The Dark Side of Transparency: Mission Variety and Industry Equilibrium in Decentralized Public Good Provision

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August 2022

Abstract

We study the implications of transparency policies on decentralized public good provision by the non-profit sector. We present a model where imperfect monitoring of the use of funds interacts with the competitive structure of the non-profit sector under alternative informational regimes. Increasing transparency regarding the use of funds may have ambiguous effects on total public good provision and on donors' welfare. On the one hand, transparency encourages all non-profit firms to engage more actively in curbing fund diversion. On the other hand, it tilts the playing field against non-profits facing higher monitoring costs, pressing them to give up on their missions. This effect on the extensive margin implies that transparency policies lead to a reduction in the diversity of social missions addressed by the non-profit sector. We show that the negative impact of transparency on social missions variety and on donors' welfare is highest for intermediate levels of asymmetry in monitoring costs.

Keywords: non-profit organizations, charitable giving, organizational economics, transparency.

JEL codes: L31, D64, D43, D23.

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1 Introduction

Non-profit organizations have increasingly taken on a leading role as providers of collective goods over the course of the past few decades (Bilodeau and Steinberg, 2006; Iossa and Saussier, 2018).[1] The non-profit sector exhibits specific features that shape several aspects of its structure as quite different from that of the private sector. One is that the funding side and the beneficiary side are connected to each other only indirectly, through non-profit organizations. This lack of direct connection severs the flow of information about non-profits' performance back to the funding side, and thus lies in sharp contrast with the feedback typically provided by markets in the private-good sector. Another important feature is the relative complexity of non-profit organizations with various layers of internal hierarchies and specialization in tasks (e.g., setting up the mission, fundraising, and carrying out the projects), combined with a deep problem non-contractibility of final output. This results in a strong need to motivate and monitor the lower layers of those organizations working on the ground to deliver output to beneficiaries. Finally, the non-profit sector as a whole represents a rather heterogeneous set of decentralized organizations, which differ vastly in terms of their core missions and their final beneficiaries.[2]

The non-profit sector is thus characterized by a peculiar intermediated nature: donors provide one of the main inputs (funds) but they have essentially no control on how their donations are ultimately put to use in the production of social goods. This problem may resemble, in principle, a standard principal-agent situation. There are, however, three crucial differences in the context with non-profits that merit a separate analysis relative to the standard for-profit sector. The first is that donors usually comprise a large number of dispersed small agents who cannot easily exert control on non-profits' actions. The second is that the output typically produced by non-profits exhibits a large social good component, and hence relies strongly on the presence of altruistic motives by different agents. The third is to do with output observability: non-profits' final output is inherently difficult to measure.[3]

[1] For instance, in the United States, non-profits account for 71 per cent of total private employment in the education sector in 2019. For health care, social assistance, and arts & recreation sectors, this share stands at 44 per cent, 42 per cent, and 16 per cent, respectively (Salamon and Newhouse, 2019).

[2] The Charity Navigator (www.charitynavigator.org) lists over 9,000 non-profit organizations that are active in the US across 38 different subcategories. Examples of these subcategories are 'Wildlife Conservation', 'Environmental Protection and Conservation', 'Medical Research', 'Foodbanks and Food Distribution', 'Humanitarian Relief Supplies', etc.

[3] In a sense, if the output produced by non-profits could be easily and accurately measured, then one could

These informational failures have called for the need to establish specific schemes that help preventing rent-seeking and misappropriation by agents who may be attracted to the non-profit sector by the prospects of monetary rewards, rather than by a sense of altruism. More generally, the sector has faced a growing push for transparency concerning the use of funds: the funders increasingly request that the non-profits clarify how their donations to these organizations are used. In the United States, this had led to the creation of several well-known watchdogs; e.g., GuideStar USA, Charity Watch, Charity Navigator, and GiveWell. These organizations provide online information about non-profits based in the U.S., placing special emphasis on the structure of their spending, their cost-effectiveness, and in providing metrics of accountability and transparency. Charity Intelligence Canada provides similar metrics for Canadian non-profits. In the U.K., the Charity Commission maintains an online register which provides the financial information about all registered charities, and it also conducts inquiries and issues public reports when finding cases of misconduct in charities.

Voicing support for enhancing transparency within a sector so sensitive to moral hazard and highly reliant on trust seems perfectly reasonable. Yet, the general equilibrium implications of such push for transparency in the context of a large and diverse sector like that one formed by non-profits are far from straightforward, and remain largely underexplored. In fact, most of the metrics used by watchdogs that evaluate non-profits performance tend to be overly standardized, and simply ignore two key issues: actual output and diversity of missions. Concerns about those shortcomings have been raised by practitioners and by academics. Some call for a more critical approach to transparency and the effects it generates: for instance, the twice Pulitzer-winning journalist Nicholas Kristof has argued that sites like Charity Navigator have led to a massive increase in non-profits' effort on accountability, with the consequence of deviating effort from actual impact. Large philanthropic organizations like the Gates Foundations have been criticized for overemphasizing accountability over social benefits, and imposing a costly administrative burden that can prove overwhelming for smaller recipients based in developing countries, shifting as a result funding towards recipients based in developed countries – The Economist (2021). Their approach has also led to focus charitable giving mostly on social actions that can be more easily measured (such as vaccination campaigns), at the expense of those where measuring output becomes really

think that for-profit firms could offer "selling" units of social output contributions to altruistic private agents who would pay for it, as opposed to these agents donating part of their income in the form of charitable giving to non-profit organizations.

difficult (e.g., women empowerment).[4]

Anecdotal evidence and several practitioners have thus raised caution about the effects of excessive emphasis on performance metrics on the overall operation of the non-profit sector. We lack, however, a rigorous and thorough analytical framework to rationalise these issues. More generally, we still lack a tractable framework to study how informational asymmetries within non-profits interact with the competitive structure of the sector, especially under different informational-transparency regimes. Our paper aims at closing this key gap.

In our model, the contractual imperfections associated to the provision of public goods are at the heart of the story. Non-profits are managed by altruistic agents who exhibit an intrinsic motivation towards a social mission. Non-profits compete among themselves for funding from a large pool of impurely altruistic donors who choose a mission to give to. A crucial aspect in the model is that, whereas setting up the social mission and raising funds are tasks typically set at the top of the organizations, the actual on-the-ground action is relegated to lower levels of the hierarchy. The actors at that lower level are often simply seeking monetary rewards, as it is hard to find a mechanism that would select them purely based on their intrinsic altruism. As a consequence of this, the actual use of collected funds is subject to potential diversion by grassroots within non-profit firms. Managers can curb such diversion, albeit at a cost, by closer monitoring of grassroots' actions. In the model, the cost of monitoring may differ across non-profits. Such heterogeneity in monitoring cost generates unequal benefits across non-profits. Importantly, those unequal benefits are magnified as transparency increases. The reason for this is that when donors receive information about the extent of funds diversion across non-profits, this in turn will influence their willingness to contribute to each of them, which then further influences non-profits' incentives to strengthen monitoring. Through this feedback mechanism, transparency leads to trade-offs between variety of missions fulfilled by non-profits versus "cleanliness" of non-profits.

Our central findings are twofold. First, we show that there is an ambiguous effect of more

[4] Related concerns have been raised by Meer (2017), arguing that the current excessive reliance on overhead cost ratio in evaluating non-profits induces them to forgo hiring skilled workers. Scholars in social innovation and non-profit literature have identified this problem as "the nonprofit starvation cycle" – Gregory and Howard (2009), Lecy and Searing (2015), and Schubert and Boenigk (2019). According to them, excessive emphasis on metrics on non-profits performance leads to donors setting expectations about how much of their donations should go directly to the projects that they fund. As a result, the competing non-profits end up trying (and struggling) to economize on indirect expenses, often worsening the output of their projects. Ultimately, some worthy nonprofits end up being "starved" of funding, and leaving the charitable sector.

transparency regarding the use of funds on the total public good provision and the welfare of donors. Second, we highlight that the sign of this effect depends crucially on the degree of heterogeneity of monitoring costs of the non-profits.

Higher transparency generates two opposite forces on the internal allocation of resources and the resulting diversion of funds. The first is *the competitive effect*: more transparency encourages a non-profit manager to devote more resources to monitoring and curbing rent-seeking inside her organization. This is because donors tend to reward "cleaner" non-profits with more donations. The competitive effect will then induce *all* non-profits to monitor rent-seeking more intensely. The second is *the strategic-interaction effect*: more transparency encourages managers of *some* non-profits to reduce the internal resources devoted to preventing rent-seeking. This effect arises because more monitoring by one non-profit manager indirectly curbs the incentives of other managers to prevent rent-seeking in their organizations, and monitoring acts as a strategic substitute for competition for funds. More precisely, non-profits facing high monitoring costs might choose to cut on this effort under more transparency. Hence, the overall effect of higher transparency on total provision of public goods may be positive or negative, depending on the relative strength of those two effects. Furthermore, transparency generates unequal effects across social missions: it rewards missions that can be more effectively monitored, at the expense of those facing higher monitoring costs.

From the donors' perspective, there are also two corresponding opposed effects. On the one hand, transparency implies that donors are better off because they expect lower misuse of funds by the non-profits active in the market. On the other hand, under more transparency, the strategic-interaction effect noted above leads to a lower diversity of non-profits in equilibrium. As a consequence, donors face a narrower set of charitable causes among which they can choose to give. We show that the second (negative) effect dominates the first (positive) one if the difference in the cost of monitoring (between low-cost and high-cost non-profits) is at an intermediate level. This surprising result arises because of the general-equilibrium aspect. Offered the option to observe or not the level of funds diversion, any rational donor always prefers transparency, when facing this choice *individually*. However, the regime with full transparency offers this option not individually, but to all the donors collectively. Hence, a randomly chosen donor may be better off in a context in which *no one* can observe the level of diversion, because this leads to an equilibrium where each donor will be able to pick the recipient of his donation from a more diverse set of non-profits.

1.1 Related literature

The problem of non-contractibility of output in sectors producing public goods has been a crucial theme in a large number of articles in the public economics literature. Glaeser and Shleifer (2001) argue that it is the issue of output non-contractibility that creates scope for non-profit firms to arise, as these organizations provide a way to commit to restricting diversion of funds. Nevertheless, the non-profit status alone seems far from acting as a guarantee of protection against funds misuse. Evidence suggests that funds diversion is still a problem that is indeed largely present in non-profits, especially at lower layers of the organization ranks and with local partners outside the rich world.[5] Mechanisms to cope with agency problems in such contexts have been studied by Besley and Ghatak (2005), who show the crucial role of matching the mission preferences of principals and agents to improve efficiency. Besley and Malcomson (2018) analyze the effects of competition between the (incumbent) non-profit and (entrant) for-profit providers, in the presence of non-contractible quality. The problem of non-contractibility of output is also at the heart of our model. In particular, we study how the agency cost within the non-profit sectors maps into equilibrium provision of public goods under information disclosure.

A growing number of articles have studied the self-selection into the non-profit/public-good sector under various informational regimes or financing schemes – e.g., Delfgaauw and Dur (2008, 2010), Auriol and Brilon (2014), Scharf (2014), Krasteva and Yildirim (2016), Besley and Ghatak (2017), Aldashev et al. (2018), Valasek (2018). The key point of this literature has been centered around motivational heterogeneity and how sorting into the non-profit/public-good sector is affected by alternative institutional characteristics. We abstract from the motivational heterogeneity and self-selection, and instead focus on how asymmetries

[5] A large number of studies document rent extraction and funds diversion practices, especially by local non-profit partners. For example, Platteau and Gaspart (2003) argue that the risk of misappropriation of funds by local NGO is a frequent problem, stating that the most common forms of misappropriation include "falsifying of accounts, invoice over-reporting, under-performance by contractors using low-quality materials, etc." Similarly, in their study of the Ugandan NGO sector, Barr et al. (2003) write “It is possible that the fluidity of the NGO sector and the focus on non-material services (e.g., ‘talk’ and ‘advocacy’) enable unscrupulous individuals to take advantage of the system [...] There is indeed a suspicion among policy circles that not all Ugandan NGOs genuinely take public interest to heart. [Some] accounts speak of crooks and swindlers attracted to the sector by the prospect of securing grant money.". Mansuri and Rao (2013) also documents various cases of rent-extraction by local NGOs and community-based groups. There is also evidence of Southern NGOs acting as "empty shells" in Tvedt (1998) and Bano (2008).

in agency costs across different types of social missions may generate strategic behavior across non-profits in different informational environments.

A number of authors constructed industry-equilibrium models of the non-profit sector. Rose-Ackerman (1982), Castaneda et al. (2008), Aldashev and Verdier (2010), and Heyes and Martin (2017) focus on the effect of competition in the non-profit sector on the fundraising expenditures and the number and variety of non-profits, from the social welfare perspective. These papers rely on symmetric models of competition, and thus do not address the distortions in provision of public goods caused by the asymmetry in monitoring costs across missions, which is central for our paper. Moreover, these contributions do not take into account how the informational environment becomes a key determinant of the equilibrium industry structure and its degree of horizontal differentiation.

A few recent empirical papers have explicitly focused on the effects of transparency and increased performance measurement in the non-profit sector. In a laboratory experiment, Metzger and Guenther (2019) study the demand by donors for information about their donations' welfare impact. Surprisingly, they find that the demand for information about the welfare impact of donations is relatively small. Yet, those donors who are willing to obtain the information increase their donations to high-impact projects. In another laboratory experiment, Exley (2020) finds that donors may use charity performance metrics as an excuse to avoid giving, implying that performance measurement might have the unintended consequences as well. Relying on observational data, Dang and Owens (2020) apply the forensic economics methods (the Benford's law) to the financial accounts of the UK non-profits and find that the non-profits with a high share of charitable spending report their data more accurately only when effort on oversight is sufficiently high. Our paper offers a theoretical framework that can help thinking about the policy and welfare implications of these findings.

Our paper also contributes to the organizational economics literature. Over the last decade, the pathbreaking incomplete-contracts approach to the theory of the firm (pioneered by Grossman and Hart, 1986) has been successfully embedded into the industrial-organization analysis, giving rise to the so-called "organizational industrial organization" sub-field (see, e.g., Legros and Newman, 2013; Alfaro et al., 2016; and Legros and Newman, 2014, for a detailed review). This novel research line has focused so far only on the private-good sector. Our paper builds an analytical framework of "organizational industrial organization" of the competitive provision of public goods in an economy.[6]

The rest of the paper is organized as follows. Section 2 introduces the environment and agents in the model. In section 3, we present a model of strategic interaction between non-profits within a monopolistically competitive industry structure under two different informational regimes: i) uninformed donors, ii) full transparency. Section 4 allows for the entry decision by non-profits and solves for the equilibrium number of firms in each of the two regimes. Section 5 provides our analysis of the impact of transparency on welfare. Section 6 concludes. Formal proofs and extensions are relegated to the appendix.

2 Environment and Agents

The non-profit sector comprises N firms, indexed by $i = 1, 2, ..., N$. Each non-profit firm targets a specific social mission (e.g., women's empowerment, child malnutrition, animal rights, etc.). Henceforth, we will think of N as a large number. This will allow us to carry out the analysis assuming that each single firm will disregard the (negligible) impact that their individual choices have on the *aggregate* behavior of the non-profit market. To highlight the effects of transparency in the use of funds, we assume that the output of the non-profit sector affects the well-being of donors without affecting their incomes.[7]

2.1 Technology and Organizational Structure of Non-Profits

Each non-profit is founded and managed by a social entrepreneur. Social entrepreneurs are in charge of the general management of non-profits, but that they do not directly work on the actual execution of their organizations' missions on the ground. Instead, because of

[6] Three other papers are closely related to our work are Schmidt (1997), Carlin et al. (2012), and Hermalin and Weisbach (2012). Schmidt (1997) studies the conditions under which increased product competition lowers managerial slack. Carlin et al. (2012) show that the presence of comparative performance considerations implies that tougher competition tends to make the disclosure of firms' private information less likely. Hermalin and Weisbach (2012) analyze the bargaining between firms' shareholders and managers and how this bargaining is affected by greater corporate disclosure requirements. A key difference of our work is the focus on the provision of public goods (where the disconnection between the funding side and the beneficiaries is crucial), whereas these papers focus on the private sector.

[7] This assumption may be justified on the grounds that most donors give to social causes that will not directly or significantly impact their income sources. Alternatively, one could think of a setup where non-profits' production occurs in less developed countries whereas the donors are located in developed economies.

specialization advantages or the need to know the local context, each social entrepreneur needs to hire one grassroot worker ("local partner") so as to help her fulfill the non-profit's mission.

Following the seminal article by Besley and Ghatak (2005), we assume that social entrepreneurs are mission-oriented, driven by a sense of pure altruism towards some specific social cause. In other words, they care about the social output generated by the organization that they manage. With regards to the grassroot workers, we instead assume these are self-interested agents who only care about their private payoffs.

Non-profit firms collect donations from private donors who enjoy giving for a social cause. Social entrepreneurs next allocate these funds within their non-profits, given the running costs and the implicit provision costs. We denote by D_i the total amount of donations received by non-profit i. Grassroot workers receive a fixed up-front wage that we normalize to zero. Throughout the model, we assume that this wage lies above the grassroot workers' outside option, so that there is always a sufficient supply of them in the non-profit sector. In addition, a grassroot worker can divert (or misuse) a fraction $t_i \in [0, 1]$ of the total donations D_i that the social manager channels to the fulfilment of the non-profit's mission. To counter this, social entrepreneurs have access to internal control mechanisms that they can use to prevent such rent-seeking within their organizations. In particular, we assume that social entrepreneurs can mitigate the diversion of funds by exerting a costly monitoring effort.[8]

We denote by $\varepsilon_i \in [0, 1]$ the intensity of monitoring by the social entrepreneur of the non-profit i, and assume that it has a simple linear technology:

$$t_i = 1 - \varepsilon_i. \tag{1}$$

Expressed in monetary terms, the effort ε_i over the grassroot worker translates into a constant marginal cost $v_i > 0$. Hence, the total cost of monitoring the grassroot worker equals $v_i \varepsilon_i$, and must be paid before use of funds takes place, out of the total collected donations D_i. For example, this might involve planning a certain number of visits to the locations where the non-profits' projects take place or setting up reporting requirements on the reports that the grassroot workers have to file in.

[8] In our model monitoring effort is a cost that must be committed before donations are collected. In that sense, it could be thought of as a fixed cost (albeit of variable size) decided before hiring a grassroot and collecting donations, but paid out of the collected donations.

Let $\mathcal{N}$ denote the set of non-profits operating in the market. We assume that each non-profit $i \in \mathcal{N}$ draws a cost parameter v_i from the following binary distribution:

Assumption 1 *Each social entrepreneur $i \in \mathcal{N}$ draws a specific monitoring marginal cost $v_i \in \{v_A, v_B\}$, where: i)* $\Pr(v_i = v_A) = \Pr(v_i = v_B) = \frac{1}{2}$*; ii)* $v_B = 1$*; iii)* $v_A = k > 1$.

Assumption 1 generates two different subsets of nonprofits: i) those with high monitoring marginal cost ($v_A = k$), ii) those with low monitoring marginal cost ($v_B = 1$). Since we assume that N is a large number, the size of each subset will be equal to $N/2$.

The part of donation D_i that is neither spent on monitoring nor misappropriated by the grassroot worker, is what ultimately remains available to fulfil the non-profit's mission. We denote this amount by $\widetilde{D}_i$, and call it 'net available donations'. Bearing in mind (1), net available donations $\widetilde{D}_i$ can be expressed as a function of ε_i, namely:

$$\widetilde{D}_i(\varepsilon_i) = (D_i - v_i\varepsilon_i)\,\varepsilon_i. \tag{2}$$

We assume that the total output generated by non-profit i, denoted by V_i, is an increasing and concave function of $\widetilde{D}_i$. Henceforth, we let $V_i(\widetilde{D}_i)$ be given by $V_i(\widetilde{D}_i) = \widetilde{D}_i^{\frac{1}{2}}$. Thus, using the expression in (2), we can then write:

$$V_i(\varepsilon_i) = \left(D_i\varepsilon_i - v_i\varepsilon_i^2\right)^{\frac{1}{2}}. \tag{3}$$

Given that the social entrepreneurs are pure altruists, the payoff of the social entrepreneur running non-profit i is given by $V_i(\cdot)$ in (3).

2.2 Donors

There is a continuum of small donors with mass equal to Δ. Each donor has 1 unit of resource to allocate to donations. Δ equals thus the exogenously given size of the donation market. In line with the public and experimental economics (e.g., Tonin and Vlassopoulos, 2010; Orenok et al., 2013) , we model small donors as impurely altruistic agents: they receive a warm-glow utility from the act of giving to a non-profit. Despite their impurely altruistic nature, we assume that donors are not oblivious to the rent-seeking behavior inside the non-profit sector: donors *only* get warm-glow utility from the part of their donation that they *expect* to be non-diverted. Formally, when donor j gives to non-profit i, he derives warm-glow utility only from the fraction $(1 - \tau_{j,i})$ of his donation, where $\tau_{j,i} \in [0, 1]$ denotes the level of diversion t_i expected by j to occur within firm i. Notice that donors may be *imperfectly* informed about the level of rent seeking within the non-profits, which is reflected by the possibility that $\tau_{j,i} \neq t_i$.[9]

We also assume that donors are heterogeneous in terms of their warm-glow motives. Each donor j receives a "taste shock" $\sigma_{j,i}$, for $i = 1, 2, ...N$, which reflects how intensely j cares about i's mission. Henceforth, we assume that the taste shocks $\sigma_{j,i}$ are all independently drawn from a probability distribution with the following density function:

$$f(\sigma_{j,i}) = \frac{\exp(-\sigma_{j,i}^{-1})}{\sigma_{j,i}^2}, \qquad \text{for } \sigma_{j,i} \geq 0. \tag{4}$$

Notice that (4) is a specific case of the Fréchet distribution.

We assume that preferences of donor j are given by:

$$U(\{d_{j,i}\}_{i \in \{1,..,N\}}) = \rho \sum\nolimits_{i=1}^{N} \sigma_{j,i} \left(1 - \tau_{j,i}\right) d_{j,i}, \tag{5}$$

where $d_{j,i}$ denotes the amount donated by donor j to non-profit i and $\rho > 0$ is a scalar factor.

The utility function (5) combines the two above-mentioned features that we introduce to the standard warm-glow preferences: (i) donors only care about the parts of the donations that they expect not to be misappropriated by the grassroot workers $(1 - \tau_{j,i})$; and (ii) the donors' heterogeneity in the intensity of the warm-glow for different social missions $(\sigma_{j,i})$.

Given the perfect substitutability across social missions implied by (5), in the optimum, each donor will donate all of her unit resource to a single non-profit. That is, $d_{j,i}^* = 1$ for non-profit i and $d_{j,l}^* = 0$ for all $l \neq i$, where $\sigma_{j,i} \left(1 - \tau_{j,i}\right) \geq \sigma_{j,l} \left(1 - \tau_{j,l}\right)$ for all l.

Consider thus a generic non-profit firm $i \in \mathcal{N}$. The probability that j donates to i is:

$$\Pr(j \text{ donates to } i) = \int_0^\infty \left[\prod\nolimits_{l \in \mathcal{N}, l \neq i} F\left(\frac{\left(1 - \tau_{j,i}\right) \sigma_{j,i}}{\left(1 - \tau_{j,l}\right)}\right)\right] f(\sigma_{j,i})\, d\sigma_{j,i}.$$

[9] There is vast support to the notion that donors tend to be quite poorly informed in terms of how donations are ultimately put to use by non-profits. See, e.g., Goldseker and Moody (2017), who provide support for this assumption on the basis of numerous interviews with donors. Relatedly, Metzger and Guenther (2019) show that donors' knowledge about the net impact of their donations is often quite limited. In a sense, this lack of knowledge is exactly what motivates the appearance of watchdogs that rate non-profits such as Charity Navigator, GuideStar, GiveWell, etc. whose mission is to inform unaware small donors. In that regard, Bagwell et al. (2013) provide survey evidence from the UK showing that the vast majority of donors claim to care about how organizations use their donations, although an extremely small fraction of them are able to obtain such information based on their own means.

Using (4), and the fact that $F(\sigma) = \exp(-\sigma^{-1})$, the above expression simplifies to:

$$\Pr(j \text{ donates to } i) = \frac{1 - \tau_{j,i}}{(1 - \tau_{j,i}) + \sum_{l \in \mathcal{N}, l \neq i} (1 - \tau_{j,l})}. \tag{6}$$

3 Optimal Monitoring Effort Analysis

In this section, we study donors' choices and monitoring effort by non-profits under two different informational regimes: i) uninformed donors; ii) fully informed donors. In the former case, donors are assumed to be totally unaware of the cost structure of non-profits. They are also unable to observe non-profits' monitoring effort. By contrast, in the fully-informed case, donors are assumed to be able to observe each single non-profit's monitoring effort. We carry out the analysis in this section for a given N. In the next section, we proceed to endogenise N by allowing entry into the non-profit sector.

3.1 Equilibrium with Uninformed Donors

We first study the case in which donors are uninformed about the level of rent-seeking that takes place within each organization. This can result, for instance, if donors are unable to observe the monitoring effort exerted by each social entrepreneur (i.e., ε_i is publicly unobservable). Furthermore, we assume that, when considering a generic firm i, donors do not know whether $v_i = v_A$ or $v_i = v_B$. As a consequence, donors are unable to form an expectation about ε_i based on the specific value of v_i.[10] Within such an informational context, it becomes natural to assume that donors will form an expectation about each single non-profit monitoring effort by relying on the average behaviour in the sector.[11] Namely,

Assumption 2 $\tau_{j,i} = \tau_j = \dfrac{\sum_{s=1}^{N} t_s}{N}$, *for all* j *and all firms* $i = 1, 2, .., N$.

When Assumption 2 holds, one can easily observe that the donation probability (6) reduces to $\Pr(j \text{ donates to } i) = 1/N$, for any generic non-profit $i \in \mathcal{N}$. Consequently, all

[10] For small donors, this assumption can be justified by the fact that collecting information about the accounts and the internal organization of a non-profit, and understanding how to extract information from these accounts about the net impact of a donation is an arduous task and its cost is prohibitively high for an individual donor in isolation.

[11] We could alternative obtain the statement in Assumption 2 (and, similarly, later on the statement in Assumption 3) as equilibrium result of the model given the information available to donors.

non-profits receive the same amount of donations: $D_i = \Delta/N$. Social entrepreneur i then chooses the intensity of monitoring effort ε_i by solving:

$$\max_{\varepsilon_i \in [0,1]} : V_i(\varepsilon_i) = \left[\left(\frac{\Delta}{N} - v_i \varepsilon_i \right) \varepsilon_i \right]^{\frac{1}{2}}, \quad \text{where } v_i \in \{v_A, v_B\}. \tag{7}$$

This problem yields:

$$\varepsilon_i^* = \begin{cases} \dfrac{\Delta}{2v_i N} & \text{if} \quad \Delta/2N < v_i, \\ 1 & \text{if} \quad \Delta/2N \geq v_i. \end{cases} \tag{8}$$

The expression in (8) shows that monitoring intensity is (weakly) increasing in the level of aggregate donations, Δ. This is the result of social entrepreneurs intending to limit how much of the donations is diverted by the grassroot workers while simultaneously try not sacrifice too much of the donations on costly monitoring. As the level of donations per non-profit increases with Δ, social entrepreneurs raise the level of monitoring (as long as $\varepsilon_i^* < 1$), since the amount of donations saved from diversion per dollar spent on monitoring rises with the gross donations received by each non-profit. In addition, we can also observe from (8) that monitoring intensity is always (weakly) greater for firms with lower v_i. This is because the opportunity cost of a unit of monitoring intensity increases with v_i.

3.2 Equilibrium with Fully Informed Donors

We now study the case in which private donors are fully informed about the level of rent-seeking that takes place in each non-profit present in the market. More specifically, we now substitute Assumption 2 with the following one:

Assumption 3 $\tau_{j,i} = t_i$ *for all* j *and all firms* $i = 1, 2, .., N$.

Using the donation probability (6) in conjunction with Assumption 3, it follows that the amount of donations received by non-profit i is given by:

$$D_i = \frac{\varepsilon_i}{E}, \quad \text{where } E \equiv \varepsilon_i + \sum\nolimits_{l \in \mathcal{N}, l \neq i} \varepsilon_l. \tag{9}$$

Consequently, a social entrepreneur i's optimization problem is now:

$$\max_{\varepsilon_i \in [0,1]} : V_i(\varepsilon_i, E) = \left[\left(\frac{\varepsilon_i}{E} \Delta - v_i \varepsilon_i \right) \varepsilon_i \right]^{\frac{1}{2}}, \quad \text{where } v_i \in \{v_A, v_B\}. \tag{10}$$

Recall that N is assumed to be a large number. Therefore, when solving (10), non-profit manager i takes E as given. This generates the following best-response functions:

$$\varepsilon_i^{br}(E;\Delta,v_i) = \begin{cases} 0 & \text{if} \quad \Delta/E < v_i, \\ [0,1] & \text{if} \quad \Delta/E = v_i, \\ 1 & \text{if} \quad \Delta/E > v_i. \end{cases} \tag{11}$$

As we can observe from (11), the best-response functions yield corner solutions for ε_i. The only exception is the knife-edge case when $\Delta/E = v_i$, in which social entrepreneurs are indifferent amongst any admissible level of ε_i. The level of monitoring effort in firm i depends on the aggregate level of donations (Δ), the firm's monitoring cost parameter (v_i), and the aggregate level of monitoring intensity in the non-profit market (E). Note that the level of E is itself endogenous, and will be determined by the Nash equilibrium solution stemming from the best-response functions of all non-profit managers. Henceforth, we restrict the analysis to symmetric equilibria in pure strategies by types of firms.[12]

Lemma 1 *Let N be large, and suppose Assumption 3 holds true. Then, in equilibrium:*

1. *If $\frac{\Delta}{N} \geq k$, $\widehat{\varepsilon}_i = 1$ for all $i \in \mathcal{N}$.*

2. *If $\frac{k}{2} < \frac{\Delta}{N} < k$, all non-profits with $v_i = v_B = 1$ set $\widehat{\varepsilon}_B = 1$, while all non-profits with $v_i = v_A = k$ set $\widehat{\varepsilon}_A = (2\Delta/Nk) - 1$*

3. *If $\frac{1}{2} \leq \frac{\Delta}{N} \leq \frac{k}{2}$, all non-profits with $v_i = v_B = 1$ set $\widehat{\varepsilon}_B = 1$, while all non-profits with $v_i = v_A = k$ set $\widehat{\varepsilon}_A = 0$.*

4. *If $\frac{\Delta}{N} < \frac{1}{2}$, all non-profits with $v_i = v_B = 1$ set $\widehat{\varepsilon}_B = 2\Delta/N$, while all non-profits with $v_i = v_A = k$ set $\widehat{\varepsilon}_A = 0$.*

The results in Lemma 1 may be compared vis-a-vis those that arise with uninformed donors in (7). An interesting observation that emerges is that while the non-profits with monitoring cost $v_B = 1$ will always end up exerting higher monitoring effort in the regime with informed donors, this is no longer the case for those with $v_A = k$. In particular, for values of Δ/N below $\frac{4}{3}k$, the level of monitoring effort exerted by firms with $v_A = k$ becomes

[12] This restriction will be without loss of generality once we endogenise N in the next section. As it will become clear later on, once we allow for entry into the non-profit market, the model will always deliver equilibria where symmetric equilibria in pure strategies will be played by all types of firms.

smaller in the regime with informed donors than in the one with uninformed donors. Even more strikingly, when Δ/N is smaller than $\frac{1}{2}k$, monitoring effort by high-cost firms falls all the way down to zero, meaning that they cease to operate in equilibrium.

The underlying reason for such asymmetric impact of transparency on monitoring effort across non-profits with different monitoring cost is to do with the tension between two opposing strategic forces. On the one hand, transparency generates a *positive* competitive effect, as it fosters monitoring effort so as to curb funds diversion and thus attract more donors. On the other hand, the presence of informed donors also brings about a *negative* interaction effect across non-profits: stronger monitoring intensity by other non-profits (materialised in a greater value of E) lower non-profit i's marginal return from monitoring intensity in terms of its capacity of attracting donations. Given the difference in monitoring cost across non-profits, those facing a higher cost of monitoring turn out to be relatively more sensitive to this negative interaction effect.

The above result carries an important warning message: full transparency may fail to induce stronger efforts to curb rent-seeking by *all* non-profits. In the presence of heterogeneity in monitoring costs, competition for donations may become so tough for the organizations with the higher monitoring cost that they may end up reducing their monitoring intensity (rather than increasing it). This strategic-substitution effect could in fact become so strong that such non-profits may end up abandoning their mission and exiting the market. This cleansing mechanism has arguably a positive aspect: it leads the entire non-profit market being catered to by firms less susceptible to funds misuse. Nevertheless, in a context of diverse social missions, it comes at the expense of leaving out some social problems unserved. In the next sections, we analyze this tension in a framework with endogenous entry.

4 Entry into the Non-Profit Market

We let now N be endogenously determined as a result of equilibrium entry decisions by the set of *potential* social entrepreneurs. Suppose that potential non-profit managers have an opportunity cost of running a non-profit firm equal to ϕ which we normalize to 1. Assume as well that, at the moment of setting up their non-profits, social entrepreneurs do not know the value of the monitoring cost parameter $v_i \in \{v_A, v_B\}$ that applies to their firms. The value of v_i is drawn according to Assumption 1, and each non-profit manager learns this value only *after* setting up the non-profit firm.[13]

We will, henceforth, assume that the pool of potential social entrepreneurs is large enough so as to ensure that the entry condition in the non-profit market always binds in equilibrium. Consequently, in equilibrium, the following condition must hold:

$$\frac{V_A + V_B}{2} = 1, \tag{12}$$

where V_i denotes the payoff of social entrepreneur i under monitoring cost $v_i \in \{v_A, v_B\}$. The equilibrium expressions of V_A and V_B will depend on the informational regime. To keep the analysis consistent with Section 3, we consider that the free-entry equilibrium condition (12) always leads to a large value of N (which amounts to assuming that Δ is a large number).

4.1 Equilibrium with Uninformed Donors

From (7) and (8), it follows that in a regime with uninformed donors the payoff obtained by social entrepreneur $i \in \mathcal{N}$ with $v_i \in \{v_A, v_B\}$ will be

$$V_i^* = \begin{cases} \dfrac{\Delta}{2\sqrt{v_i}N} & \text{if} \quad v_i > \dfrac{\Delta}{2N}, \\ \left(\dfrac{\Delta}{N} - v_i\right)^{\frac{1}{2}} & \text{if} \quad v_i \leq \dfrac{\Delta}{2N}. \end{cases} \tag{13}$$

Using (13) while bearing in mind (12), we obtain the following result:

Proposition 1 *Suppose Assumption 2 holds true. Let N^* denote the value of N that satisfies condition (12). Then,*

$$N^* = \frac{k + 2k^{\frac{1}{2}} + \left(k^2 + 4k^{\frac{3}{2}} - k\right)^{\frac{1}{2}}}{10k}\Delta, \tag{14}$$

[13] Our main results would still hold true if social entrepreneurs knew the v_i that applies to their non-profit, but they differ in terms of their outside option value (i.e., $\phi_i \subset \mathbb{R}_{++}$), as long as the specific values of $\phi_i \subset \mathbb{R}_{++}$ and $v_i \in \{v_A, v_B\}$ are drawn independently and from identical probability distributions. In a sense, what is crucial to our model is that non-profits are founded by social entrepreneurs deeply motivated by some specific cause, regardless of how relatively costly it is to carrying it out, and hence will not choose their firm's mission based on the value of v_i attached to it. In any case, assuming that social entrepreneurs find out the specific value of their monitoring cost $v_i \in \{v_A, v_B\}$ only after setting up their non-profit is akin to assuming that social entrepreneurs discover the intricacies of managing their projects (and in particular the human resource management challenges) only once their non-profits are operational.

where notice that $\partial N^*/\partial k < 0$ for all $k > 1$. The equilibrium levels of monitoring effort by the non-profit managers with costs $v_i = v_A$ and $v_i = v_B$ are given, respectively, by:

$$\varepsilon_A^* = \frac{5}{\left[k + 2k^{\frac{1}{2}} + \left(k^2 + 4k^{\frac{3}{2}} - k\right)^{\frac{1}{2}}\right]} < 1 \tag{15}$$

$$\varepsilon_B^* = 1 \tag{16}$$

Proposition 1 describes how the number of potential social entrepreneurs deciding to set up a non-profit firm varies with k. Intuitively, a higher value of the monitoring cost for the social entrepreneurs drawing $v_i = v_A$ lowers the overall expected return of setting up a non-profit, hence reducing entry into the non-profit market. Proposition 1 also shows that, for all $k > 1$, firms facing the higher monitoring cost ($v_i = k$) set $\varepsilon_A^* < 1$. On the other hand, non-profits facing the lower monitoring cost ($v_i = 1$) always set monitoring effort at the maximum level (i.e., $\varepsilon_B^* = 1$). Consequently, the regime with uninformed donors will always exhibit a positive level of funds diversion in equilibrium, which will takes place in those non-profits facing the higher level of marginal cost of monitoring.

4.2 Equilibrium with Informed Donors

As Lemma 1 shows, whenever N is greater than $2\Delta/k$, some social entrepreneurs deciding to found a non-profit end up exerting zero monitoring effort in equilibrium. In that case, some of the N non-profits remain *inactive* ex-post.

Proposition 2 *Suppose Assumption 3 holds true. Let us denote by $\widehat{N}$ the number of social managers that choose to enter the non-profit market, and by $\widehat{n}$ the number of those entrants who remain active after learning their monitoring cost parameter $v_i \in \{v_A, v_B\}$. Then,*

1. *When $k > 5$, the $\widehat{N}/2$ social entrepreneurs who receive a draw $v_i = v_B$ choose to set $\widehat{\varepsilon}_B = 1$, while the $\widehat{N}/2$ who receive a draw $v_i = v_A$ choose to set $\widehat{\varepsilon}_A = 0$. The number of non-profits that remain active in equilibrium is given by:*

$$\widehat{n} = \frac{\widehat{N}}{2} = \frac{\Delta}{5}. \tag{17}$$

2. *When $k \leq 5$, all the $\widehat{N}$ social entrepreneurs who enter the non-profit sector (regardless of the draw v_i they receive) choose to set $\widehat{\varepsilon}_i = 1$. The number of non-profits active in equilibrium is given by:*

$$\widehat{n} = \widehat{N} = \frac{16}{(k-5)^2 + 16k}\Delta. \tag{18}$$

Proposition 2 shows that the number of active non-profits $\widehat{n}$ is weakly decreasing in k (and strictly decreasing in k for $k \leq 5$). The relationship between $\widehat{n}$ and k is qualitatively analogous to that displayed in (14) in Proposition 1. Yet, despite their similarities, there is an important difference between the results in Proposition 1 and Proposition 2. In a regime with uninformed donors *all* potential social entrepreneurs who choose to enter the non-profit market will (ex-post) remain active, and they will all receive a positive share of the total pool of donations. This is no longer the case under full transparency: when $k > 5$, only those who enter the non-profit market and receive a draw $v_i = v_B$ will end up (actively) running a non-profit and receiving positive donations in equilibrium.

Proposition 2 illustrates against the tension between a competitive effect and a strategic-interaction effect present in our model. The former tends to foster monitoring effort by all non-profits, whereas the latter tends to depress monitoring effort by non-profits that find it harder to rein in the diversion of funds. Notice that the value of k governs the degree of heterogeneity in costs to curb rent-seeking across non-profits. When k is sufficiently high, the strategic-interaction effect ends up nullifying the competitive effect for high-cost non-profits, thus driving them out of the market.[14]

5 Equilibrium Comparison Between Regimes

We are now ready to contrast a number of welfare properties between the equilibrium outcomes in the two informational regimes. We start by comparing the number of active non-profits. This is important as greater non-profit diversity means that a larger variety of social issues end up being addressed by social entrepreneurs. Secondly, we study the total amount of non-profit output generated in each regime, regardless of the variety of non-profit firms. Finally, we investigate the donors' welfare under the two regimes.

[14]The interplay between these two opposing forces will also have non-monotonic implications regarding the monitoring-cost-to-donation ratio, $v_i \varepsilon_i / D_i$. In the regime with full transparency, the competitive effect will naturally push to an increase of that ratio by encouraging firms to raise ε_i. On the other hand, the strategic-interaction effect will lead, in equilibrium, to (positive) selection in terms of the types of firms that may remain active in the non-profit sector: those with lower v_i tend to stay in the market. It can be shown that the selection effects dominates the effect on ε when $k > 5$. In those cases, the equilibrium under transparency will exhibit a lower average value of $v_i \varepsilon_i / D_i$ than the one that arises with uninformed donors.

5.1 Number of active non-profits

We use the results in Proposition 1 and Proposition 2 to compare the total number of non-profits operating in the market under the two regimes.

Proposition 3 *The number of active non-profits is always smaller under full transparency than in the regime with uninformed donors; that is,* $\widehat{n} < N^*$.

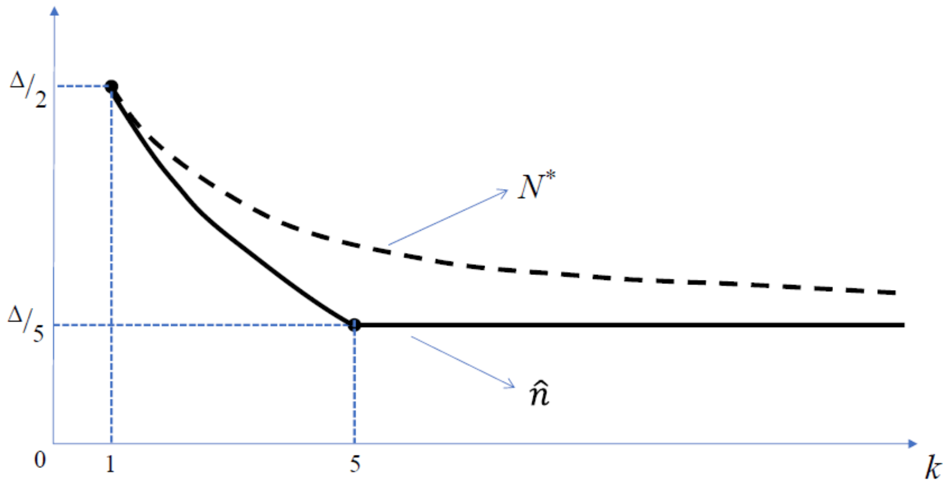
The result in Proposition 3 is illustrated in Figure 2 for different levels of k. The solid line and the dashed line indicate, respectively, the number of active non-profits in the regimes with informed and uninformed donors.

What are the reasons underlying $\widehat{n} < N^*$? For values of $k > 5$, this rests primarily on the fact that under full transparency, the social entrepreneurs who receive a high-cost draw ($v_i = k$) choose ex-post to remain inactive. The main reason for $\widehat{n} < N^*$ is substantially different when k lies below 5. In that range, all social entrepreneurs entering the non-profit market remain *active* after learning the value of v_i. There is, however, an upward distortion in the level of monitoring effort exerted by non-profit managers in the regime with informed donors. Full transparency induces a *rat race* among non-profit managers, as they all try to curb funds diversion in their own firms in order to attract a larger share of donors. This rat race leads (in equilibrium) to a fruitless competition for additional donors on the aggregate, ultimately hurting the level of net output generated by each non-profit.[15]

Another interesting feature of Figure 2 is the fact that the difference between N^* and $\widehat{n}$ is non-monotonic in k. In particular, we can observe that: *i*) $N^* - \widehat{n} \to 0$ as k approaches 1, *ii*) $N^* - \widehat{n}$ increases with k when $k \in (1, 5)$, *iii*) $N^* - \widehat{n}$ decreases with k when $k > 5$, converging asymptotically to zero as k grows to infinity. Intuitively, as k rises within the interval $k \in (1, 5)$, the rat race distortion mentioned above becomes more severe to those social entrepreneurs with $v_i = k$, discouraging entry into the non-profit market. On the

[15] A related rat race in the charitable market is present in Kratseva and Yildirim (2016). Different from our model, their rat race arises within a context with ex-ante symmetric non-profits that play mixed strategies in terms of investment in productivity, and where only one firm ends up catering to the whole market of informed donors. As a consequence, as the size of informed donors increase in Kratseva and Yildirim (2016) all non-profits will always raise their investment in productivity. In our model, the rat race generated in the non-profit market distorts the allocation of funds within non-profits between mission execution vs. monitoring. Furthermore, since non-profits are heterogeneous in their technologies, the rat race may impact unevenly different non-profits, and not all profits will necessarily end up raising their level of monitoring when donors' information improves.

Figure 2. Model with N non-profits: equilibrium number of active non-profits, as a function of asymmetry in monitoring costs



other hand, when $k > 5$, all social entrepreneurs with $v_i = k$ remain inactive in the regime with full transparency. Consequently, in that range, the level of k does not matter anymore for the number of entrants into the market ($\widehat{n}$). Contrarily, in the regime with uninformed donors, a higher k will always hurt the payoff of social entrepreneurs with $v_i = k$, as those agents remain always active in equilibrium, and therefore the expected payoff of a social entrepreneur entering the market monotonically decreases with k.

5.2 Aggregate output in the non-profit sector

The result in Proposition 3 gives us no information about the levels of *aggregate* non-profit output in each regime. We now show that the value of k is also crucial for determining which of the two regimes yields greater aggregate output. In addition, we show that the output gap between the regimes is non-monotonic in k.

Proposition 4 *Let V^{UN} and V^{IN} denote the aggregate level of non-profit output in the equilibrium with uninformed and informed donors, respectively. Then,*

1. $V^{UN} > V^{IN}$ *for all* $k \in (1, 5)$*. Furthermore,* $\partial(V^{UN} - V^{IN})/\partial k > 0$ *for all* $k \in (1, 5)$*, while* $\lim_{k\to 1}\left(V^{UN} - V^{IN}\right) = 0$.

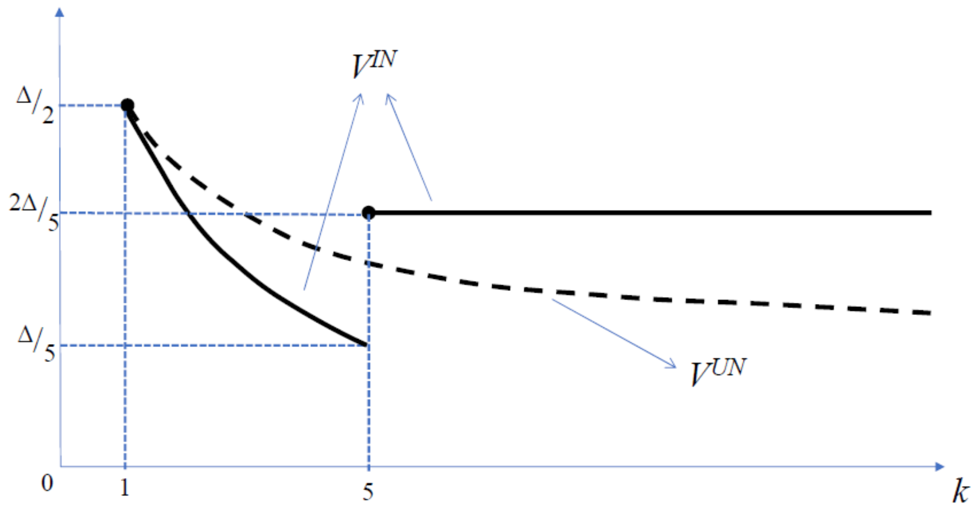
2. $V^{IN} > V^{UN}$ *for all* $k \geq 5$*. Furthermore,* $\partial(V^{IN} - V^{UN})/\partial k > 0$ *for all* $k \geq 5$.

Figure 3 displays the results of Proposition 4. The non-monotonicity of the difference between V^{UN} and V^{IN} may at first seem counter-intuitive. This is, however, the result of an implicit trade-off between the rat-race distortion in monitoring spending induced by full transparency, and the fact that informed donors tend to channel their donations to cleaner non-profits. It turns out that this trade-off behaves non-monotonically with respect to k.

For relatively low levels of the monitoring cost, $V^{UN} > V^{IN}$. In those cases, non-profits with $v_i = v_A = k$ will find it worthwhile to exert sufficient monitoring effort to keep funds diversion at relatively low levels, even when donors remain uninformed about the level of diversion. This in turn means that aggregate spending on monitoring in the regime with informed donors is unnecessarily high, as a result of the rat race mentioned above. The severity of the rat race distortion becomes worse when k is greater, which is why the gap between V^{UN} and V^{IN} grows with k while $k \in (1, 5)$. The situation changes drastically once $k \geq 5$. In those cases, only the social entrepreneurs with $v_i = v_B = 1$ remain active in the non-profit market, and thus the rat race distortion vanishes completely. The sudden switch to an equilibrium where all the donations are managed by non-profits with $v_i = v_B = 1$ leads to the result $V^{IN} > V^{UN}$ when $k = 5$. Furthermore, since rent-seeking in the regime with uninformed donors gets worse with higher k, the gap between V^{IN} and V^{UN} expands as k keeps rising above five.

Our analysis suggests that when considering promoting institutions that increase transparency in use of funds, policy-makers should be mindful about the degree of heterogeneity in monitoring efficiency across non-profits. When monitoring cost asymmetries are relatively mild, transparency comes both at low cost of variety loss and aggregate output loss, while it tends to increase monitoring effort. When monitoring cost asymmetries are very large, transparency also comes at a low cost of variety loss, while it substantially increases aggregate non-profit output by cleansing the sector from firms suffering from high levels of funds diversion. It is for *intermediate* levels of monitoring cost asymmetries (i.e., when k is around 5) that the trade-off between enhanced transparency and output/variety loss becomes hardest to resolve. In those situations, variety loss owing to transparency tends to be largest, while aggregate output behavior becomes especially sensitive to whether high-cost non-profits stay and increase monitoring or simply give up on their missions altogether.

Figure 3. Model with N non-profits: aggregate non-profit output, as a function of asymmetry in monitoring costs



5.3 Donors' Welfare

We can now compute the welfare of a generic donor under each informational regime. We compute the expected utility *before* the idiosyncratic sources of uncertainty are revealed to the donor (i.e., before the taste shocks $\{\sigma_{j,i}\}_{i=1,..,N}$ are drawn for donor j). This is analogous to computing the aggregate expected utility of the unit continuum of donors. Hence, the welfare analysis that follows could alternatively be interpreted as resulting from a utilitarian view of donors welfare.

If a donor (situated behind the veil of ignorance) could freely choose the informational regime, he would be confronted with a trade-off. On the one hand, the regime with informed donors induces the set of *active* firms to exert stronger monitoring over the grassroot workers. This, in turn, raises donors' utility by reducing the expected misuse of donations $\tau_{j,i}$ in (5). On the other hand, since the regime with informed donors leads to a smaller number of active non-profits, it will offer a narrower variety of social missions to choose from. As a consequence, informed donors will end up giving (in expectation) to non-profits with a smaller realization of the taste parameter $\sigma_{j,i}$, relative to the regime with uninformed donors.

Consider first the regime with informed donors. In equilibrium, social entrepreneurs always choose a corner solution for ε_i (i.e., either no monitoring, $\varepsilon_i = 0$, or monitoring at full intensity, $\varepsilon_i = 1$). Thus, from donor j's viewpoint, the utility he expects to obtain from giving to his selected non-profit is given by:

$$\begin{gathered}\mathrm{E}_{IN}(U_j) = \int_0^\infty \sigma_{j,IN}^{\max}\, \widetilde{f}\left(\sigma_{j,IN}^{\max}\right)\, d\sigma_{j,IN}^{\max}, \\ \text{where: } \sigma_{j,IN}^{\max} \equiv \max\{\sigma_{j,1}, \sigma_{j,2}, .., .\sigma_{j,\widehat{n}}\} \quad \text{and} \quad \widetilde{f}\left(\sigma_{j,IN}^{\max}\right) = \widehat{n}\frac{\exp(-\widehat{n}\sigma_{j,IN}^{\max})}{(\sigma_{j,IN}^{\max})^2}.\end{gathered} \tag{19}$$

In (19) $\widetilde{f}(\sigma_{j,IN}^{\max})$ is the probability density function of the extreme value $\sigma_{j,IN}^{\max}$, and its particular shape follows from the Fréchet distribution (4). Intuitively, in a regime with informed donors, all *active* non-profits (which amount to the number $\widehat{n}$) will set in equilibrium $\varepsilon^* = 1$. As a result, a generic donor j will always choose to give his unit donation to the non-profit carrying the highest taste shock, denoted by $\sigma_{j,IN}^{\max}$. Notice also that donors know that no rent-seeking will ever take place in equilibrium in this regime, hence their expected utility in (19) attaches no discount on the donation.[16]

Consider now the regime with uninformed donors. Since donors are *symmetrically* uninformed about the exact level of funds diversion taking place within each non-profit, they choose to give to the non-profit that carries the highest taste shock (from a set of N^* active non-profits). Differently from the full-transparency regime, social entrepreneurs with $v_i = v_A = k$ choose interior solutions for ε_A^* (thus, allowing for positive rent-seeking in equilibrium). Then, the *expected* utility that a generic uninformed donor j obtains is:

$$\begin{gathered}\mathrm{E}_{UN}(U_j) = \int_0^\infty \left(\tfrac{1}{2}\,\varepsilon_A^*\,\sigma_{j,UN}^{\max} + \tfrac{1}{2}\varepsilon_B^*\,\sigma_{j,UN}^{\max}\right)\, \widetilde{f}\left(\sigma_{j,UN}^{\max}\right)\, d\sigma_{j,UN}^{\max}, \\ \text{where: } \sigma_{j,UN}^{\max} \equiv \max\{\sigma_{j,1}, \sigma_{j,2}, .., .\sigma_{j,N^*}\} \quad \text{and} \quad \widetilde{f}\left(\sigma_{j,UN}^{\max}\right) = N^*\frac{\exp(N^*\sigma_{j,UN}^{\max})}{(\sigma_{j,UN}^{\max})^2}.\end{gathered} \tag{20}$$

In the case of (20), $\widetilde{f}\left(\sigma_{j,UN}^{\max}\right)$ is the probability density function of the extreme value $\sigma_{j,UN}^{\max}$. In addition, ε_A^* is given by (15), while $\varepsilon_B^* = 1$. Note that j knows that his donation will go to a non-profit with $v_i = v_A$ (resp. $v_i = v_B$) with probability $\frac{1}{2}$, in which case the warm-glow utility received from the donation is $\varepsilon_A^*\sigma_{j,UN}^{\max}$ (resp. $\varepsilon_B^*\sigma_{j,UN}^{\max}$).

Lemma 2 *The expected utility of a donor j in the two regimes compares as*

$$\mathrm{E}_{IN}(U_j) \gtreqqless \mathrm{E}_{UN}(U_j) \quad \Leftrightarrow \quad \frac{\widehat{n}}{N^*} \gtreqqless \frac{1+\varepsilon_A^*}{2}, \tag{21}$$

where $\widehat{n}$ is given by (17) when $k \geq 5$ and by (18) when $k < 5$, N^* is given by (14), and ε_A^* is given by (15).

[16] That is, donor j knows that, in equilibrium, he will always end up giving to a firm for which $\tau_{j,i} = t_i = 0$.

Condition (21) pins down precisely the trade-off faced by a generic donor behind the veil of ignorance. On the one hand, full transparency leads to a smaller variety of *active* non-profits in equilibrium (i.e., $\widehat{n}/N^* < 1$). On the other hand, the average level of monitoring effort by *active* non-profits in a regime with uninformed donors – which is given by $(1+\varepsilon_A^*)/2$ – is lower than one, whereas it is always equal to one under full transparency. Which of the two forces (variety versus efficiency) dominates is crucial in governing the welfare comparison between the two regimes. The following proposition finally ties this condition (21) to the value of the marginal cost of monitoring in the less efficient non-profits (k).

Proposition 5 *There exist thresholds* $\widetilde{k} \in (1,5)$ *and* $\widehat{k} > 5$*, such that:*

1. *A generic donor* j *behind the veil of ignorance prefers a regime with full transparency to a regime with uninformed donors for all* $k \in (1, \widetilde{k})$*, and for all* $k > \widehat{k}$*.*

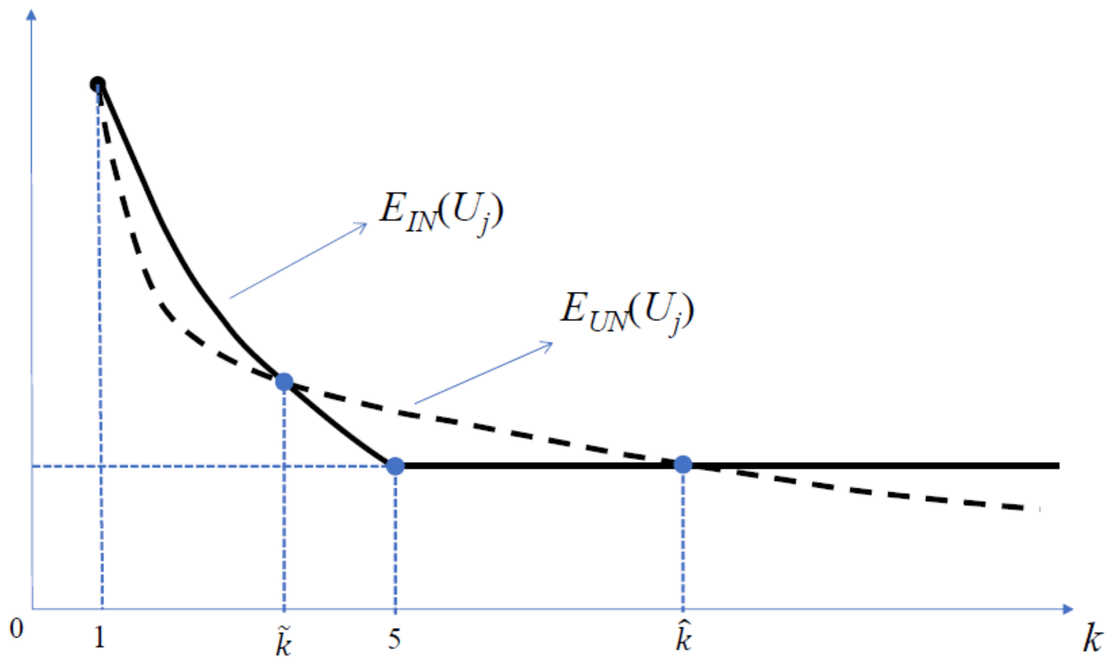
2. *A generic donor* j *behind the veil of ignorance prefers a regime with uninformed donors to a regime with full transparency for all* $k \in (\widetilde{k}, \widehat{k})$*.*

3. *Donors are indifferent between the two regimes when* $k = \widetilde{k}$ *and* $k = \widehat{k}$*.*

Proposition 5 and Figure 4 show that, if donors could choose (behind the veil of ignorance) between the two regimes, they would prefer to remain uninformed for values of $k \in (\widetilde{k}, \widehat{k})$. The intuition for this result is clear if one recalls Figure 2. The gap between N^* and $\widehat{n}$ (the loss of non-profit variety in the full-transparency regime) is widest for levels of k around 5. As k approaches 1, the gap between $\widehat{n}$ and N^* narrows, and this happens at a faster speed than the shrinking of the ratio $(1+\varepsilon_A^*)/2$ with a declining k. In other words, as the asymmetry of monitoring costs declines, the welfare loss resulting from the loss of non-profit variety shrinks faster than the decline in the ratio of monitoring efforts by *active* non-profits (under uninformed-donors regime as compared to the full-transparency regime). At $k = \widetilde{k}$, these two effects cancel each other, and for k below $\widetilde{k}$, the welfare loss from less non-profit variety is smaller than the welfare gain from the more intense monitoring by active non-profits. On the other hand, for values of $k > \widehat{k}$, the equilibrium level of monitoring effort ε_A^* is too low in order to compensate for the larger variety of non-profits that donors can choose from in a regime with uninformed donors.

The result in Proposition 5 crucially rests on a general equilibrium consideration. A generic donor j may prefer a regime where donors remain uninformed about the level of

Figure 4. Model with N non-profits: donors' welfare as a function of asymmetry in monitoring costs



diversion *not* because he appreciates ignorance *per se*. Indeed, should a donor be offered the option to observe or not the level of funds diversion, any rational donor would always choose complete observability if facing this choice *individually* (i.e., while all other donors remained uninformed about funds diversion). However, the regime with full transparency does not offer this option individually, but does it to all the donors at the same time. In such a situation, a generic donor j may turn out to be better off in a context in which *no one* can observe the level of funds diversion, as this leads to an equilibrium where each donor will be able to pick the recipient of his donation from a more diverse set of non-profits.

6 Conclusion

We have analyzed the implications of transparency policies in the non-profit sector in a context of imperfect monitoring and funds diversion. Increasing transparency regarding the use of funds has an ambiguous effect on the total public good provision and the welfare of donors. On the one hand, transparency encourages non-profits to devote more resources to curbing rent-seeking inside the organization. On the other hand, it makes it harder for non-profits facing higher cost of monitoring to withstand fiercer competition for donors, which may drive them out of the market and leave some social missions unserved. From the donors' perspective, there are also two corresponding opposing effects: transparency is desirable because of the reduction in diversion for the non-profits active in the market, but it also backfires as it leads to a narrower set of charitable causes among which they can choose.

To highlight the role of transparency on the functioning of the NGO sector in the clearest way, our basic setup abstracted from several dimensions. We present several extensions of this benchmark model in the Appendix (donors' concern about overheads expenditures, varying degrees of heterogeneity in tastes by donors, and endogenous pool of donations) and show the robustness of our basic mechanisms in these enlarged settings.

Our analysis fits into the broader debate about the new architecture of foreign aid that features more reliance on NGOs and community-driven development (e.g., Smillie, 1995, Platteau and Gaspart, 2003; Easterly, 2008; Mansuri and Rao, 2013). Our main message is that, in spite of their very good motives, transparency initiatives may end up hurting the provision of public goods in sectors/areas where exerting monitoring is more costly. This is crucial, for example, when NGOs focusing on empowerment of certain beneficiary groups (minorities, women) have to compete for funds with NGOs engaging in projects with highly visible or easily measured output (child fostering, vaccination). For the same reasons, transparency may end up deviating resources away from missions whose final beneficiaries are located in geographically remote rural areas of under-developed countries, favouring instead recipients based in the more accessible rich world. Our analysis suggests that the transparency initiatives should be paired with increased public funding towards projects with more costly monitoring, so as to avoid the loss of project diversity that more intense competition might trigger.

A natural avenue for future research would be to test empirically the mechanisms proposed in our model. This would require firstly identifying a clear date of introduction of a policy requiring more transparency. Secondly, measures on non-profit behavior in terms of monitoring and project choice (before and after the policy) would need to be collected. Although this might seem challenging, the proxies developed in recent empirical work on transparency (e.g. Dang and Owens, 2020) seem promising. Given the potential policy importance, we hope that our study encourages further investigation on the strategic behavior of non-profits in response to changes in information-related policy initiatives.

Appendix A: Proofs

Proof of Lemma 1. Notice first that $v_B = 1 < v_A = k$ implies that, in any equilibrium, $\varepsilon_A^* \leq \varepsilon_B^*$ must necessarily be verified. Hence, given the best-response functions elicited in (11), there can be four different equilibrium classes, which are those laid out in Lemma 1. From this, we can observe the results in cases 1 and 3 follow straightforwardly from (9) and (11), recalling that Assumption 1 implies there are $N/2$ non-profits with $v_i = v_B = 1$ and $N/2$ non-profits with $v_i = v_A = k$.

Next, to obtain the result in case 2, note that $\widehat{\varepsilon}_A = (2\Delta/Nk) - 1$ stems from solving the following equation:

$$\frac{\widehat{\varepsilon}_A}{\frac{N}{2}(1+\widehat{\varepsilon}_A)}\Delta - k\widehat{\varepsilon}_A = 0,$$

where notice that $E = \frac{N}{2}(1+\widehat{\varepsilon}_A)$ when all firms with $v_i = v_A$ set $\varepsilon_i = \widehat{\varepsilon}_A$ and all those with $v_i = v_B$ set $\varepsilon_i = 1$. The fact that case 2 holds for $k/2 < \Delta/N < k$ follows from noting that $(2\Delta/Nk) - 1 = 0$ when $\Delta/N = k/2$, whereas $(2\Delta/Nk) - 1 = 1$ when $\Delta/N = k$.

Finally, to obtain the result in case 4, note now that $\widehat{\varepsilon}_B = 2\Delta/N$ results from

$$\frac{\widehat{\varepsilon}_B}{\frac{N}{2}\widehat{\varepsilon}_B}\Delta - \widehat{\varepsilon}_B = 0,$$

where notice that $E = \frac{N}{2}\widehat{\varepsilon}_B$ when all firms with $v_i = v_A$ set $\varepsilon_i = 0$ and all those with $v_i = v_B$ set $\varepsilon_i = \widehat{\varepsilon}_B$. The fact that this case holds for $\Delta/N < \frac{1}{2}$ follows from noting that $2\Delta/N = 1$ when $\Delta/N = \frac{1}{2}$. ■

Proof of Proposition 1. Suppose that the equilibrium with uninformed donors satisfies $1 \leq \Delta/2N^* < k$. In that case, in equilibrium, we will have that $\varepsilon_A^* < \varepsilon_B^* = 1$. From this, using (12) and (13), it follows that N^* will stem from the following condition:

$$\frac{1}{2}\left[\left(\frac{\Delta}{N} - 1\right)^{\frac{1}{2}} + \frac{\Delta}{2\sqrt{k}N}\right] = 1. \tag{22}$$

Solving (22), the result in (14) obtains. Next, note that $\Delta/2N^* < k$ holds true for any $k > 1$ when N^* is given by (14). In addition, since N^* is strictly decreasing in k, it follows that the condition $\Delta/2N^* \leq 1$ will also always hold true for any $k > 1$. As a result, for any $k > 1$, the equilibrium must always necessarily verify $\varepsilon_A^* < \varepsilon_B^* = 1$ as initially stated. ■

Proof of Proposition 2. Firstly, recall from Lemma 1, it follows that there cannot be an equilibrium where $\widehat{\varepsilon}_A = 1$ and $\widehat{\varepsilon}_B = 0$. Secondly, notice that the equilibrium entry condition

(12) entails that there cannot exist an equilibrium with endogenous entry in which firms with $v_i = v_B = 1$ play mixed strategies between $\varepsilon_B = 0$ and $\varepsilon_B = 1$. Hence, we can focus the rest of the proof in all the other possible combinations that may arise in equilibrium.

To prove the first part of the proposition, notice that when the Nash equilibrium entails $\widehat{\varepsilon}_A = 0$ for all i with $v_i = k$ and $\widehat{\varepsilon}_B = 0$ for all i with $v_i = 1$, the value of $\widehat{n}$ will stem from $\widehat{V}_B(\widehat{\varepsilon}_B = 1) = 2$, with $\widehat{V}_B(\widehat{\varepsilon}_B = 1) = (\Delta/\widehat{n} - 1)^{\frac{1}{2}}$, from which (17) immediately obtains. For this to be a Nash equilibrium it must be the case that $\widehat{V}_A(\varepsilon_A = 1) < 0$ when $\widehat{n}$ is given by (17). Replacing (17) into $\widehat{V}_A(\varepsilon_A = 1) = (\Delta/\widehat{n} - k)^{\frac{1}{2}}$, we can indeed observe that $\widehat{V}_A(\varepsilon_A = 1) < 0$ when $k > 5$.

For the second part, notice that when the Nash equilibrium entails $\widehat{\varepsilon}_i = 1$ for all $i \in \mathcal{N}$, the value of $\widehat{n}$ stems from replacing $\widehat{V}_A = (\Delta/\widehat{n} - k)^{\frac{1}{2}}$ and $\widehat{V}_B = (\Delta/\widehat{n} - 1)^{\frac{1}{2}}$ into (12). This leads to

$$\left(\frac{\Delta}{\widehat{n}} - 1\right)^{\frac{1}{2}} + \left(\frac{\Delta}{\widehat{n}} - k\right)^{\frac{1}{2}} = 2, \tag{23}$$

from where (18) obtains after some algebra. For this to be a Nash equilibrium it must be that $\widehat{V}_A(\varepsilon_A = 1) \geq 0$ when $\widehat{n}$ is given by (18) and $1 < k \leq 5$, which is indeed the case.

Finally, note that there cannot exist an equilibrium with endogenous entry in which firms with $v_i = v_A = 1$ play mixed strategies between $\varepsilon_A = 0$ and $\varepsilon_A = 1$. This is because, according to (22), firms playing $\varepsilon_A = 1$ in such a mixed-strategy equilibrium would be making a positive (ex-post) profit while those playing $\varepsilon_A = 0$ would be making zero (ex-post) profit, contradicting the equality of (ex-post) profit for both actions required to play mixed strategies in equilibrium. ■

Proof of Proposition 3. For $k > 5$, the proof follows from noting from (14) that $\lim_{k\to\infty} N^* = \frac{\Delta}{5}$, together with $\partial N^*/\partial k < 0$. For $k \in (1, 5]$, the proof follows from noting that, in that range, using (14) and (18), we have that:

$$\frac{N^*}{\widehat{n}} = \Psi(k) \equiv \frac{\left[k + 2k^{\frac{1}{2}} + \left(k^2 + 4k^{\frac{3}{2}} - k\right)^{\frac{1}{2}}\right]\left[(k-5)^2 + 16k\right]}{160k}, \tag{24}$$

where from (24) we can observe that $\Psi(k = 1) = 1$ and $\Psi'(k) > 0$ whenever $k > 1$. ■

Proof of Proposition 4. Note first that the equilibrium entry condition (12) implies that $V^{UN} = N^*$ and $V^{IN} = \widehat{N}$. From this, the fact that $V^{UN} - V^{IN} > 0$ for all $k \in (1, 5)$, together with $\partial(V^{UN} - V^{IN})/\partial k > 0$ in that interval and $\lim_{k\to 1}(V^{UN} - V^{IN}) = 0$, follow directly from (14) and (18).

To prove the second part of the proposition, note from (14) that $N^*(k = 5) < 2\Delta/5$, and recall that $\widehat{N} = 2\Delta/5$ for all $k > 5$. Given that $\partial N^*/\partial k < 0$, it then follows that $N^* < \widehat{N}$ for all $k > 5$, implying in turn that $V^{UN} < V^{IN}$ for all $k > 5$. Lastly, the fact that $\partial(V^{IN} - V^{UN})/\partial k > 0$ for all $k > 5$ follows directly from $\partial N^*/\partial k < 0$ and the fact that $\widehat{N} = 2\Delta/5$ for all $k > 5$. ■

Proof of Lemma 2. Using the properties of the Fréchet distribution, we can obtain:

$$\frac{E_{IN}(U_j)}{E_{UN}(U_j)} = \frac{\widehat{n}}{N^*\left(\frac{1}{2}\varepsilon_A^* + \frac{1}{2}\varepsilon_B^*\right)},$$

where $\widehat{n}$ is given by (17) and (18), N^* by (14), ε_A^* by (15), and $\varepsilon_B^* = 1$, from where (21) obtains. ■

Proof of Proposition 5.

Let first $k > 5$. Plugging (14), (15), and (17), into (21), it follows that $E_{IN}(U_j) > E_{UN}(U_j)$ if and only if the following condition holds:

$$\Upsilon(k) \equiv \frac{5}{4k^{\frac{1}{2}}} + \frac{k + 2k^{\frac{1}{2}} + \left(k^2 + 4k^{\frac{3}{2}} - k\right)^{\frac{1}{2}}}{4k} < 1. \tag{25}$$

Notice now from $\Upsilon(k)$ in (25) that: *i)* $\Upsilon'(k) < 0$ for all $k \geq 5$; *ii)* $\Upsilon(5) > 1$, *iii)* $\lim_{k\to\infty} \Upsilon(k) = \frac{1}{2}$. Thus, by continuity, there must exist some finite threshold $\widehat{k} > 5$, such that: $\Upsilon(\widehat{k}) = 1$, $\Upsilon(k) > 1$ for all $5 < k < \widehat{k}$, and $\Upsilon(k) < 1$ for all $k > \widehat{k}$.

Let now $1 < k < 5$. Plugging (14), (15), and (18), into (21), it follows that $E_{IN}(U_j) > E_{UN}(U_j)$ if and only if the following condition holds true:

$$\widetilde{\Upsilon}(k) \equiv \frac{\Upsilon(k)}{5}\left[\left(\frac{k-5}{4}\right)^2 + k\right] < 1, \tag{26}$$

where $\Upsilon(k)$ is defined in (25). Note now that $\widetilde{\Upsilon}(k)$ as defined in (26) satisfies the following conditions: *i)* $\widetilde{\Upsilon}(5) > 1$; *ii)* $\widetilde{\Upsilon}(1) = 1$; *iii)* there exists a value $k_{\min} \in (1, 5)$ such that $\widetilde{\Upsilon}(k)$ reaches a global minimum within the interval $[1, 5]$. Thus, by continuity, there must exist some threshold $\widetilde{k} \in (k_{\min}, 5)$ such that: $\widetilde{\Upsilon}(\widetilde{k}) = 11$, $\widetilde{\Upsilon}(k) > 1$ for all $\widetilde{k} < k < 5$, and $\widetilde{\Upsilon}(k) < 1$ for all $1 < k < \widetilde{k}$. ■

Appendix B: Extensions

B.1: Concern for Overheads Ratio

In our benchmark model donors' preferences are given by a warm-glow utility function that depends on the share of the unit donation that is not subject to diversion by the grassroot. One could argue that donors may also care (negatively) about the share of their donation that they expect to be used to pay for monitoring effort (which would be a measure of the overheads cost ratio in the non-profit firm). In this appendix, we present an extension of the model where donors care both about funds diversion and the overheads cost ratio. To that end, we let now $\xi_{j,i}$ denote donor j's expectation of the total monetary amount spent in monitoring $v_i\varepsilon_i$ by firm i. Recall from (5) that $\tau_{j,i}$ denoted the level of diversion t_i expected by j in firm i. We let donor j's preferences be given now by the following warm-glow utility function incorporating both donors' concern for funds misuse and the overhead cost ratio:

$$U(\{d_{j,i}\}_{i\in\{1,..,N\}}) = \sum_{i=1}^{N} \sigma_{j,i}\,(1-\tau_{j,i})\,\left(\frac{\xi_{j,i}}{D_i}\right)^{-(1-\beta)} d_{j,i}, \quad \text{where } \beta \in [0,1]. \tag{27}$$

The exponent $(1-\beta)$ in (27) measures the degree of donors' concern for the expected overhead cost ratio $\xi_{j,i}/D_i$ in firm i, relative their concern for funds diversion in that firm as capture by the term $(1-\tau_{j,i})$. Notice that (27) encompasses our benchmark utility function in the main text (5) as a special case of it when $\beta = 1$ (in this case, donors do not care at all about the overhead cost ratio). As the value of β gets smaller, the (negative) weight placed by donors on the overhead ratio as a negative feature of non-profit i increases.

None of the results with uninformed donors will be affected at all when replacing (5) by (27), since in that regime each non-profit will still receive $D_i = \Delta/N$ in equilibrium. We will hence focus henceforth in the equilibrium solution with fully informed donors. In a regime with fully informed donors, we have that we can replace $1-\tau_{j,i} = \varepsilon_i$ and $\xi_{j,i}/D_i = v_i\varepsilon_i/D_i$ in (27). As a result, the total amount of donations going to non-profit i will be given by:

$$D_i = \frac{\left(\frac{v_i\varepsilon_i}{D_i}\right)^{-(1-\beta)}\varepsilon_i}{E}\Delta, \tag{28}$$

where now

$$E \equiv \sum_{j\in\mathcal{N}} \left(\frac{v_j\varepsilon_j}{D_j}\right)^{-(1-\beta)} \varepsilon_j. \tag{29}$$

Hence, from (28) and (29), it follows that $D_i = \varepsilon_i v_i^{-(1-\beta)/\beta} E^{-1/\beta} \Delta^{1/\beta}$, and therefore the optimisation problem faced by firm i in the case of informed donors is:

$$\max_{\varepsilon_i \in [0,1]} : V_i = \left[\left(\frac{\varepsilon_i}{v_i^{(1-\beta)/\beta} E^{1/\beta}} \Delta^{1/\beta} - v_i \varepsilon_i \right) \varepsilon_i \right]^{\frac{1}{2}}, \quad \text{where } v_i \in \{v_A, v_B\}. \tag{30}$$

Similarly to (10), problem (30) will always yield corner solutions –i.e., $\widehat{\varepsilon}_i = 0$ or $\widehat{\varepsilon}_i = 1$– as best-response functions. Namely,

$$\varepsilon_i^{br}(E) = \begin{cases} 0 & \text{if} \quad \Delta/E < v_i, \\ [0,1] & \text{if} \quad \Delta/E = v_i, \\ 1 & \text{if} \quad \Delta/E > v_i. \end{cases} \tag{31}$$

Note now that the best-response functions (31) display the exact same mathematical structure as previously in (11). This means that this alternative version of the model with informed donors and endogenous entry will still yield two broad types of equilibrium: i) one in which only firms with monitoring cost $v_i = v_B$ are active in equilibrium and set $\widehat{\varepsilon}_B = 1$, ii) one in which all firms are active in equilibrium and all set $\widehat{\varepsilon}_i = 1$. Below, we derive the parametric conditions leading to each type of equilibrium.

Case 1: $\widehat{\varepsilon}_B = 1$ and $\widehat{\varepsilon}_A = 0$

The best-response functions (31) imply that for this equilibrium to prevail it must be the case that $1 \leq \Delta/E \leq k$. Then, from (28) and (29), it follows that in such a case $E = n_B (D_B)^{(1-\beta)}$ and $D_B = (\Delta/E)^{1/\beta}$, where n_B denotes the number of active firms in the equilibrium (which all have $v_i = v_B$). As a consequence, in an equilibrium where $\widehat{\varepsilon}_B = 1$ and $\widehat{\varepsilon}_A = 0$, each non-profit with monitoring cost $v_i = v_B$ receives an amount of donations given by:

$$D_B = \Delta/n_B. \tag{32}$$

The equilibrium entry condition (12) specific to this case will then read:

$$\frac{1}{2}\left(\frac{\Delta}{n_B} - 1\right)^{\frac{1}{2}} = 1,$$

which in turn yields to

$$n_B = \frac{\Delta}{5}, \tag{33}$$

Notice now when (33) holds in equilibrium, then $E = \Delta/5^{\beta}$, and hence the condition $\Delta/E \geq 1$ is always satisfied for any $\beta \in [0,1]$.

Finally, for (33) to be an equilibrium, we also need to satisfy the non-deviation condition for those non-profits with $v_i = v_A$. This requires $\Delta/E \leq k$, with $E = \Delta/5^{\beta}$. Hence, it requires

$$k \geq 5^{\beta}. \tag{34}$$

Case 2: $\widehat{\varepsilon}_B = 1$ **and** $\widehat{\varepsilon}_A = 1$

For this equilibrium to prevail we need to have $k < \Delta/E$. Using (28) and (29) with $\widehat{\varepsilon}_B = 1$ and $\widehat{\varepsilon}_A = 1$, and $v_A = k$ and $v_B = 1$, it follows that in such an equilibrium:

$$\begin{aligned} E &= \frac{N}{2} D_B^{(1-\beta)} + \frac{N}{2} D_A^{(1-\beta)} k^{-(1-\beta)} & (35)\\ D_A^{\beta} &= \frac{\Delta}{E} k^{-(1-\beta)} & (36)\\ D_B^{\beta} &= \frac{\Delta}{E} & (37) \end{aligned}$$

where D_A and D_B are, respectively, the total demand going to type-A and type-B firms. Replacing now (29) into (36) and (37), after some algebra we can eventually obtain the following expressions

$$\begin{aligned} D_A &= \frac{2\Delta}{N} \frac{1}{1 + k^{\frac{1-\beta}{\beta}}} & (38)\\ D_B &= \frac{2\Delta}{N} \frac{k^{\frac{1-\beta}{\beta}}}{1 + k^{\frac{1-\beta}{\beta}}} & (39) \end{aligned}$$

and also

$$E = \left(\frac{N}{2}\right)^{\beta} \Delta^{1-\beta} \left(1 + k^{\frac{1-\beta}{\beta}}\right)^{\beta} k^{-(1-\beta)}. \tag{40}$$

By using (40) we can now observe that the condition $\Delta/E > k$ can be written as

$$N < \frac{2\Delta}{\left[1 + k^{(1-\beta)/\beta}\right] k}.$$

To pin down the equilibrium value of N we can use the equilibrium entry condition, which in this case is given by

$$\frac{[(D_B - 1)]^{\frac{1}{2}} + [(D_A - k)]^{\frac{1}{2}}}{2} = 1,$$

and after plugging (38) and (39) into the above expression, we obtain:

$$\underbrace{\left(\frac{2\Delta}{N} \frac{k^{(1-\beta)/\beta}}{1 + k^{(1-\beta)/\beta}} - 1\right)^{\frac{1}{2}} + \left(\frac{2\Delta}{N} \frac{1}{1 + k^{(1-\beta)/\beta}} - k\right)^{\frac{1}{2}}}_{\Phi(N,k)} = 2. \tag{41}$$

We can define now two thresholds for N, namely:

$$\overline{N}_A(k,\beta) = 2\Delta \frac{1}{\left(1+k^{(1-\beta)/\beta}\right)k} \quad \text{and} \quad \overline{N}_B(k,\beta) = 2\Delta \frac{k^{(1-\beta)/\beta}}{\left(1+k^{(1-\beta)/\beta}\right)}, \tag{42}$$

where note that $\overline{N}_A(k,\beta) < \overline{N}_B(k,\beta)$, since $k > 1$. Notice now from the definition of $\Phi(N,k)$ in (41) that: i) $\lim_{N\to 0}\Phi(N) = +\infty$, and ii) $\Phi(N,k)$ is a continuous decreasing function of N for all $N \in \left(0, \overline{N}_A(k,\beta)\right]$. For this type of equilibrium to prevail we need that the solution of $\Phi(N) = 2$ in (41) is such that $N < \overline{N}_A(k,\beta)$. A necessary and sufficient condition for this to hold is $\Phi\left(\overline{N}_A(k,\beta)\right) < 2$, which bearing in mind (42) leads to

$$\Phi\left(\overline{N}_A(k,\beta)\right) = \left(k^{\frac{1}{\beta}} - 1\right)^{\frac{1}{2}} < 2,$$

which in turn yields

$$k < 5^{\beta}. \tag{43}$$

Equilibrium Number of Active Non-profits

Based on the previous derivations, we can now characterise the number of active non-profits that are observed in equilibrium in a regime with fully informed donors. We do so in the following proposition, which extends the results obtained in Proposition 2, when we incorporate donors' concern for the overhead ratio by means of the utility function in (27).

Proposition B.1 (Proposition 2 bis) *Let us denote by $\widehat{N}$ the number of social managers that choose to enter the non-profit market, and by $\widehat{n}$ the number of those entrants who remain active after learning their monitoring cost parameter $v_i \in \{v_A, v_B\}$. Then,*

1. *When $k > 5^{\beta}$, the $\widehat{N}/2$ social entrepreneurs who receive a draw $v_i = v_B$ choose to set $\widehat{\varepsilon}_B = 1$, while the $\widehat{N}/2$ who receive a draw $v_i = v_A$ choose to set $\widehat{\varepsilon}_A = 0$. The number of non-profits that remain active in equilibrium is $\widehat{n} = \widehat{N}/2 = \Delta/5$.*

2. *When $k \leq 5^{\beta}$, all the $\widehat{N}$ social entrepreneurs who enter the non-profit sector (regardless of the draw v_i they receive) choose to set $\widehat{\varepsilon}_i = 1$. The number of non-profits active in equilibrium is given by $\widehat{n} = \widehat{N} = \Upsilon(k,\beta)$ where: i) $\Upsilon(1,\beta) = \Delta/2$, ii) $\Upsilon(k,\beta) < 16\Delta/\left[(k-5)^2 + 16k\right]$ for all $0 \leq \beta < 1$ and $\Upsilon(k,1) = 16\Delta/\left[(k-5)^2+16k\right]$, iii) $\Upsilon'_k(\cdot) < 0$ and $\Upsilon'_\beta(\cdot) > 0$.*

Proof. The proof of the first part of the proposition follows directly from the above derivations in Case 1.

For the second part of the proof, note firstly that $\overline{N}_A(1,\beta) = \overline{N}_B(1,\beta) = \Delta$, and thus $\Phi(N,1) = 2\left(\frac{\Delta}{N} - 1\right)^{\frac{1}{2}}$, implying $\Upsilon(1,\beta) = \Delta/2$. Secondly, denote $u \equiv k^{(1-\beta)/\beta}$ or $k \equiv u^{\beta/(1-\beta)}$, Then

$$\Phi(N,k) = \Phi(N,u) = \left(\frac{2\Delta}{N}\frac{u}{1+u} - 1\right)^{\frac{1}{2}} + \left(\frac{2\Delta}{N}\frac{1}{1+u} - u^{\frac{\beta}{1-\beta}}\right)^{\frac{1}{2}}$$

and

$$\frac{\partial \Phi}{\partial u} = \frac{\Delta}{N}\frac{1}{(1+u)^2}\left[\left(\frac{2\Delta}{N}\frac{u}{1+u} - 1\right)^{-\frac{1}{2}} - \left(\frac{2\Delta}{N}\frac{1}{1+u} - u^{\frac{\beta}{1-\beta}}\right)^{-\frac{1}{2}}\right] \tag{44}$$

When $k > 1$, $u > 1$ and $\frac{2\Delta}{N}\frac{u}{1+u} - 1 > \frac{2\Delta}{N}\frac{1}{1+u} - u^{\frac{\beta}{1-\beta}}$. Thus, the term in square brackets of the RHS of (44) is negative and consequently $\partial\Phi/\partial u < 0$ for $N \in \left(0, \overline{N}_A(k,\beta)\right]$. Then

$$\Upsilon'_k(k,\beta) = -\frac{1-\beta}{\beta}k^{(1-2\beta)/\beta}\frac{\partial\Phi/\partial u}{\partial\Phi/\partial N} < 0.$$

Next, to prove $\Upsilon'_{\beta}(\cdot) > 0$, we can define $\vartheta(\beta) \equiv k^{(1-\beta)/\beta}$, and note that $\vartheta'(\beta) < 0$ since $k > 1$. Then, differentiating $\Phi(N,k)$ with respect to β we obtain:

$$\frac{\partial \Phi}{\partial \beta} == \frac{\Delta}{N}\frac{\vartheta'(\beta)}{(1+\vartheta(\beta))^2}\left[\left(\frac{2\Delta}{N}\frac{f(\beta)}{1+f(\beta)} - 1\right)^{-\frac{1}{2}} - \left(\frac{2\Delta}{N}\frac{f(\beta)}{1+f(\beta)} - k\right)^{-\frac{1}{2}}\right], \tag{45}$$

from which, since the term in square brackets of the RHS of (45) is positive, it follows that $\partial\Phi/\partial\beta > 0$. Lastly, note that (41) boils down to (23) when $\beta = 1$, hence the its solution in that case is (18). Combining this with the fact that $\partial\Phi/\partial\beta > 0$ the result $\Upsilon(k,\beta) < 16\Delta/\left[(k-5)^2 + 16k\right]$ *for all* $0 \le \beta < 1$ immediately follows. ■

Proposition B.1 extends the results of Proposition **2** in a setup where donors care both about funds diversion and the overhead cost ratio. Recall that the smaller the value of $\beta \in [0,1]$, the more intensely donors' reluctance to give to non-profits with higher overheads cost ratio becomes. As we can observe from Proposition B.1 the presence of concern of overhead cost strengthens the asymmetric impact that transparency of use of funds has on different non-profits. Specifically, part 1 of the proposition shows that, as β gets smaller within the interval $[0,1]$, the range of values of k for which the non-profits with high monitoring cost remain inactive expands. In the limit, when $\beta = 0$, the only type of equilibrium that exists is exactly one in which high-cost non-profits always remain inactive. In addition to this, part 2 of the proposition shows that the number of active firms in this version of the model is always strictly smaller than in our benchmark model when $k \le 5^{\beta}$.

B.2: Varying Degrees of Donors Heterogeneity/Mission Diversity

Our benchmark model has worked with a specific parametrisation of the Fréchet distribution in (4) that has set the so-called 'shape parameter' equal to one. This simplification has implicitly shut down the possibility of analysing the impact of different degrees in the heterogeneity of donors' idiosyncratic preferences (or, alternatively, different degrees of mission differentiation). We now extend our benchmark model to allow for varying degrees of heterogeneity/differentiation, by generalising the Fréchet distribution generating donors' taste shocks to the following one:

$$f(\sigma_{j,i}) = \exp(-\sigma_{j,i}^{-\theta})/\sigma_{j,i}^{1+\theta}, \quad \text{where } \theta \geq 1. \tag{46}$$

In the benchmark model, we have restricted the analysis to the case in which $\theta = 1$. The parameter θ in (46) mainly governs the variance of σ. Specifically, the larger θ, the smaller the dispersion of the random variable generated by (46). Letting θ rise above one, we can then study the impact of lower diversity of taste donors.

It should be first quite straightforward to note that the equilibrium results in the model with uninformed donors remain unaffected when replacing (4) by the more general expression in (46).[17] As a consequence, we will focus only on the equilibrium results with fully informed donors. When using (46), the amount of donations received by non-profit i will be given by:

$$D_i = \frac{\varepsilon_i^\theta}{E}, \quad \text{where } E = \varepsilon_i^\theta + \sum\nolimits_{l \in \mathcal{N}, l \neq i} \varepsilon_l^\theta, \tag{47}$$

where notice that (47) boils down to (9) when $\theta = 1$.

A large N still implies that each firm takes value of E as given. The resulting optimisation problem faced by firm i will be given by

$$\max_{\varepsilon_i \in [0,1]} : \left[\left(\varepsilon_i^{1+\theta} \cdot (\Delta/E) - v_i \varepsilon_i^2 \right) \right]^{\frac{1}{2}}. \tag{48}$$

Note now that in (48) the exponent $1 + \theta \geq 2$. As a consequence, its solution will be characterised by identical corner solutions for any $\theta \geq 1$. Specifically, (48) will yield as solution the exact same best-response functions as those previously obtained with $\theta = 1$ in (11).[18] This will, in turn, imply that all the equilibrium results obtained in Lemma 1 and Proposition 2 will all hold true exactly as stated in the benchmark model for any $\theta \geq 1$.

[17] The reason for this is simply because in the uninformed regime the total amount of donations received by any generic non-profit i is given by Δ/N regardless of the specific form of the taste shock function $f(\sigma)$.

[18] The Fréchet distribution also admits $0 < \theta < 1$, which we have ruled out in this extension. For values

Donors' Welfare

The only main result of the model that will be subject to some changes when replacing (4) by its more general version (46) is the donors' welfare comparison developed in Section 5.3. The reason for this is that a higher value of θ tilts the trade-off between 'transparency' and 'mission variety' in favour of the former.

When using (46) we can obtain a generalised expression for the statement in Lemma 2, which would now read as follows:

$$\mathrm{E}_{IN}(U_j) \gtreqless \mathrm{E}_{UN}(U_j) \quad \Leftrightarrow \quad \left(\frac{\widehat{n}}{N^*}\right)^{\frac{1}{\theta}} \gtreqless \frac{1+\varepsilon_A^*}{2}, \tag{49}$$

where, exactly as in (21), $\widehat{n}$ is given by (17) when $k \geq 5$ and by (18) when $k < 5$, N^* is given by (14), and ε_A^* is given by (15).

The difference between (21) and (49) lies in that the latter applies an exponent θ^{-1} on the variety ratio $\widehat{n}/N^*$. Clearly, the larger the value of θ, the greater the value of $(\widehat{n}/N^*)^{\theta^{-1}}$ for a given values of $\widehat{n}$ and N^* since $\widehat{n}/N^* < 1$ given Proposition 3. Bearing in mind that ε_A^* is also independent of θ, it follows that larger values of θ tend to raise the value of the LHS of (49) towards unity while keeping constant the value of its RHS. This, in turn, tilts donors' welfare in favour of the regime with full transparency. The next proposition formalises this message, generalising the previous results in Proposition 5 to the setting with (46).

Proposition B.2 (Proposition 5 bis) *There exists a cut-off value $\overline{\theta} > 1$, such that:*

1. *For any $1 \leq \theta < \overline{\theta}$, we can define the threshold functions $\widetilde{k}(\theta) \in (1,5)$ and $\widehat{k}(\theta) > 5$, where $\widetilde{k}'(\theta) > 0$, $\widehat{k}'(\theta) < 0$ and $\lim_{\theta \to \overline{\theta}} \widetilde{k}(\theta) = \lim_{\theta \to \overline{\theta}} \widehat{k}(\theta) = 5$, such that a generic donor j: i) prefers a regime with uninformed donors to a regime with full transparency whenever $\widetilde{k}(\theta) < k < \widehat{k}(\theta)$; ii) prefers a regime with full transparency to a regime with uninformed donors for all $1 < k < \widetilde{k}(\theta)$ and for all $k > \widehat{k}(\theta)$.*

2. *For any $\theta > \overline{\theta}$, a generic donor j prefers a a regime with full transparency to a regime with uninformed donors for all $k > 1$.*

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of $\theta \in (0,1)$, the model will no longer deliver only corner solutions for ε_i. Further extending the model to allow also interior solutions by letting $0 < \theta < 1$ will not change the main insights from the model, but it will make it much less tractable, as with interior solutions we are no longer be able to obtain closed-form solutions for the equilibrium object E.

Proof. Notice first that Proposition 5 combined with (49) implies, by continuity, that for θ sufficiently close to one there must exist a non-empty interval $(\widetilde{k}(\theta), \widehat{k}(\theta))$ within which $\mathrm{E}_{UN}(U_j) > \mathrm{E}_{IN}(U_j)$. Also, given that $\widehat{n}$, N^* and ε_A^* in are all independent of θ, and Proposition 3 means $\widehat{n}/N^* < 1$, we can observe that the LHS of (49) is increasing in θ. As a consequence of this, it follows that $\widetilde{k}'(\theta) > 0$ and $\widehat{k}'(\theta) < 0$. Next, notice that $\lim_{\theta\to\infty} (\widehat{n}/N^*)^{\frac{1}{\theta}} = 1$. Therefore, by continuity, there must exist a value $\overline{\theta} > 1$ such that: $(\widehat{n}/N^*)^{\frac{1}{\theta}} = (1 + \varepsilon_A^*)/2$ and $(\widehat{n}/N^*)^{\frac{1}{\theta}} < (1 + \varepsilon_A^*)/2$ when $\theta < \overline{\theta}$. This, in turn, implies that $\lim_{\theta\to\overline{\theta}} \widetilde{k}(\theta) = \lim_{\theta\to\overline{\theta}} \widehat{k}(\theta) = 5$, completing the proof. ■

Proposition 5 (B.2) showcases how the donors' welfare result presented in the benchmark model extends to the case with different degrees of donors' taste heterogeneity, provided there is enough of this heterogeneity. As we can observe, provided θ is not too large (which imposes enough diversity across donors' preferences for different social missions), there will exist a non-empty range of values of k for which donors are (ex-ante) better off in a regime with uninformed donors. This range is given by $(\widetilde{k}(\theta), \widehat{k}(\theta))$, and shrinks as θ increases, eventually collapsing to an empty set for $\theta > \overline{\theta}$. Intuitively, the larger the degree the taste diversity, the stronger the importance that donors attach to mission variety. Conversely, as the degree of taste diversity declines (i.e., as θ increases), donors welfare tends to become higher in the regime with full transparency. This is because, as θ increases, curbing funds diversion tends to become relatively more important to donors' welfare than widening the number of social missions served by non-profit firms in equilibrium.

B.3: Endogenous Donations

The benchmark model has been developed under the assumption of a fixed number of donors. We extend now our previous results to a setup where donors' participation is endogenous. To maintain the generality of results from Appendix B.2, we keep assuming that taste shocks are governed by (46). Nevertheless, in the sake of brevity, and to focus on the most interesting cases the model delivers, we restrict the attention to $\theta < \overline{\theta}$. As Proposition 5 (B.2) shows, this implies that when $k \in (\widetilde{k}(\theta), \widehat{k}(\theta))$, where $(\widetilde{k}(\theta), \widehat{k}(\theta))$ is a non-empty interval, donors are better off in a regime with uninformed donors.

We assume now that there is an infinite mass of potential donors. Each potential donor will donate one unit of income to a nonprofit, provided the utility they get from the donation is greater than its opportunity cost. To scale donors' utility for different levels of θ, we let now ρ (5) be equal to $\left(\Gamma(1-\theta^{-1})\right)^{-1}$, where $\Gamma(\cdot)$ denotes the gamma function. Donor j faces an opportunity cost ς_j for his unit donation. We assume that the total mass of potential donors whose $\varsigma_j \in [0, \varsigma]$ is equal to ς^{α} with $\alpha \in (0,1)$.[19] As a result, the total mass of donations channeled to the nonprofit market as a function of the expected utility of donors, $E(U)$, will be given by:

$$\Delta\left(E(U)\right) = \left(E(U)\right)^{\alpha}. \tag{50}$$

One caveat to raise about the model with endogenous donations driven by the donors' participation constraint is that, irrespective of the distributional assumption of donors' participation constraints, there always exists an equilibrium where all potential donors expect no one to donate. In particular, since each potential donor has measure zero, when they all expect the pool of donations to be zero, their expected utility as donors will equal zero, and thus no potential donor will wish to donate in equilibrium. We disregard, henceforth, this self-fulfilling coordination failure that leads a complete collapse of entire nonprofit market in equilibrium.

Uninformed Donors Regime with Endogenous Donations

Notice that based on Proposition 1, we can write $N^* = \Omega(k)\,\Delta^*$, where Δ^* denotes now the endogenous mass of active donors in equilibrium, and we let

$$\Omega(k) \equiv \left(k + 2\sqrt{k} + \sqrt{k^2 + 4k^{\frac{3}{2}} - k}\right)/10k.$$

Using the fact that in the uninformed regime, $E^*_{UN}(U) = (N^*)^{\frac{1}{\theta}}\left(\frac{1}{2}\varepsilon^*_A + \frac{1}{2}\varepsilon^*_B\right)$, with $\varepsilon^*_A = \Delta^*/2kN^*$ and $\varepsilon^*_B = 1$, and the expression in (50), we can obtain:

$$E^*_{UN}(U) = (\Omega(k))^{\frac{1}{\theta-\alpha}}\left(\frac{1}{4k\Omega(k)} + \frac{1}{2}\right)^{\frac{\theta}{\theta-\alpha}}. \tag{51}$$

[19] Restricting $\alpha \in (0,1)$ ensures that, for any $\theta \geq 1$, we always have a stable equilibrium in the model with positive aggregate donations . Instead, if $\alpha \geq 1$ the model will fail to exhibit in general a stable equilibrium with positive donations for levels of θ not large enough. More generally, with different distributional assumptions about donors' opportunity costs the model may lead to the presence of multiple equilibria, with different levels of potential donors' participation in the non-profit market. While the presence of such type of multiple equilibria is indeed interesting, we prefer to keep this extension succinct and thus restrict the attention to distributions that do not generate such type of equilibrium multiplicity.

Plugging (51) back in (50), yields level of donations that hold in the equilibrium with uninformed donors and endogenous donations:

$$\Delta^*_{UN} = (\Omega(k))^{\frac{\alpha}{\theta-\alpha}} \left(\frac{1}{4k\Omega(k)} + \frac{1}{2} \right)^{\frac{\alpha\theta}{\theta-\alpha}}. \tag{52}$$

Finally, plugging (52) back into $N^* = \Omega(k)\,\Delta^*$ yields the number of active nonprofits in an equilibrium with uninformed donors and endogenous donations:

$$N^* = (\Omega(k))^{\frac{\theta}{\theta-\alpha}} \left(\frac{1}{4k\Omega(k)} + \frac{1}{2} \right)^{\frac{\alpha\theta}{\theta-\alpha}}. \tag{53}$$

Informed Donors Regime with Endogenous Donations

Recall from the result in Proposition 2 that the number of active non-profits consistent with the zero-profit conditions when donors are informed, $\widehat{n}$, depends on the level of k. Using the fact that in the informed regime $E^*_{IN}(U) = \widehat{n}^{\frac{1}{\theta}}$, together with (17) and (18) for $\Delta = \Delta^*$, and letting $\Delta^* = (E^*_{IN}(U))^{\alpha}$, we can obtain:

$$E^*_{IN}(U) = \begin{cases} \left[\left[(k-5)/4 \right]^2 + k \right]^{-\frac{1}{\theta-\alpha}} & \text{if } k \in (1,5)\,, \\ 5^{-\frac{1}{\theta-\alpha}} & \text{if } k \geq 5. \end{cases} \tag{54}$$

Plugging (54) back in (50), yields:

$$\Delta^*_{IN} = \begin{cases} \left[\left[(k-5)/4 \right]^2 + k \right]^{-\frac{\alpha}{\theta-\alpha}} & \text{if } k \in (1,5)\,, \\ 5^{-\frac{\alpha}{\theta-\alpha}} & \text{if } k \geq 5. \end{cases} \tag{55}$$

Lastly, replacing (55) into the corresponding expressions in (17) and (18) yields the number of active nonprofits in an equilibrium with informed donors and endogenous donations:

$$\widehat{n} = \begin{cases} \left[\left[(k-5)/4 \right]^2 + k \right]^{-\frac{\theta}{\theta-\alpha}} & \text{if } k \in (1,5)\,, \\ 5^{-\frac{\theta}{\theta-\alpha}} & \text{if } k \geq 5. \end{cases} \tag{56}$$

Comparison of Equilibrium Results with Endogenous Donations

One first preliminary result to note is that, whenever donors' expected utility is equal in both informational regimes with exogenous level of Δ, the same result will hold true as well when Δ follows (50).[20] Similarly, we can note that whenever $E_{UN}(U) > E_{IN}(U)$ or $E_{UN}(U) < E_{IN}(U)$ in a setup with a fixed level of Δ, the same qualitative result will hold respectively true as well when Δ follows (50), albeit the gaps between $E_{UN}(U)$ and $E_{IN}(U)$ will widen with endogenous donations. This means that our previous results characterised in Proposition 5 (B.2) will remain valid exactly as they are expressed therein, with the only differences being that the gaps in donors' expected utility across regimes will become more pronounced whenever they are not equal to one another.

The model with endogenous aggregate donations does yield, however, some interesting nuances relative to that with a fixed level of Δ in terms of the number of non-profits active in equilibrium. In particular, the comparison between (53) and (56) yields the following result that extends our previous result in Proposition 3 to a context with endogenous aggregate donations.

Proposition B.3 (Proposition 3 bis) *Consider the number of active non-profits in a context where aggregate of donations are given by (50), and hence N^* is given (53) by and $\widehat{n}$ by (56). For values of $\theta < \overline{\theta}$, there exists thresholds $\underline{k}(\theta) \in (1, \widetilde{k}(\theta))$ and $\overline{k}(\theta) > \widehat{k}(\theta)$, where $\widetilde{k}(\theta)$ are $\widehat{k}(\theta)$ the cut-off values defined in Proposition 5 (B.2), such that $N^* = \widehat{n}$ when $k = \underline{k}(\theta)$ and when $k = \overline{k}(\theta)$, and moreover:*

i) $N^* > \widehat{n}$ for all $k \in \left(\underline{k}(\theta), \overline{k}(\theta)\right)$,

ii) $N^* < \widehat{n}$ for all $k \in (1, \underline{k}(\theta))$ and for all $k > \overline{k}(\theta)$,

Proof. Firstly, recall that when $k = \widehat{k}(\theta)$ the result $E^*_{UN}(U) = E^*_{IN}(U)$ still holds true, implying in turn that $N^*(\widehat{k}(\theta)) > \widehat{n} = 5^{-\frac{\theta}{\theta-\alpha}}$ is still verified at $k = \widehat{k}(\theta)$. On the other hand, notice from (53) that $\lim_{k\to\infty} N^*(k) = (2^\alpha \times 5)^{-\frac{\theta}{\theta-\alpha}} < 5^{-\frac{\theta}{\theta-\alpha}}$. As a consequence, by continuity, there must exist $\overline{k}(\theta) > \widehat{k}(\theta)$ such that: i) $N^*(\overline{k}(\theta)) = \widehat{n}$, ii) $N^*(k) < \widehat{n}$ for all $k > \overline{k}(\theta)$, iii) $N^*(k) > \widehat{n}$ for all $5 \leq k < \overline{k}(\theta)$. Secondly, recall that when $k = \widetilde{k}(\theta)$ the result

[20] To see this formally, note that the model where Δ is determined by (50) collapses to the model in Appendix B.2 with $\Delta = 1$ when $\alpha = 0$. With $\alpha = 0$, we have that $E^*_{UN}(U) = E^*_{IN}(U)$ if and only if

$$(\Omega(k))^{\frac{1}{\theta}} \left(\frac{1}{4k\Omega(k)} + \frac{1}{2}\right) = \begin{cases} \left[\left[(k-5)/4\right]^2 + k\right]^{-\frac{1}{\theta}} & \text{if } k \in (1,5), \\ 5^{-\frac{1}{\theta}} & \text{if } k \geq 5. \end{cases},$$

and notice next from (51) and (51) that whenever the equality above holds true, we will also have $E^*_{UN}(U) = E^*_{IN}(U)$ for any $0 < \alpha < 1$.

$E^*_{UN}(U) = E^*_{IN}(U)$ still holds true, implying in turn that $N^*(\widehat{k}(\theta)) > \widehat{n}(\widetilde{k}(\theta))$, where recall that $\widetilde{k}(\theta) < 5$ so the first row in (56) applies in this case. From this, combined with the fact that $\Delta^*_{UN} > \Delta^*_{IN}$ for all $k \in [\widetilde{k}(\theta), 5]$, it follows that we will still have $N^*(k) > \widehat{n}(k)$ for all $k \in [\widetilde{k}(\theta), 5]$. Lastly, let

$$\psi(k,\alpha) \equiv \left\{ \left[\left(\frac{k-5}{4} \right)^2 + k \right] \Omega \right\}^{-1} \left(\frac{1}{4k\Omega} + \frac{1}{2} \right)^{-\alpha},$$

and note from (53) and (56) that for any $k \in (1,5)$: $\widehat{n}/N^* = (\psi(\cdot))^{\theta/(\theta-\alpha)}$, which is in turn a monotonically increasing transformation of $\psi(\cdot)$ since $\alpha < 1$. Notice now that i) $\psi(1,\alpha) = 1$ for any $\alpha \geq 0$, ii) $\partial\psi(1,\alpha)/\partial k > 0$ for any $\alpha > 0$, iii) $\psi(k,\alpha)$ reaches a maximum at some $k > 1$ for any $\alpha > 0$. All this implies, by continuity, that there must exist $\underline{k}(\theta) \in (1, \widetilde{k}(\theta))$ such that: i) $N^*(\underline{k}(\theta)) = \widehat{n}(\underline{k}(\theta))$, ii) $N^* < \widehat{n}$ for all $k \in (1, \underline{k}(\theta))$, iii) $N^*(k) > \widehat{n}$ for all $\underline{k}(\theta) < k \leq 5$. ■

The results in Proposition B.3 extend those obtained previously in Proposition **3** in the main text to a framework with endogenous aggregate donations given by (50), within the context of the generalised Fréchet distribution (46). The main difference that arises when total donations responds positively to donors' expected utility is that it is no longer true that the number of active non-profits is always larger in the regime with uninformed donors. As we can observe, the number of active non-profits is larger in the regime with uninformed donors for the subset $k \in (\underline{k}, \overline{k})$, where $\underline{k} \in (1, \widetilde{k})$ and $\overline{k} > \widehat{k}$. Intuitively, recall that $\widetilde{k}$ and $\widehat{k}$ are the thresholds such that, when $k \in (\widetilde{k}, \widehat{k})$, donors are better off (in expectation) in the uninformed regime. Hence, within that range our previous results in Proposition **3** will remain qualitatively unaltered (and, actually, the gap between $N^*$and $\widehat{n}$ will become quantitatively stronger). On the other hand, as k falls below $\widetilde{k}$ or rises above $\widehat{k}$, the expected utility of donors is becomes larger in the informed regime than in the uninformed one. As a consequence, the pool of donors will also be larger in the informed regime than in the uninformed one in that range. This will, in turn, partly offset the mechanisms leading to $N^* > \widehat{n}$ as presented in Proposition 3. As a matter of fact, when $k \in (1, \underline{k})$ or $k > \overline{k}$, this offsetting effect dominates, leading in the end to $N^* < \widehat{n}$ in those ranges of k.

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