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# BAD NGOS? COMPETITION IN THE MARKET FOR DONATIONS AND WORKERS' MISCONDUCT

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**Title:** Bad NGOs? Competition in the market for donations and workers' misconduct

**Abstract:**

In this paper, we investigate how competition among NGOs to attract donations affects the behavior of NGOs' employees. NGOs hire workers to undertake development projects, which are horizontally and vertically differentiated. Workers can engage in constructive activities, which enhance project quality, but also in non-observable destructive activities, that damage their employer. NGOs provide their workers with monetary incentives in order to induce them to exert the desired level of constructive effort, but NGOs also need to monitor their employees to curb destructive behavior. When workers' activities are complementary, we obtain the following results: (i) monitoring can fully deter workers' destructive behavior, provided that NGOs do not particularly care about the quality of their projects; (ii) an increase in the degree of competition in the market for development aid raises project quality, but also leads to higher destructive effort, thereby exposing NGOs to scandals; (iii) intense competition has detrimental effects because it leads to insufficient monitoring and excessive destructive behavior relative to the social optimum.

**JEL Codes:** D43, D86, L13, L31.

**Keywords:** Non-governmental organizations, Incentives and multitasking, Vertical and horizontal differentiation, Scandals.

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# 1 Introduction

Starting from the last decades of the twentieth century, non-governmental organizations (NGOs) have emerged worldwide as a valuable alternative to governments in the provision of public goods and services (see Aldashev and Navarra, 2018, and Salamon et al., 2019, among others). This is particularly true for development NGOs involved in the financing or delivery of health and human services in developing countries. The World Bank estimates that these organizations channel over 15 percent of total overseas development aid, approximately $15-20 billion per year.[1]

Development NGOs are believed to be funded in a way that guarantees them independence from both the market and political considerations. They are often described as flexible, open to innovation, and effective in implementing development efforts. This is mainly due to the dedication of their workers, who are motivated by the meaningfulness of their job and not by pecuniary incentives (see Besley and Ghatak, 2005, and Nair and Bhatnagar, 2011, among others). However, the job characteristics that are peculiar to development NGOs attract different kinds of people with dissimilar motivations, who might rather be inclined to some deviant and anti-social behavior. Indeed, NGOs' employees work in remote locations of the world, with little control over their performance, and are in a position of power *vis à vis* the beneficiaries of NGOs' aid, who are poor and vulnerable people that completely rely on NGOs' employees for their help.[2]

This is why development NGOs are not immune to scandals. Think, for instance, of the Oxfam Haiti sex scandal. It outbroke on the 9th of February 2018, when *The Times* accused Oxfam GB (one of the leading UK charities that fights global poverty and works in 67 countries) of covering up an internal investigation into the exploitation of prostitutes, presumably minors, by its senior staff working in Haiti after the 2010 earthquake. After the investigation, the charity allowed three men, including the country director, to resign, and dismissed four more of its workers for gross misconduct. But *The Times* claimed that the organization did not do enough to report the allegations and treated senior staff leniently. Shortly after, the UK Charity Commission launched a statutory inquiry into Oxfam GB amid concerns it might not have disclosed all details about the Haiti allegations.[3] More than a year later, during a hearing in front of the members of the UK Parliament, Helen Stephenson, chief executive of the Charity Commission concluded: "Our inquiry demonstrated that, over a period of years, Oxfam's internal culture tolerated poor behavior, and at times lost sight of the values it stands for". She added that the

[1]See World Bank (2013), "Civil Society Engagement", *Review of Fiscal Years* 2010-2012. See also Atkinson et al. (2012).

[2]See Stirrat (2008) and his archetypes of "misfits" and "mercenaries" for development workers.

[3]See Roderick, L. (2018), "How the Oxfam sex scandal unfolded", *The Times*.

charity should have been "fuller and franker in its reports to donors and regulators"and that its handling of the allegations "was influenced by a desire to protect Oxfam GB's reputation and donor relationships".

The scandal had immediate effects on the reputation of the organization, and a tremendous impact on its finances. Many public figures resigned as ambassador for Oxfam GB and the Haiti government announced it was withdrawing Oxfam's right to operate in the country. Most importantly, about 7.000 people stopped making regular donations to Oxfam GB, including some celebrity patrons who withdrew their support for Oxfam. Moreover, both the UK government and the European Commission suspended their funding to the charity. In sum, Oxfam GB lost approximately 16 million pounds within a few months since the scandal outbreak.[4]

The ensuing public debate insisted on the fact that the Oxfam scandal might have been the tip of the iceberg because both the misconduct by aid workers and its covering up by the employing organizations were perceived to be widespread.[5] Indeed, NGOs expected donors to fund only those organizations with the best performance, and this pressure to demonstrate value for money shifted NGOs' incentives towards providing an immaculate account of success, which in turn reinforced practices of concealment.[6] The Oxfam scandal thus revealed the need for a systemic change from all charities working in development aid, that should improve their safeguarding practices and become more accountable and transparent. The scandal also called for a cultural change on the part of donors, who should acknowledge that organizations that disclose wrongdoing are probably the most trustworthy, provided they make a genuine attempt to rectify errors.[7]

Inspired by these considerations, in this paper we aim to provide an understanding of the extent of deviant behavior in the market for development aid and analyze the behavior of NGOs that compete among each other to attract donations. Each NGO tries to differentiate itself from the rivals both horizontally and vertically. Indeed, each NGO addresses a specific project: disaster relief, fighting child malnutrition, providing healthcare, and so on. Moreover, the quality of each project depends on the constructive

[4]See Elgot, J. and McVeigh, K. (2018), "Oxfam loses 7,000 donors since sexual exploitation scandal", *The Guardian*.

[5]See the 2006 report by Save the Children which showed that aid workers were systematically abusing minors in a refugee camp in Liberia, selling food for sex. In 2008, there was another report finding similar cases in Southern Sudan, Burundi, Ivory Coast, East Timor, Congo, Cambodia, Bosnia and Haiti.

[6]See A. Crack (2018): "The Oxfam scandal has taught us there is no reward for honest charities", *The Guardian*.

[7]As Winnie Byanyima, executive director of Oxfam International from 2013 to 2019, pointed out, the number of reported cases of abuse in Oxfam rose after the Haity scandal because a stronger safeguarding policy was adopted. For more recent developments, see Oxfam GB chief executive Sriskandarajah D. (2022): "Doing good can't be an excuse for tolerating harm", *Financial Times*.

effort exerted by NGOs' workers. Therefore, NGOs need to incentivize their employees in order to induce them to provide the desired level of constructive effort. Nonetheless, workers can also behave in an anti-social way and exert destructive effort. In order to curb workers' (unobservable) misconduct and avoid scandals, it is in the best interest of NGOs to monitor their employees. By so doing, NGOs persuade donors that their overall project quality is not undermined by their workers engaging in some destructive behavior. This implies that donations to each NGO are positively affected by the monitoring intensity chosen by the NGO itself. We focus our analysis mainly on the instance in which the two activities performed by workers are complements, as we believe that, in the present context, workers can exert destructive effort (without being observed by the employing NGO) only if they also undertake the constructive activity. For example, in the case of the Oxfam Haiti sex scandal, the senior staff accused of exploiting prostitutes were already settled in Haiti from some time, because they were helping the population after the 2010 earthquake, and they were very familiar with the environment.

Within this framework, the research questions that we are going to address are the following. First, how does each NGO solve the incentive problem inherent in the lack of contractibility of (some of) its workers' actions? More specifically, can sufficiently high monitoring fully deter workers' destructive behavior? Second, how does competition in the market for donations affect the monitoring intensity and the incentive pay set by NGOs, as well as employees' choices about the provision of constructive and destructive effort? This relationship between the degree of market competitiveness and the provision of incentives is clearly affected by market structure; we thus consider both the case in which market structure is exogenous, and the number of active NGOs is fixed, and the case in which market structure is endogenous, and the number of active NGOs is determined by the free entry condition. Third, how do our results compare with those obtained when a social planner aims to maximize total welfare? In particular, are the equilibrium levels of monitoring and bonus pay insufficient or excessive relative to the social optimum?

We find that workers' destructive behavior can be completely deterred, provided that NGOs do not particularly care about the quality of the projects they pursue. When this is the case, NGOs choose a high monitoring intensity and offer a low incentive pay to their workers. The latter induces employees to exert a low level of constructive effort, however, as tasks are complements, it also induces workers to abandon destructive activities. Conversely, when NGOs particularly care about project quality, there exist solutions such that monitoring is not sufficient to deter workers' destructive effort.

Moreover, we find that an increase in the degree of competitiveness in the market for donations increases workers' destructive effort. When market structure is exogenous and competition increases, NGOs' development projects become less horizontally differentiated. This makes vertical differentiation more relevant to NGOs that try to attract donors increasing the quality of their projects and offering their workers a higher incentive pay. However, at equilibrium, all NGOs ultimately supply the same level of project quality, so that an increase in competition decreases the payoffs to each NGO and reduces NGOs' incentives to monitor their employees, resulting in higher destructive effort. Furthermore, an increase in competition decreases effective donations because the total amount of potential donations received by each NGO is reduced, given that there are more NGOs on the market, but also because each NGO's monitoring intensity decreases, causing a drop in donors' willingness to donate. The negative relationship between the intensity of competition and workers' destructive behavior continues to hold when the number of NGOs is endogenously determined.

Our results uncover an unintended effect of competition in the market for development aid: when workers' effort levels are complements and the market is highly competitive, reputation is more difficult to be maintained by NGOs and scandals are more likely to occur. Given that, we compare the market equilibrium outcomes with the optimal level of monitoring and bonus pay that a social planner, aiming to maximize total welfare, would set for each NGO. Relative to the social optimum, we find that NGOs always provide an insufficient level of monitoring, and this induces an excessive amount of destructive effort on the part of workers. Moreover, incentive pay and the resulting constructive effort are also excessive, provided that NGOs do not particularly care about project quality.

## Related Literature

Our paper brings together four different strands of theoretical literature: (*i*) NGOs' competition in the market for donations; (*ii*) work ethics in mission-oriented firms; (*iii*) moral hazard and multitasking; (*iv*) horizontal differentiation in a circular space.

**NGOs' competition in the market for donations.** Three papers on this topic are mostly related to ours: Aldashev and Verdier (2010), Aldashev et al. (2018, 2023). In Aldashev and Verdier (2010), horizontally differentiated NGOs compete for donations through fundraising activities.[8] Each NGO can run a single project and is endowed with a fixed amount of resources that have to be allocated between fundraising activities and implementation of the project. NGOs can divert donations for private uses, so that each NGO's fundraising effort increases not only with the number of NGOs in the market but also with the amount of funds that it diverts. With free-entry, there exist multiple equilibria with either no diversion or high diversion of funds. Aldashev et al. (2018) further develop this idea that good and bad equilibria can emerge, although in a different context.

[8] Aldashev and Verdier (2009) considers a similar framework to understand why many large NGOs become multinational entities and what are the welfare implications of this trend.

They consider agents who can become private or social entrepreneurs and who can be either selfish or pro-socially motivated. Social entrepreneurs collect donations which can be allocated either to cover the organization's expenses or to accomplish the organization's mission. In equilibrium, two different configurations might arise: (*i*) all mission-oriented firms are managed by selfish entrepreneurs and some motivated agents run private organizations; (*ii*) all mission-oriented firms are managed by motivated entrepreneurs and some selfish agents run private organizations. With this line of research, we share the view that competition for donations can be detrimental, although we examine a very different channel through which increased competition can affect the market outcome.[9] Aldashev et al. (2023) focus on the implications of transparency policies on decentralized public good provision. Indeed, nonprofit organizations are increasingly prompted by their donors to clarify how they use the collected funds, and they resort to monitoring in order to prevent potential diversion of funds. It is found that more transparency on the use of funds has an ambiguous effect on total public good provision and donor's welfare: on the one hand, transparency encourages nonprofits to more actively curb rent-seeking inside organizations, on the other hand, it also induces them to abandon their missions and reduce nonprofit diversity. In our model, monitoring discourages workers' destructive behavior and, as a result, has a positive impact on donors' utility.

**Work ethics in mission-oriented firms.** A growing body of the theoretical literature has examined the relationship between incentives in mission-oriented organizations and employees' motivation to work. The focus has been primarily put on pro-social motivation, *i.e.*, on employees' enjoyment of their personal contribution to their organization's mission or goal (as in Besley and Ghatak, 2005, 2017, 2018, or in Barigozzi and Burani, 2016, 2019).[10] These papers highlight the importance of matching the mission preferences of mission-oriented firms and motivated workers in order to save on monetary incentives. Nonetheless, mission-oriented organizations lend themselves easily to be the target of bad workers, who derive pleasure from destructive behavior and take advantage of operating in remote locations with little control from the outside. This is precisely the framework considered by Auriol and Brilon (2014) that analyzes the optimal sorting of workers between a profit-oriented and a mission-oriented organization. Potential employees can be good (motivated to do the right thing), regular, or bad (enjoying destructive behavior) and, accordingly, they can provide both constructive and destructive effort. Given that

[9] Aldashev et al. (2014, 2020) start from this premise and analyze sustainable cooperation agreement among NGOs and clustering of different NGOs on similar projects, respectively.

[10] See also Francois (2000, 2003), and Delfgaauw and Dur (2008, 2010) that focus mainly on intrinsically motivated workers within the public sector, and Barigozzi and Manna (2020) in which workers obtain satisfaction from contributing to the output of the mission-oriented firm.

these activities are neither observable nor contractible, firms have to resort to monitoring and bonus payment to induce the desired behavior on the part of their employees. In equilibrium, bad workers are only employed in the profit-oriented sector, where they behave like regular workers, avoiding any destructive action, whereas good workers are only employed in the mission-oriented sector, where both monitoring and bonus pay are lower.[11] We share with Auriol and Brilon (2014) the importance of considering bad workers and their preferences, but we do not analyze worker self-selection into different sectors of the labor market. This spares us from dealing with heterogeneous workers and founders, but it also allows us to include multitasking and interdependence of worker activities.

**Moral hazard and multitasking.** The seminal paper by Holmstrom and Milgrom (1991) highlights that workers' performance in different tasks can be measured with varying degrees of precision. An increase in incentive pay in the task whose performance can be more easily measured induces agents to reallocate their costly effort away from activities that are more difficult to measure. Building on these insights, Bénabou and Tirole (2016) analyze the screening problem of firms competing for workers' talent, when prospective employees are required to engage in two different activities. It is shown that, when tasks are substitutes, increased competition bids up the level of compensation for the most talented workers, but also alters the structure of incentives inside the firm to undermine work ethics. Therefore, intense competition in the labor market can have detrimental effects on social welfare. In this paper, we assume away screening for talent, but we still highlight that, with complementary tasks, bonus pay crowds in destructive behavior, whereas monitoring crowds out constructive effort and project quality, and we analyze how these unintended effects vary when competition becomes more intense.

**Horizontal differentiation in a circular space.** Our modelling strategy, which considers firms' decision problems at two different layers (*i.e.*, on the final product market and also on the factor markets), is reminiscent of Raith (2003) and Manna (2017). In Raith (2003), incentive contracts are analyzed under moral hazard but no multitasking and are related to product market competition. Firms compete on the final product market selling horizontally differentiated goods and, at the same time, provide incentives to their managers to reduce marginal costs. With endogenous market structure, it is shown that firms offer stronger incentives to their managers in response to an increase in the substitutability of their products. We confirm this result, although in a very different framework. In a setting in which profit-maximizing firms compete offering both

[11]See also Macchiavello (2008) that examines selection into government bureaucracies in developing countries.

vertically and horizontally differentiated products, Manna (2017) studies the optimal contracts that firms provide to customer-oriented or self-interested workers. Finally, let us mention Heyes and Martin (2017) in which competition is analyzed among NGOs that run labeling schemes certifying the social engagement behaviors of firms. NGOs operate in a horizontally differentiated market, given that labels vary according to the issues to which they relate. Each labeling scheme is also vertically differentiated because NGOs choose its stringency, *i.e.*, how many units of prosocial behavior to be applied to each issue. The results of Heyes and Martin (2017) are similar in spirit to ours: they find that competition among NGOs might be detrimental because it leads to too many labels being adopted, with each label being too stringent.[12]

The rest of the paper proceeds as follows. In Section 2, we set up the model that is analyzed in Section 3, where the distinction is made between market equilibrium with exogenous or endogenous market structure. In Section 4, we elaborate on the welfare implications of our main results and compare them with those obtained when a social planner chooses monitoring intensity and workers' monetary compensation. In Section 5, we discuss the policy implications of some of our main results and provide concluding remarks. All the proofs of our results are provided in Appendix A, while in Appendix B we consider the role played by the relationship between workers' activities and we show how our results would change under independence or substitutability of tasks.

# 2 The model

We build a model in which there are three main actors: social entrepreneurs, workers, and donors. Social entrepreneurs are the founders of NGOs and decide whether to enter the market for development aid and undertake a development project. Workers provide labor to each NGO and, by so doing, help realize NGOs' projects. Donors make donations to finance NGOs' activities. In what follows, we describe the three actors in detail, grouping the first two under their common organizational structure, the NGO.

### NGOs

There are $n$ NGOs that compete to attract donations and are positioned equidistantly around a circle, whose perimeter is normalized to 1 (see Salop, 1979).[13] As in Aldashev

[12]See also Heyes and Martin (2018) in which NGOs choose the scope of a labeling scheme, *i.e.*, whether it applies to a wide set of behaviors, or a narrower niche behavior. Considering competition between an incumbent NGO and a potential entrant, the authors find that NGOs behave inefficiently, bringing about strategic proliferation and fragmentation of labels.

[13]For simplicity, $n$ will be treated as a continuous rather than a discrete variable (see Raith, 2003).

and Verdier (2009, 2010), NGOs engage in development projects which are *horizontally differentiated*: the location of each NGO represents the particular social problem targeted by the NGO, such as disaster relief, promoting access to health care, fighting child malnutrition or child labor, providing education, and so on. Each NGO $i$ is conceived as a principal-agent pair: the principal is a risk-neutral social entrepreneur (she) and the agent is a risk-neutral employee (he). The social entrepreneur is the founder of the NGO and decides whether to enter the market for development aid, incurring a fixed entry cost $F$. After entering at a specific location, the founder hires a single worker and delegates him the actual realization of her development project, offering him a monetary compensation.[14] The worker can exert two types of effort: constructive effort $e_i$, which is measurable and contractible, and destructive effort $d_i$, which is not directly observable by the social entrepreneur and hence not contractible.

An employee's constructive effort determines the quality of NGO's project $q_i$, which for simplicity is assumed to be such that $q_i = e_i$. Therefore, NGOs provide *vertically differentiated* projects: given its mission, each NGO can enhance the satisfaction of its founder and the well-being of its donors by increasing the quality of its project, which depends on its employee's constructive effort. Since the latter is observable, the social entrepreneur running NGO $i$ can incentivize the provision of $e_i$ setting a bonus pay equal to $e_i b_i$ (where $b_i$ is the unit payment for the incentivized activity) and a fixed payment denoted by $z_i$. In other words, the employee working for NGO $i$ receives a linear contract of the form $w_i = z_i + e_i b_i$.[15]

Destructive effort, instead, represents an undesirable behavior on the part of the worker like sexual misconduct. An employee's contribution to such a destructive activity is driven by internal determinants, *i.e.*, by his anti-social motivation $vd_i$, which is linear in destructive effort $d_i$.[16] Being destructive activity $d_i$ not observable, social entrepreneur $i$ needs monitoring, as her worker may pursue his own private benefit to the detriment of the organization. More specifically, we assume that social entrepreneur $i$ only observes the worker's destructive effort with probability $m_i \in [0, 1]$, where $m_i$ is the monitoring level that she chooses. Conditional on being caught to exert effort $d_i$, the employee suffers a fixed cost $k \in (0, 1)$, representing the exogenous punishment that a Court of Justice can impose on the worker if such a destructive effort is observed. Hence, an employee working

[14]Think, for instance, of development aid NGOs that have their headquarters in a developed country, but carry out their projects in a developing country, where its workers are employed.

[15]Carroll (2015) shows that the optimal contract is linear and this result is robust for several extensions and variations of a basic moral hazard model.

[16]The assumption that all workers can engage in the destructive activity might appear rather extreme. Nonetheless, our results would remain qualitatively valid if we assumed that only a fraction of workers are motivated to do bad, provided that the principal cannot screen workers before hiring them.

for NGO $i$ obtains the following utility:

$$V(e_i, d_i) = z_i + e_i b_i + (v - k m_i) d_i - C(e_i, d_i). \tag{1}$$

The worker's total cost of effort provision $C(e_i, d_i)$ is strictly increasing and strictly convex in both effort levels. To obtain explicit analytical solutions, we assume that such effort cost takes the quadratic specification

$$C(e_i, d_i) = \frac{e_i^2 + d_i^2}{2} - \lambda e_i d_i.$$

We believe that, in the present context, it is plausible to assume that effort levels are complements, *i.e.*, $\lambda \in (0, 1)$, because an increase in the constructive effort that a worker is required to exert also increases the possibilities that are opened up to him for behaving badly and, as a result, decreases the additional cost of undertaking the destructive action. Indeed, when the worker has already performed a certain amount of constructive effort $e_i$, he has already become familiar with the environment and has gained the beneficiaries' confidence and trust. Then, it will be much easier for him to keep carrying out destructive effort $d_i$ without NGO $i$'s knowledge.[17]

As for the social entrepreneur, she has the following payoff function:

$$\pi_i(b_i, m_i) = y_i + (E - b_i) e_i - z_i - D d_i - \frac{m_i^2}{2} - F. \tag{2}$$

On top of labor costs, represented by contract $(b_i, z_i)$, social entrepreneur $i$ incurs a quadratic cost of monitoring $\frac{m_i^2}{2}$ and the fixed entry cost $F$. Moreover, she suffers a damage $D d_i$, which is proportional to the destructive effort $d_i$ that her employee chooses to exert, with $D > 0$. On the other hand, social entrepreneur $i$ enjoys satisfaction $E e_i$, which denotes the non-monetary benefit that she derives from pursuing a development project with positive social attributes (pinned down by project quality $q_i = e_i$). Accordingly, social entrepreneurs are altruistic in that they care about the social output of the organizations they establish. Finally, each social entrepreneur finances her operations through donations $y_i$.[18]

### Donors

All NGOs receive donations from a continuum of small donors with mass $L$ who are uniformly located on the circle. We assume that the choice of donors is made in two

[17] In Appendix B, we will analyze how our results change when tasks are either independent or substitutable .

[18] We are aware that most NGOs are non-profit organizations characterized by a non-distribution constraint, so that social entrepreneur $i$ cannot fully appropriate all her payoffs $\pi_i$. Our results would not change qualitatively had we followed Glaeser and Shleifer (2001) and assumed that the commitment to a non-distribution constraint is equivalent to each NGO $i$ capturing only some share $\alpha < 1$ of its payoffs. See also Ghatak and Mueller (2011).

steps: first, donors simultaneously decide which NGOs are going to benefit from their funding; then, donors choose how much to give to the selected NGOs based on each NGO's reputation, which is related to the monitoring intensity exerted by the NGO under scrutiny. Donor $j$ funding NGO $i$ enjoys utility:

$$U_{ji} = u + q_i - tx_{ji}^2.$$

Each donor obtains a positive constant utility from giving $u$, independently of project quality and of their preferences for development projects. We assume that $u$ is sufficiently high, so that each donor enjoys a positive total utility and that the market for donations is fully covered (see, for instance, Aldashev and Verdier, 2010, and Manna, 2017). Moreover, donor $j$'s payoff is positively related to the quality $q_i$ of the project carried out by NGO $i$. Each donor $j$ has a most preferred variety of development project, the one corresponding to his own location on the circle, and the further NGO $i$ is located on the circle, the less the project of NGO $i$ corresponds to this preferred variety. Denoting by $x_{ji}$ the distance between NGO $i$ and donor $j$, the donor incurs a quadratic transportation or mismatch cost $tx_{ji}^2$ from adhering to the mission of NGO $i$, and a cost of $t\left(\frac{1}{n} - x_{ji}\right)^2$ from funding the next NGO $i+1$, where $1/n$ is the distance between any two NGOs. Parameter $t$ measures the degree of horizontal differentiation, and captures the weight that each donor attaches to the congruence between the most preferred variety of development project and NGO $i$'s mission.[19]

Let us denote by $Y_i$ the *potential donations* destined to NGO $i$, which depend on NGO $i$'s project quality relative to the neighbouring NGOs, and whose actual expression is determined in Section 3.1. We assume that donors weigh $Y_i$ according to the monitoring effort $m_i \in [0, 1]$ that NGO $i$ undertakes.[20] Therefore, a high monitoring intensity $m_i$ exerted by NGO $i$ serves to persuade donors that NGO $i$'s overall project quality is not undermined by its employees engaging in some destructive behavior. Hence, we assume that the *actual* or *effective donations* received by NGO $i$ are given by $y_i = m_i Y_i$.[21] The remaining fraction of resources, *i.e.*, $(1 - m_i) Y_i$, stands in the donors' hands and can be converted into consumption with utility normalized to zero.

[19]Since the marginal increase in donor's utility resulting from a unit increase in project quality is equal to one, $t$ also measures the relative importance of horizontal *vs* vertical differentiation.

[20]In the literature, there is indication that ongoing monitoring on the part of non-profit organizations enhances public trust and donors' intention to donate (see Becker, 2018).

[21]Such a distinction between potential and actual funding is reminiscent of Aldashev and Verdier (2010), as for endogenous market size. In their model, fundraising effort serves the same purpose as monitoring effort in ours, namely it activates potential donors to giving.

#### Timing and solution of the game

The timing of the model is as follows. In stage 1, each social entrepreneur decides whether to enter the market for development aid, incurring the cost $F$, or stay out. In stage 2, each NGO hires an employee, offering him a contract $(b_i, z_i)$, and exerts monitoring $m_i$. In stage 3, each employee accepts any contract which yields an expected utility of at least his reservation utility. Each hired worker undertakes effort $e_i$, so that project quality $q_i$ is realized, and eventually exerts destructive effort $d_i$. In stage 4, donors decide which NGOs to finance on the basis of NGOs' observed project congruence, project quality, and monitoring activity. The solution concept is subgame perfect Nash equilibrium and the game is solved by backward induction. Only symmetric equilibria are considered and all proofs are contained in the appendix.

# 3 Market equilibrium

In this section, we first consider (backwards) all stages of the game but the first one. More specifically, we will take the number of active NGOs $n$ as given and characterize the equilibrium with exogenous market structure. In Subsection 3.2, we endogenize the market structure by letting $n$ be determined by the simultaneous entry decisions of all NGOs in the market for donations.

## 3.1 Exogenous market structure

We start examining the last stage of the game in which donors take their funding decisions. Potential donations received by NGO $i$ amount to

$$Y_i = L\left(\frac{1}{n} + \frac{n\,(q_i - q)}{t}\right), \tag{3}$$

where $q$ denotes the symmetric project quality set by all NGOs except $i$.[22] They are increasing in the quality differential between NGO $i$ and its neighbors $(q_i - q)$. More

[22] Indeed, a donor located between NGO $i$ and NGO $i+1$, at distance $x$ from NGO $i$ and at distance $\left(\frac{1}{n} - x\right)$ from NGO $i+1$, is indifferent between donating to either NGOs if and only if

$$u + q_i - tx^2 = u + q_{i+1} - t\left(\frac{1}{n} - x\right)^2$$

or, solving for $x$,

$$x = \frac{1}{2n} + \frac{n\,(q_i - q_{i+1})}{2t}.$$

A similar reasoning applies to the choice of donors located between NGO $i$ and NGO $i-1$. In a symmetric equilibrium, when all NGOs but $i$ choose the same quality $q$, potential donations received by NGO $i$ are equal to $2Lx$, whose expression is given by (3).

precisely, potential donations to NGO $i$ depend positively on its own project quality and negatively on the project quality of the nearest rival NGOs. So, by increasing its project quality, NGO $i$ imposes a negative externality on the neighboring NGOs. Furthermore, potential donations are decreasing in the (exogenous) number $n$ of active NGOs, provided that the quality differential favoring NGO $i$ is not too high. Potential donations to NGO $i$ are also decreasing in transportation cost $t$, provided that the quality differential between NGO $i$ and its neighbors $(q_i - q)$ is positive.

In stage 3, all workers simultaneously choose their effort levels. Given the monitoring level $m_i$ and the incentive scheme $(b_i, z_i)$ offered by NGO $i$, an employee chooses the effort levels that maximize his utility (1). The solutions for this problem are given by:

$$e_i(b_i, m_i) = \frac{b_i + \lambda(v - km_i)}{1 - \lambda^2} \quad \text{and} \quad d_i(b_i, m_i) = \frac{v - km_i + \lambda b_i}{1 - \lambda^2}. \tag{4}$$

Given that effort levels are complements and $\lambda > 0$, it is straightforward to see that destructive effort is difficult to eradicate, because $d_i(b_i, m_i) > 0$ can occur even if the net utility from destructive behavior is negative, namely if $v - km_i < 0$. Moreover, both constructive and destructive effort levels increase with bonus pay and decrease with monitoring. Indeed, when tasks are complements, there is a conflict between the two instruments that NGOs have at their disposal: bonus pay is targeted to increase constructive effort, but it has the adverse effect of increasing destructive effort as well; similarly, monitoring is intended to decrease destructive effort, although it decreases constructive effort as a side-effect. Let us summarize these findings in Remark 1.

**Remark 1.** *Bonus pay crowds in destructive behavior and monitoring crowds out constructive effort.*

The worker accepts any bonus pay $b_i$ and monitoring level $m_i$ that guarantee him at least his reservation utility, which is normalized to zero for simplicity. Therefore, in stage 2, social entrepreneur $i$ can offer to her worker the fixed payment $z_i$ (which will depend on her decision variables $b_i$ and $m_i$):[23]

$$z_i(b_i, m_i) = -b_i e_i(b_i, m_i) - (v - km_i) d_i(b_i, m_i) + C(e_i(b_i, m_i), d_i(b_i, m_i)). \tag{5}$$

Notice that destructive behavior, enhancing worker's satisfaction, relaxes the employee's participation constraint. This is beneficial for social entrepreneur $i$, who can afford to reduce the fixed payment $z_i$ accordingly. The founder chooses the optimal values of bonus pay and monitoring in order to maximize her payoffs, taking into account that effective

[23] Note that the fixed salary $z_i(b_i, m_i)$ is likely to be negative. To avoid this, one could set a sufficiently high reservation utility for the worker.

donations $y_i$, salary $z_i$, and effort levels $e_i$ and $d_i$ all ultimately depend on $b_i$ and $m_i$:

$$\begin{aligned}\max_{b_i,m_i} \quad \pi_i\left(b_i,m_i\right) = \quad & m_i L\left[\tfrac{1}{n}+\tfrac{n(e_i(b_i,m_i)-e(b,m))}{t}\right]+\left(E-b_i\right)e_i\left(b_i,m_i\right)-z_i\left(b_i,m_i\right) \\ & -Dd_i\left(b_i,m_i\right)-\tfrac{m_i^2}{2}-F.\end{aligned} \tag{$P1$}$$

Computing the first order conditions associated to program ($P1$), we can highlight the trade-off between the marginal benefits and the marginal costs of increasing monitoring and bonus pay. An increase in monitoring $m_i$ is beneficial to social entrepreneur $i$ because it directly increases effective donations and because it reduces worker's destructive effort and, consequently, the damage NGO $i$ suffers. Nonetheless, an increase in monitoring reduces founder $i$'s payoffs because it reduces project quality (this indirectly decreases effective donations, given that it puts NGO $i$ at a disadvantage relative to rival NGOs, and reduces the benefit that the social entrepreneur enjoys), and it directly increases both monitoring costs and labor costs, through an increase in the fixed component $z_i$ of total salary.[24] An increase in bonus pay $b_i$, instead, increases NGO $i$'s payoffs indirectly through an increase in project quality, while it decreases its payoffs by increasing worker's destructive effort, and because NGO $i$ has to reward its employee with a higher incentive pay.

Imposing symmetry on the first-order conditions, we get the equilibrium values of bonus pay and monitoring chosen by the founder of each NGO $i$. Substituting them back into worker's choices (4), we also obtain the optimal effort levels that the worker provides to NGO $i$. These expressions are reported in Proposition 1.

**Proposition 1.** ***Equilibrium with exogenous market structure.*** *For a given number of NGOs, there exists a symmetric equilibrium in which each NGO i optimally sets monitoring and incentive pay equal to:*

$$m_i^* = \min\left\{\frac{t}{n}\frac{L\left(1-\lambda^2\right)+kn(D-v-\lambda E)}{t(1-\lambda^2-k^2)+k\lambda Ln},1\right\} \quad \textit{and} \quad b_i^* = E-\lambda D+\frac{Ln}{t}m_i^*$$

*and each worker provides effort levels:*

$$e_i^* = \frac{E-\lambda(D-v)}{(1-\lambda^2)}+\frac{Ln-k\lambda t}{t(1-\lambda^2)}m_i^* \quad \textit{and} \quad d_i^* = \max\left\{\frac{v+\lambda(E-\lambda D)}{(1-\lambda^2)}-\frac{kt-\lambda Ln}{t(1-\lambda^2)}m_i^*,0\right\}.$$

In order for the results in Proposition 1 to be valid and meaningful, we make the following assumptions. First, all denominators in the above expressions must be strictly positive, and this requirement is related to the second-order conditions associated to program ($P1$).[25]

[24] Notice, though, that an increase in monitoring reduces the variable component of total salary. The net effect of an increase in monitoring on total compensation is such that $\frac{\partial w_i}{\partial m_i}>0$ if and only if $(v-km_i)>0$.

[25] See the comments that follow Assumption 4.

**Assumption 1.** $1 - \lambda^2 - k^2 > 0$ *and* $k < \lambda$.

Second, all numerators of the expressions displayed in Proposition 1 must be strictly positive. As for monitoring, it is sufficient that $D - v - \lambda E > 0$, whereas $E - \lambda D > 0$ guarantees that bonus pay is positive. The latter inequality also represents a sufficient condition for the first terms of both constructive and destructive effort to be strictly positive.

**Assumption 2.** $D > \frac{v}{(1-\lambda^2)} \equiv \underline{D}$ *and* $\underline{E} \equiv \lambda D < E < \frac{D-v}{\lambda} \equiv \overline{E}$.

Third, monitoring $m_i^*$ is allowed to be strictly lower than 1 and the following assumption guarantees this.

**Assumption 3.** $t < n^2$.

Notice that Proposition 1 expresses $b_i^*$ and effort levels $e_i^*$ and $d_i^*$ as a function of the equilibrium level of monitoring $m_i^*$ rather than as a function of the exogenous variables only. This allows us to give more structure to our results. Indeed, the expression for $b_i^*$ makes it clear that monitoring and bonus pay vary in the same direction at the equilibrium. This is because an increase in the bonus paid by NGO $i$ has a positive impact on employee's constructive effort $e_i$, leading to a higher quality differential $(q_i - q)$ and, consequently, to higher potential donations received by NGO $i$. As actual donations to NGO $i$ increase with monitoring $m_i$, the positive effect of an increase in bonus pay is stronger the higher $m_i$ is, explaining the positive relationship between monitoring and bonus. Relatedly, recall that equation (4) highlights that the use of monitoring targeted to decrease destructive effort has the side effect of decreasing constructive effort, as tasks are complements. However, given that bonus pay increases constructive effort and moves together with $m_i^*$, monitoring eventually has a positive impact on employee's constructive effort. Indeed, constructive effort $e_i^*$ is increasing in monitoring $m_i^*$ if and only if:

$$Ln - k\lambda t > 0 \Longleftrightarrow L > \frac{\lambda k t}{n} \equiv L_1; \tag{6}$$

likewise destructive effort $d_i^*$ is decreasing in monitoring $m_i^*$ if and only if:

$$kt - \lambda L n > 0 \Longleftrightarrow L < \frac{kt}{\lambda n} \equiv L_2, \tag{7}$$

with $L_1 < L_2$. Consider that one could express effort levels as a function of $b_i^*$ rather than $m_i^*$; then, conditions (6) and (7), respectively, would guarantee that constructive effort be increasing and destructive effort be decreasing in bonus pay. Since neither task can be increasing in $m_i^*$ and in $b_i^*$ at the same time (or, conversely, decreasing in both $m_i^*$ and $b_i^*$), the above inequalities must be satisfied.[26]

[26] Also notice that Assumption 3, together with $L < L_2$ implies that $L < n$. This means that potential donations received by each NGO, namely $L/n$, are always less than 1.

**Assumption 4.** $L_1 < L < L_2$.

Finally, the results contained in Proposition 1 are valid when the second-order conditions associated to program $(P1)$ are fulfilled. In the appendix, we show that, given $k < \lambda$ as required by Assumption 1, Assumption 4 implies that the second-order conditions are always satisfied.

### Interior and corner solutions

Let us now distinguish between interior solutions, such that both $m_i^* < 1$ and $d_i^* > 0$ hold, and corner solutions, such that either $m_i^* = 1$ or $d_i^* = 0$, or both realize. Within the set of corner solutions, let us address the question of whether a high enough level of monitoring is sufficient to fully deter destructive behavior on the part of workers.

Observe that monitoring $m_i^*$ is such that it decreases with $E$ and $v$, whereas it increases with $D$; destructive effort $d_i^*$ moves instead in the opposite direction. While the effects of workers' intrinsic benefit from doing bad $v$ and of the damage $D$ caused by destructive behavior are intuitive, an increase in the level of altruism $E$ of social entrepreneurs quite unexpectedly increases destructive behavior. This is because of two effects that go in the same direction: an increase in $E$ decreases monitoring, which increases $d_i^*$, and, at the same time, it increases the bonus that NGOs pay to their employees. The more interested the social entrepreneur is in project quality, the higher the incentive pay that she will offer the worker in order to induce him to exert a higher constructive effort. However, as tasks are complements, this increase in constructive effort will bring about an increase in destructive effort too.

As a result, monitoring will be lower than 1 and destructive effort will be strictly positive when the founder's degree of altruism $E$ is high enough. In particular, $m_i^* < 1$ if and only if

$$E > \frac{(D-v)}{\lambda} + \frac{L(1-\lambda^2)}{\lambda nk} - \frac{t\,(1-\lambda^2-k^2) + Lnk\lambda}{\lambda tk} \equiv E_0,$$

where $E_0 < \overline{E}$ always holds under Assumption 3. Moreover, $d_i^* > 0$ if and only if

$$E > \frac{(D-v)}{\lambda} + \frac{L\,(kt-\lambda Ln)}{\lambda nt} - \frac{D\,[t\,(1-\lambda^2-k^2) + Lnk\lambda]}{\lambda t} \equiv E_1,$$

where $E_1 \in (\underline{E}, \overline{E})$ if the damage suffered by NGOs exceeds a given threshold $\hat{D}$ that is reported in the appendix. We can state the following result.

**Proposition 2.** ***Deterrence of destructive behavior.*** *Let $D > \max\{\underline{D}, \hat{D}\}$: (i) if $\underline{E} < E \leq E_1$, monitoring always guarantees that $d_i^* = 0$; (ii) if $E_1 < E < \overline{E}$, monitoring is not sufficient to deter workers' destructive behavior.*

Proposition 2 illustrates that, when social entrepreneurs are endowed with a relatively low degree of altruism, NGOs are able to avoid workers' destructive behavior by choosing a sufficiently high level of monitoring. Conversely, when $E$ is above the threshold $E_1$, we get a solution in which destructive effort is positive. Note that if $E_0 > E_1$ we would have circumstances in which full monitoring (*i.e.*, $m_i^* = 1$) is not able to discourage workers' destructive behavior.

From now on, we focus our attention on interior solutions such that both $m_i^* < 1$ and $d_i^* > 0$ hold. Therefore, we consider the interval $E \in (\max\{\underline{E}, E_0, E_1\}, \overline{E})$. In the next subsection, we analyze in more detail how equilibrium outcomes, *i.e.*, monitoring and bonus pay chosen by the founders and effort levels exerted by the employees, vary in response to a change in the competitiveness of the market for donations.

#### 3.1.1 Impact of market competitiveness

Proposition 1 shows that at equilibrium monitoring and bonus pay move in the same direction: an increase in monitoring leads to a higher bonus and, consequently, to a higher constructive effort. Moreover, an increase in monitoring directly causes a fall in destructive effort. So the basic complementarity between tasks, that would call for a simultaneous decrease in both constructive and destructive effort in response to a rise in monitoring, is somehow attenuated by the fact that donors value an improvement in transparency as a signal of NGOs' increased reputation for doing good.

These relationships are crucial to understand the impact of the different forces that affect competition in the market for donations on the optimal choices of each NGO. In particular, we analyze how these choices vary if competition increases because of: ($i$) an increase in the number of active NGOs $n$; or ($ii$) a reduction in transportation cost $t$; or else ($iii$) an increase in the size of the market for donations $L$. Indeed, an increase in $n$ reduces market concentration and has a pro-competitive effect. Markets with lower values of $t$ are those in which NGOs' projects are more substitutable. Such markets are more competitive since donors are more sensitive to changes in the horizontal dimension of project variety relative to markets in which $t$ is higher. Finally, larger markets, *i.e.*, markets with a bigger mass of donors $L$, are more competitive because more donors are available and a larger number of NGOs can be sustained.

It is straightforward to check that an increase in $n$ causes a decrease in monitoring and a consequent increase in destructive effort, it has an ambiguous effect on bonus pay, but it clearly leads to an increase in constructive effort. A reduction in $t$ decreases monitoring and increases destructive effort, while it increases both incentive pay and constructive effort. Finally, an increase $L$ has an ambiguous impact on both monitoring and destructive effort, nonetheless it raises bonus pay, leading to a higher constructive effort. These results are summarized in the following proposition.

**Proposition 3.** ***Comparative statics with exogenous market structure.*** *With exogenous market structure: (i) monitoring is lower in markets with more substitutable projects and with a greater number of NGOs; (ii) bonus pay is higher in markets with more substitutable projects and in larger markets; (iii) constructive effort is higher in markets with more substitutable projects, with a greater number of NGOs, and in larger markets; (iv) destructive effort is higher in markets with more substitutable projects and with a greater number of NGOs.*

Notably, Proposition 3 highlights that monitoring and destructive effort do not necessarily move in opposite directions when market size varies: indeed, it might happen that both monitoring and destructive effort increase with $L$. In addition, it might be the case that monitoring and bonus pay move in the same direction as a consequence of a change either in market size or in the number of active NGOs. All these ambiguous effects can be avoided under some additional restrictions. More specifically, let

$$E < \frac{D - v}{\lambda} - \frac{t\,(1-\lambda^2)\,(1-\lambda^2-k^2)}{k^2 n^2 \lambda^2} \equiv E_2,$$

then, an increase in market size $L$ leads to a decrease in monitoring and an increase in destructive effort, whereas an increase in $n$ causes an increase in bonus pay. We summarize these findings in the next corollary.

**Corollary 1.** *Let* $\max\{\underline{E}, E_0, E_1\} < E < E_2$*. Then: (i) monitoring is lower and destructive effort is higher in larger markets; (ii) bonus pay is higher in markets with a greater number of active NGOs.*

Proposition 3 and Corollary 1 show that, when tasks are complements, an increase in the competitiveness of the market for development aid induces workers to increase their effort in the bad activity, exposing the employing NGO to the consequences of likely scandals. The intuition for this result is the following. When the market becomes more competitive, NGOs target less horizontally differentiated projects. As a consequence, to attract donors, each NGO wants to raise the quality of its project (*i.e.*, it wants to increase vertical differentiation) through an increase in the bonus paid to its employee. However, at equilibrium all NGOs choose the same level of project quality $q_i^* = e_i^*$, so that an increase in competition decreases each social entrepreneur's payoffs and reduces her incentives to monitor the employee, leading to a higher destructive effort.

Akin to the experimental paper by Goette et al. (2012), we highlight an unintended effect of competition. In our model, a higher number of NGOs in the market, more substitutable development projects and a larger market size all decrease NGOs' incentives to undertake the monitoring activity, because a good reputation is more costly to establish. As a result, employees are more willing to spend time on the destructive activity.

In order to fully characterize the market equilibrium with exogenous market size, we also determine how project quality $q_i^*$ and effective donations $y_i^* = \frac{L}{n} m_i^*$ vary in response to a change in the forces affecting the degree of competition in the market for donations. While an increase in the competitiveness of the market always has a positive effect on project quality $q_i^* = e_i^*$ (see Proposition 3), effective donations $y_i^*$ only benefit from an increase in market size $L$, but they are reduced in response to an increase in $n$ or a reduction in $t$.

**Corollary 2.** ***Effective donations and exogenous market structure.*** *When market structure is exogenous, effective donations are lower in markets with more substitutable projects and a greater number of NGOs, while they are higher in larger markets.*

Higher market competitiveness increases NGOs project quality; nonetheless, this does not translate into an increase in the amount of donations that each NGO receives. The reason is that project quality increases by the same amount for all NGOs in equilibrium. Therefore, NGO $i$ is not able to steal donors from its competitors. Furthermore, an increase in the number of active NGOs decreases effective donations for two motives: $(i)$ it reduces the total amount of potential donations; $(ii)$ it decreases each NGO's monitoring effort, leading to a reduction in donors' willingness to donate. The effect of $t$ is straightforward because a reduction in $t$ decreases monitoring, which in turn reduces effective donations.

### 3.1.2 NGOs' payoffs

Once we substitute the equilibrium values of monitoring, bonus and effort levels into the objective function in problem $(P1)$, we get the maximal payoff obtained by each NGO, denoted as $\pi_i^*$.[27] We now consider the effects that the forces determining the degree of competition in the market for donations have on $\pi_i^*$, including the fixed entry costs $F$. Markets with lower entry costs $F$ are more competitive since, *ceteris paribus*, a larger number of NGOs will be attracted. Our findings are summarized in Lemma 1.

**Lemma 1.** ***NGOs' payoffs.*** *When market structure is exogenous, NGOs' payoffs are lower in markets with more substitutable projects and with a greater number of NGOs, they are higher in markets with lower entry costs, and they are non-monotonic in market size, but decrease when both $L$ and $n$ increase by the same amount.*

[27]NGO $i$'s payoffs are given by the sum of worker's utility $V_i$ and payoffs obtained by the social entrepreneur $\pi_i$. As workers' participation constraint binds, each worker enjoys zero utility and NGO $i$'s payoffs coincide with $\pi_i$. The actual expression for $\pi_i^*$ is provided in Appendix A.

An increase in the competitiveness of the market for development aid, which takes the form of an increase in $n$ or a decrease in $t$, has a monotonically decreasing effect on NGOs' payoffs. In contrast, it is immediate to see that a decrease in $F$ has a positive impact on NGO $i$'s payoffs. These results are in line with those found by the previous papers in the literature (see, for instance, Raith, 2003). In our model, an increase in the number of active NGOs $n$ decreases the payoffs obtained by NGO $i$ because of two effects that go in the same direction. First, an increase in $n$ decreases the amount of actual donations received by NGO $i$. Second, a higher $n$ reduces horizontal differentiation making vertical differentiation more important. This induces NGO $i$'s competitors to increase the bonus offered to their employees so that a higher constructive effort is exerted and a higher project quality is provided by rival NGOs, thereby leading to a reduction in NGO $i$'s benefits. Similarly, an increase in $t$ has a positive impact on NGO $i$'s payoffs. This is because, as NGOs offer more differentiated services, the competitors of NGO $i$ have less incentives to increase their project quality through the bonus and they prefer to raise their monitoring levels. Both effects lead to higher benefits for NGO $i$.

Market size $L$ has a non-monotonic effect on NGOs' payoffs as there are two opposing effects. On the one hand, an increase in $L$ has a positive impact on NGO $i$'s payoffs as it increases effective donations (the standard *scale effect*). On the other hand, a bigger market size induces NGO $i$'s competitors to increase their project qualities imposing a negative externality on NGO $i$ (the *business-stealing effect*). Raith (2003) finds a positive relationship between market size and firms' payoffs because of the scale effect. When project qualities are exogenous, an increase in market size would induce entry and would increase the number of active NGOs. However, project quality is endogenous in our model and an increase in market size might induce each NGO to increase its bonus pay in order to increase its project quality relative to the rivals. This effect would erode the gains generated by an increase in market size and would actually decrease the number of active NGOs. It is possible to show that, when an increase in $L$ reduces monitoring, *i.e.*, when $E < E_2$, the business-stealing effect outweighs the scale effect, leading to a reduction in NGO $i$'s payoffs.

## 3.2 Endogenous market structure

In the first stage of the game, all social entrepreneurs simultaneously decide whether to enter the market for donations incurring the fixed costs $F$. Given that payoffs $\pi_i^*$ are always decreasing in $n$, there exists an equilibrium number of NGOs $n^*$ which drives NGOs' payoffs to zero and which makes further entry of NGOs unprofitable. Even if it is not possible to obtain a closed-form solution for such an equilibrium number of NGOs, one can use Lemma 1 and the implicit function theorem to study how $n^*$ reacts to a change in the forces that determine the competitiveness of the market for development aid.[28]

**Proposition 4. *Equilibrium number of NGOs.*** *When market structure is endogenous, the equilibrium number of NGOs is lower in markets with more substitutable projects, is higher in markets with lower entry costs, and it is non-monotonic in market size, but if it increases with L it does so less than proportionally.*

With endogenous market structure, a change in the degree of competition in the market for development aid has two effects on the equilibrium outcomes: a direct effect as under exogenous market structure, but also an indirect effect because an increase in competitiveness causes a change in the equilibrium number of NGOs and, in turn, this change in $n^*$ affects NGOs' optimal choices. Notice that entry costs $F$ do not influence equilibrium outcomes directly. Nonetheless, a reduction in $F$ increases the equilibrium number of NGOs in the market; given that, the effect of entry costs $F$ on the optimal choices of NGOs in the long run is the opposite of the effect that an exogenous number of NGOs $n$ has in the short run.

**Proposition 5. *Comparative statics with endogenous market structure.*** *With endogenous market structure: (i) monitoring is higher in markets with more substitutable projects, larger size, and higher entry costs; (ii) bonus pay is higher in markets with more substitutable projects and larger size; it is higher in markets with lower entry costs if and only if it increases with the number of NGOs under exogenous market structure; (iii) both constructive and destructive efforts are higher in markets with more substitutable projects, larger size, and lower entry costs.*

Proposition 5 highlights that the unintended effect of more intense competition on destructive behavior is not confined to the short run (when the number of active NGOs is exogenous), but carries over to the long run, when the number of active NGOs is determined by free entry. This occurs notwithstanding the fact that, relative to the short run, monitoring increases rather than decreases in both project substitutability and market size. This difference is clearly due to the fact that the indirect effect on monitoring of an increase in project substitutability or market size, which goes through $n^*$, more than compensates the direct effect.

When $t$ decreases, if the rivals provide higher project quality, NGO $i$ has lower potential donations and a lower incentive to invest in monitoring activities, because the benefits of increasing monitoring are proportional to potential donations. On the other hand, when $t$ decreases, the payoffs to NGO $i$ are lower and the number of competing NGOs also

[28] We still maintain that the equilibrium number of NGOs $n^*$ is such that Assumptions 3 and 4 are satisfied.

decreases. But this means that NGO $i$ can count on a greater share of total potential donations and this induces NGO $i$ to increase monitoring. Therefore, this latter effect dominates with endogenous market structure, whereas the reverse is true with exogenous market structure.

A similar reasoning applies to an increase in market size $L$, given that $n^*$ either decreases with $L$ or increases but less than proportionally with $L$; in any case, with endogenous market structure, an increase in $L$ generates an increase in the share of total potential donations going to NGO $i$, and this leads to an increase in monitoring.

Finally, entry costs affect differently monitoring and bonus pay: a lower $F$ always decreases monitoring, while it increases incentives pay as long as bonus pay increases with $n$ under exogenous market structure.

We continue to find a positive relationship between bonus pay and the intensity of competition in the market. In this regard, our paper is related to Bénabou and Tirole (2016), where it is shown that increased competition for the most productive workers escalates their performance pay, creating severe distortions and long-run welfare losses in the market. This theoretical result is supported by the large evidence on managerial compensation showing that competition for the best workers increases incentive pay (see, among others, Fabbri and Marin, 2016, and Frydman, 2019).

Proposition 5 also shows that project quality increases as competition in the market for donations becomes more intense. The impact of competition on effective donations is instead described in the following corollary.

**Corollary 3.** ***Effective donations and endogenous market structure.*** *With endogenous market structure, effective donations are higher in markets with more substitutable projects and in larger markets, but they are lower in markets with lower entry costs.*

Relative to the short run, an increase in the substitutability of development projects leads to an increase, rather than a decrease, in effective donations. This depends on the varying effect of $t$ on monitoring, which is positive under exogenous market structure but negative when $n$ is endogenized.

# 4 Welfare

Let us now analyze the welfare properties of the market equilibrium, distinguishing again between the cases in which the number of active NGOs $n$ is either exogenous or endogenous. In Subsection 4.3, we will contrast the market equilibrium outcome with the social planner solution.

## 4.1 Exogenous market structure

The objective of this section is to analyze the impact of the forces determining the degree of competition in the market for development aid on donors' well-being. The overall surplus of donors who provide funding to NGOs is given by:

$$S = L\,m_i^* \left[2n \int_0^{\frac{1}{2n}} \left(u + q_i^* - tx^2\right) dx\right] = L\,m_i^* \left(u + e_i^* - \frac{t}{12n^2}\right), \tag{8}$$

where the term inside parentheses is positive as the market is assumed to be covered. Notice that $S$ does not exhaust total welfare because the latter also includes NGOs' payoffs and workers' utility. Nonetheless, we focus on $S$ because workers' utility is always null and because NGOs' payoffs have already been examined. Moreover, we want to compare the results obtained here with those in Subsection 4.2. There, $n$ will be endogenized so that NGOs' payoffs will become equal to 0 and donor surplus will coincide with total welfare.

We start studying the impact of an increase in the number $n$ of active NGOs on surplus $S$. An increase in $n$ has a positive effect on donor surplus because it increases project quality and, at the same time, reduces the distance between donors and their nearest NGOs. Nonetheless, an increase in $n$ has a negative impact on monitoring, leading to a decrease in donors' effective donations and in their well-being. Which effect dominates depends on the degree of differentiation of development projects and on the relative importance of the vertical versus the horizontal dimension of project differentiation, namely $t$. When NGOs have highly differentiated missions, *i.e.*, $t$ is high, donors are less interested in the welfare loss resulting from a reduction in monitoring and effective donations. Therefore, they choose to donate to a NGO which is closer to their location. When this is the case, an increase in the number of NGOs $n$ has a positive impact on donor surplus.

An increase in $t$ also has an ambiguous effect on donor surplus. On the one hand, an increase in $t$ increases the distance between donors and their preferred NGOs having a negative impact on donors' well-being. On the other hand, it has a positive impact on monitoring, leading to higher quality and to an increase in donor surplus.

The effect of an increase in market size $L$ on donor surplus is positive as an increase in market size has a positive direct effect on donor surplus, and a positive effect on project quality. There is also an ambiguous effect, which depends on whether monitoring increases or decreases with market size (recall that it decreases if and only if $E < E_2$). However, it is possible to show that the overall effect of an increase in $L$ on donor surplus is always positive. All these findings are proved in Appendix A and are summarized in the next result.

**Remark 2.** ***Comparative statics of donor surplus.*** *With exogenous market structure, donor surplus is higher in markets with larger size, but it is monotonic neither in the number of active NGOs nor in the degree of project substitutability.*

It is worth noticing that an increase in the founders' degree of altruism $E$ has an ambiguous effect on donors' well-being. Similarly to an increase in the number of NGOs, an increase in $E$ leads to a higher constructive effort on the part of workers and, as a consequence, generates a higher projects quality for NGOs, but, at the same time, it decreases monitoring, leading to higher destructive effort.

## 4.2 Endogenous market structure

When market structure is endogenous, NGOs' payoffs and workers' utility are both equal to zero. As a result, total welfare coincides with donor surplus, which is again given by equation (8). When assessing the impact of the degree of competitiveness in the market for donations, one has now to take into account that a change in the intensity of competition has an influence on the equilibrium number of NGOs in the market $n^*$, which in turn affects the optimal monitoring level and project quality, both entering into the expression for welfare. In addition to the impact of a change in $t$ and in $L$, we also consider how a change in entry costs affects total welfare. As $F$ does not have an effect on either monitoring or project quality, it is straightforward that the impact of $F$ on welfare will have the opposite sign of the effect of the number of active NGOs on donor surplus under exogenous market structure. Remark 3 summarizes our results, while all the computations are provided in the appendix.

**Remark 3.** ***Comparative statics of total welfare.*** *With endogenous market structure, total welfare is higher in markets with more substitutable projects and larger size. It is higher in markets with lower entry costs if and only if donor surplus increases with $n$ when market structure is exogenous.*

Competition seems to have an unambiguously positive effect on total welfare in the long run. However, it is important to stress that, in our analysis, we have disregarded the beneficiaries of NGOs projects. These individuals are positively affected by workers' constructive activities, but they are also damaged by workers' destructive behavior. Therefore, including the well-being of beneficiaries into total welfare (as in Aldashev and Verdier, 2010) could change our results.

## 4.3 Social planner solution

### 4.3.1 Exogenous market structure

With exogenous market structure, consider now what would be the optimal level of monitoring and bonus pay chosen for each NGO $i$ by a social planner whose objective is to maximize total welfare, taking as given that workers' effort decision are still guided by equation (4) and that workers' participation constraint binds. The social planner maximizes the sum of donor surplus and NGOs' overall payoffs:

$$\max_{m_i, b_i} \quad W^P = Lm_i \left( u + e_i \left( b_i, m_i \right) - \frac{t}{12n^2} \right) + n\pi_i \tag{$P2$}$$

where superscript $P$ stands for planner and where $\pi_i$ is the objective function in program $(P1)$, with the difference that effective donations now exclude any strategic interaction among NGOs and are simply given by $y_i = \frac{L}{n} m_i$. In the next proposition, we provide the optimal solution to the planner's program.

**Proposition 6.** ***Social planner solution.*** *With exogenous market structure, a social planner aiming to maximize total surplus sets*

$$m_i^P = \min \left\{ n \frac{L\left(1-\lambda^2\right)\left(u - \frac{t}{12n^2}\right) + L(E - \lambda(D-v)) + L\left(1-\lambda^2\right) + kn(D - v - \lambda E)}{n^2(1-k^2-\lambda^2) + L(2kn\lambda - L)}; 1 \right\}$$

*and*

$$b_i^P = (E - \lambda D) + \tfrac{L}{n} m_i^P$$

*for each NGO $i$, so that workers provide effort levels*

$$e_i^P = \frac{E-\lambda(D-v)}{(1-\lambda^2)} + \frac{L-\lambda kn}{n(1-\lambda^2)} m_i^P \quad \textit{and} \quad d_i^P = \max \left\{ \frac{v+\lambda(E-\lambda D)}{(1-\lambda^2)} - \frac{kn - L\lambda}{n(1-\lambda^2)} m_i^P ; 0 \right\} .$$

Similarly to the market equilibrium, we require that: $(i)$ constructive effort be increasing in monitoring, which amounts to $L > \lambda kn \equiv L_1^P$, $(ii)$ destructive effort be decreasing in monitoring, that is $L < \frac{kn}{\lambda} \equiv L_2^P$; and $(iii)$ the second-order condition to program $(P2)$ be satisfied, which corresponds to all quantities in Proposition 6 having positive denominators or else to

$$L < \tfrac{n}{2} \left( k\lambda + \sqrt{2\left(1 - \lambda^2 - k^2\right) + k^2\lambda^2} \right) \equiv L_0^P \ , \tag{9}$$

where $L_1^P < L_0^P$ always holds.[29] We summarize these requirements in the following assumption.

**Assumption 5.** $L_1^P < L < \min\{L_2^P, L_0^P\}$.

[29] Moreover, $L_1^P < L_2^P$ always holds, whereas $L_2^P < L_0^P$ is true if and only if $k < \sqrt{\frac{\lambda^2(1-\lambda^2)}{(2-\lambda^2)}} < \lambda$.

The comparative statics of the planner solution relative to the forces affecting market competitiveness is not easy to carry out: while an increase in the fixed number of active NGOs $n$ or in the size of the market for donations $L$ has an ambiguous effect on the optimal choices of the social planner, a decrease in transportation costs $t$ (an increase in project substitutability) always increases monitoring and bonus pay, leading to a higher constructive and a lower destructive effort. Moreover, an increase in the degree of altruism $E$ of each social entrepreneur has a positive impact on monitoring and bonus pay, and it increases both constructive and destructive effort. This is in line with the results obtained at the market equilibrium, where an increase in $E$ has the unintended effect of increasing employees' destructive effort, although this effect was induced by a reduction in monitoring.[30]

Let us now compare the optimal choices made by the social planner with the outcomes chosen by each NGO at the market equilibrium. In order to do so, it is necessary to have a common set of parameters sustaining both solutions, so we require that Assumptions 1 to 5 all hold.[31] It is possible to show that there exist threshold values of $u$ such that: $(i)$ donor surplus is non-negative at the social planner solution if and only if $u \geq \underline{u}$; $(ii)$ $b_i^P > b_i^*$ if and only if $u > u_0$, and $(iii)$ $e_i^P > e_i^*$ if and only if $u > u_1$, with $u_1 > u_0 > \underline{u}$. We are then able to state the following result.

**Proposition 7.** *The comparison between the social planner solution and the market equilibrium is such that: $(i)$ $m_i^P > m_i^*$ and $d_i^P < d_i^*$ always hold; $(ii.a)$ if $\underline{u} \leq u < u_0$, $b_i^P < b_i^*$ and $e_i^P < e_i^*$ both hold; $(ii.b)$ if $u_0 \leq u < u_1$, $b_i^P \geq b_i^*$ and $e_i^P < e_i^*$ hold; $(ii.c)$ if $u \geq u_1$, $b_i^P > b_i^*$ and $e_i^P \geq e_i^*$ hold.*

At the market equilibrium, the monitoring intensity set by NGOs is always insufficient and thereby workers' destructive behavior is always excessive relative to the social optimum. Furthermore, monetary incentives and constructive effort (thereby, project quality) are excessive relative to the social optimum when donors' exogenous utility from giving $u$ is sufficiently low, *i.e.*, when $u < u_0$. To be consistent with the analysis carried out so far, consider that thresholds $u_0$ and $u_1$ are both decreasing in $E$. Therefore, the lower the altruism of social entrepreneurs, the higher $u_0$ is, and the easier it is for both conditions $b_i^P < b_i^*$ and $e_i^P < e_i^*$ to be satisfied. Hence, incentive pay and project quality are excessive provided that social entrepreneurs display a sufficiently low degree of altruism.

Let us now study how the forces affecting competition impact on total welfare $W^P$, once the social planner solution is in place. Using the envelope theorem, it is easy to prove the following results.

[30] Conversely, an increase in the damage $D$ leads to a lower destructive effort.

[31] This occurs for $n^2\lambda^2 < t < n^2$, implying $L_1 < L_1^P$ and $L_2 < \min\left\{L_2^P; L_0^P\right\}$, so that the relevant interval becomes $L_1^P < L < L_2$.

**Lemma 2.** ***Comparative statics of total welfare.*** *With exogenous market structure, total welfare at the social planner solution is higher in markets with more substitutable projects, with lower entry costs, and in larger markets.*

Observe that the above results are similar to those obtained in Section 4.2 relative to the comparative statics of total welfare under endogenous market structure.

### 4.3.2 Endogenous market structure

After choosing the optimal monitoring intensity and bonus pay, the social planner decides how many NGOs can enter the market. Similarly to the market equilibrium, we cannot find a closed form solution for the socially optimal number of NGOs, denoted as $n^P$. However, we can use Lemma 2 and the implicit function theorem and analyze how market competitiveness affects such $n^P$.

**Proposition 8.** ***Optimal number of NGOs.*** *When market structure is endogenous, the socially optimal number of NGOs is lower in markets with more substitutable projects, higher in markets with lower entry costs, and it is non-monotonic in market size.*

Notice that these results are similar to the ones obtained relative to $n^*$ at the market equilibrium. It is therefore difficult to compare $n^*$ and $n^P$ in terms of their response to a change in the intensity of competition. Indeed, both $n^*$ and $n^P$ vary in the same direction as market competitiveness increases.

# 5 Conclusions

In this paper, we have considered how competition in the market for donations affects the behavior of NGOs involved in the delivery of (often foreign) aid to poor countries. NGOs are modeled as complex organizations consisting of an altruistic social entrepreneur and a worker who is hired to carry out the specific development project chosen by the entrepreneur. The objectives of the social entrepreneur and of the worker are not aligned because, while the entrepreneur cares about the quality of her project and aims at collecting as many donations as possible, the worker has to be incentivized in order to contribute to the realization of the project and to provide the desired level of constructive effort. In addition, the worker might be intrinsically motivated to behave badly and, on top of constructive effort, he can perform a destructive activity that is neither observable nor contractible. We show that an increase in the degree of competition in the market for donations can be detrimental as workers increase their effort in the destructive activity, exposing the employing NGO to the consequences of scandals.

Our findings suggest that political changes that intend to increase NGOs' competition could have unexpected and undesirable effects. By contrast, laws that aim at raising the transparency and accountability of these organizations can be beneficial. Indeed, this was the objective of the law that passed in Ethiopia in January 2009. This law, stipulating that NGOs can only receive a maximum of 10% of their funding from abroad, made Ethiopia one of the harshest environments for NGOs on the African continent. Nowadays, Egypt is following suit and the Nigerian government is considering strict new restrictions on NGOs. Meanwhile, in Kenya an entirely different stance can be found. Kenya is one of the continent's most active hubs for foreign aid money. The number of aid organizations based in the country grew by more than 400% between 1997 and 2006, and continues growing during the last years. Kenya is now home to more than 12,000 NGOs that work in healthcare, education, human rights and civic engagement.[32]

In our model, restrictions on foreign aid mandated by the Ethiopian government represent an exogenous decrease in the total size of the market for development aid. On the contrary, in Kenya there has been an exogenous increase in the market size which has been followed by an increase in the number of active NGOs. Our theoretical results predict that it should be more likely that scandals outbreak and that we observe higher project quality in countries like Kenya rather than Ethiopia or Egypt.

[32] See the article "NGOs: Blessing or curse?" by Mark Anderson posted on Wednesday, 29 November 2017, in the *African Report*.

# A Proofs

## A.1 Proof of Proposition 1

Let us differentiate NGO $i$'s payoffs in problem $(P1)$ with respect to both $m_i$ and $b_i$. Setting these derivatives equal to zero and using the envelope theorem for the worker, that yields $\frac{\partial z_i}{\partial m_i} = kd_i(b_i, m_i)$ and $\frac{\partial z_i}{\partial b_i} = -e_i(b_i, m_i)$, we obtain, respectively:

$$\begin{aligned}
\frac{\partial \pi_i}{\partial m_i} =& L\left(\frac{1}{n} + \frac{n\left(e_i(b_i, m_i) - e(b, m)\right)}{t}\right) + \left(m_i \frac{Ln}{t} + E - b_i\right)\frac{\partial e_i(b_i, m_i)}{\partial m_i} \\
&- D\frac{\partial d_i(b_i, m_i)}{\partial m_i} - m_i - kd_i(b_i, m_i) = 0, \\
\frac{\partial \pi_i}{\partial b_i} =& \left(m_i \frac{Ln}{t} + E - b_i\right)\frac{\partial e_i(b_i, m_i)}{\partial b_i} - D\frac{\partial d_i(b_i, m_i)}{\partial b_i} = 0.
\end{aligned}$$

Substituting for the quality differential $(e_i - e)$ and computing the derivatives of effort levels relative to both monitoring and bonus pay, we get:

$$\frac{\partial \pi_i}{\partial m_i} = \frac{L}{n} + \frac{Ln(b_i - b) + kt(D - v - \lambda E) - tm_i(1 - k^2 - \lambda^2) - Lkn\lambda(2m_i - m)}{t(1 - \lambda^2)} = 0 \tag{A1}$$

and

$$\frac{\partial \pi_i}{\partial b_i} = \frac{t(E - \lambda D) - tb_i + Lnm_i}{t(1 - \lambda^2)} = 0. \tag{A2}$$

Solving (A2) for $b_i$ makes it clear that bonus pay of NGO $i$ positively depends on the monitoring level set by NGO $i$. Instead, solving (A1) for $m_i$ highlights that the monitoring level set by NGO $i$ increases with rivals' monitoring level $m$ and decreases with rivals' bonus pay $b$. Imposing symmetry, we find $m_i^*$ and $b_i^*$ displayed in Proposition 1. Once we get the equilibrium monitoring level and bonus pay, we easily obtain the worker's effort choices $e_i^*$ and $d_i^*$ from the incentive compatibility conditions in equation (4).

The results in Proposition 1 are valid when NGO $i$'s objective function $\pi_i(b_i, m_i)$ is strictly concave and has a global maximum. The second-order conditions associated to problem $(P1)$ are satisfied when the following Hessian matrix

$$\begin{bmatrix} \frac{\partial^2 \pi_i}{\partial m_i^2} & \frac{\partial^2 \pi_i}{\partial m_i \partial b_i} \\ \frac{\partial^2 \pi_i}{\partial b_i \partial m_i} & \frac{\partial^2 \pi_i}{\partial b_i^2} \end{bmatrix} = \begin{bmatrix} -\frac{t\left(1-\lambda^2-k^2\right)+2knL\lambda}{t(1-\lambda^2)} & \frac{Ln}{t(1-\lambda^2)} \\ \frac{Ln}{t(1-\lambda^2)} & -\frac{1}{(1-\lambda^2)} \end{bmatrix}$$

is negative definite. This occurs if and only if all the leading principal minors have alternate signs, in particular if $(1 - \lambda^2 - k^2) > 0$ and if

$$t^2\left(1 - \lambda^2 - k^2\right) + 2kntL\lambda - n^2L^2 = t\left(t\left(1 - \lambda^2 - k^2\right) + k\lambda Ln\right) - Ln(Ln - \lambda kt) > 0.$$

Solving the above inequality for market size we obtain

$$L < \frac{t}{n}\left(k\lambda + \sqrt{(1 - \lambda^2)(1 - k^2)}\right) \equiv L_0,$$

which is such that $L_0 > L_1$ always holds and $L_0 > L_2$ is true if and only if $k < \lambda$. Therefore, the second-order conditions associated to problem $(P1)$ are always fulfilled when Assumptions 1 and 4 hold. $\square$

## A.2 Proof of Proposition 2

The requirement $m_i^* < 1$ holds if and only if $E > E_0$. Given that $E \in (\underline{E}, \overline{E})$ by Assumption 2, a necessary condition for $m_i^* < 1$ is that $E_0 < \overline{E}$, and one can show that this inequality is always satisfied when Assumptions 1 and 3 hold.[33] Conversely, $E_0 > \underline{E}$ holds if and only if

$$D > \frac{v}{(1-\lambda^2)} + \frac{nt\,(1-\lambda^2-k^2) + L\,(n^2k\lambda - t\,(1-\lambda^2))}{knt\,(1-\lambda^2)} \equiv D_0 > \underline{D};$$

if $D \leq D_0$, $E > E_0$ is always satisfied and $m_i^* < 1$ always holds.

The condition $d_i^* > 0$ is equivalent to $E > E_1$. Again, it must be that $E_1 < \overline{E}$ or else that

$$D > \frac{L\,(kt - \lambda Ln)}{n\,[t\,(1-\lambda^2-k^2) + Lkn\lambda]} \equiv D_1,$$

but this necessary condition is always satisfied when $D_1 \leq \underline{D}$, which occurs if and only if

$$v \geq \frac{L\,(1-\lambda^2)\,(kt - Ln\lambda)}{n\,(t\,(1-\lambda^2-k^2) + Lkn\lambda)} \equiv v_0.$$

Moreover, $E_1 > \underline{E}$ holds if and only if

$$D > \frac{tvn - L(kt - \lambda Ln)}{kn(kt - \lambda Ln)} \equiv D_2,$$

where $D_2 > \underline{D}$ if and only if $v > v_0$. If $D \leq D_2$, $E > E_1$ is always satisfied and so $d_i^* > 0$ always holds. Let $\hat{D} \equiv \max\{D_1, D_2\}$, then $D > \max\{\hat{D}, \underline{D}\}$ ensures that $E_1 \in (\underline{E}, \overline{E})$.

Summing up, interior solutions attain when: $(i)$ $v \leq v_0$, $D > D_1$ and $\max\{E_0, E_1\} < E < \overline{E}$; $(ii)$ $v > v_0$ and either $\underline{D} < D \leq \min\{D_0, D_2\}$ or $D > \min\{D_0, D_2\}$ and $\max\{E_0, E_1\} < E < \overline{E}$. Instead, corner solutions, such that either $d_i^* = 0$ or $m_i^* = 1$ or both, prevail when: $(i)$ $v \leq v_0$ and $\underline{D} < D \leq D_1$, in which case $d_i^* = 0$ always occurs; $(ii)$ $v > v_0$, $D > \min\{D_0, D_2\}$ and $\underline{E} < E \leq \max\{E_0, E_1\}$, in which case $d_i^* > 0$ is incompatible with $m_i^* = 1$ provided that $\underline{E} < E < E_1$. $\square$

[33] Indeed, $E_0 < \overline{E}$ is always the case for $n^2k\lambda - t\,(1-\lambda^2) \geq 0$ or $t \leq \frac{n^2k\lambda}{(1-\lambda^2)} \equiv t_0$; conversely for $t > t_0$, we have $E_0 < \overline{E}$ if and only if

$$L < \frac{nt\,(1-\lambda^2-k^2)}{t\,(1-\lambda^2) - n^2k\lambda} \equiv L_+,$$

where $L_+ > L_2$ is true provided that $t < n^2$ and $k < \lambda$ hold. Hence, for $L_1 < L < L_2$, condition $L < L_+$ is also satisfied.

## A.3 Proof of Proposition 3 and Corollary 1

Let us consider the comparative statics of monitoring, bonus pay and effort levels relative to the number of active NGOs, the substitutability between projects and market size, respectively.

As for monitoring $m_i^*$, we have that

$$\frac{\partial m_i^*}{\partial n} = -Lt\frac{\left(t\left(1-\lambda^2-k^2\right)+kn\lambda L\right)\left(1-\lambda^2\right)+kn\lambda\left(L\left(1-\lambda^2\right)+kn\left(D-v-\lambda E\right)\right)}{n^2\left(t\left(1-\lambda^2-k^2\right)+knL\lambda\right)^2} < 0,$$

and that

$$\frac{\partial m_i^*}{\partial t} = k\lambda L\frac{L\left(1-\lambda^2\right)+kn\left(D-v-\lambda E\right)}{\left(t\left(1-\lambda^2-k^2\right)+knL\lambda\right)^2} > 0.$$

We also find that

$$\frac{\partial m_i^*}{\partial L} = t\frac{t\left(1-\lambda^2\right)\left(1-\lambda^2-k^2\right)-k^2n^2\lambda\left(D-v-\lambda E\right)}{n\left(t\left(1-\lambda^2-k^2\right)+knL\lambda\right)^2},$$

where $\frac{\partial m_i^*}{\partial L} < 0$ if and only if

$$E < \frac{D-v}{\lambda} - \frac{t\left(1-\lambda^2\right)\left(1-\lambda^2-k^2\right)}{k^2n^2\lambda^2} \equiv E_2 < \overline{E}. \tag{A3}$$

Notice that $E_2 > E_0$ if and only if $t < \frac{n^2k\lambda}{(1-\lambda^2)} = t_0$, and $E_2 > E_1$ if and only if

$$D > \frac{t\left(1-\lambda^2\right)-Lkn\lambda}{k^2n^2\lambda} \equiv D_3,$$

where $D_3 > 0$ and $D_3 > D_0$ are always true. Moreover, $E_2 > \underline{E}$ if and only if

$$D > \frac{v}{\left(1-\lambda^2\right)} + \frac{t\left(1-\lambda^2-k^2\right)}{k^2n^2\lambda} \equiv D_4 > \underline{D}.$$

Therefore, $E_2 > \max\left\{\underline{E}, E_0, E_1\right\}$ for $t < t_0$ and $D > \max\left\{D_3, D_4\right\}.$

As for bonus pay, we have

$$\frac{\partial b_i^*}{\partial n} = \frac{Lm_i^*}{n} + \frac{Ln}{t}\underbrace{\frac{\partial m_i^*}{\partial n}}_{-} = Lk\frac{t\left(1-\lambda^2-k^2\right)\left(D-v-\lambda E\right)-L^2\lambda\left(1-\lambda^2\right)}{\left(t\left(1-\lambda^2-k^2\right)+knL\lambda\right)^2},$$

where $\frac{\partial b_i^*}{\partial n} > 0$ holds if and only if

$$E < \frac{D-v}{\lambda} - \frac{L^2\left(1-\lambda^2\right)}{t\left(1-\lambda^2-k^2\right)} \equiv E_3, \tag{A4}$$

where $E_3 > E_2$ always holds provided that $\lambda < \frac{\sqrt{3}}{3}$.[34]

[34] Indeed, $E_3 > E_2$ if and only if

$$L < \frac{t\left(1-\lambda^2-k^2\right)}{kn\lambda} \equiv L_{++}$$

but $L_{++} > L_2$ provided that $\lambda < \frac{\sqrt{3}}{3}$. And since $L_1 < L < L_2$ by Assumption 4, we have that $L < L_{++}$ is always satisfied.

Moreover,

$$\frac{\partial b_i^*}{\partial t} = -\frac{Lnm_i^*}{t^2} + \frac{Ln}{t}\underset{+}{\frac{\partial m_i^*}{\partial t}} = -\frac{L\left(1-\lambda^2-k^2\right)\left(L\left(1-\lambda^2\right)+kn\left(D-v-\lambda E\right)\right)}{\left(t\left(1-\lambda^2-k^2\right)+knL\lambda\right)^2} < 0,$$

and

$$\frac{\partial b_i^*}{\partial L} = \frac{nm_i^*}{t} + \frac{Ln}{t}\underset{+/-}{\frac{\partial m_i^*}{\partial L}} = \frac{t\left(1-\lambda^2-k^2\right)\left(L\left(1-\lambda^2\right)+kn(D-v-\lambda E)\right)+L\left(1-\lambda^2\right)\left(t\left(1-\lambda^2-k^2\right)+knL\lambda\right)}{\left(t(1-\lambda^2-k^2)+knL\lambda\right)^2} > 0 \ .$$

There remains to consider effort levels. Constructive effort is such that

$$\frac{\partial e_i^*}{\partial n} = \frac{Lm_i^*}{t(1-\lambda^2)} + \frac{Ln-k\lambda t}{t(1-\lambda^2)}\underset{-}{\frac{\partial m_i^*}{\partial n}} = Lk\frac{\lambda\left(t^2\left(1-\lambda^2-k^2\right)+2Lknt\lambda-L^2n^2\right)+n^2t\left(1-k^2\right)(D-v-\lambda E)}{n^2\left(t(1-\lambda^2-k^2)+knL\lambda\right)^2} > 0 \ ,$$

because the first term in the numerator is positive for the SOC, and

$$\frac{\partial e_i^*}{\partial t} = -\frac{Lnm_i^*}{t^2(1-\lambda^2)} + \frac{Ln-k\lambda t}{t(1-\lambda^2)}\underset{+}{\frac{\partial m_i^*}{\partial t}} = -\frac{L\left(1-k^2\right)\left(L\left(1-\lambda^2\right)+kn(D-v-\lambda E)\right)}{\left(t(1-\lambda^2-k^2)+knL\lambda\right)^2} < 0 \ ;$$

finally

$$\frac{\partial e_i^*}{\partial L} = \frac{nm_i^*}{t(1-\lambda^2)} + \frac{Ln-k\lambda t}{t(1-\lambda^2)}\underset{+/-}{\frac{\partial m_i^*}{\partial L}} = \frac{(Ln-kt\lambda)t\left(1-\lambda^2-k^2\right)+\left(t\left(1-\lambda^2-k^2\right)+Lkn\lambda\right)Ln+kn^2t\left(1-k^2\right)(D-v-\lambda E)}{n\left(t(1-\lambda^2-k^2)+knL\lambda\right)^2} > 0 \ ,$$

because $Ln - k\lambda t > 0$ by Assumption 4.

At last, let us move to consider the comparative statics relative to destructive effort. It is immediate to see that

$$\frac{\partial d_i^*}{\partial n} = \frac{\lambda Lm_i^*}{t(1-\lambda^2)} - \frac{kt-\lambda Ln}{t(1-\lambda^2)}\underset{-}{\frac{\partial m_i^*}{\partial n}} = Lk\frac{\left(t\left(t\left(1-\lambda^2-k^2\right)+2knL\lambda\right)-L^2n^2\lambda^2\right)+n^2t\lambda(D-v-\lambda E)}{n^2\left(t(1-\lambda^2-k^2)+knL\lambda\right)^2} > 0 \ ,$$

because the first term in the numerator is positive for the SOC, and that

$$\frac{\partial d_i^*}{\partial t} = -\frac{\lambda Lnm_i^*}{t^2(1-\lambda^2)} - \frac{kt-\lambda Ln}{t(1-\lambda^2)}\underset{+}{\frac{\partial m_i^*}{\partial t}} = -\lambda L\frac{L\left(1-\lambda^2\right)+kn(D-v-\lambda E)}{\left(t(1-\lambda^2-k^2)+knL\lambda\right)^2} < 0 \ .$$

Finally,

$$\frac{\partial d_i^*}{\partial L} = \frac{\lambda nm_i^*}{t(1-\lambda^2)} - \frac{kt-\lambda Ln}{t(1-\lambda^2)}\underset{+/-}{\frac{\partial m_i^*}{\partial L}} = -\frac{kt^2\left(1-\lambda^2-k^2\right)-Ln\lambda\left(2t\left(1-\lambda^2-k^2\right)+Lkn\lambda\right)-kn^2t\lambda(D-v-\lambda E)}{n\left(t(1-\lambda^2-k^2)+knL\lambda\right)^2} \ , \quad \text{(A5)}$$

where $\frac{\partial d_i^*}{\partial L} > 0$ always holds when $\frac{\partial m_i^*}{\partial L} < 0$, if not then $\frac{\partial d_i^*}{\partial L} > 0$ is true when the numerator of expression (A5) is negative, which happens if and only if

$$E < \frac{(D-v)}{\lambda} + \frac{L^2}{t} + \frac{(2Ln\lambda - kt)\,t\,(1-\lambda^2-k^2)}{kn^2t\lambda^2} \equiv E_4,$$

where $E_4 > E_2$ always holds.

To conclude, we have found that $E_2 < \min\{E_3, E_4\}$ provided that $\lambda < \frac{\sqrt{3}}{3}$; therefore, when $E < E_2$ we have that $\frac{\partial m_i^*}{\partial L} < 0$, $\frac{\partial b_i^*}{\partial n} > 0$ and $\frac{\partial d_i^*}{\partial L} > 0$ all hold. $\square$

## A.4 Proof of Corollary 2

The impact of market competitiveness on project quality $q_i^*$ is the same as the impact on $e_i^*$, which has been analyzed in Section A.3 above. As for effective donations, recall that $y_i^* = \frac{Lm_i^*}{n}$. Therefore,

$$\frac{\partial y_i^*}{\partial n} = \frac{L}{n}\left(\underset{-}{\frac{\partial m_i^*}{\partial n}} - \frac{m_i^*}{n}\right) < 0,$$

moreover,

$$\frac{\partial y_i^*}{\partial t} = \frac{L}{n}\underset{+}{\frac{\partial m_i^*}{\partial t}} > 0,$$

and

$$\frac{\partial y_i^*}{\partial L} = \frac{L}{n}\underset{+/-}{\frac{\partial m_i^*}{\partial L}} + \frac{m_i^*}{n}.$$

The first term in $\frac{\partial y_i^*}{\partial L}$ is ambiguous. Nonetheless, computing the derivative one gets

$$\frac{\partial y_i^*}{\partial L} \quad = t\left[\frac{t\left(1-\lambda^2-k^2\right)\left(L\left(1-\lambda^2\right)+kn(D-v-\lambda E)\right)+L\left(1-\lambda^2\right)\left(t\left(1-\lambda^2-k^2\right)+Lkn\lambda\right)}{n^2\left(t(1-\lambda^2-k^2)+knL\lambda\right)^2}\right] > 0 \ .$$

□

## A.5 Proof of Lemma 1

NGO $i$'s maximal payoffs depend on the optimal values of monitoring and bonus pay. Taking equation (4) into account, payoffs are given by

$$\begin{aligned}\pi_i\left(b_i^*, m_i^*\right) = \quad & m_i^* L\left(\frac{1}{n} + \frac{n}{t}\frac{\left(\left(b_i^*-b^*\right)-k\lambda\left(m_i^*-m^*\right)\right)}{1-\lambda^2}\right) + Ee_i\left(b_i^*, m_i^*\right) + (v - km_i^*)d_i\left(b_i^*, m_i^*\right) \\ & -C\left(e_i\left(b_i^*, m_i^*\right), d_i\left(b_i^*, m_i^*\right)\right) - Dd_i\left(b_i^*, m_i^*\right) - \frac{m_i^{*2}}{2} - F\end{aligned}$$

where $b^*$ and $m^*$ denote the choices made by a rival NGO.

As the optimal levels of monitoring and bonus do not depend on $F$, it is immediate to see that an increase in $F$ has a negative impact on NGO $i$'s payoffs. Moreover, by the envelope theorem, only the direct effects of a change in the forces affecting market competitiveness (namely $n$, $t$ and $L$) need to be considered, notwithstanding strategic interaction among NGOs. Hence, differentiating payoffs with respect to $n$ we obtain

$$\frac{\partial \pi_i\left(b_i^*, m_i^*\right)}{\partial n} = \quad -Lm_i^*\left(\frac{1}{n^2} - \frac{\left(\left(b_i^*-b^*\right)-k\lambda\left(m_i^*-m^*\right)-n\left(\frac{\partial b^*}{\partial n}-k\lambda\frac{\partial m^*}{\partial n}\right)\right)}{t(1-\lambda^2)}\right)$$

whereby, invoking the symmetry of the market equilibrium,

$$\frac{\partial \pi_i\left(b_i^*, m_i^*\right)}{\partial n} = \quad -Lm_i^*\left(\frac{1}{n^2} + \frac{n}{t(1-\lambda^2)}\left(\underset{+/-}{\frac{\partial b^*}{\partial n}} - k\lambda\underset{-}{\frac{\partial m^*}{\partial n}}\right)\right) \ .$$

Hence, a sufficient condition for $\frac{\partial \pi_i\left(b_i^*,m_i^*\right)}{\partial n} < 0$ would be $\frac{\partial b_i^*}{\partial n} \geq 0$ or else $E \leq E_3$. By the same reasoning, differentiating maximal payoffs with respect to $t$ we obtain

$$\frac{\partial \pi_i\left(b_i^*,m_i^*\right)}{\partial t} = -Lm_i^* \frac{n}{t(1-\lambda^2)} \left( \underset{-}{\frac{\partial b^*}{\partial t}} - k\lambda \underset{+}{\frac{\partial m^*}{\partial t}} \right) > 0 \ .$$

Finally, considering market size $L$, we have

$$\frac{\partial \pi_i\left(b_i^*,m_i^*\right)}{\partial L} = \quad m_i^* \left( \frac{1}{n} - \frac{Ln}{t(1-\lambda^2)} \left( \underset{+}{\frac{\partial b^*}{\partial L}} - k\lambda \underset{+/-}{\frac{\partial m^*}{\partial L}} \right) \right) \ .$$

There is a direct and positive impact of an increase in $L$ on NGO $i$'s maximal payoffs, however, the overall effect is ambiguous.

In order to effectively assess the impact of market competitiveness on NGO $i$'s maximal payoffs, let us substitute the equilibrium values of monitoring, bonus and effort levels into expression (2), so as to rewrite $\pi_i^*$ as a function of exogenous variables only:

$$\begin{aligned} \pi_i^* = & \frac{\Big[t\left[t\left(1-\lambda^2-k^2\right)+k\lambda Ln\right]-Ln\left(Ln-k\lambda t\right)\Big]\Big[L\left(1-\lambda^2\right)+kn\left(D-v-\lambda E\right)\Big]^2}{2n^2\left(1-\lambda^2\right)\left[t\left(1-\lambda^2-k^2\right)+k\lambda Ln\right]^2} \\ & + \frac{\left(D-v-\lambda E\right)^2}{2\left(1-\lambda^2\right)} + \frac{1}{2}\left(E^2-D^2\right) - F. \end{aligned} \tag{A6}$$

The impact of $n$ on NGO's payoffs is given by:

$$\frac{\partial \pi_i^*}{\partial n} = -\Phi \frac{L\left[L\left(1-\lambda^2\right)+kn\left(D-v-\lambda E\right)\right]}{n^3\left[t\left(1-\lambda^2-k^2\right)+k\lambda Ln\right]^3},$$

where

$$\begin{aligned} \Phi \equiv & \, t^3\left(1-\lambda^2-k^2\right)^2 + Lkn^3t\left(1-k^2\right)\left(D-v-\lambda E\right) \\ & + Lkn\lambda\left[3t\left(t\left(1-\lambda^2-k^2\right)+k\lambda Ln\right)-L^2n^2\right] > 0, \end{aligned}$$

therefore $\frac{\partial \pi_i^*}{\partial n} < 0$ always holds. The impact of $L$ on NGOs' payoffs is

$$\frac{\partial \pi_i^*}{\partial L} = \Theta \frac{\left(L\left(1-\lambda^2\right)+kn\left(D-v-\lambda E\right)\right)}{n^2\left(t\left(1-\lambda^2-k^2\right)+k\lambda Ln\right)^3},$$

where

$$\begin{aligned} \Theta \equiv \quad & \left(t^2\left(1-\lambda^2-k^2\right)+2k\lambda Lnt-L^2n^2\right)t\left(1-\lambda^2-k^2\right) - Lkn^3t\left(1-k^2\right)\left(D-v-\lambda E\right) \\ & -Ln\left(Ln-kt\lambda\right)\left(t\left(1-\lambda^2-k^2\right)+k\lambda Ln\right) \end{aligned},$$

So $\frac{\partial \pi_i^*}{\partial L} > 0$ if and only if $\Theta > 0$, which occurs for

$$E > \quad \frac{D-v}{\lambda} - \frac{\left(t^2\left(1-\lambda^2-k^2\right)+2k\lambda Lnt-L^2n^2\right)t\left(1-\lambda^2-k^2\right)-Ln\left(Ln-kt\lambda\right)\left(t\left(1-\lambda^2-k^2\right)+k\lambda Ln\right)}{Lk\lambda n^3t\left(1-k^2\right)} \equiv E_5 \ ,$$

where $E_5 > E_2$ always holds under Assumption 4.

It is possible to show that maximal payoffs decrease when both $n$ and $L$ increase by the same amount. In order to do so, let us consider a factor $\alpha > 1$ and let us substitute $\alpha L$ for $L$ and $\alpha n$ for $n$ in NGO's payoffs. Taking the derivative of payoffs with respect to $\alpha$ yields

$$\frac{\partial \pi_i^*(\alpha L, \alpha n)}{\partial \alpha} = -\frac{2L^2 t\alpha^3 (1-k^2)\left[L(1-\lambda^2)+kn(D-v-\lambda E)\right]^2}{\left[t(1-\lambda^2-k^2)+\alpha k\lambda Ln\right]^3} < 0,$$

which proves that payoffs fall when $L$ and $n$ increase by the same amount $\alpha$. Then either payoffs decrease in $L$ (which happens when $E$ is low enough) as well as in $n$, or payoffs increase in $L$ (which happens when $E$ is high enough), but the effect of $L$ on payoffs is less than proportional than the effect of $n$. □

## Proof of Proposition 4

By the implicit function theorem, we have that:

$$\frac{dn^*}{dt} = -\frac{\frac{\partial \pi_i^*}{\partial t}}{\frac{\partial \pi_i^*}{\partial n}}; \quad \frac{dn^*}{dL} = -\frac{\frac{\partial \pi_i^*}{\partial L}}{\frac{\partial \pi_i^*}{\partial n}}; \quad \frac{dn^*}{dF} = -\frac{\frac{\partial \pi_i^*}{\partial F}}{\frac{\partial \pi_i^*}{\partial n}}. \tag{A7}$$

Given that $\frac{\partial \pi_i^*}{\partial n} < 0$, we have $\frac{dn^*}{dt} > 0$ and $\frac{dn^*}{dF} < 0$. Moreover, $\frac{\partial \pi_i^*}{\partial L} > 0$ if and only if $\Theta > 0$ or $E > E_5$. If this is the case, then $n^*$ increases less than proportionally with $L$. □

## Proof of Proposition 5

When market structure is endogenous, each parameter affecting the degree of competition in the market for development aid has both a direct and an indirect effect on the relevant choice variables of the NGOs.

As for monitoring, the impact of a change in transportation cost is such that:

$$\frac{dm_i^*}{dt} \equiv \frac{\partial m_i^*}{\partial t} + \frac{\partial m_i^*}{\partial n}\frac{dn^*}{dt} = -\frac{L(Ln-kt\lambda)\left(L(1-\lambda^2)+kn(D-v-\lambda E)\right)}{\Phi} < 0.$$

Indeed, the numerator is positive because $(Ln - kt\lambda) > 0$ (see Assumption 4 ) and $\Phi > 0$. So the whole expression is negative and a reduction in transportation costs unambiguously increases monitoring. The impact of market size on monitoring is:

$$\frac{dm_i^*}{dL} \equiv \frac{\partial m_i^*}{\partial L} + \frac{\partial m_i^*}{\partial n}\frac{dn^*}{dL} = \frac{2t(Ln-kt\lambda)\left(L(1-\lambda^2)+kn(D-v-\lambda E)\right)}{\Phi} > 0,$$

so monitoring unambiguously increases when the size of the market for donations increases, although neither the sign of $\frac{\partial m_i^*}{\partial L}$ nor the sign of $\frac{dn^*}{dL}$ can be ascertained with certainty.

Entry costs $F$ do not have direct effects, but there is only an indirect effect through the change in the equilibrium number of active NGOs, so:

$$\frac{dm_i^*}{dF} \equiv \frac{\partial m_i^*}{\partial n}\frac{dn^*}{dF} > 0, \quad \text{as} \quad \frac{\partial m_i^*}{\partial n} < 0 \quad \text{and} \quad \frac{dn^*}{dF} < 0.$$

As for bonus pay, the impact of the different forces affecting of competition is such that:

$$\frac{db_i^*}{dt} \equiv \frac{\partial b_i^*}{\partial t} + \frac{\partial b_i^*}{\partial n}\frac{dn^*}{dt} = -\frac{L\left(t\left(1-\lambda^2-k^2\right)+knL\lambda\right)\left(L\left(1-\lambda^2\right)+kn\left(D-v-\lambda E\right)\right)}{\Phi} < 0;$$
$$\frac{db_i^*}{dL} \equiv \frac{\partial b_i^*}{\partial L} + \frac{\partial b_i^*}{\partial n}\frac{dn^*}{dL} = \frac{2t\left(t\left(1-\lambda^2-k^2\right)+knL\lambda\right)\left(L\left(1-\lambda^2\right)+kn\left(D-v-\lambda E\right)\right)}{\Phi} > 0;$$
$$\frac{db_i^*}{dF} \equiv \frac{\partial b_i^*}{\partial n}\frac{dn^*}{dF} < 0 \quad \text{if and only if} \quad \frac{dn^*}{dF} > 0.$$

Constructive effort decreases with transportation and entry costs, while it increases with market size, so that:

$$\frac{de_i^*}{dt} \equiv \frac{\partial e_i^*}{\partial t} + \frac{\partial e_i^*}{\partial n}\frac{dn^*}{dt} = -Lt\left(1-k^2\right)\frac{\left(L\left(1-\lambda^2\right)+kn\left(D-v-\lambda E\right)\right)}{\Phi} < 0;$$
$$\frac{de_i^*}{dL} \equiv \frac{\partial e_i^*}{\partial L} + \frac{\partial e_i^*}{\partial n}\frac{dn^*}{dL} = 2t^2\left(1-k^2\right)\frac{\left(L\left(1-\lambda^2\right)+kn\left(D-v-\lambda E\right)\right)}{\Phi} > 0;$$
$$\frac{de_i^*}{dF} \equiv \frac{\partial e_i^*}{\partial n}\frac{dn^*}{dF} < 0, \quad \text{as} \quad \frac{\partial e_i^*}{\partial n} > 0 \quad \text{and} \quad \frac{dn^*}{dF} < 0.$$

Similarly, destructive effort decreases with transportation and entry costs, while it increases with market size:

$$\frac{dd_i^*}{dt} \equiv \frac{\partial d_i^*}{\partial t} + \frac{\partial d_i^*}{\partial n}\frac{dn^*}{dt} = -L\left(t\lambda - Lkn\right)\frac{\left(L\left(1-\lambda^2\right)+kn\left(D-v-\lambda E\right)\right)}{\Phi} < 0;$$
$$\frac{dd_i^*}{dL} \equiv \frac{\partial d_i^*}{\partial L} + \frac{\partial d_i^*}{\partial n}\frac{dn^*}{dL} = 2t\left(t\lambda - Lkn\right)\frac{\left(L\left(1-\lambda^2\right)+kn\left(D-v-\lambda E\right)\right)}{\Phi} > 0;$$
$$\frac{dd_i^*}{dF} \equiv \frac{\partial d_i^*}{\partial n}\frac{dn^*}{dF} < 0, \quad \text{as} \quad \frac{\partial d_i^*}{\partial n} > 0 \quad \text{and} \quad \frac{dn^*}{dF} < 0.$$

□

## A.6 Proof of Corollary 3

Effective donations $y_i^* = \frac{L}{n}m_i^*$ change in response to a decrease in transportation costs as follows:

$$\frac{dy_i^*}{dt} = \frac{L}{n}\left(\frac{\partial m_i^*}{\partial t} + \frac{\partial m_i^*}{\partial n}\frac{dn^*}{dt}\right) - L\frac{m_i^*}{n^2}\frac{dn^*}{dt}.$$

Since this is the sum of two negative terms, we have that $\frac{dy_i^*}{dt} > 0$. Effective donations increase as a response to an increase in market size if and only if:

$$\frac{dy_i^*}{dL} = \frac{L}{n}\left(\frac{\partial m_i^*}{\partial L} + \frac{\partial m_i^*}{\partial n}\frac{dn^*}{dL}\right) - L\frac{m_i^*}{n^2}\frac{dn^*}{dL} + \frac{m_i^*}{n}.$$

The first and last terms are both positive; the second term is also positive if $\frac{dn^*}{dL} < 0$, which occurs when $E < E_5$. Computing the overall effect we find that:

$$\frac{dy_i^*}{dL} = \frac{2tL\left[(Ln-kt\lambda)t\left(1-k^2-\lambda^2\right)+Ln\left(t\left(1-k^2-\lambda^2\right)+Lkn\lambda\right)+kn^2t\left(1-k^2\right)(D-v-\lambda E)\right]\left[L\left(1-\lambda^2\right)+kn(D-v-E\lambda)\right]}{n\Phi(t(1-\lambda^2-k^2)+k\lambda Ln)},$$

which is always positive.

Finally, the effect of entry costs is such that:

$$\frac{dy_i^*}{dF} = \frac{\partial y_i^*}{\partial n}\frac{dn^*}{dF} > 0$$

because $\frac{dn^*}{dF} < 0$, and $\frac{\partial y_i^*}{\partial n} < 0$ by Corollary 2. □

## A.7 Proof of Remark 2

Taking the derivative of donor surplus with respect to $n$ one obtains

$$\frac{\partial S^*}{\partial n} = L\left[m_i^*\left(\frac{\partial e_i^*}{\partial n} + \frac{t}{6n^3}\right) + \frac{\partial m_i^*}{\partial n}\left(u + e_i^* - \frac{t}{12n^2}\right)\right].$$

The first term in the above expression is positive, whereas the second term is negative. Hence, the overall effect of an increase in the number of active NGOs is ambiguous. Donor surplus changes with respect to $t$ as:

$$\frac{\partial S^*}{\partial t} = L\left[m_i^*\left(\frac{\partial e_i^*}{\partial t} - \frac{1}{12n^2}\right) + \frac{\partial m_i^*}{\partial t}\left(u + e_i^* - \frac{t}{12n^2}\right)\right].$$

The overall effect of a reduction in $t$ on donor surplus is again ambiguous because the first term in the above expression is negative while the the second term is positive. Finally, the effect of an increase in the mass of donors $L$ is such that:

$$\frac{\partial S^*}{\partial L} = m_i^*\left(u + e_i^* - \frac{t}{12n^2}\right) + \frac{\partial e_i^*}{\partial L}Lm_i^* + \frac{\partial m_i^*}{\partial L}L\left(u + e_i^* - \frac{t}{12n^2}\right).$$

An increase in market size $L$ has a positive direct effect on donor surplus (first term), and a positive effect on project quality (second term), and it has an ambiguous effect on monitoring (third term), where $\frac{\partial m_i^*}{\partial L} < 0$ if and only if $E < E_2$. In order to check that an increase in market size $L$ unambiguously increases donor surplus, it suffices to show that

$$m_i^* + \frac{\partial m_i^*}{\partial L}L > 0,$$

which is indeed the case. So we can conclude that $\frac{\partial S^*}{\partial L} > 0$. □

## Proof of Remark 3

The effect of a change in transportation costs $t$ on total welfare, which we denote as $W^*$ to distinguish it from donor surplus, is negative. To see this, note that:

$$\frac{dW^*}{dt} = \frac{dm_i^*}{dt} L\left(u + e_i^* - \frac{t}{12n^2}\right) + Lm_i^*\left[\frac{de_i^*}{dt} - \frac{1}{12n^3}\left(n - 2t\frac{dn^*}{dt}\right)\right].$$

The first term is negative because $\frac{dm_i^*}{dt} < 0$. The quantity $\frac{de_i^*}{dt}$ is negative too and it is possible to check that the whole second term is negative.

The effect of a change in market size $L$ on total welfare is given by:

$$\frac{dW^*}{dL} = m_i^*\left(u + e_i^* - \frac{t}{12n^2}\right) + \frac{dm^*}{dL} L\left(u + e_i^* - \frac{t}{12n^2}\right) + Lm_i^*\left(\frac{de_i^*}{dL} + \frac{t}{6n^3}\frac{dn^*}{dL}\right).$$

The first term is always positive, while the second term is positive if $\frac{dm_i^*}{dL} > 0$. The third and last term is ambiguous because $\frac{de_i^*}{dL} > 0$, but $\frac{dn^*}{dL}$ might be negative. However, it can be shown that $\left(\frac{de_i^*}{dL} + \frac{t}{6n^3}\frac{dn^*}{dL}\right)$ is always positive. Therefore, we can conclude that $\frac{dW^*}{dL} > 0$.

It is immediate to show that $\frac{dW^*}{dF} < 0$ if and only if $\frac{\partial S^*}{\partial n} > 0$ under exogenous market structure. This is because $F$ does not affect the equilibrium outcomes and because $\frac{dn^*}{dF} < 0$ holds. $\square$

## A.8 Proof of Proposition 6

Total welfare is given by

$$\begin{aligned} W^P = \; & Lm_i\left(u + e_i(b_i, m_i) - \tfrac{t}{12n^2}\right) + m_i L + nEe_i(b_i, m_i) - n\left(\tfrac{m_i^2}{2} + F\right) \\ & -n\left(\tfrac{\left(e_i^2(b_i,m_i) + d_i^2(b_i,m_i)\right)}{2} - \lambda e_i(b_i, m_i)\, d_i(b_i, m_i) + (D - (v - km_i))\, d_i(b_i, m_i)\right). \end{aligned}$$

Differentiating it with respect to both $m_i$ and $b_i$ and setting the derivatives equal to zero yields

$$\begin{array}{l} \frac{\partial W^P}{\partial m_i} = 0 \Leftrightarrow \frac{Lt}{12n^2} + \frac{\left(n\left(1-\lambda^2-k^2\right)+2Lk\lambda\right)m_i - L\left(1-\lambda^2\right)(u+1) - Lb_i - Lv\lambda - kn(D-v-\lambda E)}{1-\lambda^2} = 0 \\ \frac{\partial W^P}{\partial b_i} = 0 \Leftrightarrow \frac{n(E-\lambda D) - nb_i + Lm_i}{1-\lambda^2} = 0 \end{array},$$

respectively. Solving this system, we find $m_i^P$ and $b_i^P$ displayed in Proposition 6. We then obtain the worker's effort choices $e_i^P$ and $d_i^P$ from the incentive compatibility conditions (4). The results in Proposition 6 are valid when the social planner's problem is concave and has a strict global maximum. The SOCs associated to problem $(P2)$ are satisfied when the following Hessian matrix

$$\begin{bmatrix} \frac{\partial^2 W}{\partial m_i^2} & \frac{\partial^2 W}{\partial m_i \partial b_i} \\ \frac{\partial^2 W}{\partial b_i \partial m_i} & \frac{\partial^2 W}{\partial b_i^2} \end{bmatrix} = \begin{bmatrix} -\frac{n\left(1-\lambda^2-k^2\right)+2\lambda kL}{(1-\lambda^2)} & \frac{L}{(1-\lambda^2)} \\ \frac{L}{(1-\lambda^2)} & -\frac{n}{(1-\lambda^2)} \end{bmatrix}$$

is negative definite. Notice that all the leading principal minors have alternate sign if

$$n^2\left(1-\lambda^2-k^2\right)+2\lambda knL-L^2>0,$$

which is equivalent to requiring that the denominator of monitoring, bonus pay and effort levels be strictly positive. Solving for $L$, the above condition becomes $L<L_0^P$, as given by equation (9) in the main text. $\square$

## A.9 Proof of Proposition 7

In order for donor surplus to be non-negative at the social planner solution, it must be that

$$\left(u+e_i^P-\frac{t}{12n^2}\right)\geq 0,$$

which amounts to

$$u\geq \frac{t}{12n^2}-\frac{(E-\lambda(D-v))}{(1-\lambda^2)}-\frac{(L-kn\lambda)\left(L\left(1-\lambda^2\right)+kn(D-v-\lambda E)\right)}{(1-\lambda^2)(n^2(1-k^2-\lambda^2)+Lkn\lambda)}\equiv \underline{u}\ .$$

Now, $m_i^P>m_i^*$ if and only if

$$u> \frac{t}{12n^2}-\frac{(E-\lambda(D-v))}{(1-\lambda^2)}-\frac{\left(t(L-kn\lambda)+kn\lambda\left(n^2-t\right)\right)\left(L\left(1-\lambda^2\right)+kn(D-v-\lambda E)\right)}{(1-\lambda^2)n^2(t(1-\lambda^2-k^2)+k\lambda Ln)}\equiv u_+\ ,$$

and $d_i^P<d_i^*$ if and only if $u>u_{++}$ with

$$\begin{aligned}u_{++}\equiv\ &\frac{t}{12n^2}-\frac{(E-\lambda(D-v))}{(1-\lambda^2)}\\&-\frac{\left(n^3\lambda\left(1-\lambda^2\right)+kt(L-kn\lambda)-nt\lambda\left(1-\lambda^2-k^2\right)-L^2n\lambda-kn\lambda(kt-Ln\lambda)\right)\left(L\left(1-\lambda^2\right)+kn(D-v-\lambda E)\right)}{n(1-\lambda^2)(kn-L\lambda)(t(1-\lambda^2-k^2)+k\lambda Ln)}\ .\end{aligned}$$

It is immediate to observe that $\underline{u}>u_+>u_{++}$ given Assumptions 3 and 5. Therefore, $m_i^P>m_i$ and $d_i^P<d_i$ always hold.

Furthermore, $b_i^P>b_i^*$ if and only if

$$u> \frac{t}{12n^2}-\frac{(E-\lambda(D-v))}{(1-\lambda^2)}-\frac{\left(L(L-kn\lambda)-\left(n^2-t\right)\left(1-\lambda^2-k^2\right)\right)\left(L\left(1-\lambda^2\right)+kn(D-v-\lambda E)\right)}{L(1-\lambda^2)(t(1-\lambda^2-k^2)+k\lambda Ln)}\equiv u_0\ ,$$

and $e_i^P>e_i^*$ if and only if $u>u_1$ where

$$u_1\equiv \frac{t}{12n^2}-\frac{(E-\lambda(D-v))}{(1-\lambda^2)}-\frac{\left(L^2n+kt\lambda(2kn\lambda-L)-n\left(n^2-t\right)\left(1-k^2-\lambda^2\right)-kn^2\lambda(L+kn\lambda)\right)\left(L\left(1-\lambda^2\right)+kn(D-v-\lambda E)\right)}{n(1-\lambda^2)(t(1-\lambda^2-k^2)+k\lambda Ln)(L-\lambda kn)}\ .$$

We find that $u_1>u_0>\underline{u}$ is also true provided that Assumptions 3 and 5 hold. Hence, $e_i^P<e_i^*$ and $b_i^P<b_i^*$ both hold for $\underline{u}<u<u_0$. Notice that it is possible to show that all threshold values of $u$ are decreasing in $E$. In particular,

$$\frac{\partial u_0}{\partial E}=-\frac{L\left(t\left(1-\lambda^2-k^2\right)+k^2n^2\lambda^2\right)+kn\lambda\left(1-\lambda^2-k^2\right)\left(n^2-t\right)}{L\left(1-\lambda^2\right)\left(t\left(1-\lambda^2-k^2\right)+Lnk\lambda\right)}<0$$

and

$$\frac{\partial u_1}{\partial E}=-\frac{\left(1-k^2\right)\left(kn\lambda\left(n^2-t\right)+t\left(L-kn\lambda\right)\right)}{\left(L-kn\lambda\right)\left(t\left(1-\lambda^2-k^2\right)+k\lambda Ln\right)}<0.$$

Therefore, the lower the altruism of the social entrepreneur, the easier it is to satisfy condition $u<u_0$. $\square$

## Proof of Lemma 2

Using the envelope theorem, we can assess how social welfare is affected by the different forces determining market competitiveness. We have:

$$\begin{aligned}
\frac{\partial W^P}{\partial t} &= -\frac{L}{12n^2} m_i^P < 0; \\
\frac{\partial W^P}{\partial L} &= \left(1 + u + e_i^P - \frac{t}{12n^2}\right) m_i^P > 0 \\
\frac{\partial W^P}{\partial F} &= -n < 0.
\end{aligned}$$

□

## Proof of Proposition 8

The optimal number of NGOs that the social planner would choose must satisfy the first-order condition $\frac{\partial W^P}{\partial n} = 0$ and the second-order condition for a maximum $\frac{\partial^2 W^P}{\partial n^2} < 0$. One can use the implicit function theorem and obtain:

$$\frac{dn^P}{dt} = -\frac{\frac{\partial^2 W^P}{\partial n \partial t}}{\frac{\partial^2 W^P}{\partial n^2}},$$

whereby the sign of $\frac{dn^P}{dt}$ equals the sign of $\frac{\partial^2 W^P}{\partial n \partial t}$. Now,

$$\frac{\partial^2 W^P}{\partial n \partial t} = \frac{L}{12n^3}\left(2m_i^P - n\frac{\partial m_i^P}{\partial n}\right),$$

where

$$\begin{aligned}
\frac{\partial m_i^P}{\partial n} = \; & \frac{L\Big(\big(\lambda\big(L^2+n^2\big(1-k^2-\lambda^2\big)\big)-2Lkn\big)(D-v)-\big(1-\lambda^2\big)\big(L^2+n^2\big(1-k^2-\lambda^2\big)\big)(u+1)-\big(n^2\big(1-k^2-\lambda^2\big)+2k^2n^2\lambda^2-L(2kn\lambda-L)\big)E\Big)}{\left(n^2(1-k^2-\lambda^2)+L(2kn\lambda-L)\right)^2} \\
& + \frac{t\big(1-\lambda^2\big)L\big(3n^2\big(1-k^2-\lambda^2\big)+4Lkn\lambda-L^2\big)}{12n^2\left(n^2(1-k^2-\lambda^2)+L(2kn\lambda-L)\right)^2}
\end{aligned}$$

and $\frac{\partial m_i^P}{\partial n} < 0$ if and only if

$$u > \frac{t}{12n^2} - \frac{E-\lambda(D-v)}{(1-\lambda^2)} - 1 + \frac{2t\big(1-\lambda^2\big)\big(n^2\big(1-k^2-\lambda^2\big)+2Lkn\lambda-L^2\big)-24kn^3(D-v-\lambda E)(L-kn\lambda)}{12n^2(1-\lambda^2)(L^2+n^2(1-k^2-\lambda^2))} \equiv u_2 \; .$$

Given that $\underline{u} > u_2$ and that $u > \underline{u}$ must be the case, then $\frac{\partial m_i^P}{\partial n} < 0$ is true and $\frac{\partial^2 W^P}{\partial n \partial t} > 0$, so that $\frac{dn^P}{dt} > 0$. Considering entry costs, we have

$$\frac{dn^P}{dF} = -\frac{\frac{\partial^2 W^P}{\partial n \partial F}}{\frac{\partial^2 W^P}{\partial n^2}} < 0,$$

because $\frac{\partial^2 W^P}{\partial n \partial F} = -1$. Finally,

$$\frac{dn^P}{dL} = -\frac{\frac{\partial^2 W^P}{\partial n \partial L}}{\frac{\partial^2 W^P}{\partial n^2}},$$

where
$$\frac{\partial^2 W^P}{\partial n \partial L} = \left(1 + u + e_i^P - \frac{t}{12n^2}\right) \frac{\partial m_i^P}{\partial n} + \left(\frac{t}{6n^3} + \frac{\partial e_i^P}{\partial n}\right) m_i^P.$$

The first term is negative because $\frac{\partial m_i^P}{\partial n} < 0$ and $\left(1 + u + e_i^P - \frac{t}{12n^2}\right) > 0$. Moreover,

$$\frac{\partial e_i^P}{\partial n} = -\frac{1}{n^2(1-\lambda^2)} \left(L m_i^P - n\left(L - kn\lambda\right) \frac{\partial m_i^P}{\partial n}\right) < 0 \ ,$$

therefore it is very likely that $\frac{\partial^2 W^P}{\partial n \partial L} < 0$. □

# B Interdependence of workers' tasks

In the model, we have focused our analysis on the case in which worker's cost function exhibits complementarity between tasks, as we believe this is the more plausible scenario given the real-world examples we provide in the introduction. We now analyze whether and how our main results would change if effort levels were either independent or substitutes.[35]

## B.1 Independent effort levels

We first analyze the situation in which tasks are independent, *i.e.*, $\lambda = 0$, and we add subscript $I$ to denote this case. When $n$ is fixed, there exists a symmetric equilibrium in which each NGO $i$ optimally sets monitoring and incentive pay at:

$$m_{iI}^{*} = \min\left\{\frac{L+kn(D-v)}{n(1-k^2)}, 1\right\} \quad \text{and} \quad b_{iI}^{*} = E + \frac{Ln}{t} m_{iI}^{*}$$

and each worker provides effort levels:

$$e_{iI}^{*} = b_{iI}^{*} \quad \text{and} \quad d_{iI}^{*} = \max\left\{v - k m_{iI}^{*}, 0\right\} .$$

Again, monitoring and bonus move in the same direction at equilibrium, but now monitoring only serves the purpose of curbing destructive effort (while it has no effect on constructive effort) and incentive pay only enhances constructive effort (while leaving destructive effort unaffected).

There are no specific requirements to impose in this case, except that $D > v$, and that the second-order conditions hold, which amounts to

$$t^2\left(1-k^2\right) - L^2 n^2 > 0.$$

Moreover, it can be checked that $m_{iI}^{*} < 1$ if and only if the damage caused by worker misconduct falls short of some threshold, namely if $D < D_{0I}$ holds, whereas $d_{iI}^{*} > 0$ if and only if a similar requirement is satisfied, that is $D < D_{1I}$. Given that $v < k$ is the necessary and sufficient condition for $D_{1I} < D_{0I}$, one can conclude the following.

**Result 1.** *Let $\frac{Lk}{n(1-k^2)} < v < k$: (i) if $D < D_{1I}$, then $m_i < 1$ and $d_i > 0$; (ii) if $D \geq D_{1I}$, then monitoring always guarantees that $d_i = 0$.*

Indeed, worker's marginal utility from performing the destructive action, given by $v - k m_{iI}^{*}$, is negative when $m_{iI}^{*} = 1$ and $v < k$. In order to focus on interior solutions such that $m_{iI}^{*} < 1$ and $d_{iI}^{*} > 0$ both hold, let us then impose that $v < D < \min\left\{D_{0I}, D_{1I}\right\}$.

[35] All the proofs for the results of this section are not reported for brevity, but they are available under request.

The comparative statics with respect to the parameters affecting the degree of competition in the market for donations are much simpler with independent efforts. It is immediate to check that an increase in the number of active NGOs $n$ has the same effects as under complementarity. In addition, it unambiguously increases bonus pay. A reduction in transportation costs $t$ affects neither monitoring nor destructive effort, but it increases both bonus pay and constructive effort, as under complementarity. Finally, an increase in the size of the market for donations $L$ unambiguously increases monitoring and decreases destructive effort, whereas it increases bonus pay and constructive effort, as under complementarity. Hence, there only remains one aspect of market competitiveness which has a positive impact on workers' destructive effort, namely the number of active NGOs $n$. These results are illustrated in the next result.

**Result 2.** *With exogenous market structure and independent effort levels, destructive effort $d_{iI}^*$ increases with the number of active NGOs, is not affected by project substitutability, and decreases with market size.*

As for NGOs' payoffs $\pi_{iI}^*$, the same results as under complementarity hold: NGOs' payoffs decrease with the number of active NGOs $n$ and with fixed costs $F$, increase with transportation costs $t$ and are non-monotonic in market size $L$, but $\pi_{iI}^*$ decrease when both $L$ and $n$ increase by the same amount.

When market structure is endogenous, we find some important differences between independent and complementary effort levels, which are outlined in the result that follows. Moreover, it is worth highlighting that bonus pay $b_{iI}^*$ unambiguously decreases with entry costs $F$; all other effects are the same as in Proposition 5 and therefore we do not mention them here.

**Result 3.** *With endogenous market structure and independent effort levels, destructive effort $d_{iI}^*$ decreases when projects are more substitutable and when the market for donations is larger.*

Therefore, with independent tasks, the problem of worker misconduct becomes less severe as competition in the market for donations is more intense, due to an increase in the substitutability between development projects (*i.e.*, a decrease in $t$), or to an increase in market size $L$. There remains the adverse effect of a reduction in entry costs $F$ which increases destructive behavior.

## B.2 Substitutable effort levels

We now discuss how the key results of our analysis change when effort levels are substitutes. We do not report here the equilibrium outcomes, as they are those provided in Proposition 1 with the difference that with substitutable tasks $\lambda \in (-1, 0)$. We add subscript $S$ to distinguish this case from the others.

Looking at equation (4), it is possible to observe that, under substitutability, both monitoring and incentive pay serve the same objectives of enhancing constructive effort and discouraging workers' anti-social behavior. In this setting, we can say that monitoring crowds in constructive effort and bonus pay crowds out worker misconduct, thereby relaxing the incentive problems faced by social entrepreneurs when dealing with their workers. As a consequence, the SOC for an interior solution with substitutable tasks is more difficult to be satisfied relative to complementarity, whereas corner solutions such that either $mi^*_{iS} = 1$ or $di^*_{iS} = 0$, or both are easier to attain.

The comparative statics with respect to the parameters affecting the degree of competition in the market for donations shows that, while increasing bonus pay, an increase in the number of active NGOs $n$ has an ambiguous effect on monitoring and on both effort levels. Moreover, an increase in the substitutability of development projects (*i.e.*, a decrease in $t$) causes an increase in monitoring and a corresponding decrease in destructive effort, similarly to an increase in market size. Again, let us highlight what happens to worker misconduct in the following result.

**Result 4.** *With exogenous market structure and substitutable effort levels, destructive effort $d^*_{iS}$ unambiguously decreases with market size and with project substitutability. Moreover, it might decrease with the number of active NGOs.*

With substitutable tasks, an increase in the degree of competition among NGOs reduces the likelihood of worker misconduct. Notice that these results stand in sharp contrast to the corresponding findings under complementary efforts, whereas the case of independence stands somehow in-between.

The results concerning NGOs' payoffs and how they change in response to an increase in competition are the same as those obtained for the other cases. Therefore, when market structure is endogenous, the ambiguous effects of $n$ translate into the ambiguous effects of $F$.[36]

**Result 5.** *With endogenous market structure and substitutable effort levels, destructive effort $d^*_{iS}$ unambiguously decreases with market size and with project substitutability. Moreover, it might decrease with a reduction in entry costs.*

Result 5 shows that an increase in the degree of competition among NGOs leads to a decrease in worker misconduct also in the long run.

[36]Given that $dn^*/dF < 0$, the effect of entry costs $F$ on NGOs' equilibrium choices in the long run is again opposite to the effect that an exogenous number of NGOs $n$ would have on the same choices in the short run.

## B.3 Comparison

We compare the equilibrium outcomes across the different cases, focusing attention on exogenous market structure. Before proceeding, it is necessary to check that a common set of parameters supports all cases. Examining the second-order conditions and taking into account Assumption 4 for complementary efforts, it is possible to show that substitutability is a subcase of independence, but that complementarity only partially overlaps with either independence or substitutability. Nonetheless, we can state the following.

**Result 6.** *Under exogenous market structure, we find that:* $m_{iS}^* > \max\{m_{iI}^*, m_i^*\}$; $b_i^* < b_{iI}^* < b_{iS}^*$; $e_i^* < e_{iI}^* < e_{iS}^*$; $d_{iS}^* < \min\{d_{iI}^*, d_i^*\}$.

These results are not surprising, given that the two instruments in the hands of the social entrepreneurs, namely monitoring and bonus pay, reinforce each other under substitutability, whereas they partially offset each other under complementarity, and they do not affect each other under independence. Hence, with substitutable tasks, an increase in market competitiveness induces NGOs to increase their monitoring activity and to pay higher bonuses, in exchange for higher constructive effort (and hence higher project quality) and lower destructive effort.

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