\alpha_L,1)}{1+\beta h(1-q_H)} \right) \end{aligned} \tag{51}$$

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:

$$(1-h)(\rho_L\Delta - v(\alpha_H,\gamma) \quad \geq \quad \tfrac{\beta h(1-q_H)}{1+\beta h(1-q_H)} h(v(\alpha_H,1) - v(\alpha_L,1)) \tag{52}$$

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:

$$0 \geq \frac{\beta h(1-q_H)}{1+\beta h(1-q_H)} h(v(\alpha_H,1) - v(\alpha_L,1)) \tag{53}$$

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 (46) become:

$$\begin{aligned} \beta w_H + v(\alpha,\gamma) + \tfrac{\beta}{1-\beta} hv(\alpha_H,1) \quad &\geq \quad \beta w_L + \tfrac{\beta}{1-\beta}\left(\overline{v}(\alpha_H,\tau) - (1-h)\rho_L\Delta\right) \\ \beta w_L + \tfrac{\beta}{1-\beta} hv(\alpha_L,1) \quad &\geq \quad \beta w_H + v(\alpha_L,1) + \tfrac{\beta}{1-\beta} hv(\alpha_L,1) \end{aligned} \tag{54}$$

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

$$\begin{aligned} (1-\beta)(v(\alpha_H,\gamma) - v(\alpha_L,1)) \quad &\geq \quad \beta(1-h)(v(\alpha_H,\gamma) - \rho_L\Delta) \\ \iff \qquad \rho_L \quad &\geq \quad \rho(\alpha_H) - \tfrac{1-\beta}{\beta(1-h)}(v(\alpha_H,\gamma) - v(\alpha_L,\gamma)) \end{aligned} \tag{55}$$

We maximise

$$f_H(b - c - \kappa(\rho_H)) + f_L(b - c - \kappa(\rho_L)) \tag{56}$$

subject to (55) and:

$$\begin{aligned} \beta(w_L - w_H) \quad &\geq \quad v(\alpha_L,1) \\ \beta w_L + \tfrac{\beta}{1-\beta} hv(\alpha_L,1)) \quad &\geq \quad \underline{u} \\ \rho_L \quad &\geq \quad \tfrac{v(\alpha_L,\gamma)}{\Delta} \\ \rho_H \quad &\geq \quad \tfrac{v(\alpha_H,\gamma)}{\Delta} \end{aligned} \tag{57}$$

which gives rise to a solution:

$$
\begin{aligned}
w_L &= \tfrac{\underline{u}}{\beta} - \tfrac{hv(\alpha_L,1)}{1-\beta} \\
w_H &= w_L - \tfrac{1}{\beta}v(\alpha_L, 1) \\
\rho_H &= \rho(\alpha_H) \\
\rho_L &= \max\left(\rho(\alpha_L), \rho(\alpha_H) - \tfrac{(1-\beta)(v(\alpha_H,\gamma)-v(\alpha_L,1))}{\beta(1-h)}\right)
\end{aligned}
\tag{58}
$$

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:

$$
\begin{aligned}
\beta w_H + v(\alpha, 1) + \tfrac{\beta}{1-\beta}hv(\alpha_H, 1) &\geq \beta w_L + \tfrac{\beta}{1-\beta}\left(\overline{v}(\alpha_H, \tau) - (1-h)\rho_L\Delta\right) \\
\beta w_L + \tfrac{\beta}{1-\beta}hv(\alpha_L, 1) &\geq \beta w_H + v(\alpha_L, 1) + \tfrac{\beta}{1-\beta}hv(\alpha_L, 1)
\end{aligned}
\tag{59}
$$

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

$$
\begin{aligned}
(1-\beta)(v(\alpha_H, 1) - v(\alpha_L, 1)) &\geq \beta(1-h)(v(\alpha_H, \gamma) - \rho_L\Delta) \\
\iff \qquad \rho_L &\geq \rho(\alpha_H) - \tfrac{1-\beta}{\beta(1-h)}(v(\alpha_H, 1 - v(\alpha_L, 1))
\end{aligned}
\tag{60}
$$

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

$$
f_H\left(h(b-c) - \kappa(\rho_H)\right) + (1-h)(\overline{\gamma}b - c - \kappa(\rho_L)) + f_L h(b - c - \kappa(\rho_L)) \tag{61}
$$

subject to (57) and (60), which gives rise to a solution:

$$
\begin{aligned}
w_L &= \tfrac{\underline{u}}{\beta} - \tfrac{hv(\alpha_L,1)}{1-\beta} \\
w_H &= w_L - \tfrac{1}{\beta}v(\alpha_L, 1) \\
\rho_H &= \rho(\alpha_H) \\
\rho_L &= \max\left(\rho(\alpha_L), \rho(\alpha_H) - \tfrac{1-\beta}{\beta(1-h)}(v(\alpha_H, 1 - v(\alpha_L, 1))\right)
\end{aligned}
\tag{62}
$$

$\square$

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:

$$v(\alpha_H,\gamma)+\tfrac{\beta}{1-\beta}\Big(w_H(1-\beta)+hv(\alpha_H,1)x_H\Big) \;\geq\; \tfrac{\beta}{1-\beta}\Big(w_L(1-\beta)+\overline{v}(\alpha_H,\tau)-(1-h)\Delta\rho_L\Big) \tag{63}$$

$$\tfrac{\beta}{1-\beta}\Big(w_L(1-\beta)+hv(\alpha_L,1)\Big) \;\geq\; v(\alpha_L,1)+\tfrac{\beta}{1-\beta}\Big((1-\beta)w_H+\tfrac{hx_H}{1-(1-h)x_H}\overline{v}(\alpha_L,\tau)\Big) \tag{64}$$

These two constraints are compatible if:

$$\begin{aligned} & v(\alpha_H,\gamma)-v(\alpha_L,1)+\overbrace{\frac{\beta}{1-\beta}(1-h)(\rho_L\Delta-v(\alpha_H,\gamma))}^{\text{Term1}} \\ & \geq \tfrac{\beta}{1-\beta}(1-x_H)h(v(\alpha_H,1)-v(\alpha_L,1))+\tfrac{\beta}{1-\beta}\left(\underbrace{\frac{hx_H\overline{v}(\alpha_L,\tau)}{1-(1-h)x_H}-hv(\alpha_L,1)x_H}_{\text{Term2}}\right) \end{aligned} \tag{65}$$

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 65 with $\rho(\alpha_H)-\epsilon=\rho_L$ and $x_H - x(\alpha_L)=\delta$ for some small and positive δ,ϵ, as long as:

$$v(\alpha_H,\gamma)-v(\alpha_L,1) \;\geq\; \tfrac{\beta}{1-\beta}(1-x(\alpha_L))h(v(\alpha_H,1)-v(\alpha_L,1)) \tag{66}$$

ie, iff and only if:

$$\beta^* \equiv \frac{v(\alpha_L,1)(v(\alpha_H,\gamma)-v(\alpha_L,1))}{v(\alpha_L,1)(v(\alpha_H,\gamma)-v(\alpha_L,1))+hv(\alpha_L,\gamma)(v(\alpha_H,1)-v(\alpha_L,1)}\geq\beta \tag{67}$$

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

$$f_H\Big(hx_H(b-c)+(1-h)(\overline{\gamma}b-c-\kappa(\rho_L))\Big)+f_Lh(b-c-\kappa(\rho_L)) \tag{68}$$

subject to $\rho_L<\rho(\alpha_H)$, $x_H \geq x(\alpha_L)$, constraints (63) and (64) and the participation constraint of the low type,

$$\beta w_L+\frac{\beta}{1-\beta}hv(\alpha_L,1)\geq\underline{u} \tag{69}$$

Such a solution could consist, for example, of ρ_L and x_H such that 65 satisfied with equality;

then (63) and (64) 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:

$$v(\alpha_H,1)+\frac{\beta}{1-\beta}\Big(w_H(1-\beta)+hv(\alpha_H,1)x_H\Big) \geq \frac{\beta}{1-\beta}\Big(w_L(1-\beta)+\overline{v}(\alpha_H,\tau)-(1-h)\Delta\rho_L\Big) \quad (70)$$

$$\frac{\beta}{1-\beta}\Big(w_L(1-\beta)+hv(\alpha_L,1)\Big) \geq v(\alpha_L,1)+\frac{\beta}{1-\beta}\Big((1-\beta)w_H+\frac{hx_H}{1-(1-h)x_H}\overline{v}(\alpha_L,\tau)\Big) \quad (71)$$

These two equations are compatible if:

$$\begin{aligned} & v(\alpha_H,1)-v(\alpha_L,1)+\overbrace{\frac{\beta}{1-\beta}(1-h)(\rho_L\Delta - v(\alpha_H,\gamma))}^{\text{Term1}} \\ & \geq \tfrac{\beta}{1-\beta}(1-x_H)h(v(\alpha_H,1)-v(\alpha_L,1))+\tfrac{\beta}{1-\beta}\left(\underbrace{\frac{hx_H\overline{v}(\alpha_L,\tau)}{1-(1-h)x_H}-hv(\alpha_L,1)x_H}_{\text{Term2}}\right) \end{aligned} \quad (72)$$

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 (72) 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 (72) is satisfied for some $\rho_L < \rho(\alpha_H)$ and $x_H \geq x(\alpha_L)$ as long as

$$\begin{aligned} & \Big(1-\tfrac{\beta}{1-\beta}(1-x(\alpha_L))\Big)h(v(\alpha_H,1)-v(\alpha_L,1)) && \geq && 0 \\ \iff & \beta^{**} \equiv \tfrac{v(\alpha_L,1)}{v(\alpha_L,1)+v(\alpha_L,\gamma)} && \geq && \beta \end{aligned} \quad (73)$$

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

$$f_H x_H(b-c)+f_L h(b-c-\kappa(\rho_L)) \quad (74)$$

subject to $\rho_L < \rho(\alpha_H)$, $x_H \geq x(\alpha_L)$, constraints (70) and (71) and the participation constraint of the low type,

$$\beta w_L + \frac{\beta}{1-\beta}hv(\alpha_L,1) \geq \underline{u} \quad (75)$$

Such a solution could consist, for example, of ρ_L and x_H such that 72 satisfied with equality;

then (70) and (71) 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:

$$E_\tau V(\tau, c) - V(0) = \frac{1}{1-\beta} \frac{\big(eh + (1-e)(1-h)\gamma\big)\alpha b - f\mathbf{1}(e = \overline{e})}{1 + \beta(1-q)(eh + (1-e)(1-h))} \tag{76}$$

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:

$$\beta(1-q)\left(E_\tau V(\tau, c) - V(0)\right) \geq \Big(e\gamma + (1-e)\Big)\alpha b \tag{77}$$

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

$$\beta(1-q(e)) \geq \frac{e\gamma + (1-e)}{(1-\gamma)(he^2 - (1-h)(1-e)^2)} \tag{78}$$

or equivalently:

$$x(e) \equiv \frac{1}{1+\beta(1-q(e))(eh+(1-e)(1-h))} \geq 1 - \frac{e\gamma + 1 - e}{\hat{\gamma}(e)} \tag{79}$$

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 (79) with respect to e weobtain:

$$\frac{\partial x(e)}{\partial e} \leq 0 \tag{80}$$

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:

$$(\overline{e} - \underline{e})\left(h\alpha b - (1-h)\gamma\alpha b + \beta(1-2h)(1-q)(E_\tau V(\tau, c) - V(0))\right) \geq f \tag{81}$$

Lemma 5 *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 5

Substituting in (76) with $e = \overline{e}$ we require that:

$$\begin{aligned} & h\alpha b - (1-h)\gamma\alpha b + \beta(1-q)h\alpha b + (\overline{e}h + 1(1-\overline{e})(1-h) + (1-2h)\overline{e}) \\ & -\beta(1-q)(1-h)\gamma\alpha b((\overline{e}h + 1(1-\overline{e})(1-h) - (1-2h)(1-\overline{e}) \\ & \geq \tfrac{f}{(\overline{e}-\underline{e})}(1+\beta(1-q)(eh+(1-e)(1-h)) \end{aligned} \tag{82}$$

which becomes:

$$\begin{aligned}&h\alpha b(1+\beta(1-q)(1-h))-(1-h)\gamma\alpha b(1+\beta h(1-q))\\&\geq \tfrac{f}{(\overline{e}-\underline{e})}(1+\beta(1-q))(eh+(1-e)(1-h))\end{aligned} \tag{83}$$

Differentiating the LHS of (83) with respect to α, we obtain that the derviative is positive as long as:

$$h(1-h)\beta(1-q)(1-\gamma)\geq(1-h)\gamma-h \tag{84}$$

Notice that the truthtelling constraint in state γ implies that $\beta(1-q)>\frac{\gamma}{(1-\gamma)h}$. Combining the observation with (84), 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 80, 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:

$$\frac{h(b-c)}{(1-\beta)(1+\beta(1-q)(eh+(1-e)(1-h)))} \tag{85}$$

He maximises this payoff subject to:

- The truthtelling constraint (78) with $e=\underline{e}$ only
- The truthtelling constraint (78) with $e=\overline{e}$ and the effort incentive compatibility constraint (83)

Lemma 6 *The payoff of the planner under bureaucratic discretion, with bureaucratic effort* $e\in\{\underline{e},\overline{e}\}$*, is increasing in* α

Proof of Lemma 6 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

$$\Pi_D(\alpha,\underline{e})=\max\left(\overline{\gamma}b-c,h(b-c)\left(1-\frac{(\underline{e}h+(1-\underline{e})(1-h))(\underline{e}\gamma+1-\underline{e})}{\underline{e}h+(1-\underline{e})(1-h)\gamma}\right)\right) \tag{86}$$

which is independent of α

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

$$\begin{aligned}\Pi_D(\alpha,\overline{e}) &= \max\Big(\overline{\gamma}b-c,\max_{x(\overline{e})}\mathcal{L}(x(\overline{e}))\Big)\\ \max_{x(\overline{e})}\mathcal{L}(x(\overline{e})) &= h(b-c)x(\overline{e})-\lambda_1\Big(1-\tfrac{(eh+(1-e)(1-h))(e\gamma+1-e)}{eh+(1-e)(1-h)\gamma\alpha b+a)}-x(\overline{e})\Big)\\ &\quad -\lambda_2\Big(\tfrac{fx(e)^{-1}}{\overline{e}-\underline{e}}-h\alpha+(1-h)\gamma\alpha b\\ &\quad -h(1-h)\beta(1-q)(1-\gamma)\Big)\end{aligned} \tag{87}$$

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:

$$\frac{\partial\Pi_D(\alpha,\overline{e})}{\partial\alpha}=\lambda_2\Big(h-(1-h)\gamma+\beta(1-q)h(1-h)\Big) \tag{88}$$

Hence, given the result of Lemma 5, 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:

$$-(1-e)\rho_0(X - \epsilon\gamma\alpha b) \geq (e\gamma + (1-e))\alpha b - e\rho_1(X - \delta\gamma\alpha b) \tag{89}$$

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:

$$\rho_1 e(X + \delta(\gamma\alpha b + a)) \geq \rho_0(1-e)(X - \epsilon(\alpha b + a)) + (e\gamma + (1-e))\alpha b + a \tag{90}$$

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

$$\begin{aligned} &\overline{e}h\alpha b + (1-\overline{e})(1-h)\gamma\alpha b - (1-h)\rho_1(X + \delta\gamma\alpha) - h\rho_0(X - \epsilon\alpha b) - f \\ &\geq \underline{e}h\alpha b + (1-\underline{e})(1-h)\gamma\alpha b - (1-h)\rho_1(X + \delta\gamma\alpha b) - h\rho_0(X - \epsilon\alpha b) \end{aligned} \tag{91}$$

This becomes:

$$\begin{aligned} &(\overline{e} - \underline{e})\Big(h(\alpha b + a) - (1-h)(\gamma\alpha b + a) + h\rho_0(X - \epsilon(\alpha b + a)) + (1-h)\rho_1(X + \delta(\gamma\alpha b + a)\Big) \\ &\geq f \end{aligned} \tag{92}$$

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

Proof of Lemma 7

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

$$\begin{aligned}
\max_{e\in\{\underline{e},\bar{e}\}} \Pi_O(e,\alpha) &= \\
\max_{e\in\{\underline{e},\bar{e}\}} \max_{\rho_0,\rho_1,X} \mathcal{L} &= eh(b-c)+(1-e)h\rho_0(b-c)+e(1-h)0 \\
&\quad +(1-e)(1-h)(1-\rho_1)(\gamma b-c) \\
&\quad -(1-e)h\kappa(\rho_0)-(eh+(1-e)(1-h))\kappa(\rho_1) \\
&\quad -\lambda_t\Big((\rho_0(1-e)(X-\epsilon(\gamma\alpha b+a))+(e\gamma+(1-e))\alpha b+a)- \\
&\quad e\rho_1(X+\delta(\gamma\alpha b+a))\Big)+\lambda_e(X-X(e,\alpha))
\end{aligned} \tag{93}$$

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

$$\frac{\partial \Pi_O(\underline{e},\alpha)}{\partial\alpha} = -\lambda_t\Big((\underline{e}\gamma+(1-\underline{e}))b-\rho_0\epsilon(1-\underline{e})\gamma b+\underline{e}\rho_1\delta\gamma b\Big)-\lambda_e\frac{\partial X}{\partial\alpha} \tag{94}$$

$\lambda_t, \lambda_e \geq 0$ 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. $\square$

Given the results of Lemmas and 7, 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:

$$\begin{aligned} \beta\overline{v}(\alpha,\tau) &\geq v(\alpha,\gamma) \\ \iff \quad \frac{v(\alpha,1)}{v(\alpha,\gamma)} &\geq \frac{1-\beta(1-h)}{\beta h} \end{aligned} \tag{95}$$

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:

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

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:

$$\begin{aligned} \beta(1+\beta)\overline{v}(\alpha,\tau) &\geq v(\alpha,\gamma) + \beta\overline{v}(\alpha,\tau) \\ \tfrac{v(\alpha,1)}{v(\alpha,\gamma)} &\geq \tfrac{1-\beta^2(1-h)}{\beta^2 h} \end{aligned} \tag{97}$$

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:

$$\begin{aligned} \beta(hv(\alpha,1) + (1-h)\beta\overline{v}(\alpha,\tau) &\geq v(\alpha,\gamma) \\ \tfrac{v(\alpha,1)}{v(\alpha,\gamma)} &\geq \tfrac{1-\beta^2(1-h)^2}{\beta h(1+\beta(1-h)} = \tfrac{1-\beta(1-h)}{\beta h} \end{aligned} \tag{98}$$

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:

$$\beta\overline{v}(\alpha,\tau) \geq v(\alpha,\gamma) \tag{99}$$

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

(100)

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:

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

(101)

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 8 *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:

$$\beta(1+\beta)(\overline{\gamma} b - c) \geq \gamma b - c + \beta(h(b-c) + \beta(1-h)(\overline{\gamma} b - c)) \tag{102}$$

which is true if and only if:

$$b - c \geq \frac{1 - \beta(1-h)(1+\beta h)}{\beta^2 h^2}(\gamma b - c) \tag{103}$$

which always holds. □

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

$$h(b - c + \beta(\overline{\gamma} b - c)) > \overline{\gamma} b - c \tag{104}$$

Denoting $\Pi(\alpha, b)$ by the planner's payoff when the bureaucrat has pro-social motivation α and budget b. Then examining table (101) in conjunction with (104) we note that:

$$\frac{\Pi(\alpha, 2) - \Pi(\alpha, 1)}{\partial \alpha} \geq 0 \tag{105}$$

□

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Let's call the whole thing off: NGOs, mission conflict and occupational choice

*Sarah Sandford and Matthew Skellern**

Abstract

Why do donors and the recipients of gifts disagree over how funds should be used? Despite ample evidence that mission conflict in the NGO sector is a widespread phenomenon – witness, for example, the 2011 Busan Declaration, which encourages international donors to solve the problem of mission conflict by allowing the recipient to choose the project's mission – the economics literature has not been able to explain why this conflict of mission preferences arises. Besley and Ghatak (2005) predict that principals and agents in the NGO sector should be assortatively matched with respect to mission preferences. We show that mission mismatch can arise in equilibrium by allowing for endogenous choice of donor and recipient roles, and for mission preferences that are correlated with income from the private sector. When mission mismatch occurs in equilibrium, we show that enforcing the Busan declaration decreases joint donor-recipient surplus when donors care sufficiently about their preferred mission. However, it is possible that the declaration could improve social welfare when additionally beneficiary payoffs are taken into account.

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1 Introduction

> Too often, donors' decisions are driven more by our own interests or policy preferences than by our partners' real needs

Hillary Clinton, Busan High-Level Forum November 2011

> The greatest tension for the thoughtful Northern NGO today lies in the attempt to balance fundraising messages for a public most easily moved by short-term disaster appeals, with a recognition that long-term development depends on the willingness of that same public to support difficult and costly structural change. This is a tension between the 'appeal' of helplessness and antipathy towards empowerment, between concern for children and indifference towards parents, between the provision of food and the creation of jobs, between aid and trade, between charity, as some NGOs say quite clearly, and justice.

Smillie (1995)

If the above quotations are to be believed, there is a serious problem in the field of development assistance: there are substantive conflicts over how aid spending should be used, and donors seem to be inefficiently imposing their preferred way of doing things on recipient organisations. The 2011 Busan Declaration[1] – the successor of two previous and similar international declarations on aid effectiveness in Paris and Accra – expresses a commitment to "give ownership of development policies to aid recipients, and to give in line with these priorities." However, it seems that implementation of these commitments has been incomplete. Leo (2013), for example, demonstrates that US development assistance is less aligned with the priorities of developing country residents than multilateral assistance provided through the African Development Bank and the Inter-American Development Bank. Hedger and Wathne (2010) note that, while donors pay lip service to the principles of alignment and ownership, it is implicitly understood by both donors and recipients that the objectives of the former should not be overridden.[2]

This paper has two main objectives. One is to ask whether the policy embodied in the Busan Declaration is a suitable instrument to deal with the mission mismatch problem outlined above. In order to reach a conclusion we need first to address a more fundamental question: why would there be such a conflict between donors and aid recipients in the first place?

[1] According to the OECD (2014), "The Busan Partnership document does not take the form of a binding agreement or international treaty. It is not signed, and does not give rise to legal obligations. Rather, it is a statement of consensus that a wide range of governments and organisations have expressed their support for, offering a framework for continued dialogue and efforts to enhance the effectiveness of development co-operation."

[2] "A number of respondents to the latest ODI study note that while many national and sector strategies appear to be domestically 'owned', governments recognise that the policies they adopt must address donor expectations to some degree."

And relatedly, if donors and recipients do indeed have different preferences, is it necessarily inefficient for the donor to enforce his preferred mission?

The economics literature to date does not have a satisfactory explanation as to why such conflict over the goals or ethos of an aid project arises. Besley and Ghatak (2005) predict an assortative stable matching between principals and agents in a matching market where there are diverse social goals. Their result is based on the premise that, for any given goal – which we will refer to as a *mission*[3] – there exists the same number of principals and agents sharing the same mission preferences. If this symmetry assumption were to be relaxed, then principals and agents with different preferred missions would necessarily be matched with one another. Whilst Besley and Ghatak's symmetry assumption may seem intuitively appealing, we show in a model with endogenous choice of donor or NGO role, there is often a donor who cannot find an NGO which produces his preferred mission.

We show that if mission preferences are correlated with an individual's capacity to earn in the private sector, those who can earn a lot in the private sector will tend to do so, and seek to provide charitable goods (or aid) by making donations. Those who cannot earn much in the private sector will set up NGOs and make a contribution to charitable goods by providing their labour to turn financial contributions into goods valued by beneficiaries. Thus donors will tend to face a shortage of recipients (whom we call *NGO entrepreneurs*) who share their mission preferences and thus will be forced to deal with mission conflict in the course of their giving.

To explain the forces that keeps such a mismatch equilibria in check, consider the following concrete example. Mother Teresa (as part of what became a global large-scale operation aimed at serving the poorest of the poor) ran hospices for the dying, starting with small scale operations in Calcutta. These facilities were run with a specific ethos, derived from Catholic theology.[4] She professed that suffering would bring people closer to Jesus, proclaiming that: "I think it is very beautiful for the poor to accept their lot, to share it with the passion of Christ. I think that the world is being much helped by the suffering of poor people." Despite being awarded the Nobel Peace prize in 1979 for her work to combat the poverty and distress, several critics suggested that Mother Teresa could have made better use of medical techniques and financial resources to keep dying people comfortable in their last days – indeed, that she deliberately favoured running her operations on meagre resources, thus keeping the poor in their place. (Shields, 1997; Greene, 2004; Hitchens, 2012; Larive *et al*, 2013)

Donors to Mother Teresa's mission did not have to accept this situation passively. Perhaps they did not have much power to change the Missionaries of Charity's practices, or they could not find an NGO sharing their preferred way of doing things. However, they could have chosen to contribute to the wellbeing of the poor and sick by setting up and running their own NGO, using more medical and scientific methods than the Mother Teresa's religious order. Why

[3] A mission is an action choice (choice of project) or choice of ethos (such as a religious or secular approach), and can be represented formally as a choice of the 'variety' of the good that the NGO produces

[4] N.B. These hospices were open to people of all confessions of faith and the dying were ministered to in accordance to their religious practices

didn't they? This paper offers a credible response; because, for people like them, setting up and running a hospice charity would – even without taking a vow of poverty as Mother Teresa did – require a significant sacrifice of private consumption. To such people, giving to someone with somewhat different ideals (it is clear that many donors were still moved by the mercy and love her sisters showed to the dying) might seem a small price to pay to maintain a degree of comfort in day-to-day living.

In order to explain mission mismatch, there is a second piece of the puzzle to resolve. Why did Mother Teresa and the Missionaries of Charity – who could have incurred some costs in dealing with donors with different preferences – content themselves with their position caring for the poor directly and facing whatever costs this conflict incurred,[5] rather than earning in the private sector and contributing financially to the organisation? The answer is that the capacity of the sisters to earn in the private sector – and hence to offer donations – would be smaller than the large donations than that which the Missionaries of Charity were used to receive (the sisters regularly received donations for over $50,000 (Sheilds, 1997)).

Given our result that mismatch equilibria can exist, what can we deduce about the usefulness of the Busan Declaration as a policy? First, looking at a fixed donor-entrepreneur pairing, we provide some calculations that would seem to support the notion that sometimes donors should let NGO entrepreneurs choose their own preferred mission. We show that, given that a donor has committed a fixed amount to distribute to an NGO, the donor (from the point of view of joint donor-entrepreneur surplus, or beneficiary utility) sometimes wastefully uses some of those funds to enforce his preferred mission. This inefficiency comes about because the charitable project is a public good for the donor and entrepreneur: the donor does not directly take into account the entrepreneur's payoff. This suggests that there could be a return to enforcing the Busan Declaration on a wider group of donors that those who already voluntarily adhere to it.

However, this conclusion does not always carry through (from the point of view of joint donor-entrepreneur surplus) when we allow donors to choose the amount that they give and allow all agents to choose whether or not to donate – otherwise put, when donors have the capacity to respond to this loss of mission influence by "calling the whole thing off". When donors care sufficiently about their preferred mission, enforcing the Busan Declaration when it is not voluntarily adhered to strictly reduces joint donor-NGO entrepreneur surplus. This happens for two reasons. Firstly, restricting the mission choice means that any agent who chooses to be a donor and expects to face mismatch gives less. Secondly there are effects on entry; for example, those who earn the least in the private sector may be encouraged to become NGO entrepreneurs now that they are guaranteed their preferred mission when they are matched with a donor of different preferences. If the total number of recipients or NGO

[5] There is not much evidence that the Missionaries of Charity were beleaguered by donors seeking to overturn the things that were done. It seems in this case that the majority of costs of mismatch were borne by donors and that Mother Teresa's mission or vision was adopted in practice. However, a former sister, Susan Sheilds, recalls liaising with donors and thanking them for their gift, knowing full well that the money would only help the poor within the limits circumscribed by Mother Teresa's philosophy, and not in line with donor expectations (Sheilds, 1997)

entrepreneurs already exceeds the number of donors in equilibrium – as we will show is the case – then this movement away from earning in the private sector is bad for welfare, as it reduces the total amount of income available to donate to the goods produced by NGOs.

However, the welfare of donors and NGO entrepreneurs is not necessarily the right measure of global social welfare. There are beneficiaries of the NGO's activities who perhaps have neither the donor or NGO entrepreneur occupational choice available to them; to continue the Missionaries of Charity example given above, the poor and dying could clearly neither give to a hospice nor nurse within it. What can we say about the Busan Declaration's effect on their payoffs? First, we need to define what their payoffs look like. We consider the two following assumptions.

1. The beneficiaries are indifferent between missions; or
2. The beneficiaries care about the mission and share the mission preferences of the type who has the lowest earnings capacity in the private sector.

Unfortunately we can reach no definite conclusion on beneficiary welfare. Under the first assumption (beneficiaries indifferent between missions), implementing the Busan Declaration creates two effects. The first is, that for every donation made, a (weakly) higher share of each donation goes directly to the cause and less is "wasted" on mission influencing activities. The second is that each individual donation is (weakly) lower. We are unable to calculate an analytic solution which would resolve the trade-off. Under the second assumption (beneficiaries ahre mission preferences of low earnings capacity types), there is a third effect, which is that more donations go towards the beneficiaries' preferred mission. Again, we cannot resolve the trade-off. When donors care sufficiently about their preferred mission, if there is a rationale for making the Busan Declaration enforceable, it must come from beneficiary welfare and not from the welfare of participating donors and entrepreneurs.

The remainder of this paper is structured as follows. In Section 2.1, we review the policy literature relating to mission conflict, highlighting the wealth of evidence that this phenomenon is particularly pertinent in donor and recipient relationships. Then in Section 2.2, we analyse the related literature within economics, emphasising two main strands; the literature on mission conflict and the literature on occupational choice. In Section 3, we introduce the model, and then solve it by backward induction in Sections 3.1 to 3.4. In Section 3.5, we examine the policy of leaving mission choice to NGO entrepreneurs embodied in the Busan Declaration and examine whether the policy could do more good if it were enforced. Section 4 concludes.

2 Literature Review

2.1 Mission conflict in the NGO sector

The decade-old international efforts to agree upon broadly-supported principles of aid effectiveness, culminating in the Busan Declaration, reflect a recognition amongst that mission conflict between international aid donors and recipients is a widespread phenomenon.[6] The problem of mission mismatch, and the pressure donors may exert on aid recipients, is extensively documented by Smillie (1995). Discussing relationships between Northern government aid donors and Southern NGOs, Smillie notes that:

> There are very real and sometimes volatile tensions between governments and the voluntary sectors of the North and the South. On the one hand, more service delivery is expected of voluntary organizations as governmental expansion in health, education and job creation halts or retreats. Faced with static levels of private income, voluntary organizations are easily enticed by the financial blandishments of large benefactors. Governments, however, which are providing them with more and more support, do so on conditional terms... Advocacy and reform, long an integral part of the voluntary *raison d'être*, are unwanted or feared by governments, and means are sought, through legislation, contracting and spurious theorizing about 'voluntarism', to minimise, subvert or suppress it.

Meyer (1995) documents some of the disparaging language used about NGOs who accept large grants that lead to some degree of mission compromise. Other NGOs who question the legitimacy of such organisations have been known to call them 'BINGOs' (big NGOs), 'DONGOs' (donor-organised NGOs), 'GONGOs' (government-organised NGOs), or even 'Yuppie NGOs'.

Pache and Santos (2010) show that competing views of how to run an organisation can be strong enough to tear it apart. In the 1980s, ten years after it was founded, Médecins Sans Frontières was divided over the appropriate role of the NGO vis-à-vis the state. On the one side, there were the so-called legitimists, who believed that the only legitimate actors in humanitarian crises were nation states, and argued that the NGO should therefore see itself as an adjunct to and assistor of state actions. On the other were those who believed that the organisation should have an independent approach, driven by a legitimacy over and above that enjoyed by some states, which implied that they should have an independent and fully-functional logistical machine for intervention into humanitarian crises. Ultimately the difference of opinion was resolved when a group of legitimists left and became Médecins du Monde.

Mission mismatch and mission influencing activities are not just a phenomenon found in the field of development assistance. Alexander (1996) studies the evolution of exhibitions at leading art galleries in the United States during a period when the main source of gallery funding shifted from individual philanthropists (from the 1920s to the 1970s) to corporate funders, private foundations, and public arts foundations such as the National Endowment

[6] The Busan Declaration is a voluntary compact that donors can sign, to illustrate, amongst other things, their commitment to allow NGO entrepreneurs to choose their preferred mission, and to provide financing to realise this mission. It does not take the form of a binding agreement or international treaty. It is not signed, and does not give rise to legal obligations. Rather, it is a statement of consensus that a wide range of governments and organisations have expressed their support for, offering a framework for continued dialogue and efforts to enhance the effectiveness of development cooperation.

for the Arts. She shows that, whereas funding by individual philanthropists often led to exhibitions containing art from an individual collector, corporations and public and private art foundations have tended to favour more popular and accessible formats that are more likely to attract a broad public (such as high-profile exhibitions focused on a single artist). However, Alexander also provides evidence that the changes brought about by this shift in funding sources has been mediated by museum curators – in our model, NGO entrepreneurs – who ensured that, whilst the format of exhibitions may have changed, their content – in terms of the artworks displayed – did not.

Oliver (1991), in a seminal contribution to the institutional logics and resource dependency literature, develops a typology of institutional responses to external pressures to adopt a particular approach (or mission). Internal actors can respond to such pressure with compliance, active defiance (dismissal, challenge and attack), and passive defiance (acquiescence, compromise, and buffering – that is, reducing the degree of external inspection and scrutiny). Whilst our theoretical framework is not rich enough to separately model these different potential organisational responses to external pressure, a central feature of our model is the related notion that it is costly for external agents – in our model, donors – to impose their preferred approach on an organisation, and that these costs are greater when internal actors have a stronger adherence to their own preferred approach (on this point, see also Greenwood and Hinings 1996).

2.2 Economic literature on mission-driven organisations

This paper brings together two literatures in the area of public organisation – the first concerned with the mission choice problem and the way in which disagreements over the mission play out within public organisations, and the second concerned with the problem of occupational choice within the charitable and non-profit sectors.

Our contribution to these literatures is twofold. We develop a model that addresses the problems of mission conflict and occupational choice within a unified framework, which few other contributions have attempted. Further, we provide a model in which donors can exert some limited influence over an NGO's mission (i.e., the mission is subject to moral hazard) – whereas earlier contributions tend to assume either that mission is contractible, or that the mission is neither observable nor contractible.

We start by considering the literature which addresses the mission choice problem. Rose-Ackerman (1982) and Aldashev and Verdier (2010) consider a model in which potential NGO entrepreneurs have differing mission preferences. Their choice is between entering and running their own preferred mission, and between staying out of the sector altogether. They find, depending on assumptions, that there is over- or under-entry of NGOs. However, in contrast to our model, the pool of potential NGO entrepreneurs is fixed and none of these potential entrants can become donors. Missions are chosen by NGOs and are not influenced by donors (though a lack of donor support may induce some NGOs to stay out of the market and hence their mission from arising).

The above-mentioned papers allow for donors' choices to influence NGO's entry decisions; other contributions allow for donors to influence the NGO's mission choice. In Rose-Ackerman (1987), NGOs choose their (perfectly observable) mission to maximise donations from a group of small (atomistic) donors with differing preferences. In equilibrium, the extent to which the NGO compromises on mission choice is dependent on the extent of unconditional support from a large donor (such as the government). Similarly Meyer (1995) considers a single NGO who must decide whether to accept an ideologically compromising grant, which may increase the NGO's visibility at the cost of its legitimacy with local people. In contrast to our contribution, in Meyer (1995) the mission is both observable and contractible..

Cassar (2013), again in a contractible mission setting, shows that, when a single donor chooses between NGOs, all of whom have different mission preferences from the donor, the donor can screen between those who are more or less willing to substitute between mission and money. Like us, Cassar finds that the donor may make the entrepreneur choose a mission which is not socially optimal in the sense of being too close to the donor's preferred mission. However, as in Meyer (1995) and Rose-Ackerman (1987), Cassar does not provide the micro-foundations for mismatch that we outline in this contribution.

Besley and Ghatak (2005) study matching between principals and agents in a contractible mission setting and show that mismatch (which they define as a stably matched principal-agent pair in which the two parties have different mission preferences) only occurs when there is an asymmetry in the type space – that is to say that many principals have one preferred mission, whereas few agents share it. Why such a correlation between preferences and roles might arise is not clear. By contrast, in our model, with endogenous choice of donor/entrepreneur roles, we show that such an asymmetry can indeed arise as an equilibrium phenomenon if differences in private sector earnings opportunities are correlated with mission preferences.

Besley and Ghatak (2014) also study principal-agent matching in an environment in which, as well as effort moral hazard, there is, firstly, a mission choice problem, where the 'mission' corresponds to a choice between 'purpose' and 'profit', and, secondly, a choice of organisational form, between a non-profit organisation, a for-profit organisation, and a social enterprise. Like Besley and Ghatak (2005), this paper predicts assortative matching between principals and agents based on pro-social motivation, conditional on a balanced type space for the pro-social types. That is to say, mismatch is only residual phenomenon.

The intermediate scenario that we develop (between donors being able to directly prescribe the mission via the contracting process, and donors being completely unable to influence the mission) by making an alternative observability assumption was first suggested by Scharf (2010) – namely that the NGO's choice of mission is unobservable, but that an imperfect signal of the mission is observable and contractible. This setup gives rise to a *mission moral hazard* problem, in which the donor can structure her contributions to induce a particular mission by satisfying a mission incentive compatibility constraint.[7]

[7]Besley & Ghatak (2005) and Cassar (2013) analyse an *effort* moral hazard problem in a setting where

Next we consider the relationship between our paper and those that study occupational choice in public organisations. Auriol and Brilon (2014) consider the choice between the private and charitable sector amongst agents who may actively wish to subvert or overturn an NGO's mission – for example, paedophiles who seek to work for a children's charity. We do not go as far as considering NGO entrepreneurs who actively wish to sabotage the donor's mission – but NGO entrepreneurs do need, in our model as well as in that of Auriol and Brilon, to be incentivised to do the 'right' thing from the donor's point of view.

Aldashev et al. (2014) look at occupational choice in a framework which breaks the link between donors' desires to give and the outcomes of funding to NGOs. Donors may still receive warm glow utility from giving, even when the expected outcomes from giving are poor. Those who run non-profits are heterogeneous in their desire to use funds for the public good as opposed to for their own benefit. There exists a 'bad' equilibrium in which the non-profit sector is primarily run by those who enter to divert donations for their private usage. Our paper does not go as far as these authors in breaking the link between the motivation for giving and the results achieved – indeed, all agents in our model rationally anticipate the way that their funds will be used to achieve a project with a particular mission, and this drives their occupational choice. Nevertheless, Aldashev et al. (2014) is one of the few papers that, like ours, examines the problem of occupational choice in a principal-agent model of charitable sector activity.

Bilodeau and Slivinski (1997) also consider both choice of mission and occupational choice, but with one constraint that we do not have here – the NGO entrepreneur always chooses his preferred mission. As compared with our own setting, mission is not only non-contractible, but donors have no means of influencing the entrepreneur's choice of mission. They show that, in general, NGOs will specialise and choose extreme missions, but they provide no definitive answers about who enters as a donor and who as an entrepreneur.

More broadly our paper also relates to the delegation literature. This literature (e.g. Prendergast 2007, 2008) – see also Vickers (1985) for a review of an earlier related literature – examines situations in which a principal might actively wish to hire an agent that does not share her own preferences, for example because of measurement problems, or because of the fact that citizens only challenge a bureaucrat's decisions when they incorrectly rule against them, not when they rule in their favour. We examine a different situation, in which participants in the model prefer, *ceteris paribus*, to be assortatively matched, but can nevertheless end up mismatched in equilibrium if there is a correlation between income-earnings capacity and preferences over the mission.

principals and agents both care about the mission that the organisation adopts, and the mission is assumed to be observable and contractible. Their setup gives rise to an agency problem that is not dissimilar to our own modelling of a mission moral hazard problem. This is especially true in the case of Cassar (2013), who also allows for differential strength of feeling about the mission that the NGO adopts.

3 Model & Results

Agents in the set $\mathcal{A}$, of size $2N$, have preferences over a private good and over charitable goods. Charitable goods are produced by NGOs, using both the labour of NGO entrepreneurs and the financial contributions of donors.

The good produced by any given NGO can either be of type or mission R, or of mission S. A mission is an action choice (choice of project) or choice of ethos (such as a religious or secular approach).[8]

There are N agents of mission preference R in $\mathcal{A}$ who have preferences over the private good p and over charitable goods to which they contribute, giving b_1 to mission R and giving b_2 to mission S:

$$U_R(p, b_1, b_2) = p + \mu v(b_1) + \mu(1 - \Delta^R)v(b_2)$$

where $1 > \Delta^R > 0$, $\mu > 1$ and $v(b) = b^a$ for some $a \in (0, 1)$.[9]

Similarly there are N agents of mission preference S who have preferences:

$$U_S(p, b_1, b_2) = p + \mu(1 - \Delta^S)v(b_1) + \mu v(b_2)$$

where $1 > \Delta^S > 0$ and as above $\mu > 1$ and $v(b) = b^a$. We assume that an agent's mission preference $\in \{R, S\}$ is common knowledge.

We use the terms charity and NGO interchangeably to denote a donative non-profit in the sense used by Hansmann (1980) – that is to say, an organisation with a non-distribution constraint whose activities are funded by donations rather than by sales to the end recipients of the goods and services that the organisation provides.[10]

Agents $\in \mathcal{A}$ have two ways to influence the mission choice of an NGO. The first is to run the charity itself, i.e. to become an NGO entrepreneur. The set of NGO entrepreneurs is denoted by $\mathcal{E}$. The second is to give to the NGO, in which case the donor (the set of donors is denoted by $\mathcal{D}$) can choose to induce the NGO entrepreneur to undertake the donor's preferred mission, by playing a mission influence game we set out below. Thus each agent $a \in \mathcal{A}$ chooses to be a donor $a \in \mathcal{D}$ or an entrepreneur $a \in \mathcal{E}$. No agent can split their time between being a donor and being an NGO entrepreneur, i.e. $\mathcal{D} \cap \mathcal{E} = \emptyset$. Let $|\mathcal{D}| = N_D$ and $|\mathcal{E}| = N_E$.

Both the donors to the NGO, and the "NGO entrepreneur", value the output of the NGO.

[8] Bilodeau and Slivinski (1997) note that non-profit firms can attempt to differentiate themselves by offering public goods that have particular characteristics. For example, communities often include several nonprofit organizations that provide a variety of in-kind assistance to the indigent, shelters for battered spouses or runaway teenagers, or support alternative kinds of medical research. Private post-secondary educational institutions in the U.S. differ considerably in the nature of the education they provide, and are partly funded through private contributions. The towns of London, Ontario and Sherbrooke, Quebec are each home to a number of youth hockey leagues, each of them offering different programs and each soliciting private contributions to aid their operations.

[9] We choose $v(b) = b^a$ as we require that $v(0) = 0$, $v'(b) > 0$, $v''(b) < 0$ and $v^3(b) > 0$.

[10] We are aware that a "charity" has a specific legal definition in many jurisdictions, for example in relation to tax liability. However, the specific legal status of a charity is not relevant to our model – all that is important is that the organisation's activities are funded by donors rather than by the direct beneficiaries of the organisation's activity.

Thus the charitable good is a public good.[11]

Agents who choose to become donors earn m_j in the private sector, where $j \in \{R, S\}$ is the donor's mission preference. He endogenously chooses to give d_j to charity. Those who choose to be NGO entrepreneurs have no private sector earnings and are dependent on donors to provide income which can be used for private consumption.

We assume that $m_S \geq m_R$ – that is, S types earn at least as much as R types. If $m_S = m_R$, mission preferences are uncorrelated with private sector earning capacity. If $m_S > m_R$, mission preferences are correlated with private sector earnings. We will later demonstrate the influence of this correlation on mission mismatch.

We assume that, in the set $\mathcal{A}$, only the donor and the entrepreneur involved in giving/production value the output of the NGO. However, as well as donors and NGO entrepreneurs, there exists a set of beneficiaries $\mathcal{B}$, where $\mathcal{A} \cap \mathcal{B} = \emptyset$ who also value the output of all the NGO. These agents play a passive role in our model; they derive utility from the charitable goods in a way we will specify, but provide neither funds nor labour to assist in its production. The utility function of a beneficiary is:

$$U_B(b_1, b_2) = \mu v(b_1) + \mu(1 - \Delta^B)v(b_2)$$

If $\Delta^B = 0$ beneficiaries are indifferent to the mission. If $\Delta^B > 0$ then they prefer mission R. We will assume $\Delta^B \geq 0$. We take the position that beneficiaries are either neutral about the mission – or they prefer the mission R, that is to say $\Delta^B > 0$. We come down on the side of R since beneficiaries are presumably less advantaged than agents in $\mathcal{A}$, and when $m_S > m_R$ the worst off agents in $\mathcal{A}$ prefer mission R.

Donor of mission preference j decide up-front on an allocation of funds d_j to be allocated for charitable giving. Once this allocation has been decided upon, the funds cannot be used for private consumption. Such up front contributions are common in aid agencies and amongst wealthy donors, who will often commit funds to their foundation to demonstrate their capacity to give to potential recipient organisations, or to benefit from favourable tax treatment.

The funds of the donor, and the labour of the entrepreneur are both necessary for the production of the charitable good: no unmatched agent can produce alone. Thus we assume that NGO entrepreneurs have no funds of their own that they can use to fund their NGO's project.

Once agents in $\mathcal{A}$ have chosen to be a donor or an entrepreneur, donors and entrepreneurs are matched in a one-to-one stable matching.[12] A matching is a pairing between donors and

[11] This is the case even though the good produced by the NGO could be private for the recipients of the charity – the fact that both entrepreneur and donor value the welfare of the homeless means that providing housing to the homeless is a public good

[12] In this paper we assume that a single donor is paired with a single NGO entrepreneur – that is, donors cannot donate to multiple charities, and entrepreneurs can only receive money from a single donor. This is a strong assumption – though there is substantial evidence that donors face capacity constraints, which prevent them from scaling up their activities even when new funding sources become available. Feeny and de Silva (2012) provide a typology of such constraints. These include physical and human capital constraints, policy and institutional constraints, macroeconomic constraints and social and cultural constraints. Both within and

entrepreneurs, in which every donor (entrepreneur) is either matched with an entrepreneur (donor), or goes unmatched. Recall that $\mathscr{D}$ is the set of donors, and $\mathscr{E}$ the set of entrepreneurs, endogenously determined at $t = 1$. At $t = 2$, If $f \in \mathscr{D}$ and $e \in \mathscr{E}$, a matching is a function

$$\eta : \mathscr{D} \cup \mathscr{E} \to \mathscr{D} \cup \mathscr{E}$$

such that:

1. $\eta(f) \in \{f\} \cup \mathscr{E}$
2. $\eta(e) \in \mathscr{D} \cup \{e\}$
3. $\eta(e) = f \iff \eta(f) = e$

If $\eta(k) = k$, then k is matched with herself (otherwise put, remains unmatched). The three conditions above thus say that f must be matched with herself or with an element of $\mathscr{E}$; e must be matched with himself or with an element of $\mathscr{D}$; and if e is matched with f, then f must be matched with e.

Following Roth & Sotomayor (1992) a matching is stable if there exists no donor and entrepreneur, who, whilst not matched with one another, could obtain higher payoffs if they were to be matched with each other (with at least one of these agents obtaining a strictly higher payoff). We assume that, if an agent is indifferent between two matchings, they choose the one that maximises the joint surplus produced by the match (i.e. they choose the match for which their partner receives higher utility).

The payoffs of the agents in a stable matching are determined as follows. Let $\Pi(j, i)$ and $\pi(j, i)$ be the utility of the donor and NGO entrepreneur respectively from the donations of donor of type j to an NGO entrepreneur of type i. These are defined by the mission contracting game that takes place between matched donors and entrepreneurs, set out below. Let z_{ji} be the equilibrium transfer of a donor of type j to an entrepreneur of type i. If a donor of mission preference j is matched with an entrepreneur of mission preference i, the donor receives $m_j - d_j + \Pi(j, i) - z_{ji}$ and the entrepreneur receives $\pi(j, i) + z_{ji}$.

Following Besley and Ghatak (2005; 2014), we assume that a person on the short side of the market gets the maximum amount of surplus from the match compatible with $z_{ji} > 0$ (that is to say, transfers can only be made from donors to entrepreneurs and not vice-versa). This pins down payoffs in a stable matching for all agents who are not unmatched for $N_D \neq N_E$. If $N_D = N_E$ we assume that a donor gets a share 1/2 of the surplus from the match, with the entrepreneur extracting the remaining surplus.

outside of development contexts, 'capacity building' is a commonly used term to indicate that NGOs may need investment in their management, strategy, human resource management and culture in order to be able to scale up their activities (including by accepting funds from multiple donors) and hence to achieve their maximum possible impact. The United Nations Development Program has a Capacity Development Group to support aid recipients to develop their leadership, institutions knowledge and accountability mechanisms (UNDP 2011).

As for unmatched agents in $\mathcal{A}$, an unmatched NGO entrepreneur has a payoff of zero. An unmatched donor has a payoff of $m_j - d_j$ where m_j is his income and d_j is the amount of funding he has pre-committed to charity.

The donor's contribution to the NGO d_j can be split into two parts: project funding b_j and mission influencing activities w_j. If donors and entrepreneurs do not share the same mission preference, the donor cannot directly specify the mission to be chosen in a contract – because, although the donor eventually observes the mission chosen (in the long run) the donor cannot observe the mission realisation on the time scale of the contract (in the short run). He can only influence the mission chosen by the NGO entrepreneur by offering a payment which is conditional on a signal received in the short run that indicates which mission the agent has chosen. Thus, following Scharf (2010), there is *mission moral hazard*.

The entrepreneur chooses either mission R or mission S for the entire project – he cannot use some of the funding for mission R and some for mission S. Let the signal of the mission be denoted by $\sigma \in \{0, 1\}$ and let $j \in \{R, S\}$ be the donor's preferred mission. Then the signal is high when the mission m is the donor's preferred mission with probability θ_1, and the signal is high when the mission chosen is the entrepreneur's mission with probability $\theta_0 < \theta_1$, i.e.:

$$\begin{aligned} Pr(\sigma = 1 | m = j) &= \theta_1 \\ Pr(\sigma = 1 | m \neq j) &= \theta_0 < \theta_1 \end{aligned}$$

We define a measure of signal strength Θ – the effectiveness with which the signal distinguishes between desirable and undesirable actions by the entrepreneur – as:[13]

$$\Theta = \frac{\theta_1 - \theta_0}{\theta_1}$$

Thus the expected mission-conditional payment received by the entrepreneur is $\theta_1 w_j$ if he chooses mission j and is $\theta_0 w_j$ otherwise. The budget constraint[14] of the donor must be

[13] We motivate our assumption regarding the observability of the entrepreneur's choice of mission by noting that there are many situations in which the full benefits of an NGO's activity are only observable in the long run. For example, in the short run a NGO entrepreneur can share data with a donor about how many people attend a clinic for an HIV test, but it takes longer to evaluate the effects of such an initiative on new HIV infections. The first may be an indicator of the second, but the second is what the donor really cares about. Alternatively, mentoring is a common approach to tackle delinquency amongst disaffected youth. In the short run, a donor to a mentoring programme may be able to observe how many mentor-mentee pairs have been formed and how often they have met, but it would take years to be able to compare the outcomes for mentees against comparable youths who were not mentored. Finally, an aid donor may want to promote trade and development, and may fund the construction of new roads in order to facilitate the exchange of goods. In the short run, the donor may be able to verify how many roads have been constructed. But to gauge the long term impact, the donor needs to know how well the roads are maintained, and what additional trade has taken place.

[14] We assume that the donor has access to actuarily fair insurance, and that when she offers the entrepreneur a contract involving a strictly positive conditional payment, she fully insures against the possibility of having to make this payment. Thus, the donor's budget constraint must be satisfied in expectation, but does not necessarily need to be satisfied *ex post*

respected:

$$\begin{array}{lrcl} \text{Entrepreneur chooses mission } j\text{:} & b_j + \theta_1 w_j & \leq & d_j \\ \text{Entrepreneur chooses mission } i \neq j\text{:} & b_j + \theta_0 w_j & \leq & d_j \end{array}$$

In summary, agents in $\mathcal{A}$ play a game with the following timing convention:

1. **Occupational Choice and donations decisions:** Agents in $\mathcal{A}$ make an irrevocable decision about whether to become a NGO entrepreneur, or a donor. Agents of preference type j that decide to be donors earn m_j in the private sector and set aside funds that can only be used for charitable giving, d_j. Agents that decide to be entrepreneurs earn nothing in the private sector.

2. **Stable Matching:** The set of donors $\mathcal{D}$ and NGO entrepreneurs $\mathcal{E}$ are matched in a stable matching (Roth and Sotomayor, 1992). A donor makes an unconditional transfer $z \geq 0$ to the entrepreneur with whom they are matched.

3. **Donor-entrepreneur interaction:**

   i **Contracting:** When a donor is matched to an entrepreneur, the donor offers (b, w) to the NGO entrepreneur, where b is project size and w is a mission-conditional payment.

   ii **Mission choice and production:** Given the offer of (b, w) the entrepreneur chooses the mission, receives project funding b, and produces.

   iii **Signal-conditional payment:** Given the realisation of the signal, the donor pays out the relevant mission-conditional payment w.

   iv **Donor experiences mission utility:** The donor observes the realisation of the mission and experiences the utility of having contributed to such a good.

We suppose that the discount factor is 1 and we seek a subgame perfect Nash equilibrium of the above game (noting, however, that strictly speaking the second stage does not correspond to a game solvable by Nash equilibrium, but to a stability concept). Otherwise put, we solve for a Nash equilibrium of the first (entry) stage above, where the payoffs are determined by the expected payoffs in a stable matching.

The sections that follow are structured to solve the game set out above by backwards induction. In Section 3.1, we study the game that takes place at $t = 3$, once a donor and entrepreneur have been matched. Determining the payoffs from those steps allows us to determine the stable matchings at $t = 2$, which we undertake in Section 3.2. Finally, we determine the $t = 1$ entry decisions of all agents in $\mathcal{A}$, which yields us the SPNE, in Section 3.3.

3.1 Contracting in a fixed donor-entrepreneur pair

In this section, we study the interaction between a paired donor and entrepreneur that takes place at $t = 3$. We take d_j as fixed (recall this is determined at $t = 1$) – in Section 3.3

we solve for its value.

3.1.1 Mismatched pair

Suppose that a donor, without loss of generality, of mission preference S, is matched with a donor of mission preference R. Suppose that the S donor wishes the R donor to choose mission S, offering a contract (b_S, w_S). Then, the *mission incentive compatibility constraint* of the entrepreneur must be respected:

$$\begin{array}{rcl} \mu(1-\Delta^R)v(b_S) + \theta_1 w_S & \geq & \mu v(b_S) + \theta_0 w_S \\ \theta_1 w_S & \geq & \frac{\mu \Delta^R}{\Theta} v(b_S) \end{array} \tag{1}$$

In the first line of the above, each side of the equation on the top line consists of the mission-dependent utility from the project of size b_S, plus the expected mission-conditional payment that the entrepreneur receives. The left hand side gives the payoff under mission S, the right hand side the payoff under mission R. The donor's budget constraint implies:

$$b_S + \theta_1 w_S \leq d_S$$

Combining this with the mission incentive compatibility constraint (1), we obtain that the maximum project size b_S compatible with mission S being chosen is implicitly defined by:

$$b_S + \frac{\mu \Delta^R}{\Theta} v(b_S) = d_S$$

We thus obtain that $b_S = g^{-1}(d_S)$ where $g(b) = b + \frac{\mu \Delta^R}{\Theta} v(b)$. Let the utility of a donor of type j matched with an entrepreneur of type i implementing mission m be $\Pi(j, i, m)$. Similarly let the utility of an entrepreneur of type i matched with an entrepreneur of type j when the mission m is chosen be $\pi(j, i, m)$. Given the donor's choice of b_S, the utility of the donor and the entrepreneur under mission S are given by:

$$\begin{array}{rcl} m_S - d_S + \Pi(S, R, m = S) & \equiv & m_S - d_S + \mu v(g^{-1}(d_S)) \\ \pi(S, R, m = S) & = & \left(\mu(1-\Delta^R) + \frac{\mu \Delta^R}{\Theta}\right) v(g^{-1}(d_S)) \end{array} \tag{2}$$

Alternatively, the donor can choose not to implement his preferred mission, and to allow the entrepreneur to implement his preferred mission. In this case, there is no mission-conditional payment, and the payoffs of the donor and entrepreneur respectively are:

$$\begin{array}{lcl} m_S - d_S + \Pi(S, R, m = R) & \equiv & m_S - d_S + \mu(1-\Delta^S)v(d_S) \\ \pi(S, R, m = R) & \equiv & \mu v(d_S) \end{array} \tag{3}$$

Now the donor chooses between enforcing mission S and choosing mission R. We denote the payoffs when the donor chooses the mission as follows at stage 3 (iv) as follows:

$$\begin{aligned} \Pi(S,R) &= \max_m \Pi(S,R,m) \\ \pi(S,R) &= \pi(S,R,\arg\max_m \Pi(S,R,m)) \end{aligned}$$

Considering the donor's mission choice decision, we obtain the following Lemma.

Lemma 9 *Fix a donor's contribution to an NGO at $d = d_S$. Then the entrepreneur always prefers that the donor chooses mission R.*

The donor chooses mission S if and only if:

$$d_S \geq d_S^* \tag{4}$$

Mission S maximises joint donor-entrepreneur surplus if and only if:

$$d_S \geq d_S^{**} \tag{5}$$

with $d_S^{**} > d_S^*$ Thus, on the interval (d_S^*, d_S^{**}), the donor enforces mission S when mission R would maximise joint surplus.

Consider a beneficiary $\in \mathcal{B}$ who cares only about project size. Then the beneficiary strictly prefers that the donor allows the NGO entrepreneur to choose mission R.

Lemma 9 says that, over some range of d_S, the donor sometimes chooses a mission that is good for him but bad for joint donor-entrepreneur surplus. This effect arises because the donor does not take into account the effect the mission choice has on the entrepreneur's payoff – beyond, of course, the necessity of satisfying the entrepreneur's mission incentive compatibility constraint.

Lemma 9 provides partial support for the Busan Declaration's ideal of placing the mission decision in the hands of the NGO entrepreneur. When $d_S \in (d_S^*, d_S^{**})$, the donor does not choose the joint surplus maximising mission, and joint welfare would be higher if the NGO entrepreneur chose the mission.[15] If, instead, we consider uniquely the interest of the beneficiaries $\mathcal{B}$, then the entrepreneur should always choose the mission because they priortise the highest project size b and mission R. However, given that this lemma relies on an exogenous choice of d_S, we should be careful in its application. Later we will see that the conclusions of this lemma can be overturned for endogenous d_S and occupational choice.

3.1.2 Assortatively matched pair

Suppose that donor and entrepreneur share the same mission preference j. Then there is no need for a mission-conditional payment to enforce the donor's preferred mission. Hence the donor sets $b_j = d_j$ and the payoff of the donor $\Pi(j,j)$ and entrepreneur $\pi(j,j)$ respectively,

[15] Above d_S^{**}, however, the NGO entrepreneur would choose mission R when mission S should have been chosen.

at $t = 3(iv)$ are:

$$\begin{aligned} m_j - d_j + \Pi(j,j) &\equiv m_j - d_j + \mu v(d_j) \\ \pi(j,j) &= \mu v(d_j) \end{aligned}$$

3.2 Stable matchings

In this section, we characterise the set of stable matchings at $t = 2$, given the entry decisions of agents in $\mathcal{A}$ at $t = 1$. That is to say, we take the set of donors $\mathcal{D}$ and entrepreneurs $\mathcal{E}$ as fixed. Then, in Section 3.3, we will explore which agents in $\mathcal{A}$ choose to be donors and which choose to be entrepreneurs, given that they anticipate that at $t = 2$ they will be matched in a stable matching.

Let N_D^R be the number of R agents who have chosen to be donors, and let N_E^R be the number of R agents who have chosen to be entrepreneurs, with $N_D^R + N_E^R = N$. Similarly, let N_D^S be the number of S agents who have chosen to be donors, and N_E^S to be the set of S agents who have been chosen to be entrepreneurs, with $N_D^S + N_E^S = N$.

Let $m(e)$ be the preferred mission of entrepreneur e, $m(f)$ be the preferred mission of donor f and $z(f,e)$ be the transfer of donor f to entrepreneur e. Recall from section 3 that a matching is stable if there no two matched donor- entrepreneur pairs (f_1, e_1) and (f_2, e_2) such that $\eta(f_i) = e_i$ and $\eta(e_i) = f_i$ $\forall i = 1, 2$ and both:

$$\begin{aligned} \Pi(m(f_1),(m(e_2)) - z(f_1,e_2) &\geq \Pi(m(f_1),(m(e_1)) - z(f_1,e_1) \\ \pi(m(f_1),(m(e_2)) + z(f_1,e_2) &\geq \pi(m(f_2),(m(e_2)) + z(f_2,e_2) \end{aligned} \tag{6}$$

with at least one inequality strict. If two such donor-entrepreneurs exist, then donor f_1 and entrepreneur e_2 would want to break their existing pairing to match with each other, so the matching would not be stable.

In the following Lemma, we characterise the possible payoffs of each type of agent in a stable matching. That is to say, we characterise the payoffs where each possible element of $\mathcal{D}$ is matched with each possible element $\mathcal{E}$. In a stable matching, which we characterise in a later proposition, only a subset of these possible matches will occur.

The concept of a stable matching at $t = 2$ will has different implications for payoffs depending on whether donors are on the short side of the market $N_D < N_E$ or the long side $N_D > N_E$, as transfers z are only possible from donors to entrepreneurs. If donors are on the long side of the market, then entrepreneurs will be able to extract all the surplus from a prospective donor match at the matching stage, by demanding a transfer z from a prospective donor match that is equal to the donor's payoff Π from the match. By contrast, when donors are on the short side of the market, the fact that entrepreneurs have no private sector earnings implies that donors cannot, at $t = 2$ extract the entire surplus from a donor-entrepreneur match in the same manner. The following Lemma summarises this basic situation.

Lemma 10 *The payoffs in a stable matching equilibrium can be characterised as follows:*

- *Let $N_D > N_E$ (donors are on the long side of the market). Then $z(j,i)$ is such that a* *donor with mission preference j will always have payoff $m_j - d_j$ regardless of whom she is matched with. An entrepreneur of type i, matched with a donor of type j will have a payoff of $\pi(j,i) + \Pi(j,i)$.*

- *Let $N_D < N_E$ (donors are on the short side of the market). Then $z(j,i)$ is such that an unmatched entrepreneur receives a payoff of zero; an entrepreneur of type i matched with an donor of type j receives a payoff of $\pi(j,i)$; and a donor of type j matched with an entrepreneur of type i receives a payoff of $m_j - d_j + \Pi(j,i)$.*

We are now in a position to characterise the set of possible stable matchings that can arise for a given configuration of the occupational choice entry game:

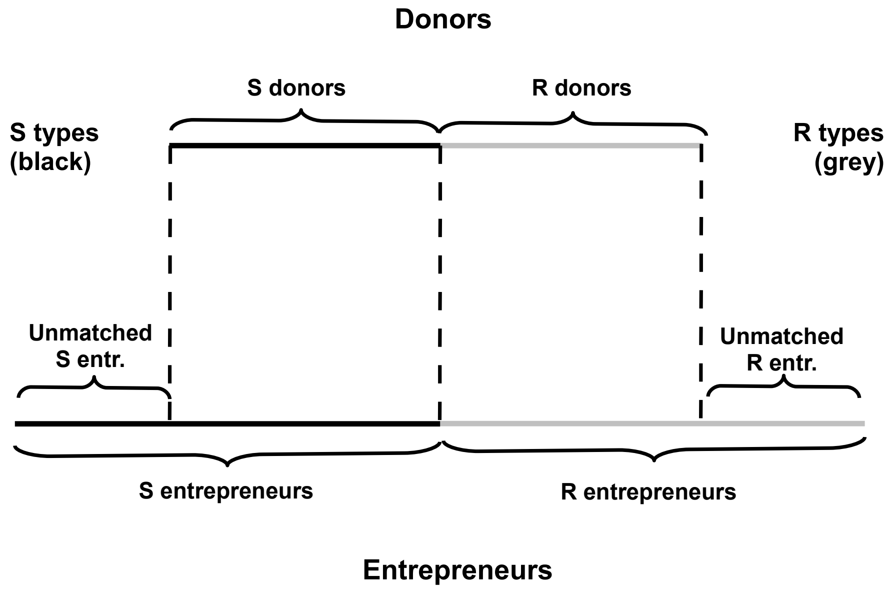
Lemma 11 *A stable matching falls into one of the four following categories depending on $N_E^R, N_D^R, N_E^S, N_D^S$:*

1. ***More entrepreneurs than donors*** $N_E \geq N_D$
   - *(a)* **No mission mismatch; see Figure 1**
     If $N_E^i \geq N_D^i$, $\forall i \in \{R, S\}$, then all donors are matched with an entrepreneur sharing their mission preference. Any remaining entrepreneurs go unmatched.
   - *(b)* ***Mission Mismatch; see Figure 2*** *If there are not enough entrepreneurs for all donors of type i to be matched with entrepreneurs of type i (wlog assume $N_E^S < N_D^S$), then all S entrepreneurs are matched with S donors; all remaining S donors are matched with R entrepreneurs; and all R donors are matched with R entrepreneurs. Any remaining entrepreneurs, all of type R, go unmatched.*

2. ***More donors than entrepreneurs*** $N_D \geq N_E$
   - *(a)* ***No mission mismatch; see Figure 3*** $N_D^i \geq N_E^i$, $\forall i \in \{R, S\}$ *Then all entrepreneurs of type i are matched with donors of type i and any remaining donors go unmatched*
   - *(b)* ***Mission Mismatch; see Figure 4*** *Suppose wlog $N_D^S < N_E^S$. Then all S donors are matched with S entrepreneurs and the remaining S entrepreneurs are matched with R donors. All R entrepreneurs are matched with R donors and the remaining donors, all of type R, go unmatched.*

The intuition for Lemma 11 is straightforward. Consider first the case when $N_E > N_D$ and $N_E^i > N_D^i$ for both $i \in \{R, S\}$, as in case 1(a). Since each donor prefers being matched with an entrepreneur of his preferred mission to being matched with an entrepreneur of a different mission preference, and each entrepreneur prefers to be matched than to go unmatched, the only stable matching involves assortative matching. A similar argument can be made for $N_D > N_E$ and $N_D^i > N_E^i$ for both $i \in \{R, S\}$, ie, for case 2(a). Now consider a case where $N_E > N_D$ and suppose that that $N_D^S > N_E^S$, as in case 1(b). Then there are not enough

Figure 1: $N_E > N_D$ with no mission mismatch



Donors are matched with the entrepreneurs vertically beneath them

S entrepreneurs to be matched with S donors. As S donors are better of being matched with an entrepreneur sharing their mission preferences, we can show that this means that all S entrepreneurs are matched with S donors – that is to say, no S donor is matched with an R entrepreneur whilst an S entrepreneur goes unmatched. This means that mismatch is a residual phenomenon – only after the supply of S entrepreneurs has been used up are S donors matched with R entrepreneurs. A similar argument can be made for $N_D > N_E$ with $N_D^S < N_E^S$, ie, for case 2(b).

3.3 Entry Equilibria

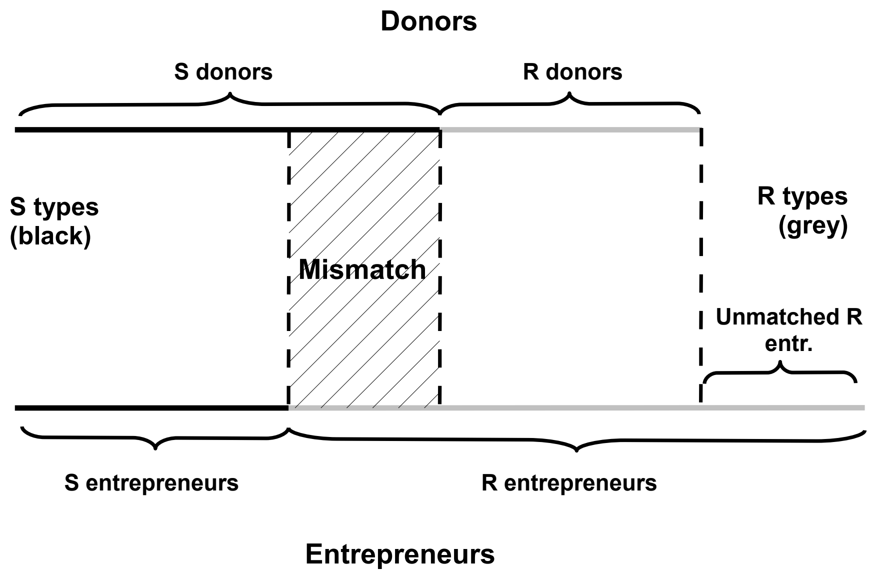
In this section, given our knowledge of stable matchings and their payoffs from Sections 3.1 and 3.2, we now solve for this first step of the game, when agents in $\mathcal{A}$ choose to be either donors or entrepreneurs, and in which those who decide to be donors choose how much to commit to charitable giving.

We begin by noting an important feature of the entry equilibrium where the number of donors endogenously exceeds the number of entrepreneurs.

Lemma 12 *The only equilibrium with $N_D > N_E$ involves $N_E^R = N_E^S = 0$ and $d_R = d_S = 0$. This equilibrium always exists.*

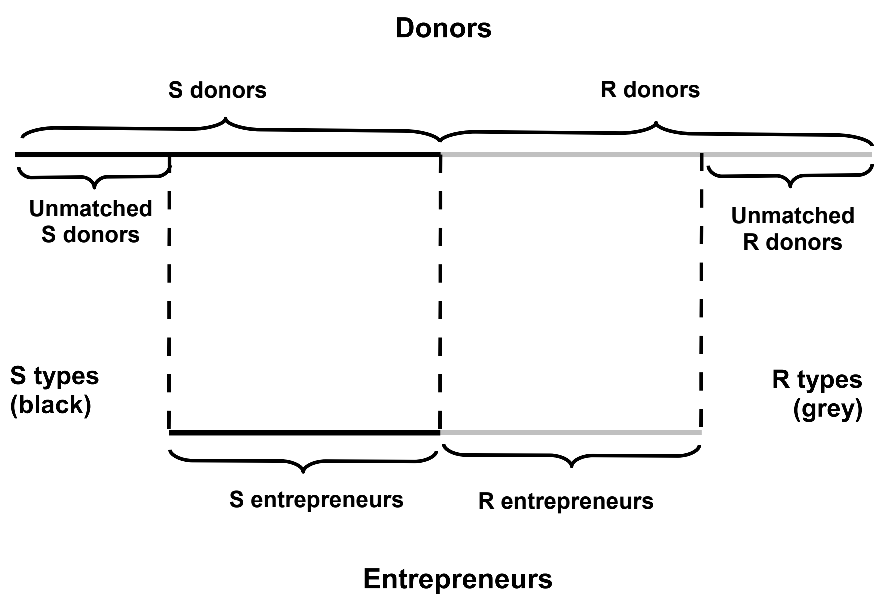
Proof of Lemma 12. Suppose that $N_D > N_E$. Then the payoff of every donor of type j in a matching equilibrium is $m_j - d_j$. At $t = 1$, given this payoff in a stable matching

Figure 2: $N_E > N_D$ with mission mismatch



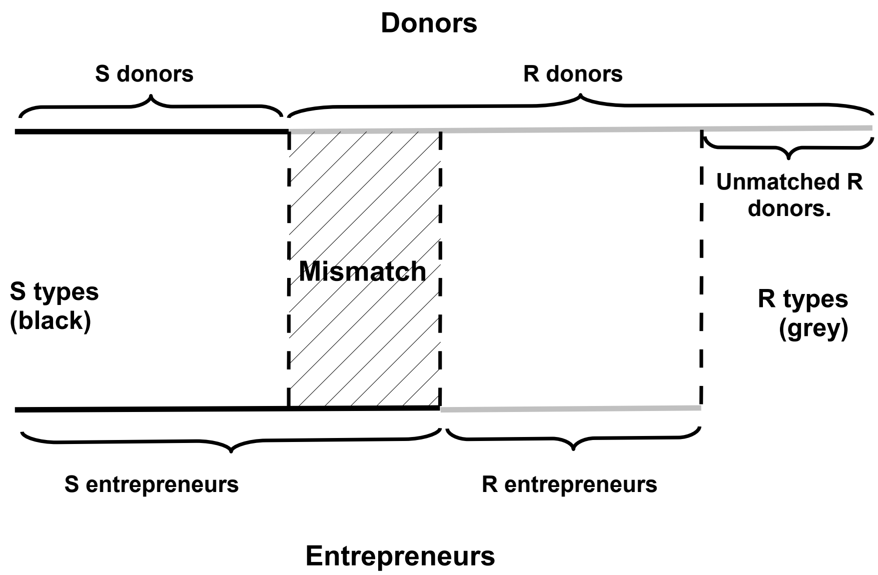
Donors are matched with the entrepreneurs vertically beneath them

Figure 3: $N_D > N_E$ with no mission mismatch



Donors are matched with the entrepreneurs vertically beneath them

Figure 4: $N_D > N_E$ with mission mismatch



Donors are matched with the entrepreneurs vertically beneath them

equilibrium, the donor chooses how much to commit to giving to charity, that is to say, he chooses d_j to maximise $m_j - d_j$. Thus he chooses $d_j = 0$. Given this the payoff of any type that enters as an entrepreneur is 0. Thus all types enter as donors, with the payoff of type j being m_j. $\square$

The intuition behind Lemma 12 is simple. When donors are on the long side of the market they are pushed down to their utility they would have when they have found

no entrepreneur to give to. Thus in equilibrium they never experience any of the surplus from their gift, and given this, they should never commit any funds to charitable giving.[16]

Having characterised the set of equilibria with $N_D > N_E$, we turn our attention to entry equilibria with $N_E \geq N_D$. We first rule out entry equilibria which give rise to more entrepreneurs than donors in which there is assortative matching.

[16] Lemma 12 seems to be dependent on our assumption that donors commit funds to be used only for charitable giving before the matching takes place. In fact, this is not the case. donation decisions after being matched with an entrepreneur. In this case, there is only an equilibrium with $N_D > N_E$ for a set of (m_i, m_j) of measure zero in $\mathcal{R}^2$ – specifically, the following would be necessary. Without loss of generality let k be the preferred mission of the entrepreneur who is always assortatively matched (see Lemma 11 to verify that there is alway such an entrepreneur).

$$m_k = 2\mu v(v'^{-1}(1/\mu)) - v'^{-1}(1/\mu) \tag{7}$$

The left hand side is the payoff of the donor, given that he can never do worse than to give nothing up front. The right hand side is $\mu v(v'^{-1}(1/\mu)) + z$ where z is the maximum transfer that the donor can make to the entrepreneur whilst guaranteeing himself a payoff of z. To have a k type on both sides of the market, equation (7) is necessary. But this corresponds to a particular value of m_k.

Lemma 13 *Suppose that $m_S > v'^{-1}(1/\mu)$; ie, donors have strictly positive private consumption. Then there is no entry equilibrium with $N_E \geq N_D$ characterised by assortative matching.*

The intuition for Lemma 13 is as follows. When donors and entrepreneurs are assortatively matched, the entrepreneur receives no mission-conditional payment. Thus an entrepreneur who is matched with a donor in equilibrium receives only utility from the production of the charitable good with his preferred mission, $\mu v(d_j)$ where d_j is the total donated by the donor for the production of a charitable good. The donor also receives this utility, but also benefits from his leftover income as private consumption $m_j - d_j$. To show that all j types are strictly better off as donors – so there is no entry equilibrium with j types on both sides of the market –it suffices to show that private consumption is strictly positive, i.e. that $m_j > d_j = v'^{-1}(1/\mu)$.

Having set out the unique equilibrium with $N_D > N_E$, and having shown that assortative matching equilibrium with $N_E \geq N_D$ cannot arise, we now turn to characterising the conditions under which a mismatch equilibrium with $N_E > N_D$ can arise.

Proposition 1 *Let $m_R = m_S = m$. Then there is no equilibrium with $N_E > N_D$ involving mismatch.*

When R types and S only differ in their mission preferences and in no other aspect that there is no force that could sustain the system in a state of mission mismatch. The proof for Proposition 1 works as follows. Suppose that such an equilibrium exists, and consider Figure 2. As S donors are not matched with S entrepreneurs with probability 1, they give less than R donors, who are matched with R entrepreneurs with probability 1. But then an R type would always better off as a donor, since he can earn $m_R - d_R + \mu v(d_R)$ as a donor, and less than $\mu v(d_R)$ as an entrepreneur. Hence there are no R entrepreneurs – a contradiction.

In the next proposition, we prove that such equilibria exist when, apart from differing mission preferences, types R and S differ in terms of income. We provide a set of sufficient conditions for a mission mismatch equilibrium to exist. Although we prove existence, we do not have uniqueness: for example, it is possible that there is an equilibrium in which donations from S donors are high, the degree of mismatch is low and the mission chosen by the S donor when mismatched is mission S – and that there also exists an equilibrium with lower donations from S donors, a higher degree of mismatch and where the mission chosen by the S donor when mismatched is either mission R or S.

Proposition 2 *Let the difference in private sector earnings abilities between S and R types be sufficiently high in the sense that they obey the conditions:*

$$m_S > v'^{-1}\left(\frac{1}{\mu}\right) > g^{-1}\left(v'^{-1}\left(\frac{1}{\mu(1-\Delta^S)}\right)\right) > m_R \tag{8}$$

Then there exists some l and $\hat{\Delta}^S$ such that for $m_S - v'^{-1}(1/\mu) < l$ and $\Delta^S \geq \hat{\Delta}^S$ there exists an entry equilibrium with mismatch, that is to say, the equilibrium involves a matching as in part 1(b) of Lemma 11, ie, as follows:

- $N_D < N_E$ – *entrepreneurs are on the long side of the market.*

  certain proportion.

- $N_D^S > N_E^S$ – *there are more* S *donors than* S*entrepreneurs, so that some* S *donors must be matched with* R *entrepreneurs.*

The condition $m_S - v'^{-1}(\frac{1}{\mu}) < l$ is not a necessary condition for the existence of a mismatch equilibrium, but it is necessary for an equilibrium with some S entrepreneurs to exist. If not, then S donors' private consumption is so large that all S types prefer to be donors. Neither is the assumption that $\Delta^S \geq \hat{\Delta^S}$ necessary for our result, though it comes in useful as a sufficient condition for existence.

What is crucial for existence of a mismatch equilibrium – given the result of Proposition 1 – is that income is correlated with preferences, ie $m_S > m_R$. In the Proof of Proposition 1, we note that the conditions $v'^{-1}(1/\mu) > m_S$ and $g^{-1}\left(v'^{-1}\left(\frac{1}{\mu(1-\Delta^S)}\right)\right) > m_R$ imply that $d_S > d_R$. In other words, it is inequality in donations which holds together this mismatch equilibrium. R entrepreneurs, who face the risk of being mismatched or unmatched, must be content with their lot and not be tempted to change their entry decision at $t = 1$ to become a donor. If they were to do this, they would get their preferred mission with probability 1. What makes it worthwhile for them to stay as entrepreneurs and tolerate the probability of mission mismatch? R entrepreneurs are actually better off matched with an S donor than they would be with an R donor in this equilibrium: they don't get their preferred mission but they do get a much larger donation than they would from someone who share their preferences and private sector income-earning opportunities. To take the example used in the introduction, Mother Teresa (an R entrepreneur) must have found the donations she receives from rich benefactors sufficiently appealing, even taking into account any cost she may have faced as a result of mission tensions,[17] to prevent her from wishing to earn money in the private sector and donate it to a cause sharing perfectly her values.

Secondly, S donors, who face the risk of being matched with an R entrepreneur, must not have been tempted to make a different entry decision at $t = 1$ and decide to obtain an S mission with probability one by becoming an S entrepreneur (who would always obtain their preferred mission). What prevents them doing this? S types who enter as entrepreneurs have to give up a payoff from private consumption of $m_S - d_S$ that they could get if they earned in the private sector. Going back to the Mother Teresa example, those who gave to her charity must have been content in their role of donors, and were not tempted to pack in their job in the private sector which allowed them both to contribute to Mother Teresa, and to have a comfortable life. Becoming a NGO entrepreneur would have allowed them to do things in line with their preferences – for example, using a more medicalised approach to end-of-life care – but would have involved a substantial sacrifice in terms of lifestyle.

[17] There is little evidence to suggest that donors with different preferences had much mission influence on her practices. In our model, this lack of donor influence over the mission in mission-mismatched donor-entrepreneur pairs is equivalent to donors allowing entrepreneurs to choose their preferred mission R.

3.4 The Busan Declaration

The Busan Declaration is a voluntary compact that donors can sign, to illustrate, amongst other things, their commitment to allow NGO entrepreneurs to choose their preferred mission, and to provide financing to realise this mission. It does not take the form of a binding agreement or international treaty. It is not signed, and does not give rise to legal obligations. Rather, it is a statement of consensus that a wide range of governments and organisations have expressed their support for, offering a framework for continued dialogue and efforts to enhance the effectiveness of development cooperation.[18]

As is the case for many international accords, one might imagine that the Busan Declaration have more effect if it were enforceable – that is to say, if donors were compelled to put the choice of the mission in the hands of NGO entrepreneurs. Given the result of Lemma 9 – which says that, fixing the donation d_S, the donor sometimes inefficiently enforces his preferred mission on the entrepreneur – it would seem that this declaration might sometimes achieve more when it is enforced. However, we cannot conclude this from Lemma 9 – we need to check this given donation levels and entry decisions are endogenous.

In this section, we examine the Busan Declaration in the full model set out in section 3, including endogenous donation decisions and entry choices – and find, under some circumstances – our earlier, tentative conclusion, is not justified. If the conditions of Proposition 2 hold – and particularly the assumption $\Delta^S \geq \hat{\Delta}^S$ (that S donors care more than a minimum amount for mission S over mission R), then the Busan Declaration should never be enforced – if we take the point of view of the welfare of agents in $\mathcal{A}$. Unfortunately, we cannot reach a conclusion if we also take into account the welfare of the set of beneficiaries $\mathcal{B}$.

Given that the model we have been studying has multiple equilibria, one might imagine that little can be said about the effects of the Busan Declaration on welfare. We are able to tackle this question for two reasons. One is that it turns out the welfare of the agents in $\mathcal{A}$ can be written in a very simple form that depends on donations only. This expression implies that the equilibrium with the highest donations from S types is the equilibrium giving rise to the highest possible welfare of agents in $\mathcal{A}$, regardless of the mission chosen when agents are mismatched (which is logical given than a higher degree of mission mismatch always leads to lower donations). The second reason is that one can show that, for $\Delta^S > \hat{\Delta}^S$, imposing mission R on S donors either creates a mismatch equilibrium with lower donations, or destroys the mismatch equilibrium and pushes the equilibrium to the inefficient, no donations equilibrium described in Lemma 12.

We now introduce the following notation. Let $\mathcal{M}(\mathcal{A})$ be the maximum possible welfare of the agents in $\mathcal{A}$, taken over all the possible equilibria of the entry game. Let $\mathcal{M}_B(\mathcal{A})$ be the maximum possible welfare of the agents in $\mathcal{A}$, taken over all the possible equilibria of the entry game when the Busan declaration is enforced (that is to say, mission conditional payments are banned and so entrepreneurs always choose mission R).

[18] (OECD, 2011): http://www.oecd.org/development/effectiveness/49732200.pdf

Proposition 3 *Suppose that the conditions of proposition 2 hold. Then: $\mathcal{M}_B(\mathcal{A}) \leq \mathcal{M}(\mathcal{A})$ – the maximum possible welfare of agents in $\mathcal{A}$ falls with the implementation of Busan. Then the effects on the welfare of agents on $\mathcal{B}$ cannot be determined.*

To understand this proposition, note that the Busan Declaration has the following potential effects on agents in $\mathcal{A}$:

- The marginal return on giving is lowered, hence S donors give less.
- This reduces the payoffs of all S types, but donors by more since entrepreneurs never face mission mismatch. As a result the number of S donors goes down.
- The effect on R types is uncertain; there are fewer S donors who could be matched with R entrepreneurs. If an R type is an entrepreneur matched with an S donor, then the R type's payoff could be higher or lower than in the equilibrium giving rise to welfare $\mathcal{M}(\mathcal{A})$, depending on how the smaller project size weighs against the fact that R type will have his preferred mission. If overall these effects bring about an increase in an R entrepreneur's expected payoff, then the number of R donors will go down. Thus fewer R types create wealth m_R that can be used to fund R entrepreneurs. (Given that the equilibria involves $N_E > N_D$, we would like more R entrepreneurs to become donors who create income that can be transformed into charitable goods, and thus also reducing the number of unmatched R entrepreneurs).

The proposition shows that, under the assumptions in the previous proposition that allowed us to construct a mismatch equilibrium, the above effects combine so that the welfare of agents in $\mathcal{A}$ goes down when the Busan Declaration is enforced. We note that this result rests on $\Delta^S \geq \hat{\Delta}^S$. Although we cannot prove existence of a mismatch equilibrium when $\Delta^S < \hat{\Delta}^S$, we note that, intuitively, as $\Delta^S \to 0$, the cost of implementing the Busan Declaration to the S types goes to zero.

Likewise for agents in $\mathcal{B}$, supposing that they are neutral about the mission, i.e. $\Delta^B = 0$, we have the following effects.

- On the positive side, less of the funding committed is wasted on mission-influencing activities and more reaches the beneficiaries in the form of project funding.
- On the negative side, less funding is given by S donors and there are fewer of them than when donors had free choice over mission-influencing activities
- There may be more or less funding from R donors, depending on the effect that the Busan Declaration has from R types.

When $\Delta^B > 0$ there is an additional positive effect on beneficiaries, who now always get their preferred mission.

We are unable to resolve the combination of these effects on beneficiaries $\mathcal{B}$. Whilst we cannot be sure that their welfare goes down with the enforcement of Busan, we hardly have a compelling case to implement it.

4 Discussion and Conclusion

This paper has used the Busan Declaration as a springboard to asking a question of broad relevance to many contexts involving the donor funding of NGO activity – namely, should donors, as the Busan Declaration suggests, limit their activity to providing funding, and allow recipients to decide on the uses to which these funds are put? Or are there circumstances under which it is socially desirable for donors to seek to shape the type of mission that is undertaken by recipient organisations?

We answer these questions by embedding a model of donor-entrepreneur interactions in a matching market of occupational choice, in which agents decide whether to enter the private sector or the charitable sector, private sector entrants decide how much to give, and donors and entrepreneurs are paired endogenously in a stable matching equilibrium.

Using this model, we first answer a question implicitly posed by the economic literature on the mission choice problem: namely, why should we expect mission conflict to arise in the first place, when agents can match assortatively and entry into the donor and entrepreneur roles (or, in other models, to the manager and worker roles) is endogenous? We show that, when occupational choice and donor-entrepreneur matchings are endogenous, mission conflict can arise in the charitable sector when additionally mission preferences are correlated with income-earning ability in the private sector. In such a world, rich philanthropists may have difficulty finding NGO entrepreneurs who share their preferences, and NGO entrepreneurs may be willing to compromise on the mission in order to access the larger donation budgets that come from being paired with a rich philanthropist. These two factors combine to create a charitable sector with a systematic tendency towards donor-entrepreneur pairings that involve disagreement over the mission. In this way, we offer an insight into how rich philanthropists can exert a decisive influence over the charitable sector, but we also suggest that this influence may come at the cost of a charitable sector riven with mission conflict.

In this richer setting, we consider a possible policy response to the tendency of donors to inefficiently enforce their mission – direct enforcement of the Busan Declaration. We find that directly prescribing that charities must implement the entrepreneur's preferred mission risks reducing the welfare of donors and entrepreneurs, because when richer donors care sufficiently about the mission, making them adopt NGO entrepreneurs' mission pushes them to donate less, and to strive to influence the mix of charitable goods provided by becoming NGO entrepreneurs themselves.

These nuanced conclusions allow for a reflection on the quotes provided at the start of this paper. Our model of the market for charitable donations suggests that Hillary Clinton was – in the limited sense which we describe in section 3.1 – right to criticise the tendency of donors to impose their own preferences on the organisations that they donate to – but it also suggests that the power of donors to choose whom they give to, and whether or not to give in the first place – their capacity to call the whole thing off, in the words of our title – limits the scope for policy to rectify the problem of inefficient donor enforcement of their own preferred mission. Secondly, the quotation from Smillie (1995) highlights the tensions between donors and recipients, and alleges that the question boils down to one of justice – justice, presumably for the beneficiary group. This is in line with our result that if the Busan Declaration can be justified for Δ^S over some threshold, it must be beneficiaries that tip the balance, since welfare of the group of donors and entrepreneurs must go down. However, we must be more tentative than Smillie, as we cannot prove that enforcing the Busan Declaration would in fact makes this group any better off.

5 Appendix: Proofs

Proof of Lemma 9

The limit d_S^* can be chosen by comparing (2) and (5). The S mission is better for the donor if and only if:

$$\begin{aligned} v(g^{-1}(d_S)) &\geq (1-\Delta^S)v(d_S) \\ \iff \quad g^{-1}(d_S) &\geq (1-\Delta^S)^{1/a} d_S \end{aligned} \tag{9}$$

Note that g is increasing and concave:

$$\begin{aligned} g(b) &= b + \tfrac{\mu\Delta^R}{\Theta} v(b) \\ g'(b) &= 1 + \tfrac{\mu\Delta^R}{\Theta} v''(b) \\ g''(b) &= \tfrac{\mu\Delta^R}{\Theta} v''(b) \end{aligned} \tag{10}$$

Since $g^{-1}(d)$ is an increasing and convex function of d with slope that tends to 1 as d_S tends to infinity, there exists d_S^* such that the RHS = LHS of (9). For all $d_S \geq d_S^*$ the LHS> RHS and hence the S mission is preferred.

Now we compare joint donor-entrepreneur surplus. Surplus is higher under mission S if and only if:

$$\begin{aligned} v(g^{-1}(d_S)) - (1-\Delta^S)v(d_S) &\geq v(d_S) - \left((1-\Delta^R) + \tfrac{\Delta^R}{\Theta}\right) v(g^{-1}(b)) \\ \iff g^{-1}(d_S) &\geq \left(\frac{2-\Delta^S}{2-\Delta^R+\frac{\Delta^R}{\Theta}}\right)^{1/a} d_S \end{aligned} \tag{11}$$

Since for all $\Delta^R, \Delta^S \in (0,1)$, $\frac{2-\Delta^S}{2-\Delta^R+\frac{\Delta^R}{\Theta}} > 1-\Delta^S$ the threshold d_S^{**} at which (11) is satisfied with equality is above d_S^*.

Similarly, we can obtain that the entrepreneur prefers the R mission when

$$v(d_S) \geq \left((1-\Delta^R) + \frac{\Delta^R}{\Theta}\right) v(g^{-1}(d_S)) \tag{12}$$

by comparing (2) and (5). Next we will show that (12) holds if

$$v'(d_S) \geq \frac{1-\Theta}{\mu} \tag{13}$$

By the concavity of v – specifically using the relationship between the slope of a chord and the derivative – we have that

$$v'(d_S) \leq \frac{v(d_S) - v(g^{-1}(d_S))}{d_S - g^{-1}(d_S)} = \frac{v(d_S) - v(g^{-1}(d_S))}{\frac{\mu\Delta^R}{\Theta} v(g^{-1}(d_S))} \tag{14}$$

Rearranging (12) we have:

$$\begin{array}{rcl} v(d_S) - v(g^{-1}(b)) & \geq & \Delta^R \frac{1-\Theta}{\Theta} v(g^{-1}(b)) \\ \frac{v(d_S) - v(g^{-1}(b))}{\frac{\mu\Delta^R}{\Theta} v(g^{-1}(d_S))} & \geq & \frac{1-\Theta}{\mu} \end{array} \tag{15}$$

This holds if (13) holds. But (13) always holds, because at $t = 1$ the S donor is always matched with an S entrepreneur with probability $\rho < 1$. Thus $d_S < v'^{-1}(1/\mu)$ or $\mu v'(d_S) > 1$. Finally, the fact that $g^{-1}(d) < d$ yields the result that agents in $\mathcal{B}$ prefer mission R as it gives rise to the largest project size.□

Proof of Lemma 10 When entrepreneurs are on the long side of the market, the donors cannot drive down entrepreneurs' share of the surplus of the match to zero, since entrepreneurs cannot make transfers to donors. If donor and entrepreneur share the same mission preference i the entrepreneur receives $\mu v(d_i)$. If a donor of type j and entrepreneur of type $i \neq j$, either:

- If the donor chooses mission j, the entrepreneur, as well as receiving utility $\mu(1 - \Delta_i)v(g^{-1}(d_i))$ from the charitable project, receives $\frac{\mu\Delta_i}{\Theta} v(g^{-1}(d_i))$ in expected mission-conditional payments
- Otherwise the entrepreneur receives payoff $\mu v(d_j)$

When donors are on the long side of the market, donors can make transfers to the entrepreneur. Hence the entrepreneur receives all the surplus from the match and the donor of type j receives only what he would receive when unmatched, ie $m_j - d_j$. □

The intuition behind this result is as follows. A donor has the ability to transfer any surplus he receives from the match to an entrepreneur. However, an entrepreneur cannot transfer surplus in the same way to a donor. An entrepreneur on the long side of the market matched with a donor may thus earn rents over the payoff he would receive if unmatched – ie, 0. □

Proof of Lemma 11

First we consider the case $N_E > N_D$. Note first that all donors are matched, since each match generates positive surplus. In order to show that the match is as stated in part 1(a) or part 1(b) of the proposition, it suffices to show that:

- No R donor is matched with an S entrepreneur, whilst an S donor is matched with an R entrepreneur
- No j donor is matched with an i entrepreneur whilst an j entrepreneur goes unmatched

To show the first item above, suppose that $d_S > d_R$. Then note that the payoff of an S donor matched with an R entrepreneur is strictly less than $m_S - d_S + \mu v(d_S)$ whereas if he were to be matched with an S entrepreneur he would have payoff equal to $m_S - d_S + \mu v(d_S)$. The payoff of the S entrepreneur matched with the R donor would be less than $\mu v(d_R)$, whereas if he were matched with an S donor he could have payoff equal to $\mu v(d_S)$. Thus both the S donor and S entrepreneur could be made strictly better off by matching with one another. A similar argument applies if $d_R > d_S$. To show the second item above, note that the j donor has a payoff of less than $m - d_j + \mu v(d_j)$ when matched with an i entrepreneur but can achieve payoff $m - d_j + \mu v(d_j)$ when matched with a j entrepreneur. Further, the j entrepreneur is strictly better off when matched than unmatched. This is sufficient to prove part 1 of the proposition.

To prove part 2, when $N_D > N_E$, it is sufficient to prove that:

- No R donor is matched with an S entrepreneur, whilst an S donor is matched with an R entrepreneur
- No i entrepreneur is matched with an $j \neq i$ donor whilst an i donor goes unmatched

To prove the first part of the above, note that whilst each donor of type j earns $m_j - d_j$ regardless of the matching, note that an S entrepreneur matched with an R donor gets at most $\pi(R,S) + \Pi(R,S)$, an S entrepreneur matched with an S donor gets $\pi(S,S) + \Pi(S,S)$. Since the total surplus when an S donor is matched with and S entrepreneur is higher than the total surplus when an S entrepreneur is matched with an R donor, and since the S donor is indifferent between being matched with the R and S entrepreneur, our assumption that when one party is indifferent he goes with the match which generates the largest overall surplus implies that an S entrepreneur cannot be matched with and R donor whilst an R entrepreneur is matched with an S donor. To prove the second part of the above, it suffices to notice that an i entrepreneur is strictly better off with an i donor than with a j donor, whilst the i donor is indifferent between being matched with an i entrepreneur or going unmatched. $\square$

Proof of Lemma 13

Suppose first that there exists an assortative matching equilibrium with $N_E > N_D$, ie the matching is characterised by part 1 of Lemma 11 and Figure 1. Now we examine the entry decisions of type j in such an entry equilibrium. As every j donor is matched with a entrepreneur of the same mission preference, a donor of type j gives $\max(v'^{-1}(1/\mu), m_j)$. Suppose first that there exists an equilibrium with $N_E > N_D$. The utility of the donor is $m_j - \max(v'^{-1}(1/\mu), m_j) + \mu v(\max(v'^{-1}(1/\mu), m_j))$ and the utility of the entrepreneur is less than $\mu v(\max(v'^{-1}(1/\mu), m_j))$. The payoffs of the donor and entrepreneur of type j thus cannot be equal – so we cannot have j types on both side of the market, as all types would strictly prefer to be donors. This is a contradiction of our assumption of $N_E > N_D$.

Suppose now that there exists and equilibrium with $N_D = N_E$ and the donor gets a share $1/2$ of the surplus from the match. Then the donor's payoff is $m_j - d_j + \mu v(d_j)$ (where d_j is the endogenous donation level, to be specified) and the entrepreneur's payoff is $\mu v(d_j)$. The donor maximises $m_j - d_j + \mu v(d_j)$, hence $d_j = v'^{-1}(1/\mu)$. Thus j types are willing to enter on both side of the market if and only if:

$$\begin{array}{rrcl} & m_j - d_j + \mu v(d_j) & = & \mu v(d_j) \\ \iff & m_j = d_j & = & v'^{-1}(1/\mu) \end{array} \tag{16}$$

But we assumed that $m_S > v'^{-1}(1/\mu)$, a contradiction. $\square$

Proof of Proposition 1

Suppose that an equilibrium with mismatch exists; wlog that $N_D^S \geq N_E^S$, so that all S entrepreneurs are matched and all unmatched entrepreneurs are R types as in Figure 2. Note first that this implies that $d_R \geq d_S$, since all R donors are matched with R entrepreneurs and S donors face a probability of mismatch. That is to say that the R donor maximises $\mu v(d_R) + m_R - d_R$ so that $d_R = \min(m_R, v'^{-1}(1/\mu))$, whereas the S donor is mismatched with positive probability, so that he maximises

$$\left(\mu \frac{N_E^S}{N_D^S} v(d_S) + \left(1 - \frac{N_E^S}{N_D^S}\right) \max(\mu v(g^{-1}(d_S)), (1-\Delta^S)\mu v(d_S)\right) + m - d_S$$

Hence $d_S < d_R$. Consider now the R type's decision to become a donor or an entrepreneur. An R donor has payoff $m - d_R + \mu v(d_R)$ as he is matched with certainty with an R entrepreneur. An R entrepreneur, however, is matched with an S donor with a certain probability, in which case his payoff is $\leq \mu v(d_S)$ and is unmatched with a certain probability. This implies that the R entrepreneur's payoff is less than $\mu v(d_R)$. But then an R type is strictly better off as a donor than as an entrepreneur. In this case, $N_D \geq N_E$ – a contradiction. □

In order to prove proposition 2 we will need the following lemma.

Lemma 14 *Let $v(b) = b^a$ where $a \in (\frac{1}{2}, 1)$. Then*

$$\mu y(d) \equiv \mu v(d) - \mu v(g^{-1}(d)) \tag{17}$$

is an increasing and concave function of d.

Proof of Lemma 14

The first derivative of $y(d)$ can be written:

$$\frac{\partial y}{\partial d} = \frac{\partial b}{\partial d}\left(v'\left(b + \frac{\mu\Delta^R}{\Theta}v(b)\right)\left(1 + \frac{\mu\Delta^R}{\Theta}v'(b)\right) - v'(b)\right) \tag{18}$$

where $b = g^{-1}(d)$. This is positive if and only if:

$$\left(1 + \frac{\mu\Delta^R}{\Theta}v'(b)\right)\left(v'\left(b + \frac{\mu\Delta^R}{\Theta}v(b)\right) - v'(b)\right) + \frac{\mu\Delta^R}{\Theta}v'(b)^2 > 0 \tag{19}$$

Given that $v''(b) < 0$ and $v^3(b) > 0$ we have that:

$$v'(b) - v'\left(b + \frac{\mu\Delta^R}{\Theta}v(b)\right) \leq -v''(b)\frac{\mu\Delta^R}{\Theta}v(b) \tag{20}$$

Hence (19) holds if:

$$\left(1 + \frac{\mu\Delta^R}{\Theta}v'(b)\right)v''(b)v(b) + v'(b)^2 > 0 \tag{21}$$

This is greater than $v''(b)v(b) + v'(b)^2$ which, given $v(b) = b^a$, is positive for $a > \frac{1}{2}$. So

$a \in (\frac{1}{2}, 1)$ is a sufficient condition for $y(d)$ to be increasing. It remains to show that $y''(d) < 0$. Recall that $g(d)$ is increasing and concave in d, so that g^{-1} is increasing and convex. Note that

$$y''(d) = v''(d) - (g^{-1}(d))^2 v''(g^{-1}(d)) - g^{-1\prime\prime}(d) v'(g^{-1}(d)) \tag{22}$$

The first term is negative. It remains to show that $(g^{-1}(d))^2 v''(g^{-1}(d)) - g^{-1\prime\prime}(d) v'(g^{-1}(d)) < 0$. To show this, we note that:

$$\begin{array}{rcl} g^{-1\prime}(d) & = & \frac{1}{b+\alpha a b^{a-1}} \\ g^{-1\prime\prime}(d) & = & \frac{a(1-a)\alpha b^{a-2}}{(1+\alpha a b^{a-1})^3} \end{array} \tag{23}$$

Now note that

$$(g^{-1}(d))^2 v''(g^{-1}(d)) - g^{-1\prime\prime}(d) v'(g^{-1}(d)) = a g^{-1}(d)^{a-2} \Big(-(1-a) g^{-1\prime}(d)^2 + (g^{-1}(d))^{a-1} g^{-1\prime\prime}(d) \Big) \tag{24}$$

In iorder to verify the sign of the second derivative of y it suffices to show that the term in the large brackets on the RHS of the above is negative. Plugging in from (23) we find that:

$$-(1-a)(g^{-1\prime}(d))^2 + g^{-1}(d)^{a-1} g^{-1\prime\prime}(d) = -\frac{(1-a)}{(1+\alpha a b^{a-1})^3} \tag{25}$$

Hence $y''(d) < 0$ and $y(d)$ is an increasing and concave function of d. □

Proof of Proposition 2

The proof can be broken down into the following steps:

1. We show that $d_S > d_R$ and $d_R = m_R$ and show that these are necessary condition for a mismatch equilibrium to exist
2. We establish the simultaneous equations which define $\left(d_S, \frac{N_E^S}{N_D^S}\right)$ and show that $\Delta^S \geq \hat{\Delta}_S, \breve{\Delta}^S)$ and $m_S - v'^{-1}(\frac{1}{\mu}) < n$ is sufficient to establish the existence of a mismatch equilibrium.
3. We calculate N_D^S and N_E^S as functions of d_S and fundamental parameters[19]
4. We consider the free-entry decision of the R agent and determine N_D^R and N_E^R as functions of d_S and fundamental parameters[20]
5. We use the expressions for the N_k^is, to check whether $N_E > N_D$.

First, to demonstrate step 1, note that we require that $m_R < v'^{-1}(1/\mu)$, and hence $d_R = m_R$. Otherwise we could not have R types on both sides of the market. To show this, suppose m_R exceeds this bound. Then d_R is chosen to maximise the R donor's expected utility

[19] It is not necessary to determine the N_k^i in terms of fundamental parameters to prove the existence of a mismatch equilibrium with $N_E > N_D$

[20] as above

from giving, which is $m - d_R + \mu v(d_R)$, since an R donor is matched with an R entrepreneur with probability 1. Then d_S is smaller that $d_R = v'^{-1}(1/\mu)$, since some S donors are matched with R entrepreneurs and so the return on giving is lower. But if $d_R > d_S$, we cannot have R types on both sides of the market, since R donors have payoff $m_R - d_R + \mu v(d_R)$, whereas R entrepreneurs have payoff $\frac{N_D^S - N_E^S}{N_E^R}\pi(S,R) + \frac{N_D^R}{N_E^R}\mu v(d_R)$ which, since $N_D^S - N_E^S + N_D^R < N_E^R$ and $\pi(S,R) < \mu v(d_S)$, is less than $\mu v(d_R)$. Thus, if $d_S < d_R$ there is no mismatch equilibrium.

We thus require that $d_S > d_R = m_R$. In order to check that this happens, we will need to establish that $v'^{-1}(1/\mu(1-\Delta^S)$ is a lower bound for d_S. If this is the case then we can apply the following reasoning: $d_S > v'^{-1}\left(\frac{1}{\mu(1-\Delta^S)}\right) > g^{-1}\left(v'^{-1}\left(\frac{1}{\mu(1-\Delta^S)}\right)\right)$. Finally our assumption that $g^{-1}\left(v'^{-1}\left(\frac{1}{\mu(1-\Delta^S)}\right)\right) > d_R$ ensures that $d_S > d_R$. We will prove that $d_S \geq v'^{-1}(1/\mu(1-\Delta^S))$ in Lemma 15.

Moving on to step 2, suppose now that a mission mismatch equilibrium exists, with $N_D^S > N_E^S$ and $N_E > N_D$. An equilibrium consists of entrant numbers $(N_D^S, N_E^S, N_D^R, N_E^R)$, donation levels (d_R, d_S) and a mission m chosen when an S donor is matched with an R entrepreneur.

We begin by considering the indifference condition of the S type which ensures that S types can be both donors and entrepreneurs:

$$\mu v(d_S) = m_S - d_S + \frac{N_E^S}{N_D^S}\mu v(d_S) + \left(1 - \frac{N_E^S}{N_D^S}\right)\Pi(S,R) \tag{26}$$

An S entrepreneur is matched with an S donor with probability 1, giving rise to a payoff of $m_S - d_S + \mu v(d_S)$ (LHS of (26)). An S donor is matched with probability 1, but with an S entrepreneur of probability $\frac{N_E^S}{N_D^S} < 1$. The rest of the time he is matched with an R donor, achieving payoff $m_S - d_S + \Pi(S,R)$. At $t = 1$ the donation of the S type is chosen to maximise the right hand side of (26), so that:

$$\frac{N_E^S}{N_D^S}\mu v'(d_S) + \left(1 - \frac{N_E^S}{N_D^S}\right)\frac{\partial}{\partial d_S}\Pi(S,R) = 1 \tag{27}$$

The fact that $\Pi(S,R) = \max(\mu(1-\Delta^S)v(d_S), \mu v(g^{-1}(d)))$ implies that $d_S < v'^{-1}(\frac{1}{\mu})$. Thus, given our assumption that $m_S \geq v'^{-1}(1/\mu)$, $m_S - d_S > 0$. Further we can rearrange (26) to obtain:

$$\frac{N_E^S}{N_D^S} = \frac{\mu v(d_S) - \Pi(S,R) - (m_S - d_S)}{\mu v(d_S) - \Pi(S,R)} \tag{28}$$

Supposing (as we will prove below)that (27) and(28) admit a solution, the above ratio of S entrepreneurs to S donors, given that $m_S > d_S$, is strictly less than 1, as desired – there are more S donors than S entrepreneurs.

Now we show that (27) and (28)admit a solution. Recall that $\Pi(S,R) = \max(\mu(1-\Delta^S)v(d_S), \mu v(g^{-1}(d_S))$. Rather than work with the kinked function $\Pi(S,R)$, and its derivative (which is not defined at d_S^*) we work with two separate scenarios and then check that they are consistent with the donor's (endogenous) mission choice decision.

The first scenario is to look at the pair of equations that would be relevant if the donor were to choose to implement mission R:

$$\begin{aligned} \frac{N_E^S}{N_D^S} &= 1 - \frac{m_S - d_S}{\mu\Delta^S v(d_S)} \\ \left(\frac{N_E^S}{N_D^S}\mu + \left(1 - \frac{N_E^S}{N_D^S}\right)\mu(1-\Delta^S)\right)v'(d_S) &= 1 \end{aligned} \tag{29}$$

If we find an intersection point between the two curves above, it is necessary to check that it has $d_S \leq d_S^*$ for it to be consistent with the donor to choosing mission R. The second is to look at the pair:

$$\begin{aligned} \frac{N_E^S}{N_D^S} &= 1 - \frac{m_S - d_S}{\mu y(d_S)} \\ \frac{N_E^S}{N_D^S}\mu v'(d_S) + \left(1 - \frac{N_E^S}{N_D^S}\right)\mu g^{-1\prime}(d_S) v'(g^{-1}(d_S)) &= 1 \end{aligned} \tag{30}$$

If such an intersection point between the curves above exists, it is necessary to check that this corresponds to $d_S \geq d_S^*$ in order for the equilibrium to be consistent with the donor choosing mission S.

Note that the first line of (29) defines $\frac{N_E^S}{N_D^S}$ as a concave function of d_S, since the first and second derivatives are:

$$\begin{aligned} \frac{\partial}{\partial d_S}\frac{N_E^S}{N_D^S} &= \frac{1}{\mu v(d_S)\Delta^S} + \frac{v'(d_S)(m_S - d_S)}{\mu v(d)^2\Delta^S} > 0 \\ \frac{\partial^2}{\partial d_S^2}\frac{N_E^S}{N_D^S} &= -\frac{2v'(d_S)}{\mu v(d_S)\Delta^S} + \frac{v''(d_S)}{\mu v(d)\Delta^S} - \frac{(2v'(d_S))^2(m_S - d_S)}{\mu v(d_S)^3\Delta^S} < 0 \end{aligned} \tag{31}$$

Note that when $d_S = 0$, $\frac{N_E^S}{N_D^S} = -\infty$ and when $d_S = m_S$, $\frac{N_E^S}{N_D^S} = 1$. When instead 30 holds, we can use the concavity of $y(d_S) = v(d_S) - v(g^{-1}(d_S))$ to show (28) also corresponds to an increasing and concave function of d_S which passes through the points $(0, \infty)$ and $(m_S, 1)$. Note also that the two possible curves defined by the first lines of (29) and (30) intersect at d_S^*.

Now we treat the second lines of (29) and (30) and show that, in both cases, the curve is increasing and convex. Then differentiating the second line of (29) with respect to d_S we have that:

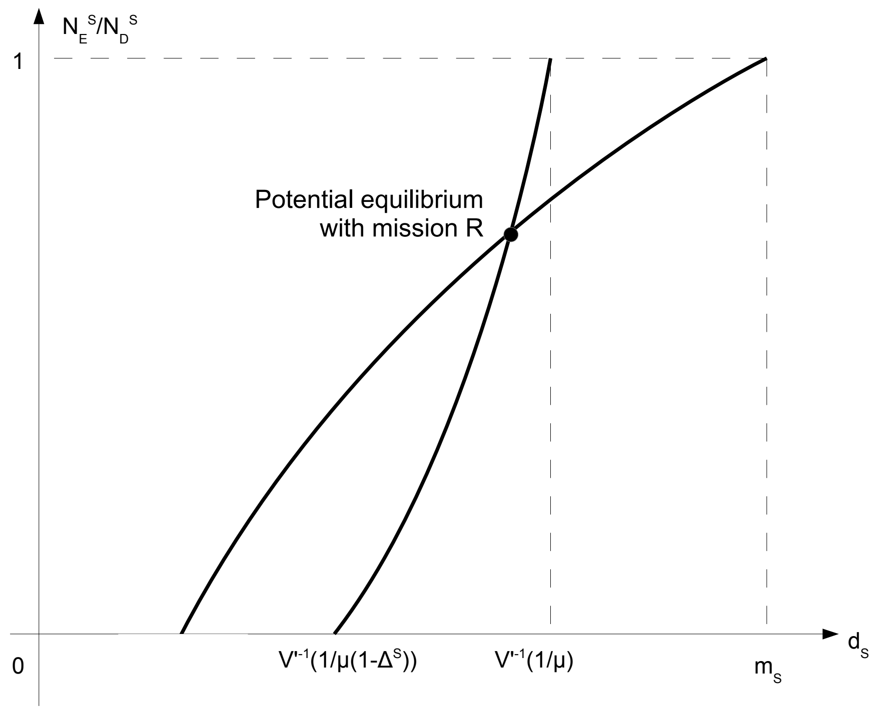
$$\begin{aligned} \frac{\partial}{\partial d_S}\frac{N_E^S}{N_D^S} &= -\frac{N_E^S}{N_D^S}\frac{v''(d_S)}{v'(d_S)} > 0 \\ \frac{\partial^2}{\partial d_S^2}\frac{N_E^S}{N_D^S} &= -\frac{\partial}{\partial d_S}\frac{N_E^S}{N_D^S}\frac{v''(d_S)}{v'(d_S)} - \frac{N_E^S}{N_D^S}\left(\frac{v''(d_S)^2}{v'(d_S)^2} - \frac{v^3(d_S)}{v'(d_S)}\right) > 0 \end{aligned} \tag{32}$$

This function passes through the points $\left(v'^{-1}\left(\frac{1}{\mu(1-\Delta^S}\right), 0\right)$ and $\left(v'^{-1}\left(\frac{1}{\mu}\right), 1\right)$ Similarly we can show that the second line of 30 corresponds to an increasing and convex function of d_S which passes through the points $\left(\tilde{d_S}, 0\right)$ and $\left(v'^{-1}\left(\frac{1}{\mu}\right), 1\right)$ where $\tilde{d_S}$ is defined by:

$$g^{-1\prime}(\tilde{d_S})v'(g^{-1}(\tilde{d_S})) = 1 \tag{33}$$

An increasing and convex function can intersect and increasing and concave function between zero and two times. However, in this particular case, we will show that we can make parameter restrictions that ensure that these functions intersect at least once.

Figure 5: A potential equilibrium with mission S



Notice that when $m_S = v'^{-1}(1/\mu)$, the two curves (28) and (27) cross at $d_S = m_S$. Further, (28) lies above 27 for $d_S = m_S - \epsilon$ for ϵ positive and not too large, since the slope of (28) is strictly lower than the slope of (27) at $d_S = m_S$. This implies that there is an intersection point of the two curves (28) and (27) near to $d_S = m - S$ as long as $m_S - v'^{-1}(1/\mu) < l$ for some $l > 0$. We verify the relative sign of the derivatives first in the case where (28) and (27) are captured by (29), in which case the first derivatives of (28) and (27) are respectively:

$$\begin{array}{rcl} \frac{\partial}{\partial d_S}\frac{N_E^S}{N_D^S}\Big|_{d_S=m_S} & = & \frac{1}{\mu\Delta^S v(m_S)} \\ \frac{\partial}{\partial d_S}\frac{N_E^S}{N_D^S}\Big|_{d_S=v'^{-1}(1/\mu)} & = & \frac{1-a}{a\mu\Delta^S v(v'^{-1}(1/\mu))} \end{array} \tag{34}$$

Since $a \geq \frac{1}{2}$ the slope of the (28) is larger than the slope of (27) at $m_S = v'^{-1}(1/\mu)$. Now we verify the relative signs of the derivatives in the case (28) and (27) are captured by (30), in which case the first derivatives of (28) and (27) are respectively:

$$\begin{array}{rcl} \frac{\partial}{\partial d_S}\frac{N_E^S}{N_D^S}\Big|_{d_S=m_S} & = & \frac{1}{\mu y(m_S)} \\ \frac{\partial}{\partial d_S}\frac{N_E^S}{N_D^S}\Big|_{d_S=v'^{-1}(1/\mu)} & = & \frac{-v''(v'^{-1}(1/\mu))}{y'(v'^{-1}(1/\mu))} \end{array} \tag{35}$$

However, we have not established whether these intersection points are coherant with the S donor enforcing an S or an R mission. We need to know whether the donation of the S donor is compatible with the mission we assume that they have chosen. Rather than calculate explicitly the donations level and check whether it is above or below d_S^*, we will

Figure 6: Multiple (potential) equilibria with mission R

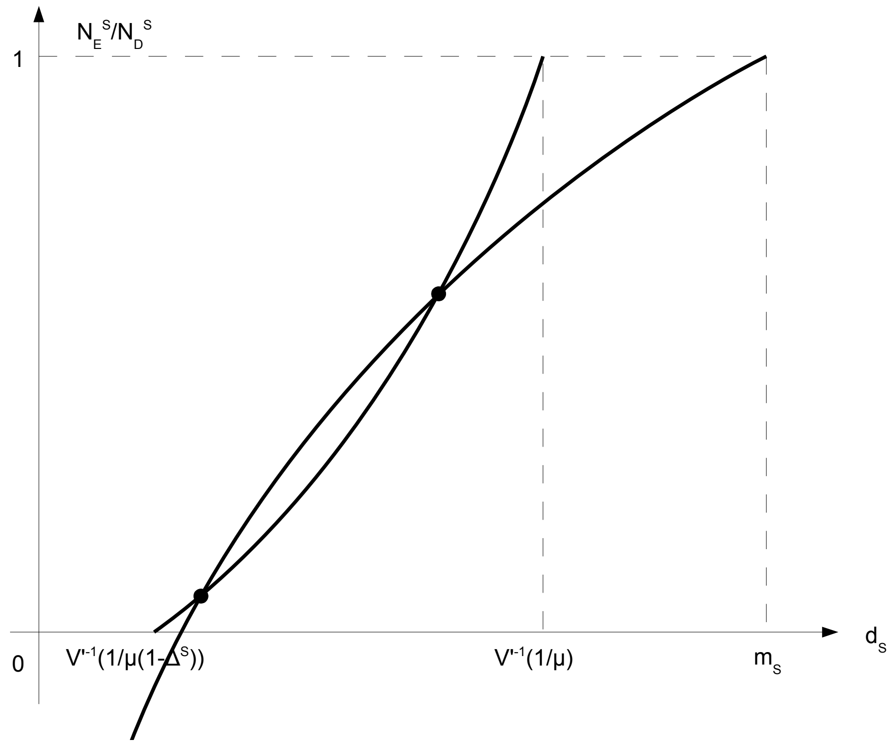


Figure 7: An equilibrium with mission R

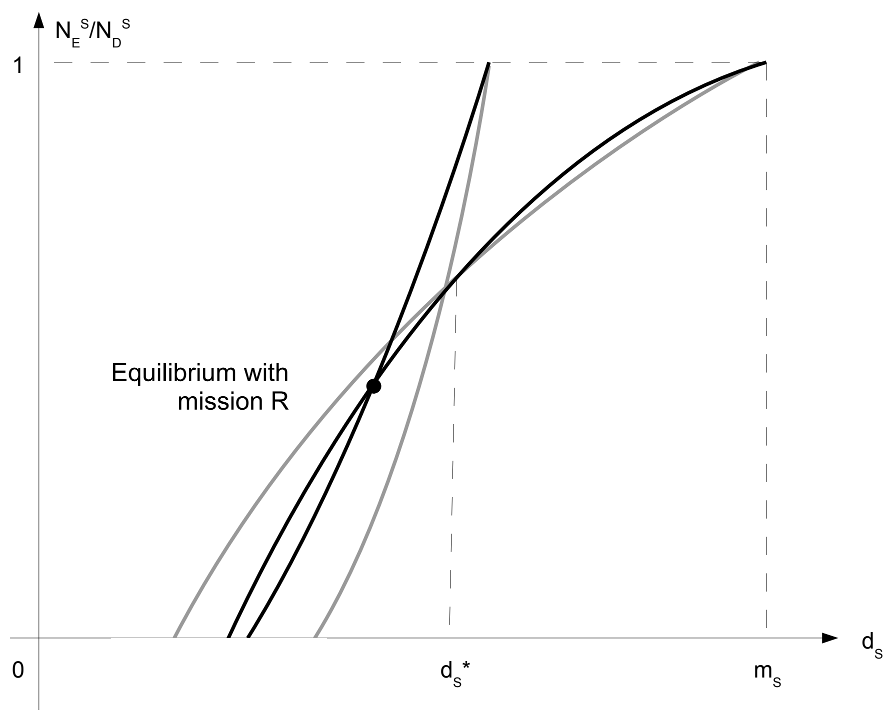


Figure 8: An equilibrium with mission R, an equilibrium with mission S

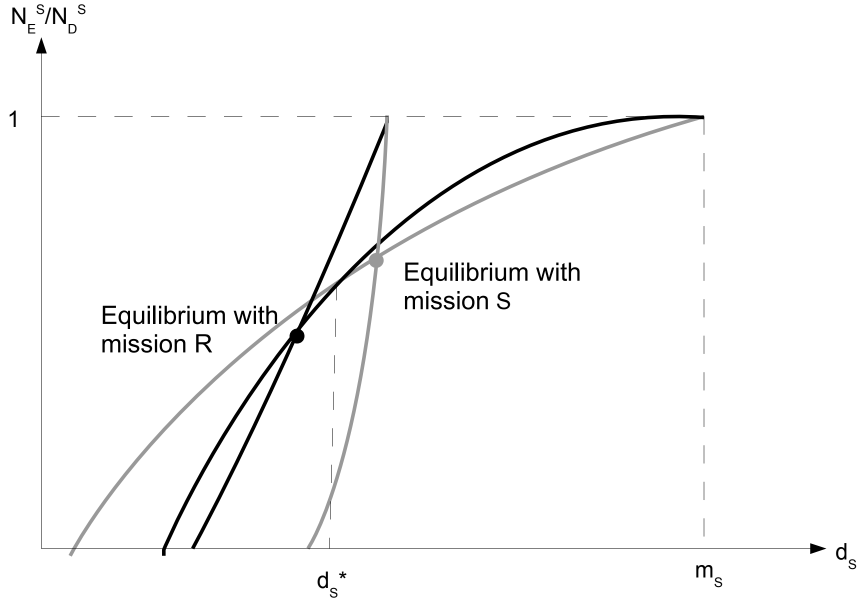
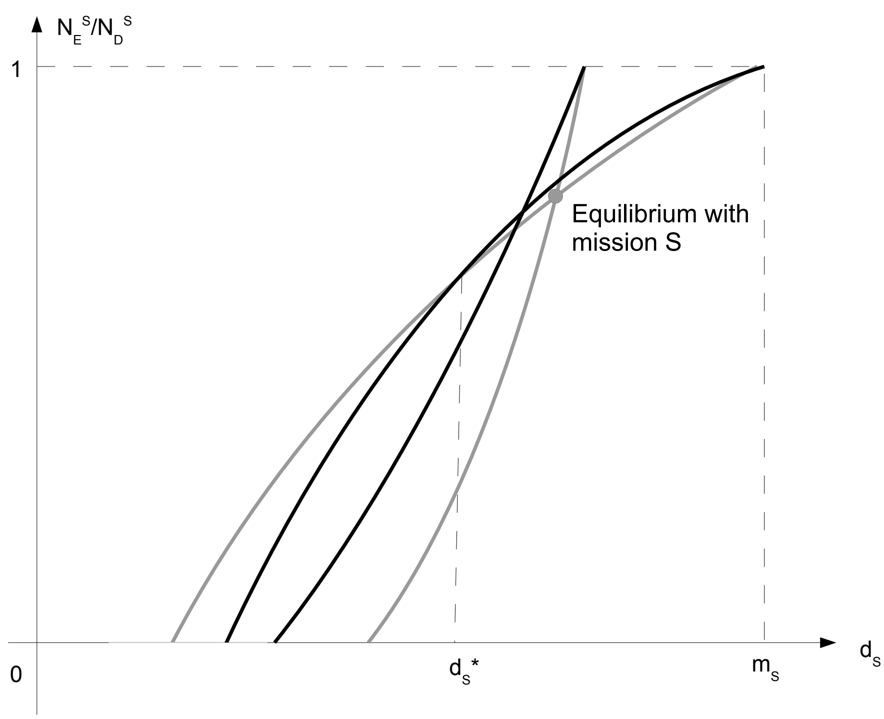


Figure 9: An equilibrium with mission S



place a restriction on Δ^S which we will show implies that there is at least one equilibrium (ie, an intersection of the curves in (29) with $d_S \leq d_S^*$, or an intersection of the curves in (30) with $d_S \geq d_S^*$). We define this restriction of Δ^S and note its useful properties in the following Lemma.

Lemma 15 *There exists a threshold $\hat{\Delta^S}$, such that, for all $\Delta \geq \hat{\Delta^S}$, the function*

$$\left(\frac{N_E^S}{N_D^S}\mu + \left(1 - \frac{N_E^S}{N_D^S}\right)\mu(1-\Delta^S)\right)v'(d_S) = 1 \tag{36}$$

lies to the left of the function

$$\frac{N_E^S}{N_D^S}\mu v'(d_S) + \left(1 - \frac{N_E^S}{N_D^S}\right)g^{-1\prime}(d_S)v'(g^{-1}(d_S)) = 1 \tag{37}$$

in $\left(d_S, \frac{N_E^S}{N_D^S}\right)$ space. In particular this implies $\tilde{d_S} > v'^{-1}(1/\mu(1-\Delta^S))$ and hence $d_S > v'^{-1}(1/\mu(1-\Delta^S))$.

(38)

Proof of Lemma 15 As the two functions defined in the statement of the lemma are increasing and convex, it suffices to show:

1. $v'^{-1}(1/\mu(1-\Delta^S)) < \tilde{d_S}$ and
2. The slope of (36) at $d_S = v'^{-1}(1/\mu)$ is higher than the slope of (37) at the same d_S.

To demonstrate the first point, define $\tilde{b} = g^{-1}(v'^{-1}(\tilde{d_S})$. Then the definition of $\tilde{d_S}$ can be rewritten in terms of the definition of $\tilde{b}$, as:

$$\begin{aligned} \frac{v'(\tilde{b})}{g'(\tilde{b})} &= \frac{1}{\mu} \\ \iff \quad \frac{\mu a\tilde{b}^{-(1-a)}}{1+\frac{\Delta^R}{\Theta}\mu a\tilde{b}^{-(1-a)}} &= 1 \\ \iff \quad \tilde{b} &= (\mu a)^{\frac{1}{1-a}}\left(1 - \frac{\Delta^R}{\Theta}\right)^{\frac{1}{1-a}} \end{aligned} \tag{39}$$

Since $v'^{-1}(1/\mu) = (\mu a)^{\frac{1}{1-a}}$ we have:

$$\begin{aligned} v'^{-1}(1/\mu(1-\Delta^S) &< \tilde{d_S} \\ \iff \quad (1-\Delta^S) &< \left(\left(1-\frac{\Delta^R}{\Theta}\right)^{\frac{1}{1-a}} + \frac{\Delta^R}{\Theta a}\left(1-\frac{\Delta^R}{\Theta}\right)^{\frac{a}{1-a}}\right)^{1-a} \end{aligned} \tag{40}$$

hence we can define a threshold Δ_1^S, such that for $\Delta^S > \Delta_1^S$, we have $v'^{-1}(1/\mu(1-\Delta^S) < \tilde{d_S}$.

For the second half of the proof we use a similar method.

The slope of (36) at $d_S = v'^{-1}(1/\mu)$ is:

$$\frac{\partial}{\partial d_S}\frac{N_E^S}{N_D^S}\bigg|_{d_S = v'^{-1}(1/\mu)} = \frac{-v''(v'^{-1}(1/\mu))}{(1-(1-\Delta^S))v'(v'^{-1}(1/\mu))} \tag{41}$$

and the slope of (37) at the same point is:

$$\frac{\partial}{\partial d_S}\frac{N_E^S}{N_D^S}\bigg|_{d_S=v'^{-1}(1/\mu)} = \frac{-v''(v'^{-1}(1/\mu))}{v'(v'^{-1}(1/\mu)) - v'(g^{-1}(v'^{-1}(1/\mu)))g^{-1\prime}(v'^{-1}(1/\mu))} \tag{42}$$

Comparing and rearranging, we find that the slope of the (36) is higher if and only if:

$$v'(g^{-1}(v'^{-1}(1/\mu)))g^{-1\prime}(v'^{-1}(1/\mu)) > \frac{1-\Delta^S}{\mu} \tag{43}$$

By setting Δ^S sufficiently close to 1 we can ensure that this is satisfied, that is to say, there exists Δ_2^S such that for all $\Delta^S \geq \Delta_2^S$, the slope condition set out in the second of the two steps above above is satisfied. Finally, we set $\hat{\Delta^S} = \max(\Delta_1^S, \Delta_S^2)$ $\square$

Next we prove the existence of an candidate equilibrium with mission R corresponding to the intersection of the equations in (29), and a candidate equilibrium corresponding to the intersection of the equations in (30). We call these candidate equilibrium because it remains to show that the candidtate equilibrium level of d_S is consistent with the donor's choice of mission – ie, we need to know whether the donations are lower or higher than d_S^*.

First turning our attention to the intersection of the curves defined by (30), we note that the d_S at a point of intersection is defined by:

$$\frac{1-\mu(1-\Delta^S)v'(d_S)}{\mu\Delta^S v'(d_S)} + \frac{m_S - d_S}{\mu\Delta^S v(d_S)} = 1 \tag{44}$$

At $d_S = 0$ we have that the right hand (∞) side is greater than the left hand side. At $d_S = v'^{-1}(1/\mu)$ we have that the left hand side is smaller than 1 if and only if:

$$m_S - v'^{-1}(1/\mu) < (\mu - 1)v(v'^{-1}(1/\mu)) \tag{45}$$

which, supposing $\mu > 1$ defines another upper limit on $m_S - v'^{-1}(1/\mu)$

Assuming now that (45) holds, the left hand side of (44) is a continuous function of d_S that takes the value ∞ at $d_S = 0$ and is less than one at $d_S = v'^{-1}(1/\mu)$. By continuity, there must exist a value of $d_S \in (0, v'^{-1}(1/\mu))$ such that 44 holds with equality. That is to say, there is at least one candidate equilibrium with mission R. We will denote the candidate equilibrium with mission R, $\left(d_S, \frac{N_E^S}{N_D^S}\right)$ with the highest level of d_S by $\mathcal{C}_R$.

Now consider the curves defined by (30) we note that, at an intersection, we would have:

$$\frac{1-\mu(v\circ g^{-1})'(d_S)}{\mu v'(d_S) - \mu(v\circ g^{-1})'(d_S)} + \frac{m_S - d_S}{(d_S) - \mu(v\circ g^{-1})(d_S)} = 1 \tag{46}$$

At $d_S = 0$ we have that the right hand (∞) side is greater than the left hand side. At $d_S = v'^{-1}(1/\mu)$ we have that the left hand side is smaller than 1 if and only if:

$$m_S - v'^{-1}(1/\mu) < 1 - \mu(v\circ g)'(v'^{-1}(1/\mu)) \tag{47}$$

Then, if (47) holds, the left hand side of (46) is a continuous function of d_S that takes the value ∞ at $d_S = 0$ and is less than one at $d_S = v'^{-1}(1/\mu)$. By continuity, there must exist a value of $d_S \in (0, v'^{-1}(1/\mu))$ such that 46 holds with equality. That is to say, there is at least one candidate equilibrium with mission S. We will denote the candidate equilibrium of mission S $\left(d_S, \frac{N_E^S}{N_D^S}\right)$ with the highest level of d_S by $\mathcal{C}_S$. Finally we set $l = \min\Big(1 - \mu(v \circ g)'(v'^{-1}(1/\mu)), (\mu - 1)v(v'^{-1}(1/\mu))\Big)$.

We are now in a position to deduce which of the potential equilibria defined above do in fact correspond to equilibria in which donations are coherant with mission choices. There are now three possibilities:

- Both $\mathcal{C}_R$ and $\mathcal{C}_S$ lie to the left of d_S^* – in this case, there is a mismatch equilibrium with mission R, see figure 7.
- $\mathcal{C}_R$ lies to the left of d_S^* and $\mathcal{C}_S$ to the right of d_S^* – then there are at least two mismatch equilibria, one with mission R enforced; the other with mission S, see figure 8.
- Both $\mathcal{C}_R$ and $\mathcal{C}_S$ lie to the right of d_S^* – there is at least one mismatch equilibrium with mission S, see figure 9.

Given that we have now shown that a solution $\left(d_S, \frac{N_E^S}{N_D^S}, m\right)$ to (27) and(28) exists it will be useful to write N_D^S and N_E^S in terms of d_S.

Using $N_D^S + N_E^S = N$ we obtain that:

$$\begin{array}{lcl} N_E^S & = & \frac{\mu v(d_S) - \Pi(S,R) - (m_S - d_S)}{2(\mu v(d_S) - \Pi(S,R)) - (m_S - d_S)} N \\ N_D^S & = & \frac{\mu v(d_S) - \Pi(S,R)}{2(\mu v(d_S) - \Pi(S,R)) - (m_S - d_S)} N \\ N_D^S - N_E^S & = & \frac{m_S - d_S}{(\mu v(d_S) - \Pi(S,R)) - (m_S - d_S)} N \end{array} \tag{48}$$

Next we consider the indifference condition of the R type. The gift of an R donor is constrained to be m_R. An R donor is matched with probability 1 with an R entrepreneur, giving him utility $\mu v(m_R)$ with certainty. An R entrepreneur is matched with an S donor with probability $\frac{N_D^S - N_E^S}{N_E^R}$, is matched with an R donor with probability $\frac{N_D^R}{N_E^R}$ and is unmatched with probability $\frac{N_E - N_D}{N_E^R}$. Hence his indifference condition is given by:

$$\mu v(m_R) = \frac{N_D^S - N_E^S}{N_E^R} \pi(S,R) + \frac{N_D^R}{N_E^R} \mu v(m_R) \tag{49}$$

Rearranging we find that:

$$\begin{array}{lcl} N_E^R & = & \frac{(N_D^S - N_E^S)\pi(S,R) + N\mu v(m_R)}{2\mu v(m_R)} \\ N_D^R & = & \frac{N\mu v(m_R) - (N_D^S - N_E^S)\pi(S,R)}{2\mu v(m_R)} \\ N_E^R - N_D^R & = & \frac{(N_D^S - N_E^S)\pi(S,R)}{2\mu v(m_R)} \end{array} \tag{50}$$

We have already checked, by showing that $\frac{N_E^S}{N_D^S} < 1$, that this equilibrium involves an excess of

S donors. In order to show that it involves mismatch with $N_E > N_D$ it is sufficient to check that $N_E > N_D$, or, equivalently, $N_E^R - N_D^R > N_D^S - N_E^S$. (50) implies this is the case if and only if:

$$\pi(S,R) > \mu v(m_R) \tag{51}$$

This holds since $\pi(S,R) > \mu v(g^{-1}(d_S))$, and further since we have shown $d_S > v'^{-1}(1/\mu(1-\Delta^S))$, we can deduce from our assumption $g^{-1}(v'^{-1}(1/\mu(1-\Delta^S))) \geq m_R$ that $\pi(S,R) > \mu v(m_R)$ $\square$

Proof of Proposition 3

First note that if the equilibrium with the highest welfare for agents in $\mathcal{A}$ involves mission R, then implementing the Busan declaration does not change the equilibrium with the highest welfare for agents in $\mathcal{A}$

Now suppose that in the equilibrium with the highest welfare for agents in $\mathcal{A}$ involves mission S, the S donors commit to giving d_S and the ratio of S entrepreneurs to S donors is $\frac{N_E^S}{N_D^S}$. Then the welfare of agents in $\mathcal{A}$ is:

$$N_E^S(2\mu v(d_S)+m_S-d_S)+(N_D^S-N_E^S)\left(\left(\mu+\mu(1-\Delta^R)+\frac{\Delta^R}{\Theta}\right)v(g^{-1}(d_S))+m_S-d_S\right)+2N_D^R\mu(v(m_R)) \tag{52}$$

The first term is the number of S donor -S entrepreneurs multiplied by the joint donor-entrepreneur surplus from such a match. The second term in the number of S donor - R entrepreneurs multiplied by the joint surplus from such a match. The third term is the number of R donor -R entrepreneur pairs multiplied by the surplus coming from such a match. Using that $2\mu v(d_R)N_D^R = N\mu v(m_R) - (N_D^S - N_E^S)\pi(S,R) + N\mu v(m_R)$ the welfare of agents in $\mathcal{A}$ becomes:

$$N_E^S(2\mu v(d_S)+m_S-d_S)+(N_D^S-N_S^E)\left(\mu v(g^{-1}(d_S))+m_S-d_S\right)+N\mu v(m_R) \tag{53}$$

Plugging in the expressions for N_E^S and $N_D^S - N_E^S$ from (48) we obtain that the welfare of agents in $\mathcal{A}$ is:

$$N(m_S-d_S)+N\mu v(d_S)+N\mu v(m_R) \tag{54}$$

Now suppose that the Busan declaration is enforced. Then there are two possibilities:

1. There is a mismatch equilibrium with mission R
2. There is no mismatch equilibrium and we are in the bad equilibrium $d_R = d_S = 0$

In the first of these two possibilities, supposing that the equilibrium level of donations is $\hat{d}_S$, and the number of S donors and entrepreneurs is $\hat{N}_D^S$ and $\hat{N}_E^S$ respectively, using a similar method to the above, the equilibrium gives rise to welfare for agents in $\mathcal{A}$ of:

$$\begin{aligned} & \hat{N}_E^S(2\mu v(\hat{d}_S) + m_S - \hat{d}_S) + (\hat{N}_D^S - \hat{N}_E^S)\left((2-\Delta^S)\mu v(\hat{d}_S) + m_S - \hat{d}_S\right) + 2\hat{N}_D^R \mu(v(m_R)) \\ = \; & \hat{N}_E^S(2\mu v(\hat{d}_S) + m_S - \hat{d}_S) + (\hat{N}_D^S - \hat{N}_E^S)\left((1-\Delta^S)\mu v(\hat{d}_S) + m_S - \hat{d}_S\right) + N\mu(v(m_R)) \\ = \; & N(m_S - \hat{d}_S) + N\mu v(\hat{d}_S) + N\mu v(m_R) \end{aligned} \tag{55}$$

In order for equilibrium welfare to go down when the Busan declaration is enforced, it suffices that $\hat{d}_S < d_S$. After Busan is enforced the new equilibrium donations and N_k^Ss are defined by the intersection of 29. But as the first line of (29) is to the left of the first line of (30), and as the second line of (29) is to the left of the second line of (30), the intersection point of the two equations in (29) lies to the left of the intersection point of the two equations in (30), ie, $\hat{d}_S < d_S$.

In the second of these two possibilities, equilibrium welfare clearly goes down. $\square$

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Mission Impossible:
Donor influence and economies of scale in the charitable sector

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Abstract

Small charities proliferate, but is this an efficient response to donor preferences? When donors have heterogeneous preferences for charities' missions, and providing a charitable good requires meeting a fixed cost, donors choose between a small charity with their preferred mission and a larger charity entailing mission compromise. Income inequality between donors can prevent Pareto-improving economies of scale being realised when a charity's mission is observable but not contractible. A donor's investment in meeting the charity's fixed costs can be later hijacked by donors with different preferences who later make mission-conditional contributions. When donors have equal incomes they can make conditional contributions to fixed costs, sharing the pain of being expropriated ex-post and permitting cooperation. However, with income inequality the poorer donor is limited in his capacity to contribute towards fixed costs, leading the richer donor to bear the lion's share of risk of being expropriated ex-post. This can lead the richer donor to not invest in the fixed costs in the first place and to inefficient fragmentation of the charitable sector. Progressive tax incentives for giving and government funding of fixed costs of charities with broad-based support can be used to achieve the second best.

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1 Introduction

The inefficiencies entailed by hold-up problems are well-understood (Grossman Hart 1986; Hart Moore 1990), but how can one mitigate such a problem when ownership and control rights cannot be assigned to investing parties? By law, charities[1] must assign control rights not to the donors that fund them, but to a board of trustees who represent a diverse group of stakeholders, and whom are expressly prohibited from rewarding the private interest of any individual, particularly the trustees themselves. Hold-up problems arise in the presence of ex-ante investment in fixed costs when, ex-post, a donor tries to influence the charity's mission and bring it closer to his preferences and away from that of other donors. We show that when the hold-up problem is not addressed by the policy solutions we outline, the charitable sector may become inefficiently fragmented – ie, there may be too many charities.

Politicians tend to take a rosy view of charitable sector diversity. The current Conservative Government in the UK made the "Big Society" a central plank of its election campaign in 2010. Broadly speaking, this concept encapsulates the state handing over its traditional functions and empowers voluntary and community groups to take on this role. Politicians were candid about the implications of this, with Francis Maude, Cabinet Secretary in 2010, commenting[2]:

> The result of a big, strong society is that it will be administratively untidy. People will come together to do things in different ways and different places.

George Bush Senior also made the diversity of charities, voluntary and citizen groups a theme of his electoral campaign for the presidency in 1989, even referring to his respect for such groups in his inauguration address. During his campaign, he put it lyrically, referring to them as:[3]

> A brilliant diversity spread like stars, like a thousand points of light in a broad and peaceful sky

But are politicians right to praise the diversity of the charitable sector, when diversity has costs as well as benefits? One may be dazzled by one thousand point of light, but as anyone who has ever paid an electricity bill knows, one thousand points of light may well be more expensive than a large focused beam.

Whatever the welfare implications of his statement, Bush's metaphor seems apt: In the United States, in 2009, 45% of all registered public charities (the largest category of tax-exempt organisations in the US) - of which there are over 1.6m in total - had annual expenditure under $100,000 (where charities with annual expenditure under $5,000 are not included in the data at all) (Roeger *et al*, 2012). In England and Wales, of the 164,345 charities legally registered in March 2012, 42% had annual income under 10,000 and 75% had annual income under 100,000 (Charity Commission, 2014). Reliable data from developing countries is harder

[1] By which we mean donative non-profits in the typology of non-profits outlined by Hansmann (1980)

[2] BBC, 14th February 2011, Big society: more than a soundbite? http://www.bbc.com/news/uk-politics-12163624

[3] From his acceptance address at the nomintating Republican National Convention, New Orleans August 18, 1988. Taken from Harward and Shea (2013).

to come by, but the first official estimate of the number of registered NGOs operating in India puts the number at 3.3 million – a statistic that does not include the number – probably very large – of informal projects which exist to promote welfare and provide public goods (Indian Express, 2009).

Donors recognise the benefits of collaborating to jointly fund charities, though that recognition has not necessarily led to action. Why could that be? The Director of the international foundation, Calouste Gulbenkian, provided a tentative answer in an opinion piece.[4]

> Collaboration is a hot topic. But more people are talking about it than could do it – especially in the social sector ...I think it comes down to the notion of independence. For a long time, this has been a defining feature of foundations; a badge we treasure and defend.

In our model, it is precisely donors' drive to see their independence – more specifically their desire to see their own preferred mission implemented by the charity to which they contribute – which leads to a lack of collaboration.

A mission is a project choice or an ethos of a charitable project. Many previous contributions have recognised the heterogeneity of non-profit provision (Aldashev and Verdier, 2010, Bilodeau and Slivinski, 1992; 1997, Cassar, 2013, Rose-Ackerman 1982; 1987;1996, Sandford and Skellern, 2014). The mission choice could be to focus on a particular beneficiary group (eg, one tribe or geographic area; a specific type of cancer), a choice of methodology (eg, cognitive-behavioural therapy vs. 12-step approaches to treatment for addiction), or of an ethos (eg, religious or secular) permeating the charity's operations.

In our model, fixed costs mean that donors face a trade-off between a small charity operating their preferred mission and a joint-funded larger charity operating a mission that involves compromises between donors' diverse interests. These fixed costs – which could constitute the costs of renting premises, of hiring key staff, or of publicising the service to potential beneficiaries – are investments made by a donor which can be later expropriated by another donor with different preferences. Charities often lament that donors are typically unwilling to fund core costs and consistently lobby government to step in with grants to cover their fixed operating costs. (Scott, 2003; Institute for Philanthropy, 2009)

Our model can both explain the difficulty and provide a positive rationale for government intervention. We show that not only do donors fail to collaborate when it would be social-welfare maximising for them to do so, they also fail to collaborate when it would be in in all their interests to do so. Our result rests on our key assumption that the charity's choice of mission is not contractible. The expropriation comes indirectly, through the ability donors have to make their later gifts conditional on a specific mission – which may not be valuable to the donor who made the investment in fixed costs.

In our model, if donors have equal outside options (of funding another charity that perfectly reflects their preferences) then they can share fixed costs up front and share the risk of being expropriated ex-post. This allows for both donors to make contributions to cover

[4] Collaboration: a matter of heart and head: http://www.thinknpc.org/blog/heart-and-head/

the initial investment. However, if one donor is much poorer than another, he is limited in the contribution he can make to fixed costs, and forces the other donor to take on the lions' share of the risk of being expropriated ex-post. When there are inequalities, ex-ante, both donors might recognise it to be in their interest to collaborate if there were no risk of ex-post appropriation, but given that the charities' mission is determined ex-post, the richer donor is not prepared to risk making the initial investment. Therefore, it is richer donors who lead to a break-down in Pareto-improving economies of scale.

Our inefficiency result depends on richer and poorer donors having different preferences for charitable contributions. If wealth and preferences are uncorrelated, the efficient outcome can be attained. Evidence from the United States is consistent with the former scenario. Clotfelter (2012) shows that there are stark difference in giving patterns by donor's wealth. Richer donors tend to give to education, with over 90% of contributions to educational causes coming from those with incomes over $200,000, though their contributions to charity make up 59% of total donations. Poorer donors tend to give more to religious causes, with over 60% of contributions to such groups coming from donors who give under $100,000, whereas such donors gifts make up less than 36% of contributions to all causes. Earlier data, eg, Auten (2000), shows that this is a steady pattern and not an isolated event in the history of American giving.

As is the case for for-profit firms, the problem could be mitigated[5] if one donor was allowed decision-rights on the charity's mission (analogous to asset ownership) ex-post in the event of disagreement. However, these rights are retained by charities' boards – which are made up of a broad-based group of people, including beneficiaries of the charity's activities and those who can provide specific competencies to the non-profit (for example, accountancy or legal expertise). Should donors disagree about the mission, the board does not necessarily share any particular donor's mission preferences about which funding to accept or mission to implement. Indeed, they may prefer for the charity to shut down rather than cater to the tastes of a donor who wants to run an extreme mission.[6]

This control by a board representing diverse stakeholders reflects legal obligations on the part of charities. No one donor can control the charity for his own ends – in the United States, in order to qualify for tax-exempt status, according to federal guidelines, public charities who are eligible for broad-based tax rebates (Internal Revenue Service, 2014; The Foundation Group):

[5] In this case, solved rather than mitigated, as the investment in fixed costs is in fact a discrete event – either they are met and production is possible, or they are not met and production is impossible

[6] We will assume that in the event of disagreement no donor can make use of the ex-ante investments made by the joint charity to support an alternative charitable project running that donor's preferred mission. There are two possible rationales for this assumption. One is that fixed costs are mission specific. For example, if we consider the costs of recruiting personnel as part of the fixed costs of the charity, a charity that runs an arts project working with adolescents, and a charity that runs an arts project working with ex-prisoners will require different personnel. Another explanation is that the investment in fixed costs *are* convertible from one project to another, but that the charity's board in the event of disagreement between donors on a compromise mission would rather run no mission at all than an extreme mission (which we could attribute to the board being made up of ideologically committed agents). In fact it is sufficient for our results that, if the investment is convertible, that the board does not always allow the donor making the larger gift the right to run an extreme mission.

- Must represent the public interest and be managed by a board of stakeholders;
- Cannot work for or reward any private interests; that is, no individual or shareholder can profit or benefit from its assets or operations;
- More than half the members of the board must be unrelated to each other by blood, marriage or business;
- Must receive at least one-third of their income from donors each giving under 2% of total gifts to the charity; and
- No part of the activities or the net earnings can unfairly benefit any director, officer, or any private individual, and no officer or private individual can share in the distribution of any of the corporate assets in the event the organization shuts down.

Given this constraint on ownership/decision-rights, we look at alternative solutions to this problem. We find that progressive tax incentives for giving can help (incentives that lower the effective price of giving more for lower-income donors), because they put more power in the hands of smaller donors to invest in fixed costs and thus reduce the risk that wealthier donors are expropriated ex-post. This prescription is the opposite of the current policy in the UK and US, which, as noted by Clotfelter (2012), seems to put more power in the hands of richer donors:

> ...this tax policy allows many citizens to gain a sense of participation that they might not otherwise have, by choosing the causes and organizations that will receive their donations....This policy has the effect of handing over to wealthy individuals an extraordinary amount of influence over the allocation of public funds. As a result of these two effects, American tax policy contains an inherent tension between participatory citizenship and elitism.

and indeed, according to Walzer, (1982), this elitism verges on privileges of regal proportions:

> American philanthropy is radically dependent on what I once heard a successful fund-raiser call the "princely gift". Indeed, philanthropy has probably never been organised in any other way. But the price we pay for the "princely gift" is the power of princes...to princes must be courted, flattered, pandered to, and pleased.

Whilst the paper recognizes the validity of this concern, in showing that richer donors have more influence on the missions pursued by charities than poorer donors, it also shows that means the power of princes needs to protected for the sake of the poor as well as the rich. If donors did not have a choice of how much to give or of which charities to support, a jointly funded charity should have a mission closer to poorer donors' preferences. But donors do have such a choice, and hence the donor who has the largest outside option from an alternative use of his funds wields the most power. One can speculate that this may drive Walzer's recognition that philanthropy has probably always been the realm of princes. We go further and suggest ways that wealthier donors' investments should be protected from ex-post appropriation by poorer donors. Whilst all have the same ends, some of our suggestions seem to favour rich donors directly (by having charitable boards represent rich donors' interests) whilst others hint at supporting poorer donors' interests (by having progressive tax subsidies for giving). We also show that governments using financing from taxation can cover the fixed costs of all charities obtaining support from a broad set of donors, to obtain the second best. However, we show that a similar policy of subsiding the marginal costs of charities supported by a sufficient number of small donors does not always produce Pareto improvements.

In the next section, we set out our contribution to the existing literature on the incomplete contracts, charitable giving and public good provision.

2 Related Literature

Our model, inspired by Grossman Hart (1986) and Hart Moore (1990), differs in several respects. The key similarity is the inability to write complete contracts. Whilst in the incomplete contracting literature this is typically a result of the difficulties of writing a contract which covers all contingent possibilities before trade takes place, in our model this comes from the difficulty of specifying in a contract what something as complex as a charity's purpose or "mission" and enforcing sanctions in case of a deviation from a previous agreement.

Grossman and Hart (1986) assume that investments that increase the value of a good are uncontractible. Here we assume that contributions to a charity are monetary and hence could be contracted upon. What cannot be specified in a contract is exactly how these donations will be used. While a donor can see whether his contributions have been used for the purpose he originally intended, he cannot use an explicit contract to ensure that this happens.

Lastly, because no donor owns the non-profit, no donor controls the choice to accept donations and the right to decide on the mission in the event that the charity is unable to attract contributions from multiple donors. If a donor decides not to give any more to a non-profit they have already contributed to, the donor's outside option comes not from control of the non-profit's mission in the event of disagreement, but from the ability that the donor has to fund another charity.

In practice, the fact that a donor's initial investments benefits more than himself and that bargaining takes place after these investments are made means that the differences between our model and Grossman Hart (1986) are subtle rather than substantive. However, our assumptions are adapted to the charitable sector in which ownership is not an option and other solutions need to be found. We make our contribution in specifying these alternative solutions: progressive tax-incentives and funding rules on tax exemptions.

Within the incomplete contracting literature, our paper is closest to Besley and Ghatak (2001), who also model contributions of several parties to a public good. The key difference between their contribution and ours relates to disagreement payoffs. They assume that the public good produced is of a single type (whereas we consider a mission that can be seen as a mixture of two public goods), and that under disagreement, the party that owns the asset still produces the public good. This assumption gives rise to their result that the most motivated contributor should own the asset. In our context, if the charity operates at all under disagreement between various donors, one party's preferred mission – which is not valued by the other – is run. Hence our result is closer to the standard results in the incomplete contracting literature. Besley and Ghatak's model is more adapted to their context – in which the investing parties are a government and NGO – and ours to a context in which the investing parties are multiple donors giving to an NGO, and for which solutions other than ownership of the mission need to be found.

Our paper contributes to an exisiting literature on the social welfare maximising number of charities, but goes further and shows that the number of charities may be not only excessive but Pareto sub-optimal. Several papers consider fundraising as a potentially wasteful source of expenditure when charities prefer their own output to that of others. Rose-Ackerman (1992), like us, allows charities to specialise, and shows that charities tend to enter the market for donations up to the point where fundraising competition is so intense that total resources available to charitable projects are reduced. However, the welfare implications of this result are not clear, as with more charities entering the market, donors can give to charities which provides a good more closely matched to their preferences. Aldashev and Verdier (2010) use a similar model to study the welfare implications, and show that the free-entry number of charities can be larger or smaller than the socially optimal number, depending on the fundraising technology and (potentially positive) fundraising spillovers.

Other papers also consider whether a commitment to a particular mixture of public goods is efficient. In Bilodeau and Slivinski (1992,1997), a mission is conceived as a mixture of two public goods; an interpretation that can also be applied to our model. Bilodeau and Slivinski (1997) show that non-profits have a tendency to specialise by running extreme missions. However, in their framework, this is efficient[7] – as there are no fixed costs associated with running a mission or charitable project. They suggest that charities can still attract donations from a diverse group by running many specialised projects, but do not consider that doing so may result in cost savings over separate charities. Blidodeau (1992) is in the same spirit.

In a similar vein, Ghosh *et al.* (2007) highlights the benefits of joint contributions mechanisms to multiple public goods when, in contrast to charity choosing the split of funds as in Bilodeau (1992) and Bilodeau and Slivinski (1997), the allocation rule to public goods is fixed. They show that with heterogeneous wealth and preferences, social welfare can be higher when, instead of uncoordinated contributions to separate public goods, a joint contributions mechanism (corresponding to a particular mission in our framework) is enforced. Likewise, Cornes and Itaya (2010) show that, fixing the total level of contributions to all varieties of a public good, the mix of public goods provided in an voluntary contributions equilibrium is suboptimal. These papers do not delve into the questions which we pose and address: is a joint contributions mechanism incentive compatible when donors can choose between providers offering competing missions? Is the optimal joint contributions mechanism, or indeed any joint

[7]Note that the langugage of the abstract of this paper suggests the contrary – but the proposition that total contributions are higher when non-profits specialise – and the corresponding intuition – are clearly laid out on page 459. In the abstract, when the authors refer to the equilibrium level of contributions, they appear to be talking about the contributions received by a single charity, hence the discrepancy.

contributions mechanism, available in a voluntary contributions equilibrium?

We also contribute to the literature on inequality and public goods contributions. In the literature, inequality between contributors and non-contributors typically raises public goods contributions, since richer agents have a higher private incentive to give and get public goods contributions off the ground, as highlighted by the pioneering contribution of Olson (1965). Here, we assume that both donors must be able to give positive amounts tol a joint project in order to exercise influence over its mission, so wealth inequalities do not play the same role (though the complementarities between private and charitable goods means that richer donors give more). In fact, inequality plays the opposite role, as it lowers the contribution that the poorer donors makes ex-ante to fixed costs in order that such donors still have something to contribute ex-post. As the variety of the public good is chosen ex-post, this leaves the richer donor liable to exploitation.

We make a complementary contribution to recent work on the influence of fixed costs on the efficiency of the charitable sector. Pogrebna *et al,* (2014a) show that coordination failures between donors may lead to efficient high fixed cost low marginal cost technologies being overlooked in favour of less efficient lower fixed cost charities. A charity's non-distribution constraint means that unless donors are sufficiently sure that others will adopt the high-fixed costs technology, a donor risks a low payoff from contributing to this charity, since if few contribute, the fixed costs may not be met and production could be zero. Whilst this explanation for donations scattered across several charities rather than focused on one is a good model for the behaviour of multiple donors who are unknown to one another, it is a less credible explanation for large institutional donors. Our model is better suited to a small group of donors for which coordination failures are less likely.

3 Model

There are two donors, 0 and 1, with incomes m_0 and m_1 respectively, where the poorer donor is donor 0, ie, $m_1 \geq m_0$. We fix total income $m_0 + m_1 = 1$. Donors have constant elasticity of substitution preferences over a mission-augmented public good and private good.

Charities are the unique providers of the public good. Each charity has a "mission" γ, where $\gamma \in [0, 1]$. All charities possess identical technologies for converting donations into the public good. Given total donations D, the charity produces:

$$B = D - F = d_0 + d_1 - F \tag{1}$$

where F is a fixed cost of production, $F \geq 0$. Implicitly, there is a marginal cost of 1 and charities are obliged to turn all gifts received into the maximum possible production of the public good: that is to say, they are governed by a *non-distribution constraint* (Hansmann, 1980). As charities are funded uniquely by donations and obey a non-distribution constraint, they correspond to Hansmann (1980)'s notion of a *donative non-profit.*

No charitable good can be produced until the fixed costs constraint is covered. In practice, fixed costs could consist of the deposit on premises, the costs of equipment (eg medical equipment, books, kitchen tools) and the costs of hiring key staff.

The fact that the charity's fixed costs must be met before production happens introduces two time periods. After the fixed costs are covered, the charity is capable of producing a good, but the at this stage, none of the value of the investment made in the charity's infrastructure can be returned to donors. That is, the non-distribution constraint implies that fixed costs become sunk.[8]

Donors differ in their preferred missions. We assume that the 1 donor has preferred mission $\gamma = 1$ and the 0 donor preferred mission $\gamma = 0$. Preferences have the following characteristics:

- There is a constant elasticity of substitution between the private good and the mission-augmented charitable good (γB (for the 1 donor) and $(1-\gamma)B$ for the 0 donor):[9]

$$U_0(p_0, B) = (p_0^\rho + ((1-\gamma)B)^\rho)^{\frac{1}{\rho}} \tag{2}$$

$$U_1(p_1, B) = (p_1^\rho + (\gamma B)^\rho)^{\frac{1}{\rho}} \tag{3}$$

- Involve a minimum degree of complementarity between the private good and the mission-augmented charitable good. Without this complementarity, donors are never willing to collaborate because, letting the mission of the joint charity moves away from the donor's preferred mission at 0 or 1, the donor would substitute away from the public to the private good to an extent that the size of the joint charity diminishes significantly, to an extent that it is never worthwhile for donors to fund the same charity in equilibrium. See the second appendix for a proof that this implies that the elasticity of substitution $\sigma \equiv \frac{1}{1-\rho} < 2$.

Notice that we assume neither type obtains positive utility from the other type's ceteris paribus most preferred mission. That is to say, for all $\gamma \in (0,1)$ contributions toward a charitable good with mission γ are contributions to a good which is public between the donors. However, at the extremes, at mission 0, the charitable good is a private good for donor 0 and, similarly at mission 1, the good is a private good for donor 1. As Clotfelter (2012) notes, many charitable contributions in the US finance goods that are partly public and partly private in nature.

The two donors can give to separate charities, or they can give to the same charity. If they give to separate charities, then each donor can always obtain their preferred mission, as long as they have provided donations of at least F. We will assume that $m_0 > F$, which implies that both donors have the potential to fund a separate charity with the donor's preferred

[8]This is analagous to Grout (1984)'s model of hold-up in wage bargaining, in which some part of capital investment is sunk before negotiations take place between the firm and worker or union.

[9]Notice that we could micro-found γ by assuming that a mission corresponds to the charity committing to produce a mixture of two public goods B_0 and B_1, with $B_0 + B_1 = B$ with donors having preferences

$$U_i(p_i, B) = (p_i^\rho + (\alpha_i B_0^\eta + (1-\alpha_i)B_1^\eta)^{\frac{\rho}{\eta}})^{\frac{1}{\rho}}$$

where $\alpha_0 = 1$ and $\alpha_1 = 0$. Extreme missions correspond to $B_1 = B$ and $B_1 = 0$; intermediate missions to $B_1 = \gamma B$.

mission. Notice that this condition implies an upper limit on the inequality of the income distribution.

Whereas contributions to the public good and charitable good are chosen by individual donors, a jointly-funded charity charity will choose a mission that is acceptable to all donors, given the donors' outside options, through a process we set out shortly. We make the following assumptions about a charity's mission:

Assumption 4 *A charity's mission is observable but not contractible.*

This assumption has the same origins as the corresponding assumption in the incomplete contracting literature for firms. A mission is an object that is clearly observable and quantifiable by donors (given the unit interval of missions that we have specified), but is too complicated to set down in a contract that can be verified by someone outside the contractual relationship. As a motivating example, consider a mentoring project, funded by religious and secular donors. The degree of disagreement between donors is over the extent to which a faith-based ethos is implemented in the project. A contract may be able to specify whether or not priests can be mentors, but it could not cover how a religious person communicates about their faith in the course of a mentoring relationship. Or, to take another example, a contract may be able to specify whether a charity works with prisoners in a particular geographic area, but, given confidentiality issues, it might not be able to set down the severity of the offenses for which prisoners are sentenced, or their openness to rehabilitation. These variables can, however, be observed by a contracting party with sufficient knowledge and access to unverifiable data about the charity's operations.

Wooster (1994), cited in Abbinante (1997), argues that Henry Ford and Andrew Carnegie, despite their sophistication as philanthropists and clear philosophies about whom to help and how to help, were not specific about how the very large funds that they gave to endow their foundations were used. Perhaps this reflects the difficulty in embodying Ford's maxim "a chance and not a charity" in foundation law. Similarly, Carnegie was strongly against paternalistic welfare programmes, but only instructed the trustees of his foundation to "best conform to [his] wishes by using their own judgement".

Of course, there are situations in which setting down a mission would seem more straightforward. However, in these situation, there is still some room for charities' boards to manoeuvre. Abbinante (1997) demonstrates that, even when donors specifically set down their intent for donations, US law allows for their intent to be overruled by the board of trustees under certain circumstances:

- *"Cy pres" (meaning as close as possible)* If the specific wishes of the donor cannot be carried out, then the trustees may be allowed to use the funds to effectuate the general charitable intentions of the donor.

- *Administrative deviation* If circumstances change so that administrative requirements embodied in the founding principals of the trust are no longer practical, they can be overruled in order to perpetuate the trust's specific aims. Whilst this is often used to tackle purely administrative issues, it has been used to change parameters intimately linked with mission – for example, it has been used to eliminate restictions on racial groups that can benefit from the trust's activities, and to allow for the use of tuition fees.

We also assume that no charity can credibly commit to a particular mission before fixed costs have been covered. Thus we assume that:

Assumption 5 *A charity's mission is negotiated after fixed costs have been sunk*

Thus no effective decisions are taken about the mission until after fixed costs are sunk.[10] We assume that the ex-post bargaining rule is Nash bargaining with equal bargaining power.[11]

We make the following assumption so that the only margin of negotiation between donors is over the charity's mission, and not over contributions to the other party's private consumption.

Assumption 6 *No transfers between donors are possible.*

In the field of charitable giving, many large donors will channel their contributions through foundations to benefit from tax advantages. The funds committed to these foundations could not be used to make contributions to other donor's private consumption.

To summarise, the timing convention of the game is as follows:

1. *Ex-ante, t=1*: Donors earn their incomes (m_0, m_1) and choose between:
   (a) Making a contribution to the joint charity offering to cover a share of its fixed costs (s_0F for donor 0 and $(1 - s_1)F$ for donor 1), with mission determination taking place at t=2.
   (b) Giving a donation to a separate charity's costs, a charity which chooses the sole donor's preferred mission.
2. *Ex-post, t=2*: Donors choose between:
   (a) Making contributions to the joint charity. If the joint charity's fixed costs have been covered in $t = 1$, ie $s_0 = s_1$, the charity announces a mission, which is determined by Nash bargaining, with each donor who contributes at $t = 2$ having bargaining power 1/2.
   (b) Making contributions to separate charities, as in step 1b. The payoff from making contributions to separate charities defines the disagreement payoffs in the bargaining process over the joint charity's mission above.

[10] In practice, there could be several rounds of giving before the mission is renegotiated in the final round. However, it is optimal for there only to be two rounds of giving: the round where the fixed cost requirement is met, and a second round where the mission is renegotiated. If any donor makes a contribution between the two rounds, he loses mission influence in the final period.

[11] In this model, charities are essentially passive and have no role in mission determination. In another contribution, Sandford and Skellern (2014), we examine the influence of the "NGO entrepreneur" on mission choice.

3. During the production period all charities who have received total donations greater than their fixed costs produce and donors' payoffs are realised.

Given this timing convention we are now in a position to work out the payoffs achievable in equilibrium at each stage of the game.

From now on, we will work with Cobb-Douglas preferences in this section, so that the preferences are:

$$\begin{aligned} U_0(p_0, B, \gamma) &= p_0^{1/2}((1-\gamma)B)^{1/2} \\ U_1(p_1, B, \gamma) &= p_1^{1/2}(\gamma B)^{1/2} \end{aligned} \tag{4}$$

The treatment of more general constant elasticity of substitution preferences is confined to the second Appendix, in which we show that the core property that we use to reach our conclusions – that income inequality shrinks the set of compromise missions compatible with ex-ante investment – is common to all CES preferences for which some Pareto-improving compromise mission exists.[12]

4 Benchmarks

In this section, we seek to provide some context which we will later use to show which of the distortions in our model are crucial for generating our results. Thus we examine the first and second best scenarios. In the first best, the planner gets to redistribute income through taxation and mandate the contributions to the public good – removing key sources of distortion – and the mission of the joint charity is contractible. In the second best, the planner cannot choose the distribution of income and public goods contributions are at their second best levels, but the mission choice is contractible. These scenarios contrast to our model set out above in which income is unequally held, contributions are at second best levels and the mission is non-contractible. We solve our model in section 5.

4.1 The first best

The first best occurs when the planner chooses:

- The distribution of income (m_0, m_1) (chosen indirectly through tax rates)
- The contributions towards the joint project $(\hat{d}_0, \hat{d}_1)$ or towards separate projects.
- The mission γ, if the first best involves a joint project.

It is characterised by the following lemma.

[12] In further work, we plan extend this work to show that Proposition 1 can be proved for all CES preferences with elasticity of substitution < 2 – that is to say for all CES preferences for which some compromise mission exists.

Lemma 1 *The first best solution sets $m_0 = m_1$, $B = \frac{1-F}{2}$ and always involves a joint project, with mission choice given by:*

$$\gamma \in \left(\left(\frac{1-2F}{1-F} \right)^2, 1 - \left(\frac{1-2F}{1-F} \right)^2 \right)$$

When a social planner has control over tax rates and the contributions to the public good, he recognises the potential for economies of scale, and always chooses a joint project, with a mission in the region of 1/2. We can think of this as a state choosing a single social programme which involves a compromise between citizens' interests. In our model we consider several departures from this benchmark. We assume the that state has limited capacity to redistribute m, that mission is observable but not verifiable, and that contributions to the joint project are at their second best levels. It is possible to show that it is the first two distortions that drive our main result of inefficient fragmentation in the charitable sector; in the presence of the mission uncontractibility and income inequalities, it does not matter whether the contribution levels are at first or second best levels: the charitable sector is inefficiently fragmented for some F.

4.2 The second best

In this section, we will examine the second best, given that contributions to charities are voluntary, but we will allow for mission to be contractible.

In this section, the game tree is as on page 124, with one key exception: at $t = 1$, when donors contribute towards fixed costs of a joint charity, they are able to specify a mission in the contract. The joint charity can only exist only if both donors specify the same mission γ and if their contributions at $t = 1$ add up to F. The mission is not renegotiated at $t = 2$. Thus the game tree is as follows:

1. *Ex-ante, t=1*: Donors earn their incomes (m_0, m_1) and choose between:
   - (a) Making a contribution to the joint charity offering to cover a share of its fixed costs. When donors make an offer to cover fixed costs, they specify in a contract which mission should be chosen at $t = 2$. The charity only collects these contributions if both donors specify the same mission in their contract offer and fixed costs are completely covered by their offers, ie, if $s_0 = s_1$, or if one donor offers to cover all of the fixed costs.
   - (b) Giving a donation to a separate charity's costs, a charity which chooses the sole donor's preferred mission.
2. *Ex-post, t=2*: Donors choose between:
   - (a) Making contributions to the joint charity whose mission γ was chosen at $t = 1$.
   - (b) Making contributions to separate charities, as in step 1b.

3. During the production period all charities who have received total donations greater than their fixed costs produce and donors' payoffs are realised.

To solve this game we need to determine the final payoffs given all possible decisions. First we will suppose that, at $t = 1$ donors give to separate charities which, by assumption, run missions that perfectly reflect their own preferences.[13] Then, maximising (4) subject to the budget constraint

$$p_i + d_i = m_i \tag{5}$$

gives rise to a donation and indirect utility of, respectively:

$$\begin{array}{lcl} d_1 & = & \frac{m_1+F}{2} \\ V_1(S, t=1) & = & \frac{m_1-F}{2} \end{array} \tag{6}$$

Similarly for the 0 donor, who faces a similar budget constraint, when he gives to a charity not also funded by the 1 donor, his donation and indirect utility are respectively:

$$\begin{array}{lcl} d_0 & = & \frac{m_0+F}{2} \\ V_0(S, t=1) & = & \frac{m_0-F}{2} \end{array} \tag{7}$$

If the two donors were instead to contribute to separate charities at $t = 2$, having contributed to the fixed costs of the joint charity at time $t = 1$, with donor 0 contributing sF and donor 1 contributing $(1 - s)F$ at $t = 1$, indirect utilities would be instead:

$$\begin{array}{lcl} V_0(S, t=2) & = & \max\left(\frac{m_0-F-sF}{2}, 0\right) \\ V_1(S, t=2) & = & \max\left(\frac{m_1-F-(1-s)F}{2}, 0\right) \end{array} \tag{8}$$

Now consider the donors' contributions at $t = 2$ if, having made contributions to the fixed costs of the joint charity at $t = 1$, they decide, given its mission choice, to continue to give to the joint charity.

When preferences are Cobb-Douglas, the Nash equilibrium contributions of donors 0 and 1 satisfy:

$$\begin{array}{c} d_0^* = \frac{m_0-sF-d_1^*}{2} \\ \\ d_1^* = \frac{m_1-sF-d_0^*}{2} \end{array} \tag{9}$$

which, solving the simulateneous equations, assuming that both donors make a positive contribution, give rise to:[14]

[13] Given that public charity status in the US depends on support of a wide group of donors, there are two ways to think about this. One is that the i donor consists not of one donor, but of a group of donors; the other is to note that private foundations in the US can apply to become operating foundations, who run charitable programmes directly, rather than fund programmes run by other organisations.

[14] A useful feature of Cobb-Douglas preferences is that for $\gamma \in (0, 1)$ these contributions are independent of the compromise mission selected. This is not necessary for our results; we concentrate on these preferences in the main body of the text and extend the proofs to CES preferences in the proofs appendix.

$$\begin{aligned} d_0^* &= \tfrac{2(m_0-sF)-(m_1-(1-s)F)}{3} \\ d_1^* &= \tfrac{2(m_1-(1-s)F)-(m_0-sF)}{3} \end{aligned} \tag{10}$$

This gives rise to a joint project size of:

$$B = \frac{1-F}{3} \tag{11}$$

ie, the final project size is independent of the distribution of income and the share of fixed costs paid by each donor. This is the standard distribution neutrality result of Bergstrom, Blume and Varian (1986).

The derivation of the donations at $t = 2$ to the joint charity allow us to make the following observation.

Lemma 2 *If donors fund a joint charity J at t=1, then both make positive contributions to J at t=2.*

Proof If instead of the above interior solution, one donor's contribution to the joint charity at $t = 2$, say donor 0's, was 0, $d_0^* = 0$, donor 1 contribution to J would be $d_1^* = \frac{m_1-(1-s)F}{2}$. Notice that this is identical to the size of the separate charity that he could fund at $t = 2$. That would mean that donor 1, as the only contributor, could exert complete mission influence over the joint charity. That would give the other donor a zero payoff, as he does not value the other donor's preferred mission. This gives the 0 donor no incentive to contribute at $t = 1$. Hence, if both contribute to J at $t = 1$, both contribute at $t = 2$. $\square$

Corollary 1 *A joint charity with donor* 0 *contributing sF to fixed costs only exists in equilibrium if the share of income held by the* 0 *donor and the share of fixed costs borne by the* 0 *donor obey:*

$$\begin{aligned} sF + \tfrac{2(1-F)}{3} > m_0 > \tfrac{1-F}{3} + sF \\ \tfrac{3m_0-(1-F)}{3F} > \ s\ > \tfrac{3m_0-2(1-F)}{3F} \end{aligned} \tag{12}$$

Proof By imposing $d_0^*, d_1^* \geq 0$.$\square$

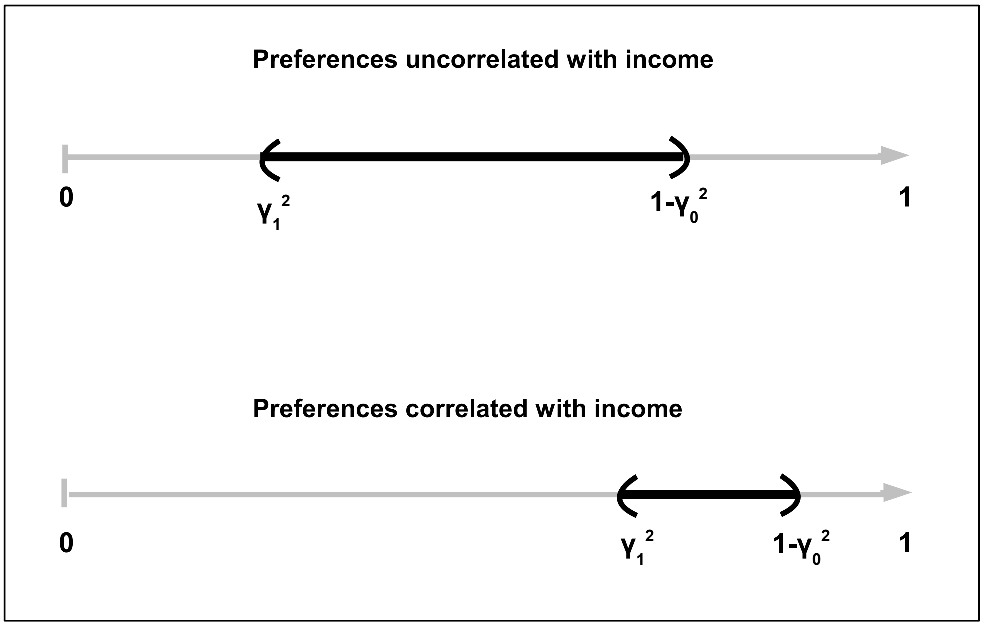
Given these limits derived on s, we choose to focus on income distributions for which the 0 donor can pick up at least some share of the fixed costs, ie, we assume:

Assumption 7 $m_0 \geq \frac{1-F}{3}$

As s tends to the upper limit on the left hand side of equation (12), the 0 donor's contribution to the marginal costs of the joint project tends to zero. This limit on the 0 donor's contribution to fixed costs will be used in the proofs of the main propositions and is a key driver of the results.

A consequence of Lemma 2 and comparing equations (6) and (7) with (8) is that:

Figure 1: Pareto-improving compromise missions



Corollary 2 *If donors give uniquely to separate charities, they choose to do so at $t = 1$. Consequently, there are two possible classes subgame perfect equilibria:*

- *Donors give to the same charity (J) at $t = 1$ and $t = 2$*
- *Donors give to separate charities (S) at $t = 1$*

The joint project size (11) allows us to derive indirect utilities:

$$\begin{aligned} V(0,J) &= (1-\gamma)^{1/2}\tfrac{1-F}{3} \\ V(1,J) &= \gamma^{1/2}\tfrac{1-F}{3} \end{aligned} \tag{13}$$

Given Corollary 2 and the payoffs in equations (6), (7) and (13), we can derive which – if any – choices of mission for the joint charity γ give rise to a Pareto improvement over separate charities. Otherwise put, we find the second best outcomes of the game, supposing that mission is contractible but that contributions to charitable goods are voluntary.

Proposition 1 *The second best:*

1. *Joint missions γ that are a Pareto improvement over separate charities satisfy:*

$$1-\gamma_0^2 \equiv 1-\left(\frac{3(m_0-F)}{2(1-F)}\right)^2 \geq \gamma \geq \left(\frac{3(m_1-F)}{2(1-F)}\right)^2 \equiv \gamma_1^2 \tag{14}$$

2. *A compromise mission exists if and only if:*

$$\left(\frac{3(m_0 - F)}{2(1-F)}\right)^2 + \left(\frac{3(m_1 - F)}{2(1-F)}\right)^2 \leq 1 \tag{15}$$

3. *Given F with $\frac{8}{9} \geq \left(\frac{1-2F}{1-F}\right)^2$, there exists a joint mission which would constitute a Pareto improvement on separate missions if the distribution of income $m_0 < \frac{1}{2}$ satisfies:*

$$\frac{1}{2} > m_0 \geq m_0^*(F) \tag{16}$$

where $m_0^*(F)$ is a lower limit on inequality depending on F, ie, the result holds for a sufficiently equal income distribution.

From now on we will say that Pareto-improving economies of scale exist if (15) is satisfied. This equation is our main benchmark for understanding the results of the uncontractible mission game solved in section 5.

Pareto-improving compromise missions only exist for sufficiently equal distributions of income (recall, the planner has no longer the power to perfectly redistribute income) because the minimum demand that a donor makes on a compromise mission is a convex function of the share of total income that he holds. Hence mean preserving spreads of income lead to an interval of Pareto-improving compromise missions which decreases in size and shifts towards $\gamma = 1$ as income inequality rises (see Figure 1). At a a certain point, the richer donor will only accept missions which the poorer donor is unwilling to accept and no compromise mission is a Pareto improvement over separate missions.

The minimum demand that a donor makes on a compromise mission is a convex function of his income because his indirect utility from the mission is a concave function of γ or $1 - \gamma$. Indirect utility is a concave function of this parameter because it augments the consumption of the charitable good B, but not the private good p. As the two goods are complementary (so that a movement of the mission away from the donor's preferred mission leads to limited substitution towards private consumption), the indirect utility function is concave in γ.[15]

$\frac{8}{9} \geq \left(\frac{1-2F}{1-F}\right)^2$ corresponds to F being above a threshold close to 0.03. This condition says, that for F sufficiently small, there can be no gains from collaboration: both donors are as well off from funding separate charities as they would be collaborating to fund a joint project.

5 Model solution: the third best

Having solved the model when mission is contractible, we return to our core model in which mission is not contractible and is negotiated at $t = 2$ after fixed costs have become sunk. Thus we return to the game tree set out on page 124.

[15] One can show that for CES preferences, mission demands have this property as long as compromise missions exist.

In order to obtain the equilibria of the model, we need to calculate the expected utility from funding a joint charity given the renegotiation rule that determines the choice of mission. The project sizes and indirect utilities at each node of the game tree are taken from the calculations in the previous section.

Given the Nash bargaining rule and the outside options (which come from the donors funding separate charities at $t = 2$, whose size are given by equation (8)), the chosen mission Γ maximises:

$$\Gamma = \text{argmax}_\gamma \left(\gamma^{1/2}\left(\tfrac{1-F}{3}\right) - \tfrac{m_1-(1-s)F-F}{2}\right)\left((1-\gamma)^{1/2}\left(\tfrac{1-F}{3}\right) - \tfrac{m_0-sF-F}{2}\right) \tag{17}$$

Defining:

$$\gamma_1' = \left(\tfrac{3(m_1-(1-s)F-F)}{2(1-F)}\right)$$
$$\gamma_0' = \left(\tfrac{3(m_0-sF-F}{2(1-F)}\right)$$

The first order conditions of Equation (17) give rise to a solution for the mission Γ:

$$\Gamma^{1/2}(\Gamma^{1/2} - \gamma_1') = (1-\Gamma)^{1/2}((1-\Gamma)^{1/2} - \gamma_0') \tag{18}$$

Lemma 3 *Suppose that Γ satisfying (17) exists. Then the compromise mission Γ chosen by Nash bargaining has the following properties:*

1. $\Gamma \in (\gamma_1'^2, 1 - \gamma_0'^2)$
2. *The mission chosen is increasing in the $t = 2$ outside option of the 1 donor and decreasing in the outside option of the 0 donor, ie :*
   $\Gamma(\gamma_0', \gamma_1')$ *satisfies* $\Gamma_1 < 0$*, and* $\Gamma_2 > 0$
3. *Equal $t = 2$ outside options imply a compromise mission at $\gamma = 1/2$: $\gamma_0' = \gamma_1' \leq \frac{1}{\sqrt{2}} \implies \Gamma = 1/2$*

This lemma allows us to specify the conditions for each donor to participate in the joint project at t=0 – the utility from a joint mission at Γ must be higher than the utility that a donor could obtain by funding a separate project at $t = 0$. We obtain:

$$\begin{aligned} \Gamma^{1/2} &\geq \tfrac{3(m_1-F)}{2(1-F)} = \gamma_1 \\ (1-\Gamma)^{1/2} &\geq \tfrac{3(m_0-F)}{2(1-F)} = \gamma_0 \end{aligned} \tag{19}$$

Notice that Γ depends on the share of the fixed costs paid for at $t = 1$ by the 0 donor. As γ_0' is decreasing in s and γ_1' is increasing in s, we obtain:

Corollary 3

$$\frac{\partial \Gamma}{\partial s} < 0 \tag{20}$$

The higher the share of the fixed costs picked up by the 0 *donor at* $t = 1$*, the further the mission at* $t = 2$ *is from his preferred mission* 0 *and the closer it is to the* 1 *donor's preferred mission.*

If one of the inequalities in (19) is violated, then there is no joint mission equilibrium with donor 0's contribution to fixed costs at $t = 1$ at sF. In the following proposition, we will show that in some cases, there is no s compatible with $d_0^* \geq 0$ that gives rise to a joint missions equilibrium, even though, for the same distribution of income, if mission were contractible there would exist a joint missions that constitutes a Pareto improvement over separate missions (ie there is a joint missions equilibrium of the second best game solved in section 4.2).

Proposition 2

1. *Let* $m_0 = m_1 > F$*. Then, whenever there exists an equilibrium of the game with contractible mission involving a joint project (ie (15)) is satisfied, then a compromise mission of the uncontractible mission game with* $\Gamma = \frac{1}{2}$ *always exists, with* $s = \frac{1}{2}$.
2. *There exists* F^* *such that for* $F \in (F^*, \frac{1}{4})$*, there are income distributions* $m_1 \in (\underline{m_1}(F), \overline{m_1}(F))$*, with* $\underline{m_1}(F) > 1/2$ *such that the contractible mission game involves a joint project (ie (15)) is satisfied, but the only equilibrium in the uncontractible mission game is separate missions.*

A proof is provided in the appendix. The idea of the proof is as follows. The richer donor's utility from a joint project is increasing in the share of fixed costs born by the poorer donor. Investing in fixed costs at $t = 1$ means giving up mission influence at $t = 2$. When the poorer donor gives a higher share of fixed costs ex-ante, the richer donor has a higher outside option in the $t = 2$ period, which, given Lemma 3 translates to more mission influence on the joint project.

However, the poorer donor is limited in his ability to invest fixed costs: at $t = 1$ he can only give as much as is compatible with him making a contribution at $t = 2$ (as we saw in Corollary 1). This forces the rich donor to bear a large share of fixed costs. Thus the rich donor is forced to lose mission influence ex-post: the poor donor will skew the mission further towards $\gamma = 0$ than the rich donor would be willing to accept ex-ante. Therefore at $t = 1$ the richer donor will never choose to joint fund a project with the poorer donor.

The result holds for intermediate levels of inequality, since, when inequality is really low, a compromise mission at $\frac{1}{2}$ will always be available in equilibrium if it is a Pareto-improvement on separate missions. When inequality is sufficiently high, no Pareto-improving compromise mission exists.

Figure 2 illustrates that, when donors with different preferences have the same income, they can find a share of fixed costs so that that the ex-post mission choice will be compatible

Figure 2: Compromise mission feasibility with income equality

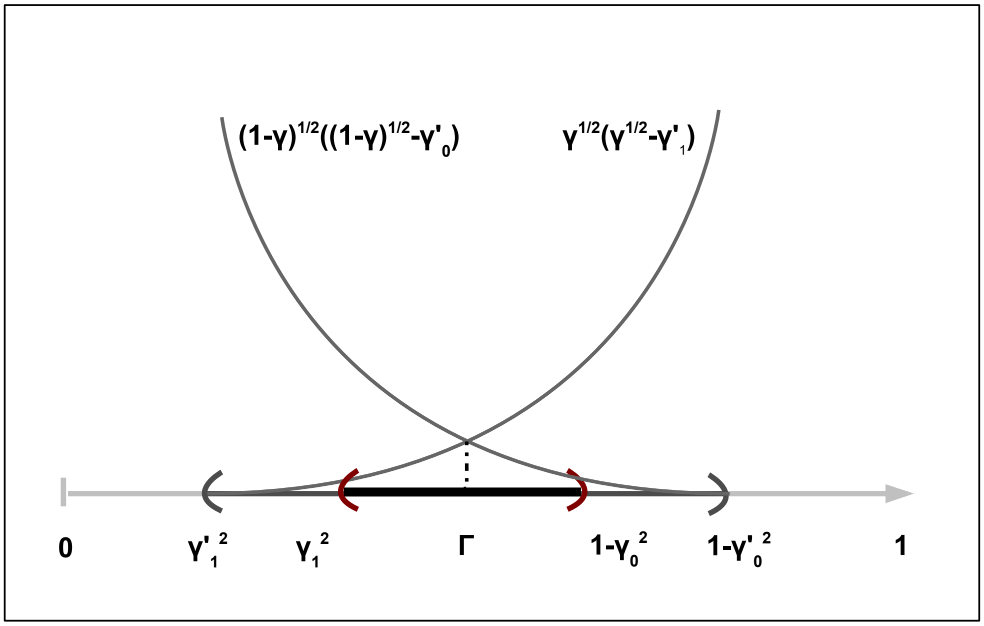
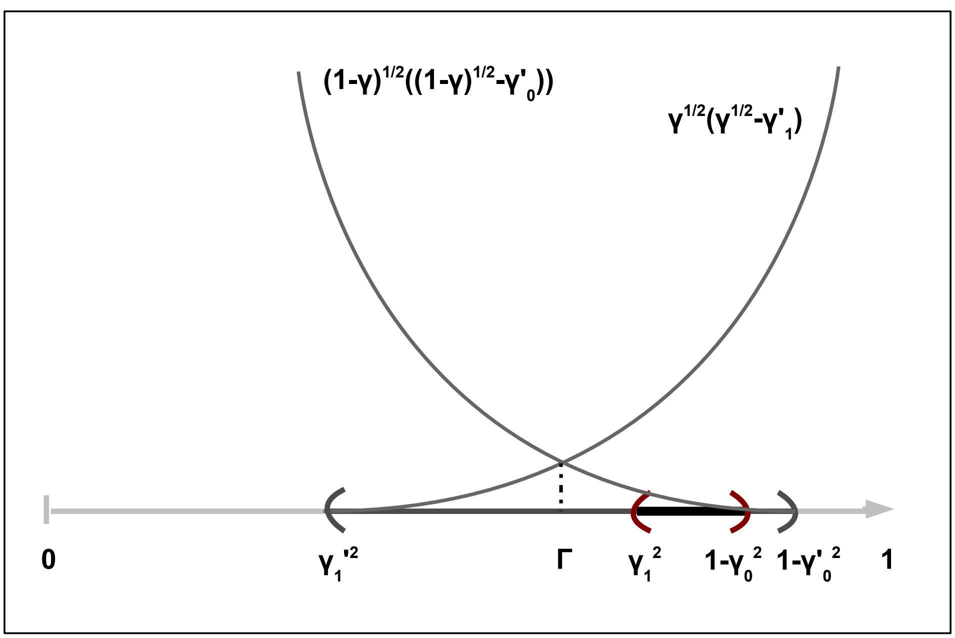


Figure 3: Compromise mission feasibility with income inequality



with ex-ante incentives to invest in fixed costs. Ex-ante, at $t = 1$, when the two donors think about contributing to a joint project versus a separate project, the 0 donor requires that the chosen mission Γ be less than $1 - \gamma_0^2$ and the 1 donor requires that it be greater than γ_1^2. This corresponds to the black interval on the diagram Supposing that the two donors share the fixed costs equally; after they have been sunk, the value of the donors' outside options are reduced equally, and the minimum mission acceptable to the 1 donor becomes $\gamma_1'^2$, and the maximum acceptable to the 0 donor is $1 - \gamma_0'^2$. The Nash bargaining solution corresponds to the value of γ at which the two grey curves intersect, ie at $\Gamma = \frac{1}{2}$, which falls into the black shaded interval under which the donors will at $t = 1$ undertake to fund the fixed costs of the joint mission.

However, in figure 3, the 1 donor is richer than the 0 donor. This means that the dark grey shaded interval of missions corresponding to potential Pareto improvements on separate missions is narrower, and shifted towards 1. The fact that the 0 donor has limited wealth to contribute towards investment in fixed costs means that the ex-post interval of missions which are compatible with both donors making a contribution to the joint mission, $[\gamma_1'^2, 1 - \gamma_0'^2]$ is such that $\gamma_1^2 - \gamma_1'^2 >> (1 - \gamma_0'^2) - (1 - \gamma_0^2)$ – that is to say, the richer donor is more disadvantaged ex-post than the poorer donor by the investment he has made in fixed costs. The Nash bargaining solution, Γ, lies outside of black shaded interval compatible with ex-ante investment, and so donors will not be prepared to put up the fixed costs of the joint venture.

6 Policy solutions

In this section, we consider the policy solutions available to a social planner who wishes to avoid the inefficiencies occurring in Proposition 2. We start by examining two solutions which are close to the solutions proposed by the incomplete contracting literature, *de facto* decision rights on the mission (analogous to ownership) and long-term contracting (analogous to a commitment not to renegotiate). Though charities and donors may have some margin to manoeuvre, these solutions are at least in part restricted by charity law. Therefore we turn our attention to more novel solutions, linked to tax incentives and government funding of the core costs of charities.

6.1 Biased boards

According to a study of America's philanthropic elite, wealthy donors are greatly "over-represented" on governing boards and at high profile gatherings of supporters (Ostrower, 1997) and, according to another, cited by Ostrower (1997), wealth may help donors gain exclusive access to policy-making positions within charities. (Oedendahl, 1990). This "power of princes" plays an intuitive role in protecting the interests of wealthy donors if they risk ex-post appropriation.

Suppose that the investment of fixed costs at $t = 1$ can be used to realise any mission at $t = 1$ and that the board of trustees of the joint charity chooses the mission in the event of disagreement. Then, if the trustees choose to use the investment at $t = 1$ towards the realisation of the richest donor's preferred mission with probability p and the poorest donor's with probability $1-p$, then, in contrast to the disagreement payoffs in equation (8), the disagreement payoffs are:

$$V_1(t=2) = p\frac{m_1-(1-s)F}{2} + (1-p)\frac{m_1-(1-s)F-F}{2}$$

$$V_0(t=2) = (1-p)\frac{m_0-sF}{2} + p\frac{m_0-sF-F}{2}$$

Notice that at $p = 1$, the rich donor will then be prepared to cover all the fixed costs at $t = 1$, since for all $s \geq 0$ his disagreement payoff, coupled with the Nash bargaining rule, means that he is at least as well off funding a joint charity as separate charities.

Whilst legal restrictions may place some limit on p – for example the requirement in the US that 50% of the members of a board should be unrelated (generally taken to mean by blood, marriage or business) – in practice there may be ways round this restriction. For example, like-minded but unrelated members can be recruited to uphold wealthy donors' interests. Note, however, that when the interval of Pareto-improving compromise missions $(\gamma_1^2, 1-\gamma_0^2)$ is very small, even slight uncertainties about the board's decision, ie, $p = 1-\epsilon$ where ϵ is small, will lead to a lack of investment at $t = 1$.

6.2 Long-term contracting

Notice that a simple solution to the contracting problem exists if all committments to fund the joint charity can be made up front: that is, once the fixed costs have been sunk at $t = 1$, both donors are committed to fund the joint project at $t = 2$. This is analogous to a committment not to renegotiate in standard models of incomplete contracting applied to firms.

What stops this simple solution being implemented in practice? One possible explanation stems from the possibility of corruption: charities could misuse funds given to cover fixed costs and so donors make donations at $t = 2$ conditional on observable (but not contractible) good behaviour at $t = 1$. Whilst entirely credible, if this is true, then donors are weighing up the risks of corruption against the benefits of economies of scale. If a donor chooses not to commit funds at $t = 1$ for $t = 2$ then the donor is better off not committing funds at $t = 1$ than writing a binding contract to give at $t = 2$ we can no longer speak of Pareto inefficiencies in outcomes.

However, another explanation for the lack of committment comes from verifiability constraints. Donors contract with charities and not with each other over their gifts. Perhaps a donor can write a contract with a charity that makes a credible committment to give funds in a future period, but is unable to verify that the other donor has also made such a credible committment. If he suspects that the other donor's contract may allow him to pull out at $t = 2$, he has no interest himself in writing a contract which commits him to giving in both periods, hence giving rise to the inefficiencies we have identified.

If verifiability constraints are the issue, introducing new legal instruments to allow donors to contract directly with one another about gifts to the joint charity would solve the problem.

6.3 Tax incentives for giving

Charitable giving is encouraged by governments through tax incentives. In the United Kingdom and the United States, amongst other countries, charitable contributions are tax deductible. As marginal tax rates increase with income, this gives rise to a system in which poorer donors face a lower price for their charitable contributions than poorer donors.

We will show that such a system will exacerbate the problems that inequality between donors creates for the achievability of Pareto-improving economies of scale. On the contrary, tax incentives which lower the price of giving for poorer donors more than for richer donors increases the income available to poorer donors to contribute to fixed costs ex-ante, and thus reduces the hold-up problem ex-post.

We will suppose that m_0 and m_1 correspond to donors' after tax incomes, and that for each dollar the rich donor gives, $1-\mu_1$ dollars are received by a charity, whereas each dollar the poor donor gives leads to a total charitable gift of $1+\mu_0$ dollars. $\mu_0, \mu_1 < 0$ corresponds to the status quo in the UK and US: richer donors facing a lower price of giving than poor donors. We will show that $\mu_0, \mu_1 > 0$ aids the achievement of Pareto-improving economies of scale.

We will impose that this adjustment to prices must be revenue neutral for the government who implements such a policy through their tax system. That is:

$$\mu_0 d_0^* + \frac{\mu_0}{1+\mu_0} sF = \mu_1 d_1^* + \frac{\mu_1}{1-\mu_1}(1-s)F \tag{21}$$

where the term in sF comes from the fact that the donor pays out $\frac{sF}{1+\mu_0}$ and the joint project obtains sF dollars. d_i^* is the equilibrium donation of donor i under this system of prices at $t=2$.

This leads to the poor donor being able to fund, at $t=1$ a charity yielding indirect utility

$$V(0, t=1) = \frac{m_0(1+\mu_0) - F}{2}$$

and the rich donor a charity of size (and indirect utility of)

$$V(1, t=1) = \frac{m_1(1-\mu_1) - F}{2}.$$

The joint charity has size

$$(1+\mu_0)d_0^* + (1-\mu_1)d_1^* - F = \frac{m_0(1+\mu_0) + m_1(1-\mu_1) - F}{3}$$

with equilibrium contributions received by the charity being given by:

$$
\begin{aligned}
(1+\mu_0)d_0^* &= \tfrac{2(m_0(1+\mu_0)-sF)-(m_1(1-\mu_1)-(1-s)F)}{3} \\
(1-\mu_1)d_1^* &= \tfrac{2(m_1(1-\mu_1)-(1-s)F)-(m_0(1+\mu_0)-sF)}{3}
\end{aligned} \tag{22}
$$

We will define $T = m_0\mu_0 - m_1\mu_1$. The size of the joint project under these tax incentives is

$$B = \frac{1+T-F}{3}$$

$T \geq 0$ implies that the tax incentives increase the size of the joint project. We will see that this is possible whilst maintaining budget balance for well chosen tax incentives.

Lemma 4 *Suppose that $\mu_0, \mu_1 \geq 0$ and $\frac{\mu_0}{1+\mu_0} \geq \frac{\mu_1}{1-\mu_1}$. Then equation (21) – budget balance – implies that $T \geq 0$, ie, that tax incentives can be used to increase total project size.*

It is possible to use tax incentives to improve project size when $m_1 > m_0$, since budget balance implies a small increase in the price of giving for the richer donor can be used to subsidize quite a large decrease in the price of giving for the poorer donor. Since donor give according to marginal returns total contributions can go up.

Lemma 5 *For donor 0 to make a positive contribution at $t = 2$,*

$$\max\left(\frac{3m_0(1+\mu_0)-(1+T-F)}{3F}, 0\right) \geq s \geq \frac{3m_0(1+\mu_0)-2(1+T-F)}{3F}$$

For $\mu_0, \mu_1 > 0$,

$$\frac{3m_0(1+\mu_0)-(1+T-F)}{3F} > \frac{3m_0-(1-F)}{3F}$$

ie, the maximum share of fixed costs that can be born by the 0 donor is strictly higher than when $\mu_0 = \mu_1 = 0$

Proof By inspection of equations (22).□

This increase in the capacity of the 0 donor to put up the fixed costs ex-ante increases the value of the richer donor's outside option at $t = 2$ and increases his mission influence on the joint project. This reduces his risk of being expropriated by a mission that he does not like.

Lemma 6 *The minimum mission choice compatible with the 1 donor's participation in the joint project is:*

$$\left(\frac{3(m_1(1-\mu_1)-F)}{2(1+T-F)}\right)^2 \tag{23}$$

which, when $T > 0$ is strictly less than $\frac{3(m_1-F)}{2(1-F)}$

These results give rise to the following:

Proposition 3 *Let tax incentives for donors be chosen so that $\mu_0, \mu_1 > 0$ with $\frac{\mu_0}{1+\mu_0} \geq \frac{\mu_1}{1-\mu_1}$. Then the set of fixed costs F for which Pareto-improving economies of scale are achievable is strictly larger than at $\mu_0 = \mu_1 = 0$.*

This proposition suggests that the elitism referred to by Clotfelter (2012) present in US tax policy is at times to the detriment of rich donors as well as the poor. Both could be made better off by tax incentives that set a lower price for giving to poorer donors.

6.4 Government subsidies of fixed costs

If governments can cover the fixed costs of a joint charity using tax revenues, the second best outcome can be achieved – if additionally the government chooses the right tax rates. Suppose that a Pareto-improving compromise mission exists, ie equation (16) is satisfied. Suppose also that $F = t_0 + t_1$ where $m_i - t_i$ is the after-tax income of each donor and the government only funds the fixed costs of a joint charity. Then the condtion that must be satisfied for both donors to give to the joint charity at $t = 2$ is:

$$\Gamma\left(\tfrac{3(m_0-t_0-F)}{2(1-F)}, \tfrac{3(m_1-t_1-F)}{2(1-F)}\right) \in \left(\left(\tfrac{3(m_1-t_1-F)}{2(1-F)}\right)^2, 1-\left(\tfrac{3(m_0-t_0-F)}{2(1-F)}\right)^2\right)$$

Given the properties of Γ outlined in Lemma 3, this is always satisfied. However, suppose that without government covering fixed costs, the only equilibrium outcome is separate missions. For the policy of funding the joint charity's fixed costs to be a Pareto improvement on that separate missions equilibrium, we require that a more stringent condition be satisfied:

$$\begin{aligned}\Gamma\left(\tfrac{3(m_0-t_0-F)}{2(1-F)}, \tfrac{3(m_1-t_1-F)}{2(1-F)}\right) &\in \left(\left(\tfrac{3(m_1-F)}{2(1-F)}\right)^2, 1-\left(\tfrac{3(m_0-F)}{2(1-F)}\right)^2\right) \\ &\equiv (\gamma_1^2, 1-\gamma_0^2)\end{aligned}$$

The left hand side, which we will refer to as $\Gamma(t_1)$ is a continuous and decreasing function of t_1. This gives rise to three cases:

- $\Gamma(0), \Gamma(F) \in (\gamma_1^2, 1-\gamma_0^2)$ – any choice of taxation policy permits Pareto-improving economies of scale.
- $\Gamma(0) \leq 1-\gamma_0^2$, $\Gamma(F) \leq \gamma_1^2$. A taxation policy with $t_0 > 0$ permits Pareto-improving economies of scale exists.
- $\Gamma(0) \geq 1-\gamma_0^2$, $\Gamma(F) \leq \gamma_1^2$. Whilst neither extreme gives rise to the desired result, the fact that Γ is a continuous and decreasing function of t_1 leads to a standard application of the intermediate value theorem. Thus there exist tax policies, with $t_0, t_1 > 0$ such that Pareto improving economies of scale are achievable.

Hence we have the following result.

Proposition 4 *Suppose that equation (16) is satisfied but that Pareto-improving economies of scale are not feasible in equilibrium, as in part 2 of proposition 2. Let the government fund the fixed costs of the joint charity through taxation. Then there exists t_0, t_1 with $t_0 + t_1 = F$ such that the after-tax income of the i donor is $m_i - t_i$ that makes feasible Pareto-improving economies of scale.*

Notice that this result rests on the government correctly being able to identify the joint charity. If the government instead is obliged to fund the fixed costs of all charities receiving support from donors, the policy furthers inefficient fragmentation. Suppose that $t_0 + t_1 = F$ so that in equilibrium, the government only funds one charity. If it funds a joint charity's fixed costs, total project sized is still $\frac{1-F}{3}$. But if one donor deviates, government funding for the deviation charity's fixed costs means that that donor can expect a project size of $\frac{m_i - t_i}{2}$ Then we require, for a compromise mission to exist given tax incentives:

$$\left(\frac{3(m_0-t_0)}{2(1-F)}\right)^2 + \left(\frac{3(m_1-t_1)}{2(1-F)}\right)^2 \leq 1$$

$$\iff 2\left(\frac{m_0-t_0}{1-F} - \frac{1}{2}\right)^2 + \frac{1}{18} \leq 0$$

As this is always violated, a tax policy with such a budget constraint can never aid Pareto-improving economies of scale.

This suggests that governments should make fixed cost support conditional on receiving support from more than one donor at $t = 2$. If realised contributions come from too narrow a group, then governments should have the capacity to demand that the later contributions must also cover the fixed costs so that the fixed cost support from the government is reimbursed.

Similarly to Pogrebna *et al.* (2014) we find that there is a role for the government to play in funding fixed costs. In this context with uncontractible mission and preferences correlated with wealth, government's contribution to fixed costs must be conditional on the charity obtaining broad-based support.

In Pogrebna *el al.* (2014) we show that government funding choices do appear to be sensitive to charities fixed costs, as measured by the "Management and General Administration Expenditure" expenses category which must be included in Canadian charities' accounts. In a sample of 48,346 charities examined over the period 1997-2005, a one percentage point increase in charities' fixed costs is associated with almost a two percentage point increase in government funding.[16]

In the next section, we examine a policy in a similar spirit: in the US, only charities who receive a third of their contributions from donor who give less than 2% of the charity's total income are eligible for tax deductions on contributions. We show that, when this policy applies to marginal as well as fixed costs, and to all charities, the policy may in fact prevent Pareto-improving economies of scale being achieved. However, the implementation may lead to social welfare gains.

6.5 Tax deductions and broad-based support

In the US, public charities (those who are eligible to receive tax-deductible contributions) must receive at least one third of their income from donors who each contribute less than

[16] In the same dataset, a charitys age appears to be positively and significantly correlated with the proportion of revenue it receives from government. Clearly, this pattern may have nothing to do with optimal policy choices on the part of government: it may simply be that established charities are better at soliciting government funding.

2% of the charity's total income. In this section we examine the effect of such a policy. We show that it can in fact impinge on the feasibility of Pareto-improving economies of scale in the charitable sector: that is to say, a policy in which tax subsidies are made conditional on the distribution of gifts in this way may be worse for some donors than a situation in which tax incentives are not conditional on the composition of contributions. However, introducing such a policy, whilst making rich donors worse off, can induce both donors to contribute to a joint project which is closer to the social welfare maximising mission at $\Gamma = 1/2$.

Assume that there are $2N$ donors where N is even. N donors have income $m_0 < m_1$, with $N(m_0 + m_1) = 1$. All donors with income m_0 prefer mission 0, all donors with income m_1 prefer mission 1.

We will assume that the donations rule is that 1/2 of all donors must give a maximum of αB towards project size B in order to to maintain public charity status. If contributions obey the tax-exempt rule, then \$1 of gifts gives rise to $(1 + \mu)$ of receipts by the charity. In this section, we assume that μ is independent of the donor's income.

Consider first the case of separate projects.

Lemma 7 *Let N donors have income m_i and let $\alpha < \frac{1}{N}$.*

- *The size of the project funded with fixed costs F by the group of donors with income m_i is:*
$$B_i^{CON} = \max\left(\frac{\frac{N}{2}(1+\mu)m_i - F}{1 + \frac{N}{2}(1-\alpha)}, \frac{Nm_i - F}{N+1}\right) \tag{24}$$
- *Donors prefer to benefit from the tax incentives if their income is greater than some threshold:*
$$m_i \geq \hat{m} \tag{25}$$
ie, if income is sufficiently large.
- *The project size is strictly less than the size of the charity when tax incentives are unconditional, $B_i^{UNCON} = \frac{N(1+\mu)m_i - F}{N+1}$. The difference is increasing in m_i,*
$$\frac{\partial}{\partial m_i}\left(B_i^{UNCON} - B_i^{CON}\right) > 0$$

Alternatively, if $\alpha \geq \frac{1}{N}$ project size is $\frac{N(1+\mu)m_i - F}{N+1}$.

If $\alpha < \frac{1}{N}$ then the normal symmetric equilibrium in which each donor gives the same amount, which implies a project size of $\frac{N(1+\mu)m_i - F}{N+1}$, is incompatible with donors benefiting from tax incentives for giving. Either some donors give less in order for the tax deductible status to be maintained, or donors decide to give to a charity which does not benefit from tax incentives. This choice exists in practice for non-profits in the US; of the estimated 2.3 voluntary organisations, 1.6 million are registered with the Internal Revenue Service (IRS) in order to benefit from tax incentives. (Roeger *et al*, 2012)

We have shown that the reduction in project size when tax incentives are made conditional is greater for the group of richer donors. Consider the case when both sets of donors wish to benefit from tax incentives – because the constraint that donors give less than a share α of total contributions leads to a lower absolute reduction in donations in the poorer group of donors.

Now we turn to the size of the joint project.

Lemma 8 *Consider the size of the joint project given conditional tax incentives:*

- *Suppose that*
$$\alpha < \frac{(1+\mu)m_0}{\frac{1+\mu-F}{2N+1}} - \frac{N+1}{N} \tag{26}$$
and $m_0 \geq \alpha\frac{(1-F)}{N+1}$. *Then a joint project exists and has size:*
$$B_J^{CON} = \max\left(\frac{N(1+\mu)m_1 - F}{N(1-\alpha)+1}, \frac{1-F}{2N+1}\right) \tag{27}$$
The size of the joint project is strictly less than the size of the joint project when the constraint is not binding.

- *If (26) is violated, the constraint is not binding and*
$$B_J^{CON} = \frac{1+\mu-F}{2N+1}$$

Corollary 4 *Let* $\alpha < \frac{1}{N}$. *The demand that donor i makes on the mission that is compatible with ex-ante investment falls when the policy is introduced. Thus the set of compromise missions compatible with ex-ante investment increases in size.*

The sizes of the separate projects fall more than the size of the joint project, since in the joint project, the poorest donors can be prevailed upon to take upon them the constraint that their contributions individually make up less than a share α of total contributions, leaving the richer donors to make large contributions without constraint. When all donors have the same income, there is no way to encourage a poorer group of donors to make smaller donations (less that α of total contributions).

Next we turn our attention to the share of fixed costs which can be born by the 0 donors which is still compatible with them making an ex-post donation.

Lemma 9 *Let* s^{CON} *be the share of fixed costs picked up by the* 0 *donors given the conditional tax incentives scheme. Then* $s^{CON} \leq s^{UNCON}$.

With conditional tax incentives, the 0 donors are restricted in their ability to give donations ex-ante and ex-post. Thus the maximum amount the 0 donors can give to fixed costs whilst maintaining a positive donation ex-post falls.

We now show that introducing conditional tax incentives is not Pareto-improving. We provide an example in which Pareto-improving economies of scale are achievable with unconditional tax incentives. The introduction of conditional tax incentives still allows economies of scale, but leaves the richer donors worse off than they would be when tax incentives are unconditional on the distribution of gifts.

Proposition 5 *Suppose that, when tax incentives are unconditional, economies of scale are just compatible with the* 1 *donors' participation constraint, ie:*

$$\Gamma^{1/2}\left(\gamma_0'(s^{UNCON}), \gamma_1'(s^{UNCON})\right) B^{UNCON} = \tfrac{N(1+\mu)m_1 - F}{N+1} \tag{28}$$

Let $\alpha N = 1 - \epsilon$ *where* ϵ *is infinitesimally small. Then (26) is violated, so that* $B^{UNCON} = B^{CON}$*. Then the introduction of conditionality is not Pareto-improving, but does increase social welfare:*

$$B_1^{CON} < \Gamma^{1/2}\left(\gamma_0'(s^{UNCON}), \gamma_1'(s^{CON})\right) B^{CON} < \tfrac{N(1+\mu)m_1 - F}{N+1} = B_1^{UNCON} \tag{29}$$

The result that social welfare increases with incentives conditional on the distribution of gifts depends on the joint project under conditional incentives having the same as the size as with unconditional tax incentives. If this is not the case, the reduction in Γ achieved with conditional tax incentives may not lead to an increase in social welfare.

In the above example, we examine a situation in which, without conditional tax incentives, a single compromise mission that is a Pareto improvement on separate missions exists (and involves the 0 donors take on the maximum share of fixed costs compatible with them making an ex-post donation). Then, introducing an α which is less that $\frac{1}{N}$ but is still large enough to allow 0 donors to make their unconstrained contribution to the joint project, leads to a decrease in ex-ante demands that both types make on the mission, but more so for the richer donors, by Lemma 7. In addition, the share of the fixed costs which can be born by the 0 donors goes down, further pushing the chosen compromise mission away from the 1 donor's preferred mission. This means that the 1 donors are strictly worse off than when the tax incentives are unconditional. However, given that the policy is chosen by the government, the reduction in the rich donor's demand on the mission means that is prepared to invest at $t = 1$ all the same.

7 Discussion

In this section, we discuss implications of our results for further research. Notice that Proposition 2 implies that joint-funding of charities is more likely, the closer the income/endowment of contributing donors, and secondly, that the relationship between total donations to non-profits and social welfare is ambiguous. To see this last point, notice that:

In order to see this, take the example of two donors and Cobb-Douglas preferences:

$$\underbrace{\frac{m_0+F}{2}+\frac{m_1+F}{2}}_{\text{Total donations: separate mission}} \geq \underbrace{\frac{m_0+m_1+2F}{3}}_{\text{Joint mission}} \tag{30}$$

Total donations under separate missions are always higher – but Proposition 2 implies that both parties may be better off under a joint mission, whether or not this happens in practice.

A good test of our model would be to look at whether, fixing total income, inequality between donors income has an effect on total donations. Our model predicts that when preferences and wealth are correlated, for low levels of inequality, donations are low because donors can always collaborate to fund a joint mission near $\Gamma = 1/2$, but for larger levels of inequality, the ability to reach a compromise on a joint mission breaks down and total donations increase.

This could be examined further by looking at the behaviour of individual donors – for example – looking at whether foundations of similar endowments are more likely to joint-fund charities than foundations of unequal endowments.

Equally it could be tested for groups of donors. An assumption that is often made in the empirical literature on ethnic diversity is that different ethnic or religious groups have different preferences for public goods. Whilst a large literature finds that contributions to public or charitable goods go up with increasing levels of ethnic or religious diversity (for example, Alesina *et al.* (1999), Miguel and Gugerty (2005) and Andreoni *et al.* (2011)), there are also other papers that find no link. Glennister *et al.* (2009), for example, find no effect of ethnic diversity on local public goods provision in Sierra Leone for a variety of model specifications and measures of diversity. Nor does Miguel (2004). In our model, we have focused upon the interpretation of B as a charitable good, but B can also be interpreted as a lpublic good, and γ as a measure of conformity to the preferences of a particular ethnic group. Income inequality between ethnic groups should thus be included in regressions on the effect of ethnic diversity on contributions towards public goods. If there is little inequality between the projects sizes that the ethnic groups could fund if they acted separately, then this could account for donation levels which remain low in spite of ethnic diversity; whereas if inequality by this measure is higher, we would expect higher levels of donations corresponding to separate projects being funded.

8 Conclusions

The inability of donors to write long-term, binding committments to joint fund a charity, coupled with fixed costs and uncontractible mission leads, when preferences are correlated with wealth and inequality is high, to the breakdown of economies of scale that would be Pareto-improving if such long-term committments were possible. This suggests that Bush Snr's "thousand points of light" observation about the charitable sector in unequal societies is indeed an idealisation of politicians' creation, or at least an acceptance of the limitations of voluntary contributions equilibria, and not an objective statement about optimality.

Whether politicians are motivated by pragmatism or the political gains by praising the diversity of the charitable sector, this paper suggests policy instruments that can create better results than voluntary contributions alone. In contrast to the tax policy that we observe in the US and UK, tax subsidies for giving that decrease with income could remedy the situation. Alternatively, the funding of fixed costs of charities having broad support through taxation allows for the achievement of more efficient outcomes.

9 Appendix: Proofs

Proof of Lemma 1 Given that, with Cobb Douglas preferences, contributions towards the joint project are independent of mission γ, we note first that preferences imply that contributions should be chosen such that $m_i - d_i = D - F$. This comes from maximising:

$$\lambda(m_0 - d_0)(d_0 + d_1 - F) + (m_0 - d_0)(d_0 + d_1 - F) \tag{31}$$

for some $\lambda > 0$. Substituting out λ from the first order conditions, this gives rise to $\left(1 - \frac{D-F}{m_0-d_0}\right)\left(1 - \frac{D-F}{m_1-d_1}\right) = 1$. We can use this conclude that both terms in the product are equal to one, otherwise we could not be at a Pareto optimum. If the first term is larger than one, then $m_0 - d_0 > D - F$ which implies that the marginal return to 0 of reducing his donation is positive. Further, the second term being smaller than 1 implies that $m_1 - d_1 < D - F$, so that the 1 donor would like to contribute more to the joint project, so a Pareto improvement can be achieved by lowering d_0, increasing d_1 and keeping D constant. Now, adding $m_0 - d_0 = D - F$ to $m_1 - d_1 = D - F$ we obtain $D - F = \frac{1-F}{2}$ This gives rise to an indirect utility for donor 0 of $(1-\gamma)^{1/2}\frac{1-F}{2}$ and of donor 1 of $\gamma^{1/2}\left(\frac{1-F}{2}\right)$. The indirect utilities imply that, restricting attention to consider only joint projects, any choice of γ with a would be Pareto optimal.

We now return to the choice of the joint project versus the separate project. The indirect utility at separate projects is, as in the second best case, $V_i(S, t = 1) = \frac{m_i - F}{2}$ Now we can examine whether the planner would impose a compromise mission or would prefer separate missions. There exists a Pareto-improving compromise mission with first best contribution levels if and only if:

$$\begin{aligned} \gamma^{1/2} &\geq \tfrac{m_0-F}{1-F} \\ (1-\gamma)^{1/2} &\geq \tfrac{m_1-F}{1-F} \end{aligned} \tag{32}$$

which has a solution for γ provided that:

$$\left(\frac{m_0 - F}{1 - F}\right)^2 + \left(\frac{1 - 2F}{1 - F} - \frac{m_0 - F}{1 - F}\right)^2 \leq 1 \tag{33}$$

The left hand side of the polynomial achieves its minimum value at $m_0 - F = \frac{1}{2} - F$. Then the (33) can be satisfied by picking $m_0 = 1/2$ as long as $2\left(\frac{1-2F}{1-F}\right)^2 \leq 1$, which is true for all $F \in [0, 1]$. Given $m_0 = \frac{1}{2}$ any mission that simultaneously satisfies $\gamma^{1/2} \geq \left(\frac{1-2F}{1-F}\right)^2$ and $(1-\gamma)^{1/2} \geq \left(\frac{1-2F}{1-F}\right)^2$ can be chosen to obtain the first best. □

Proof of Proposition 1. Equation (14) follows from comparison of payoffs. Equation (15) follows by rearrangement. To obtain m_0^* we rearrange (15):

$$2\left(\frac{3(m_0-F)}{2(1-F))}\right)^2 - 2\left(\frac{3(m_0-F)}{2(1-F)}\right)\left(\frac{3(1-2F)}{2(1-F))}\right) + \left(\frac{3(1-2F)}{2(1-F))}\right)^2 - 1 \le 0 \tag{34}$$

This quadratic equation in $\frac{3(m_0-F)}{2(1-F)}$ has a real solution so long as:

$$\frac{3}{2\sqrt{2}}\left(\frac{1-2F}{1-F}\right) \le 1 \tag{35}$$

. Intuitively, this condition says, when $m_0 - F = m_1 - F = \frac{1-2F}{2}$, a compromise mission exists at $\Gamma = \frac{1}{2}$. It can be rearranged to state that $F \ge \frac{5-3\sqrt{2}}{14} \approx 0.03$. This threshold for F exists, because if $F = 0$ there can be no rationale for collaboration: each donor is at least as well off funding a separate charity with his preferred mission than in making any compromise with the other over the mission. Then, picking the root of equation (34) that implies $m_0 \le m_1$ we obtain that a compromise mission exists if:

$$m_0 - F \ge m_0^* - F \equiv \frac{1}{2}(1-2F) - \sqrt{\frac{1}{9}(1-F)^2 - \frac{1}{8}(1-2F)^2} \tag{36}$$

which is strictly less than $\frac{1}{2}(1-2F)$. Notice that this condition implies $m_0 \ge F$ if $\frac{3(1-2F)}{2(1-F)} \ge 1$. So, conditional on (35) being satisfied, compromise missions exist for a non-empty interval of m_0. $\square$

Proof of Lemma 3. Restrict attention to $\Gamma \in [0,1]$. Note that the LHS and the RHS of (18) are both strictly positive – that is to say compatible with the participation constraint of both donors – if and only if the first part of the lemma holds. On this interval the LHS is an increasing function of Γ and the RHS an increasing function of $1-\Gamma$. This implies that there is a unique solution to (18) and the solution is on the interval specified. Differentating (18) and using that, on the interval $({\gamma_1'}^2, 1-{\gamma_0'}^2)$ the LHS is an increasing function, and the RHS is a decreasing function of Γ, we obtain the comparative statics in point 2;taking the comparative static with respect to γ_1' as an example we obtain:

$$\frac{\partial \Gamma}{\partial \gamma_1'} = \frac{\Gamma^{1/2}}{1 - \frac{\gamma_1'}{2}\Gamma^{-1/2} + 1 - \frac{\gamma_0'}{2}(1-\Gamma)^{-1/2}} \tag{37}$$

To derive point 3, notice that this gives rise to

$$2\Gamma - 1 = \frac{1}{2}(\Gamma^{1/2} - (1-\Gamma)^{1/2})$$

which has a solution at $\Gamma = \frac{1}{2}$.

If a solution exists, it is unique, hence result.$\square$

Proof of Proposition 2

1. Setting $s = \frac{1}{2}$ yields a compromise mission at $\Gamma(\gamma_0', \gamma_1')$ with $\gamma_0' = \gamma_1'$, which given Lemma 3 implies that $\Gamma = \frac{1}{2}$. This is compatible with $t = 1$ incentives to invest in fixed costs if (35) is satisfied.

2. Suppose that the distribution of income is as specified in item 3 of Proposition 1. That is to say, $m_0 \geq m_0^*$ so that the set of Pareto-improving compromise missions is non-empty. Equation (36) corresponds to the lower bound on $m_0 - F$ compatible with a compromise mission existing, going back to (15) we can see that $\left(\frac{3(m_1-F)}{2(1-F)}\right)$ corresponds to the other root of the quadratic equation (34) and so we rewrite the condition for a compromise mission existing in terms of m_1:

$$\left(\frac{3(m_1 - F)}{2(1 - F)}\right) \leq \frac{1}{2}\frac{3(1 - 2F)}{2(1 - F)} + \sqrt{\frac{1}{4} - \frac{1}{8}\left(\frac{3(1 - 2F)}{2(1 - F)}\right)^2} \tag{38}$$

Now we consider the utility of the 1 donor from contributing to a joint charity at $t = 1$, given that the 0 donor makes a positive contribution to the joint charity at $t = 2$:

$$\frac{3(m_1 - F)}{2(1 - F)} < 1 \tag{39}$$

Let s approach the maximum share of fixed costs that can be born by the 0 donor which is compatible with him making a donation to the joint project at $t = 2$. This limit $s = \frac{3m_0-(1-F)}{3F}$, obeys $2(m_0 - sF) = (m_1 - (1 - s)F)$ (see (10). Thus we find that as $s \to \frac{3m_0-(1-F)}{3F}$ from below:

$$\begin{aligned} \gamma_1' &\to 1 - \tfrac{3F}{2(1-F)} \\ \gamma_0' &\to \tfrac{1}{2} - \tfrac{3F}{2(1-F)} \end{aligned} \tag{40}$$

Notice that as the ex-post contribution of the 0 donor goes to zero, for $\frac{3F}{2(1-F)} < \frac{1}{2}$, the minimum demand of the 0 donor on the mission of the joint charity remains bounded away from 0. This is because he can still fund his own charity, and may prefer a comparatively large donation to a separate project at $t = 2$ than an ϵ-small donation to the joint project, if the joint project mission is not sufficiently attractive.

As this limit is reached, given the participation constraint for the joint project (19), the richer donor 1 will not find it worthwhile to contribute at $t = 1$ if:

$$\Gamma\left(\frac{1}{2} - \frac{3F}{2(1 - F)}, 1 - \frac{3F}{2(1 - F)}\right) \leq \left(\frac{3(m_1 - F)}{2(1 - F)}\right)^2 \tag{41}$$

Now we notice that the left hand side is decreasing in $a \equiv \frac{3F}{2(1-F)}$.

$$\frac{\partial \Gamma}{\partial a} = -\frac{\Gamma^{1/2} - (1 - \Gamma)^{1/2}}{1 - \frac{\gamma_1'}{2}\Gamma^{-1/2} + 1 - \frac{\gamma_0'}{2}(1 - \Gamma)^{-1/2}} \leq 0 \tag{42}$$

since $m_1 > m_0$ implies, using parts 2 and 3 of lemma 3 $\Gamma \geq 1 - \Gamma$ and the denominator is positive since $\Gamma^{1/2}(\Gamma^{1/2}-\gamma_1')$ is an increasing function of Γ at the Nash-bargaining solution, whereas $(1-\Gamma)^{1/2}((1-\Gamma)^{1/2}-\gamma_0')$ is a decreasing function at the solution.

Now combining equations (38) and the converse of (41), we find that there exists a distribution of income (m_0, m_1) such that economies of scale would be Pareto-improving, but no compromise mission equilibrium, only if the following conditions are satisfied:

$$\begin{aligned}\Gamma^{1/2}\left(\tfrac{1}{2}-\tfrac{3F}{2(1-F)}, 1-\tfrac{3F}{2(1-F)}\right) \le \left(\tfrac{3(m_1-F)}{2(1-F)}\right)&\\ \le \tfrac{1}{2}\tfrac{3(1-2F)}{2(1-F)} + \sqrt{\tfrac{1}{4}-\tfrac{1}{8}\left(\tfrac{3(1-2F)}{2(1-F)}\right)^2}&\end{aligned} \tag{43}$$

The left hand side is decreasing in $\frac{F}{1-F}$ and the right hand side is decreasing in $\frac{1-2F}{1-F}$; hence the left hand side is decreasing in F and the right hand side is increasing in F. Let us set $F=\frac{1}{4}$. Then $\frac{3}{2}\frac{F}{1-F}=\frac{1}{2}$ and $\frac{3(1-2F)}{2(1-F)}=1$ We need to check that this choice of F is compatible with our assumption that $m_0 > F$. Indeed it is, since $m_0 = F$ can be rewritten as $\frac{3(1-2F)}{2(1-F)}=1$. Thus, at this value of F, the 0 donor can no longer fund a separate charity of positive size at $t=2$ (or indeed $t=1$) so that his demand on the mission tends to zero. Then the right hand side of (43) is equal to $\frac{2+\sqrt{2}}{4}\approx 0.85$ and the left hand side is $\Gamma\left(0,\frac{1}{2}\right)=\frac{1+\sqrt{31}}{8}\approx 0.82$.

Thus for F sufficiently close to 1/4, there exists distributions of income m_1 for which a Pareto-improvement over separate missions exists when mission is contractible, but not as an equilibrium outcome. Applying the intermediate value theorem to (43), we find that there exists $F^* < 1/4$ such that both inequalities hold with equality. At $F^*+\epsilon$ there is a small interval of income distributions such that Pareto-improving economies of scale exist but are not feasible. As F approaches 1/4 from below the interval of possible m_1 gets larger. $\square$

Proof of Lemma 4. Equation (21) gives rise to:

$$\frac{\mu_0}{1+\mu_0}\left(2(1+\mu_0)m_0-(1-\mu_1)m_1+F\right)=\frac{\mu_1}{1-\mu_1}\left(2(1-\mu_1)m_1-m_0(1+\mu_0)+F\right)$$

Defining $\eta \equiv \frac{\mu_0}{1+\mu_0}\frac{1-\mu_1}{\mu_1}$ we find that:

$$\begin{aligned}&(2\eta+1)\tfrac{1+\mu_0}{\mu_0}\mu_0 m_0+(\eta-1)F &&= (\eta+2)\tfrac{1-\mu_1}{\mu_1}m_1\mu_1\\ \iff\ &(2\eta+1)(\mu_0 m_0-\mu_1 m_1) &&= (\eta^2-1)\mu_1 m_1-(\eta-1)\tfrac{\mu_0}{1+\mu_0}F\\ \iff\ &(2\eta+1)(\mu_0 m_0-\mu_1 m_1) &&= (\eta-1)\tfrac{\mu_0}{1+\mu_0}\left((1+\tfrac{1}{\eta})m_1-F\right)\end{aligned}$$

Since we have assumed that $m_1 > F$ and that $\mu_1, \mu_0 > 0$ we have that $\eta > 1$ implies that $T > 0$. $\square$

Proof of Proposition 3 It suffices to examine the equivalent of Equation (43) given the outside option of the 1 donor derived in Lemma 6, and using the upper bound on s outlined in Lemma 5. That is to say, we let $s=\frac{3(1+\mu_0)m_0-(1+T-F)}{3F}$, which implies that the outside options of the donors, divided by the joint project size, become:

$$\begin{aligned} \tfrac{3((1+\mu_0)m_0-F)}{2(1+T-F)} &= \tfrac{1}{2} - \tfrac{3F}{2(1+T-F)} \\ \tfrac{3((1+\mu_1)m_1-F)}{2(1+T-F)} &= 1 - \tfrac{3F}{2(1+T-F)} \end{aligned} \tag{44}$$

Hence, we obtain that the 1 donor will refuse to participate in the joint project if:

$$\Gamma^{1/2}\left(\frac{1}{2} - \frac{3F}{2(1+T-F)}, 1 - \frac{3F}{2(1+T-F)}\right) - \frac{3(m_1(1-\mu_1)-F)}{2(1+T-F)} \geq 0 \tag{45}$$

Differentiating the left hand side of this equation, we find that it is strictly increasing in T and μ_1. Hence, increasing μ_0 and μ_1 away from zero, and respecting $\frac{\mu_0}{1+\mu_0} \geq \frac{\mu_1}{1-\mu_1}$, we find that 45 holds for a larger set of F and m_1 than in the case $\mu_0 = \mu_1 = T = 0$. $\square$

Proof of Lemma 7.

First suppose that $\alpha \geq \frac{1}{N}$. Then the project has its unconstrained size because each donor gives a fraction $\frac{1}{N}$ in equilibrium. If not, we will assume that each donor from group i bears a share $\frac{1}{N}$ of fixed costs of their preferred project. By the distribution neutrality results of Bergstrom, Blume and Varian (1986), it does not matter which of the donors bears the fixed costs, as long as each donor can make a contribution to marginal costs. For the donors who are restricted by the constraint, whom we will sometimes refer to as "small donors" their donation d_s towards marginal costs obeys:

$$b_s + \frac{F}{N} \leq \alpha B_i$$

and the optimisation condition for other donors, whom we will sometimes refer to as "large donors" gives rise to:

$$b_l + B_i = m_i - \frac{F}{N} \tag{46}$$

Using that $B_i = \frac{N}{2}\left(\alpha B_i - \frac{F}{N}\right) + \frac{N}{2} b_l$ we also obtain that:

$$\frac{N}{2}\left(m - \frac{F}{N} - B_i\right) + \frac{N}{2}\left(\alpha B_i - \frac{F}{N}\right) = B_i$$

Solving for B_i we derive the size of the i donors' contributions if they decide to fund a project which is eligible for tax incentives, $B_i = \frac{\frac{N}{2}m_i - F}{\frac{N}{2}(1-\alpha)+1}$. If they decide to fund a project ineligible for tax incentives, it has size $\frac{Nm_i - F}{N+1}$. Comparing the sizes of the two projects we see that richer donors prefer projects eligible for tax incentives. We impose the notation B_i^{CON} for the larger of the two projects. To show that $B_1^{UNCON} - B_1^{CON} > B_0^{UNCON} - B_0^{CON}$ note that this is satisfied if: $\frac{N(1+\mu)m_1 - F}{N+1} - \frac{\frac{N}{2}(1+\mu)m_1 - F}{\frac{N}{2}(1-\alpha)+1} \geq \frac{N(1+\mu)m_0 - F}{N+1} - \frac{\frac{N}{2}m_0(1+\mu) - F}{\frac{N}{2}(1-\alpha)+1}$ which can be verified by differentiation.

Comparing (24) with the unconstrained size of the project, we find that the constrained size is strictly smaller if and only if:

$$\frac{F}{N}(1+\alpha)+m_i\left(\frac{1}{N}-\alpha\right)\geq 0$$

ie, given that $N \geq 2$, for all values of parameters. □

Proof of Lemma 8. In a joint project where the constraint on donation size $d_0+\frac{sF}{N} \leq \alpha B$ does not bind, the value of a 0 donor towards the joint project is:

$$\frac{N((1+\mu)m_0 - s\frac{F}{N}) - (N+1)((1+\mu)m_1 - (1-s)\frac{F}{N})}{2N+1} + \frac{sF}{N}$$

If the constraint does bind then this quantity must be greater than $\alpha\frac{1+\mu-F}{2N+1}$. Eliminating the terms is $\frac{sF}{N}$, the converse of that condition gives rise to equation (26).

Let the 0 donors bear a share s of fixed cost F, and the 0 donors be bound by the constraint $(1+\mu)d_0 + \frac{sF}{N} \leq \alpha(B_J^{CON}+F)$. Then the 1 donors set:

$$(1+\mu)b_1 + B_J^{CON} = (1+\mu)m_1 - (1-s)\frac{F}{N} \tag{47}$$

using that $(1+\mu)N(b_0+b_1) = B_J^{CON}$ we obtain the result. This is smaller than in the unconstrained case (in which case the project size is $\frac{1-F}{2N+1}$)

$$\begin{aligned} \tfrac{1+\mu-F}{2N+1} &\leq \tfrac{N(1+\mu)m_1-F}{N(1-\alpha)+1} \\ \iff m_0(1+\mu) &\geq (1+\alpha)\tfrac{1+\mu-F}{2N+1} \end{aligned} \tag{48}$$

So it suffices to show that the last expression in the above equation holds. To do this we note that the 0 donors are at a corner solution as long as the constraint $b_0+\frac{sF}{N} \leq \alpha B$ so that $m_0 - \frac{sF}{N} - b_0 - B > 0$. Using that constraint on contributions holds, we find that $m_0 \geq (1+\alpha)B$. Hence result.□

Proof of Corollary 4

We compare

$$\frac{\frac{N}{2}m_i - F}{Nm_1 - F}\frac{N(1-\alpha)+1}{\frac{N}{2}(1-\alpha)+1}$$

with

$$\frac{2N+1}{N+1}\frac{Nm_i - F}{N(m_0+m_1)-F}$$

First note that:

$$\frac{2N+1}{N+1} \geq \frac{N(1-\alpha)+1}{\frac{N}{2}(1-\alpha)+1}$$

Next note that $Nm_1 \geq N\frac{m_1+m_0}{2} = \frac{N}{2}(m_0+m_1)$ Hence :

$$\frac{\frac{N}{2}m_i - F}{Nm_1 - F} \leq \frac{\frac{N}{2}m_i - F}{\frac{N}{2}(m_0+m_1) - F} \leq \frac{Nm_i - F}{N(m_0+m_1) - F}$$

These two observations yield the result. □

Proof of Lemma 9. When tax incentives are not conditional, in order for each 0 donor to make a positive contribution to the joint project (assuming that they share fixed costs equally between them:

$$(1+\mu)m_0 - \frac{sF}{N} \geq \frac{1+\mu-F}{2N+1}$$

Therefore s^{UNCON}, the maximum share of fixed costs compatible with an ex-post donation, satisfies:

$$s^{UNCON}F = N\left((1+\mu)m_0 - \frac{1+\mu-F}{2N+1}\right)$$

as the ex-post donation of the 0 types d_0 satisfying (from the FOC for b_0):

$$(1+\mu)b_0 = (1+\mu)m_0 - \frac{s^{UNCON}F}{N} - \frac{1+\mu-F}{2N+1}$$

When tax incentives are conditional, the ex-post donation of the zero types falls, hence:

$$s^{CON}F + N(1+\mu)d_0^{CON} \leq N\alpha B \leq N\left((1+\mu)m_0 - \frac{1+\mu-F}{2N+1}\right) = s^{UNCON}F$$

Setting $d_0^{CON} = 0$ to obtain the maximum s we obtain the result.□

Proof of Proposition 5. Notice that the requirement that 0 donors make a positive donation ex-post implies that:

$$(N+1)\left(m_0 - \frac{sF}{N(1+\mu)}\right) - N\left(m_1 - \frac{(1-s)F}{N(1+\mu)}\right) \geq 0$$

Thus:

$$\begin{aligned}
&\Gamma^{1/2}\left(\frac{\frac{Nm_0 - s^{UNCON}F - F}{N+1}}{D^{UNCON}}, \frac{\frac{Nm_1 - (1-s^{UNCON})F - F}{N+1}}{D^{UNCON}}\right)B^{UNCON} = \\
&\Gamma^{1/2}\left(\frac{N}{N+1} - \frac{(2N+1)F}{N(1+\mu-F)}, 1 - \frac{(2N+1)F}{N(1+\mu-F)}\right)B^{UNCON} \qquad = \frac{N(1+\mu)m_1 - F}{N+1}
\end{aligned} \tag{49}$$

$\alpha N = 1-\epsilon$ where ϵ is infinitesimally small implies both (i) that the size of the separate projects falls when tax incentives become conditional and (ii) that the size of the joint project remains the same (since the 1 donors give $b_1^* = m_1 - \frac{(1-s)F}{N(1+\mu)} - \frac{D_J^{UNCOND}}{1+\mu} = \frac{N+1}{N}\left(m_0 - \frac{sF}{N(1+\mu)}\right) - \frac{D_J^{UNCOND}}{1+\mu} > b_0^*$ and $N\left(b_1^* + \frac{(1-s)F}{N(1+\mu)}\right) + N\left(b_0^* + \frac{sF}{N(1+\mu)}\right) = D_J^{UNCOND}$. Hence the 0 donor's donations make up weakly less than $\frac{1}{N}$ of total donations, with equality if and only if $m_0 = m_1$.

We verify first that there exists m_1 satisfying (49). The left hand side of the following equation is a decreasing function of F:

$$\Gamma^{1/2}\left(\frac{N}{N+1}-\frac{(2N+1)F}{N(1+\mu-F)},1-\frac{(2N+1)F}{N(1+\mu-F)}\right)=\frac{N(1+\mu)m_1-F}{N+1} \tag{50}$$

Choose F by setting $\frac{N}{N+1}=\frac{(2N+1)F}{N(1+\mu-F)}$, the left hand side becomes $\Gamma\left(0,\frac{1}{N+1}\right)$. Solving for Γ, (50) becomes:

$$\frac{1}{2}\left(1+\frac{1}{4(N+1)^2}+\sqrt{\frac{1}{16(N+1)^4}+\frac{1}{2(N+1)^2}}\right)\leq\left(\frac{N(1-\alpha)}{N+1}\right)^2$$

As the left hand-side is decreasing in N and the right hand is decreasing in N, and $\alpha N<1$, for large enough N this inequality can be satisfied.

Now we need to show that Γ falls relative to the no conditional tax-incentives case. This follows immediately from the following facts:

- The size of the separate project that can be funded by separate donors falls for the richer donors more than for the poorer donors, and $\frac{\partial\Gamma}{\partial\gamma_1}\geq-\frac{\partial\Gamma}{\partial\gamma_0}$. This implies that fixing s, Γ falls.

- The maximum share of the fixed costs born by the poor donors falls, and the share picked up by the richer donors rises correspondingly. This also implies that Γ falls.

Hence the 1 donor is worse off. If economies of scale are possible given the new joint mission, then he likes this mission strictly less. If economies of scale are not possible, the 1 donors obtain a payoff of less than or equal to B_1^{CON}, which is strictly less than his payoff under unconditional tax incentives B_1^{UNCON}

In order to show that, given the policy, that the 1 donors will make the investment in fixed costs, we note that:

$$\frac{\partial\Gamma^{1/2}}{\partial\gamma_1}\leq\frac{1}{2} \tag{51}$$

which follows from Lemma 3. As $\alpha N\to 1$ the share of fixed costs which can be born by the 0 donors falls linearly with $\epsilon=\frac{1}{N}-\alpha$. However, the mission demands fall discretely at $\alpha=\frac{1}{N}$.The reduction in $\Gamma^{1/2}$, which is less strictly less than $\frac{1}{2}\frac{B_1^{UNCON}-B_1^{CON}}{D_J}$ is less than the reduction in the mission demand which falls by $\frac{B_1^{UNCON}-B_1^{CON}}{D_J}$. Hence, the imposition of the constraint on tax incentives keeps economies of scale possible, and shifts the compromise mission towards the socially optimal compromise mission at $\frac{1}{2}$ $\square$.

10 Appendix: Extension to CES preferences

Let each donor have constant elasticity of substitution preferences,

$$U_1(p_1,B,\gamma)=(p^\rho+(\gamma B)^\rho)^{\frac{1}{\rho}}$$

$$U_0(p_0,B,\gamma)=(p^\rho+((1-\gamma)B)^\rho)^{\frac{1}{\rho}}$$

Let $\sigma = \frac{1}{1-\rho}$ be the elasticity of substitution. The first order conditions of the problem, given the budget constraints $p_0 + d_0 = m_0 - sF$ and $p_1 + d_1 = m_1 - (1-s)F$, yields $p_i = \gamma^{1-\sigma} B$

Suppose that, having contributed sF and $(1-s)F$ at $t = 1$ towards fixed costs, both donors make a contribution to the joint project ex-post. Then contributions satisfy:

$$d_1(\gamma) = \frac{(1 + (1-\gamma)^{-(1-\sigma)})(m_1 - (1-s)F) - \gamma^{-(1-\sigma)}(m_0 - sF)}{1 + \gamma^{1-\sigma} + (1-\gamma)^{1-\sigma}}$$

$$d_0(\gamma) = \frac{(1 + \gamma^{-(1-\sigma)})(m_0 - sF) - (1-\gamma)^{-(1-\sigma)}(m_1 - (1-s)F)}{1 + \gamma^{1-\sigma} + (1-\gamma)^{1-\sigma}}$$

which implies that project size, $B = d_0 + d_1$ satisfies:

$$B = \frac{1 - F}{1 + \gamma^{1-\sigma} + (1-\gamma)^{1-\sigma}}$$

The indirect utility of donor 1 can be written:

$$g(\gamma)B = \gamma(1 + \gamma^{(1-\sigma)})^{-\frac{\sigma}{1-\sigma}} \frac{1 - F}{1 + \gamma^{1-\sigma} + (1-\gamma)^{1-\sigma}} \tag{52}$$

Proposition 6 *For all σ for which there exists some (m_0, F) at which a Pareto-improving compromise mission exists, $g(\gamma)$ is concave in γ*

The intuition is as follows. In order for a compromise mission to exist, the public and private good must be sufficiently complementary, ie σ, the elasticity of substitution must be sufficiently small. If not, as the γ moves away from the donor's preferred mission, the donor substitutes away from the public good to the private good, making it impossible for both donors to contribute to the same mission.

Now consider the donor's preferences over the private and public good. γ augments the donor's enjoyment of the public good, but not of the private good. When the elasticity of substitution of the two goods is high enough, the donor benefits from this augmentation directly, through his enjoyment of higher γ fixing B, and indirectly, by his ability to substitute away from the private good to the public good. In this case, indirect utility is a convex function of γ. However, when the goods are sufficiently complementary, an increase in γ augments the increase in enjoyment of the public good but does not lead to an additional gain through substitution. In this case, indirect utility is a concave function of γ.

Fixing the mission γ to which donors make contributions at $t = 2$, this Proposition implies that, as inequality between donors 0 and 1 increases, any γ is weakly less likely to constitute a Pareto improvement over separate missions. Why? Because γ constitutes a Pareto improvement over separate missions if, assuming that $\sigma < 1$, so that donors always wish to contribute to a charitable good:

$$\gamma \in \left(g^{-1}\left(\frac{m_1 - F}{2B(\gamma)}\right), 1 - g^{-1}\left(\frac{m_0 - F}{2B(\gamma)}\right) \right) \tag{53}$$

As g is concave, g^{-1} is convex, and

$$\frac{\partial}{\partial m_1}\left(g^{-1}\left(\frac{1-m_1-F}{2B(\gamma)}\right)+g^{-1}\left(\frac{m_1-F}{2B(\gamma)}\right)\right)<0 \tag{54}$$

– that is to say, the width of the interval on the RHS of 53 decreases.

If $\sigma \in (1,2)$ then m_i replaces $\frac{m_i-F}{2}$ in the above two formulae, but the argument is essentially identical.

Proof of Proposition 6 We will show that(i) that for all $\sigma < 2, V_1(m_1, d_0, \gamma)$ is an increasing and concave function of γ and (ii) a necessary condition for a compromise mission to exist is that $\sigma < 2$.

(i) We note that:

$$\begin{aligned} g(\gamma) &= \gamma\left(1+\gamma^{1-\sigma}\right)^{-\frac{\sigma}{1-\sigma}} \\ g'(\gamma) &= \left(1+\gamma^{1-\sigma}\right)^{-\frac{\sigma}{1-\sigma}}\left(1-\sigma\tfrac{\gamma^{1-\sigma}}{1+\gamma^{1-\sigma}}\right) \\ g''(\gamma) &= -\sigma\gamma^{1-\sigma}(1+\gamma^{1-\sigma})^{-\frac{1}{1-\sigma}}\left(2-\sigma-\tfrac{\gamma^{1-\sigma}}{1+\gamma^{1-\sigma}}\right) \end{aligned} \tag{55}$$

We note that, for all $\gamma \in [0,1]$ $g'(\gamma) > 0$ for all $\sigma < 1$ and $g''(\gamma) < 0$ for all $\sigma < 2$.

(ii) We show that if $\sigma > 2$ no compromise mission can exist. For $\sigma > 1$ the size of the joint project is less than or equal to $\frac{m_0+m_1-F}{2}$, and in addition, each agent can have indirect utility of at least m_i by contributing nothing to the joint project and consuming all his income in private consumption. For $\sigma > 1$, the agent strictly prefers to consume all of his income as private consumption than to found his own charity. This implies that, for a compromise mission to exist:

$$\begin{aligned} \gamma(\gamma^{1-\sigma}+1)^{-\frac{\sigma}{1-\sigma}}\tfrac{m_0+m_1-F}{2} &\geq m_1 \\ (1-\gamma)((1-\gamma)^{1-\sigma}+1)^{\frac{-\sigma}{1-\sigma}}\tfrac{m_0+m_1-F}{2} &\geq m_0 \end{aligned} \tag{56}$$

Adding, these two equations imply:

$$\gamma(\gamma^{1-\sigma}+1)^{-\frac{\sigma}{1-\sigma}}+(1-\gamma)((1-\gamma)^{1-\sigma}+1)^{-\frac{\sigma}{1-\sigma}} \geq \frac{2(m_0+m_1)}{m_0+m_1-F} > 2 \tag{57}$$

But, given that $\sigma > 2$, the left hand side is a convex function of γ, and thus has a maximum at $\gamma = 0$ or $\gamma = 1$, at which it takes a value weakly less than 2. This is a contradiction of (57). Thus there can be no compromise mission for $\sigma > 2$.□

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