NGO Competition and the Markets for Development Donations*

Gani Aldashev† and Thierry Verdier‡

May 11, 2006

Abstract

Is competition for donations between development NGOs good for welfare? We address this question in a monopolistic competition model à la Salop (1979). NGOs - defined by the non-distribution constraint - compete for donations from donors by exerting fundraising effort. If the market size is fixed, the free-entry equilibrium number of NGOs is larger than the optimal number. However, if the market size is endogenous and NGOs both compete and co-operate in attracting new donors, the free-entry equilibrium number of NGOs is smaller than the optimal number. If NGOs can divert a part of funds for private use, for some range of outside option of NGO entrepreneurs multiple equilibria (with high diversion and no diversion of funds) co-exist.

Keywords: NGOs, monopolistic competition, non-distribution constraint.

JEL Classification: L31, L13, D43.

---

*The authors thank the participants of the EUDN-Paris conference and seminars in ECARES and Solvay Business School for useful suggestions.

†FUNDP and CORE. Email: gani.aldashev@fundp.ac.be.

‡PSE and CEPR. Email: verdier@pse.ens.fr.

"In the now-crowded relief market, campaigning groups must jostle for attention: increasingly, NGOs compete and spend a lot of time and money marketing themselves. Bigger ones typically spend 10% of their funds on marketing and fundraising. The focus of such NGOs can easily shift from finding solutions and helping needy recipients to pleasing their donors ..." ("Sins of the secular missionaries," *The Economist,* Jan. 27th, 2000)

1 Introduction

The development experience since the World War II suggests that channeling development funds through recipient countries' governments is inefficient. Such governments often divert foreign aid money for private use. Often, they also use these development funds to finance military actions directed to repress particular ethnic groups. The effect of such aid on development is thus absent or negative.

Increasingly, the World Bank and other development institutions, as well as private donors, consider non-government organizations (NGOs) a superior alternative to public channels. A recurrent argument is that NGOs are good at identifying issues where assistance is most needed, and through their development projects they manage to substantially improve the well-being of the most needy groups in beneficiary countries.

However, some features of the NGO sector call for a more cautious judgement. Given that most development NGOs operate as not-for-profit organizations, they have to rely on financing by donors. This imples that NGOs engage in competition for these funds. The opening quote from *The Economist* suggests that this competition may have a detrimental effect for beneficiaries' welfare. Moreover, NGOs that receive donations can divert a part of these funds for private use, just like governments do.

From an economist's point of view, we need a rigorous economic analysis of this market for development donations, in order to understand the functioning of the NGO sector. So far - to our knowledge - no economic research has performed such an analysis. This paper is the first attempt to fill this gap.

We build a simple economic model, inspired by industrial organization literature, to answer the following questions. Does competition for donations among NGOs increase welfare (and, in particular, the welfare of beneficiaries)? Given free entry, how many NGOs should we observe in equilibirum? From the welfare-maximization point of view, are there too many (or too few) NGOs in an unregulated donations market? How do the answers to these questions change when NGOs can divert a part of donations for private use? What about the situation in which NGOs engage both in competition and co-operation by attracting new donors?

We adopt a workhorse model of industrial organization field (Salop 1979) for our non-profit setup. One simple extention of the basic model allows us to model the joint decision of an NGO to engage in fundraising and to divert a part of raised funds. Another extension analyzes the interplay between competition and co-operation among NGO.

Our main results are as follows. When the donations market size - i.e. the number of donors - is fixed, the unregulated competition for donations normally leads to excessive fundraising and to a higher than optimal number of NGOs. When fundraising serves also to increase the size of the donations market, we characterize the condition under which the competition results in a less than optimal number of NGOs. Finally, if NGOs can divert a part of funds, an easier entry can result in welfare reduction and multiple equilibria (with either high and low diversion of funds) can occur.

The existing literature on this topic stems from the analysis of private provision of public goods. The early paper by Rose-Ackerman (1982) presents the model in which donors dislike charities with high spending on fundraising. Nevertheless, the competition for donations lead non-profits to engage in excessive fundraising. A related paper by Economides and Rose-Ackerman (1993) employs the monopolistic-competition approach to the donations market and makes similar conclusions on the number of non-profits: the unregulated market delivers too many providers.

The paper by Bilodeau and Slivinski (1997) adopts a different approach. In their model, charities can produce bundles of public goods. They show that the competition between charities leads to specialization in production. This, in turn, reduces equilibrium contributions by donors. Thus, they conclude that allocation rules that reduce this competition can be ex ante welfare-increasing. Although this modelling approach differs from the paper by Rose-Ackerman (1982), the main insight is similar: curbing competition can be welfare-increasing.

Our paper shows that these results crucially rely on the assumption of a fixed market size. We generalize these results, present a model in which these results are reversed, and characterize the conditions under which the unregulated competition delivers too many (or too few) NGOs.

In a recent paper, Castaneda et al. (2004) present a model in which non-profits can divert a part of donations for perquisite consumption. They analyze the effect of an (exogenous) increase in the number of competing non-profits on the amount of diverted funds and on fundraising expenses. They show that increased competition reduces diversion and increases fundraising. The increase in the number of non-profits is, however, exogenous, and thus one finds it difficult to interpret their results. Instead, we allow for endogenous entry of NGOs and characterize, in Section 3, the conditions that lead to high diversion of funds.

Rowat and Seabright (2006) construct a principal-agent problem between donors and aid agencies. In their model, the aid agency serves as a platform on a two-sided market, with altruistic donors on one end and aid recipients on the other. They show that in a setting with both moral hazard and adverse selection, the declaration of a non-profit status serves as a costly committment mechanism to curb diversion of funds by aid agencies. Since our main interest regards entry of NGOs on the donations market, we abstract from such informational asymmetries. In our model in Section 3, the diversion of funds in equilibrium arises not because of the asymmetric information, but because of the excessive competition between NGOs.

From the normative side, papers by Barla and Pestieau (2005) and by Pestieau and Sato (2006) address the question: What is the optimal number of charities? These papers derive the optimal number of charities as a function of set-up costs and of donor attachment, in a setup similar to ours Their description of donor behaivour is richer that in our model. However, these papers differ from ours in two crucial aspects. First, fundraising by non-profits is not present in these models, while in ours it is a fundamental decision variable of NGOs. Second, these papers consider only the markets with a fixed market size. Instead, we also allow for the endogenous market size, and derive the optimality conditions also in this latter case.

The structure of the paper is as follows. Part 2 builds a basic model with a fixed market size. Part 3 extends this analysis by allowing for diversion of funds by NGOs. Part 4 considers the model with endogenous market size. Part 5 discusses the implications of our results and concludes.

2 Basic model

2.1 Setup

We consider a simple extension of the Salop (1979) model of monopolistic competition adapted to the case of not-for-profit competition for donations. There is a given number of NGOs, $i = 1, ..., n$, and a continuum of (small) donors located on a circle of perimeter 1. Each NGO can run only one project and is endowed with one unit of divisible resource (time). It can divide this unit between fundraising activities and implementation of the project. Each donor has 1 indivisible unit of resource that can be converted into consumption with utility normalized to zero.

An NGO i faces the non-distribution constraint - in that it cannot retain donations it receives:

$$D_i(y_i) = cD_i(y_i) + f + F_i, \tag{1}$$

where y_i is the time spent in fundraising activities, D_i is the amount of donations i collects, f is the fixed cost of entry, c is the cost of administering a unit of donations, and F_i is the amount of resources the NGO invests in the development project. Thus, funds devoted to the project are

$$F_i(y_i) = D_i(y_i)(1 - c) - f. \tag{2}$$

The impact of the project is a described by a production function, with time and money as inputs:

$$Q_i = F_i(y_i)(1 - y_i), \tag{3}$$

where $1 - y_i$ is time spent implementing the project. Thus, time and money enter into the production function multiplicatively[1]. The objective of an NGO is to maximize the impact of its project.

Donors are located on the circle, thus they decide between giving to one of the 'nearest' NGOs. This distance is defined in the following sense: each donor has its' ideal image of how development should be done, and the less the projects of NGOs correspond to this ideal image, the further the NGOs are

[1] More general functional forms can be adopted, at a cost of increased mathematical complexity. As far as the elasticity of substitution between time and money is not too high, the qualitative results of the model do not change (in this case, the returns to scale also does not affect the results).

located on the circle. The donation motive is warm-glow, and the utility from giving depends on total impact of the projects and on the distance from the NGO to which the donor decides to give. Thus, a donor located at distance x from the closest NGO i enjoys utility

$$U(x) = u(\sum_{j=1}^{n} Q_j) - \frac{t}{y_i}x, \tag{4}$$

where $u(\sum_{j=1}^{n} Q_j)$ is the warm-glow utility of giving, t is the unit 'transport' cost, which measures the conservativeness of donors with respect to their ideal image of development, y_i is the fundraising effort by NGO i, and the function $u(.)$ is an increasing function. Thus, the fundraising effort of an NGO serves to persuade donors that the NGO's project is 'closer' to their ideal view of development.

We assume that the lower bound of the warm-glow utility is high enough, so that all donors always prefer to give to some NGO. This assumption corresponds to ruling out the "monopoly" region of consumer demand curve in the Salop (1979) model.

Let all NGOs (except i) choose fundraising effort y, and the NGO i choose effort y_i. The donor located at distance x from i is indifferent between giving to i and giving to the other nearest NGO if

$$u(\sum_{j=1}^{n} Q_j) - \frac{t}{y_i}x = u(\sum_{j=1}^{n} Q_j) - \frac{t}{y}(\frac{1}{n} - x), \tag{5}$$

where n is the total number of NGOs entering the donations market.

2.2 Equilibrium

From (5), the total donations that NGO i collects are

$$D_i(y_i, y) = 2x = \frac{2}{n}\frac{y_i}{y + y_i}. \tag{6}$$

NGO i's problem is to maximize the impact of its' project by choosing its' fundraising effort y_i, given the fundraising efforts of other NGOs, y:

$$\max_{y_i} Q_i(y_i, y). \tag{7}$$

Given (3), the first-order condition of this problem is:

$$\frac{\partial F_i}{\partial y_i}(1 - y_i) = F_i(y_i). \tag{8}$$

The left-hand side is the marginal benefit of an extra fundraising effort, in terms of the impact of the project. For each unit of time spent in the development project, the extra effort increases the donations that the NGO can invest into its' project by $\frac{\partial F_i}{\partial y_i}$. The right-hand side is the marginal cost: one more unit of time spent for fundraising reduces time spent implementing the project by one unit, which means a reduction of project impact by F_i.

2.2.1 Equilibrium fundraising effort and project impact

We analyze symmetric equilibria, $y_i = y$. Then,

$$\frac{\partial F_i}{\partial y_i}\,|_{y_i=y} = \frac{1-c}{2ny}, \quad F_i(y_i)\,|_{y_i=y} = \frac{1-c}{n} - f. \tag{9}$$

The first-order condition (8) thus becomes

$$\frac{1-c}{n}\frac{1}{2y}(1-y) = \frac{1-c}{n} - f. \tag{10}$$

Solving (10) for y, we find the equilibrium fundraising effort, given the number of NGOs on the market, n:

$$y^* = \frac{1-c}{3(1-c) - 2fn}. \tag{11}$$

This gives the equilibrium project impact, given n:

$$Q^*(n) = \left(\frac{1-c}{n} - f\right)(1 - y^*(n)). \tag{12}$$

A simple differentiation of expressions (11) and (12) gives the following comparative statics results.

Proposition 1. The equilibrium fundraising effort, y^*, increases with the number of NGOs on the market, with fixed cost of the project, and with the unit cost of administering donations:

$$\frac{\partial y^*}{\partial n} > 0, \quad \frac{\partial y^*}{\partial f} > 0, \quad \frac{\partial y^*}{\partial c} > 0. \tag{13}$$

The equilibrium project impact, Q^*, decreases with the number of NGOs on the market, with fixed cost of the project, and with the unit cost of administering donations:

$$\frac{dQ^*}{dn} < 0, \qquad \frac{dQ^*}{df} < 0, \quad \frac{dQ^*}{dc} < 0. \tag{14}$$

Intuitively, an increase in the number of NGOs on the market reduces less the marginal benefit of fundraising, $\frac{\partial F_i}{\partial y_i}(1-y_i)$, than it reduces the opportunity cost of fundraising, $F_i(y_i)$. Hence, for each NGO, the incentives to engage in fundraising are higher, which in equilibrium induces a higher value of y^*. Similarly, a higher fixed cost, f, or a higher administrative cost, c, both decrease the marginal profitability of time devoted to the project; i.e. they decrease the opportunity cost of fundraising. The resulting outcome is again a higher equilibrium value of y^*.

The comparative statics on Q are also straightforward. A larger number of NGOs tends to reduce the equilibrium project impact through two channels. First, it is the usual "business stealing" effect of an increased competition. An additional NGO on the donations market reduces the market share of each existing NGO. Second, as we have found, a higher n triggers a more intense competition for funds and thus diverts NGOs' time from the implementation of development projects towards unproductive fundraising. Through both channels, an increase in n leads to a reduction of project impact for each NGO. Thus, NGOs impose a negative externality on the impact of each other's project. The intuition for the comparative statics on fixed and administration costs, f and c, is similar.

2.2.2 Free entry

Let us assume that NGOs are founded by 'NGO entrepreneurs', who can also engage in other activities (such as working in a for-profit sector). The free-entry condition requires that the equilibrium payoff to an NGO enterpreneur equals her outside option that she can earn in the for-profit sector. Let this outside option be exogenous and equal to w, and let her get the payoff $\delta Q^*(n)$ from the impact of the project. Thus, δ measures the degree of altruism of NGO entrepreneurs.

Under the free-entry condition, the equilibrium number of NGOs, n^*, satisfies

$$\delta Q^*(n) = w. \tag{15}$$

Graph 1 represents the free-entry equilibrium in this benchmark model. Given that the equilibrium project impact decreases everywhere with the number of NGOs on the market, the free-entry equilibrium is unique and stable. The following comparative statics results are true.

Proposition 2. The free-entry equilibrium number of NGOs in the donations market, n^*, is unique and stable. It increases with the NGO entrepreneurs' altruism, and decreases with the outside option of NGO entrepreneurs, and with the fixed and administrative costs of development projects:

$$\frac{dn^*}{d\delta} > 0, \quad \frac{dn^*}{dw} < 0, \quad \frac{dn^*}{df} < 0, \quad \frac{dn^*}{dc} < 0. \tag{16}$$

The first two comparative statics results come from (15). The last two results come directly from the comparative statics on $Q^*(n)$, described by (14).

Intuitively, an increase in NGO entrepreneurs' outside option, w, temporarily sets the payoff to NGO entrepreneurs present on the donations market below their outside option. This induces some entrepreneurs close their NGOs and quit the market, which reduces the number of NGOs, relaxes the competition for funds, and, therefore, increases the project impact for all remaining NGOs. This process continues until the free-entry condition (15) is not again satisfied. The intuition for the remaining three comparative statics results is similar.

2.3 Welfare

In this sub-section we analyze the welfare properties of the free-entry equilibrium.

We assume that beneficiaries of NGO projects (as a group) care only about the total impact of projects. Thus, their welfare is

$$W^B \equiv v(\sum_{j=1}^{n} Q_j) = v(nQ^*), \tag{17}$$

where $v(.)$ is an increasing function.

The social welfare is the sum of the welfare of donors, that of beneficiaries, and that of NGO entrepreneurs:

$$W = W^D + W^B + W^N. \tag{18}$$

1. The welfare of donors,

$$W^D(n) = 2n \int_0^{\frac{1}{2n}} (u(\sum_{j=1}^{n} Q_j) - \frac{t}{y}x)dx = u(nQ^*(n)) - \underbrace{\frac{t}{4ny^*(n)}}_{T(n)}, \tag{19}$$

   is made of two parts: the warm-glow utility (increasing in projects' total impact) and the total "transport" cost (decreasing in total fundraising effort).

2. The welfare of beneficiaries,

$$W^B(n) = v(nQ^*(n)), \tag{20}$$

   increases in the projects' total impact.

3. The welfare of NGO entrepreneurs,

$$W^N(n) = n(\delta Q^* - w) = n\delta Q^* - wn, \tag{21}$$

equals the total payoff to the entrepreneurs less their total opportunity cost.

Maximizing W with respect to n, we find the socially optimal number of NGOs[2]:

$$\frac{dW}{dn} = \frac{dW^D}{dn} + \frac{dW^B}{dn} + \frac{dW^N}{dn} = 0. \tag{22}$$

It is useful to define the elasticity of equilibrium project impact with respect to the number of NGOs:

$$\varepsilon \equiv \frac{n}{Q^*(n)} \frac{dQ^*(n)}{dn}. \tag{23}$$

The following Lemma is true.

Lemma 1. The elasticity of equilibrium project impact is larger than 1 in absolute value. Equivalently, total project impact decreases with the number of NGOs on the market:

$$\frac{d(nQ^*(n))}{dn} < 0. \tag{24}$$

Proof: see Appendix.

Lemma 1 states that the positive effect on total project impact from the entry of one additional NGO on the donations market is smaller than the negative externality that this entrant imposes on the impact of all the existing NGOs' projects.

Now we can analyze the effect of a higher number of NGOs on total welfare.

1. The effect of a higher number of NGOs on donors' utility is:

$$\frac{dW^D(n)}{dn} = u'(.)[Q^* + n\frac{dQ^*}{dn}] - \frac{dT(n)}{dn}. \tag{25}$$

[2] Note that this is a second-best optimum, as we assume that the social planner can only choose the number of NGOs on the market.

The first term is the effect on the warm-glow utility from giving. It is negative by Lemma 1. The second term decreases with n. This is because the entry of one additional NGO increases fundraising effort of all existing NGOs (by Proposition 1), and thus *a fortiori* decreases the total "transport" cost for donors. The overall effect on the welfare of donors is ambiguous. On one hand, one additional NGO on the market reduces the total project impact and the "warm-glow" utility from giving. On the other hand, it makes the average distance to the "nearest" NGO closer for each donor.

2. The effect on the welfare of beneficiaries is:

$$\frac{dW^B(n)}{dn} = v'(.)[Q^* + n\frac{dQ^*}{dn}]. \tag{26}$$

This effect is negative, as the total project impact is reduced (from Lemma 1). One additional NGO on the donations market dilutes the total project impact. Given that the beneficiaries care only about the total impact, their welfare is unambiguously reduced.

3. The effect on the welfare of NGO entrepreneurs:

$$\frac{dW^N(n)}{dn} = n\delta\frac{dQ^*(n)}{dn} + [\delta Q^*(n) - w]. \tag{27}$$

The term in square brackets constitutes the net benefit from an additional NGO on the market. The first term is the negative externality that each NGO imposes on the welfare of other NGO's (by reducing their projects' impact). Thus, in a free-entry equilibrium - given that the last two terms amount to zero - the effect on the welfare of NGO entrepreneurs is unambigously negative.

Overall, the condition for the socially optimal number of NGOs is:

$$\frac{dW(n)}{dn} = u'(.)[Q^* + n\frac{dQ^*}{dn}] - \frac{d\left(\frac{t}{4ny^*}\right)}{dn} + v'(.)[Q^* + n\frac{dQ^*}{dn}] + \\ + n\delta\frac{dQ^*}{dn} + \delta Q^* - w = \underbrace{\left[\{u'(.) + v'(.)\}\left(Q^* + n\frac{dQ^*}{dn}\right)\right]}_{-} + \tag{28} \\ + \underbrace{\left[n\delta\frac{dQ^*}{dn}\right]}_{-} - \underbrace{\frac{d\left(\frac{t}{4ny^*}\right)}{dn}}_{-} + [\delta Q^* - w] = 0$$

The first and the second terms are negative, while the third one is positive (as it enters with the minus sign). Assuming that $W(n)$ admits a well-defined interior optimum n_s, we can compare the free-entry equilibrium with the optimal number of NGOs. Under free entry, the last term in square brackets $[\delta Q^* - w]$ adds up to zero. Clearly, the social optimum $n_s(t)$ depends positively on the unit "transport" cost, t. Thus, for a small enough t, the value of n_s is smaller than the free-entry equilibrium number of NGOs.

Proposition 3. There exists a value $\bar{t}$ such that, for $t < \bar{t}$, the free-entry equilibrium number of NGOs, n^*, is *above* the socially optimal number $n_s(t)$.

In other words, when donors have a low enough degree of conservativeness (the unit "transport" cost, t, is low enough), unregulated entry in the donations market delivers a number of NGOs *above* the socially optimal number[3]. If the threshold value $\bar{t}$ is low enough to be compatible with our assumption of the "covered market"[4], we also get the symmetric result: when donors are conservative enough in terms of their ideal views about development (i.e., $t > \bar{t}$), the free-entry equilibrium number of NGOs, n^*, is *below* the socially optimal number $n_s(t)$.

[3]The unregulated market can still deliver the optimal number of the NGOs, but only at the stringent condition that the negative effect on the welfare of all the three parties (donors, beneficiaries, and NGO entrepreneurs) exactly equals to the positive effect on the transport-cost part of the welfare of donors.

[4]That is, if $\bar{t}$ is less than some $t_{\max}$ defined by the condition of the "covered market": $u(n^*Q(n^*)) - \frac{t_{\max}}{n^*y^*} \geq 0$.

Proposition 3 and the preceding discussion provide conditions for regulatory action regarding entry of NGOs in the donations market. The correct policy (restricting or subsidising entry) depends crucially on the relative effectiveness of fundraising at influencing donors' perceptions about development issues. In particular, our results suggest that when donors become more sensitive to fundraising effort by NGOs, public intervention restricting entry of NGOs in the donations market is desirable.

Finally, note that we conduct our normative analysis on the basis of social welfare function aggregating the welfare of donors, beneficiaries, and NGO entrepreneurs with equal weights. However, one can adopt a different criterion to evaluate equilibrium outcomes. For instance, one can mainly be concerned with the welfare of recipients (it is typically the case in a development policy context)[5]. In that case, independently from donors' perceptions, a decrease in the number of the NGOs with respect to the free-entry equilibrium increases the welfare of beneficiaries, as it reduces the crowding-out effect of excessive fundraising and competition between the NGOs.

3 Soft non-distribution constraint

3.1 Setup

In the previous section, NGOs had to satisfy the non-distribution constraint and could not divert received donations for private uses. However, this assumption is restrictive. A recent quote from *The Economist* reads:

> "Competition for funds and publicity among the larger NGOs results in a divided movement that is not making the best use of its assets. It also results in the diversion of funds ... to institutional survival, self-interest and a lack of transparency." ("Who guards the guardians?"

[5] This could be justified if recipients are much poorer than donors and one puts more weight on beneficiaries' welfare for ethical reasons.

The Economist, Sep. 18th, 2003).

This quote suggests that competition for funds between NGOs may lead to diversion of funds for uses other than development projects. Thus, in the context of our model, obvious questions arise: How are the results of the benchmark model affected when we allow for a soft non-distribution constraint? Does increased competition between NGOs lead to an *increased* diversion of funds?

To investigate these questions, we consider the following simple extension of the basic model[6]. Each NGO i can now divert a part of collected donations, G_i, for private use (prestige, non-pecuniary advantage, etc.) and gain additional payoff ηG_i from this activity. Thus, η measures the weight an NGO entrepreneur gives to her payoff from diverted funds with respect to her payoff from the impact of the project she implements.

The non-distribution constraint of NGO i becomes:

$$D_i(y_i) = cD_i(y_i) + f + F_i + G_i. \tag{29}$$

We assume that there is an upper limit $\overline{G} < \frac{1-c}{n} - f$ to funds that an NGO can divert from its' budget[7]. This limit can be imposed because of a stringent regulation or some control mechanism. For instance, if an NGO entrepreneur diverts funds beyond this limit, this can be immediately observed and can lead to the loss of reputation or can be legally punished. The key point of this assumption is to ensure, in a simple way, that the cost of diversion becomes very steep after a certain level.

Moreover, the level of $\overline{G}$ allows an easy parametrization of the degree of softness of the non-distribution constraint. Hence, the smaller is $\overline{G}$, the better

[6] We do not claim generality in this simple extension. Our aim is rather to illustrate the intuition of the relationship between the intensity of competition and the diversion of collected funds by NGOs.

[7] Given that the lower bound of the warm-glow utility is high enough (as in the basic model), this condition guarantees that in equilibrium the NGOs devote a strictly positive amount of funds to the project and, thus, the market is entirely covered.

is the governance strutrure of the NGO industry and the "harder" the non-distribution constraint.

The problem of NGO i is to maximize the weighted sum of payoffs from the project impact and diverted funds:

$$\omega_i = Q_i + \eta G_i, \tag{30}$$

subject to soft non-distribution constraint, $D_i(y_i) = cD_i(y_i) + f + F_i + G_i$, and the cap on funds diversion, $G_i \leq \overline{G}$. As before, $Q_i = F_i(1 - y_i)$ denotes the impact of the NGO's project.

This problem reduces to:

$$\max_{y_i, G_i \leq \overline{G}} \left[(1 - c)D_i(y_i) - f - G_i\right](1 - y_i) + \eta G_i. \tag{31}$$

3.2 Equilibrium

Consider first maximization with respect to G_i. The first-order condition with respect to G_i implies:

$$G_i = 0 \text{ for } y_i \leq 1 - \eta \text{ and } G_i = \overline{G} \text{ for } y_i > 1 - \eta. \tag{32}$$

Given that the diverted donations enter the objective function of the NGO linearly, for effort level $y_i \leq 1 - \eta$ the marginal benefit of diversion (private use) is everywhere lower that its' marginal cost (a reduction in the project impact). Intuitively, when the fundraising effort is low, the NGO devotes a lot of time for the project implementation. Since time and donations are multiplicative in the project production function, this means that the opportunity cost of donations - in terms of project impact - is high. The intuition is reversed when fundraising effort is high enough: $y_i > 1 - \eta$. Thus, for an NGOs, its' fundraising effort and the diversion of funds are complements.

Let all NGOs (except i) choose fundraising effort y. Denote the NGO i's payoff function as

$$\begin{aligned}\pi(n,y_i,y,G_i) &\equiv [(1-c)D_i(y_i)-f-G_i](1-y_i)+\eta G_i \\ &= \left[(1-c)\frac{2}{n}\frac{y_i}{y+y_i}-f-G_i\right](1-y_i)+\eta G_i,\end{aligned} \tag{33}$$

and denote its' payoff function when it optimally chooses its' diversion of donations as

$$\Omega(n,y_i,y,\overline{G}) \equiv \begin{cases} \pi(n,y_i,y,0) & \text{for } y_i \leq 1-\eta \\ \pi(n,y_i,y,\overline{G}) & \text{for } y_i > 1-\eta \end{cases}. \tag{34}$$

Then, the problem of NGO i becomes:

$$\max_{y_i} \Omega(n,y_i,y,\overline{G}). \tag{35}$$

In other words, NGO i chooses its' fundraising effort y_i to maximize its' payoff, given that it chooses the level of diversion optimally.

For a given value of $G_i \in \{0,\overline{G}\}$, the first-order condition of problem (35) for y_i in each of the two regimes ($G_i = 0$ and $G_i = \overline{G}$) writes as:

$$\frac{\partial \pi(n,y_i,y,G_i)}{\partial y_i} = (1-c)\frac{2}{n}\frac{y(1-y_i)}{(y+y_i)^2}-(1-c)\frac{2}{n}\frac{y_i}{y+y_i}+f+G_i=0, \tag{36}$$

which implicitly describes NGO i's reaction curve $\widetilde{y_i}(n,y,G_i)$. For convenience, we denote with $V(n,y,G_i) \equiv \pi(n,\widetilde{y_i}(n,y,G_i),y,G_i)+\eta G_i$ the maximum payoff of NGO i in a regime with $G_i \in \{0,\overline{G}\}$.

Lemma 2. The reaction curve of NGO i, $\widetilde{y_i}(n,y,G_i)$, is increasing in n, y, and G_i. Moreover, the best responses to the end points of y are: $\widetilde{y_i}(n,0,G_i)=0$ and $\widetilde{y_i}(n,1,G_i)<1$.

Proof: See Appendix.

Lemma 2 states that fundraising efforts of NGOs are strategic complements. The bigger is the fundraising effort y of a rival NGO, the higher is the incentive for NGO i to increase its' effort y_i. The intuition is as follows. An increase in rival's effort, y, reduces both the marginal benefit and the marginal cost of fundraising effort of NGO i. However, the reduction in the marginal cost is larger than the reduction in the marginal benefit. Therefore, the payoff-maximizing fundraising effort y_i increases with the fundraising effort of the rival, y.

From Lemma 2, for η large enough (i.e. larger than some threshold η_0), there exists a unique $\overline{y}(n, G_i, \eta) \in (0, 1)$ such that

$$\widetilde{y}_i(n, y, G_i) \geq 1 - \eta \text{ if and only if } y \geq \overline{y}(n, G_i, \eta). \tag{37}$$

By simple differentiation, we find that $\overline{y}(n, G_i, \eta)$ is decreasing all three arguments. Furthermore, whenever $\overline{y}(n, G_i, \eta)$ exists for $G_i \in [0, \overline{G}]$, there exists a threshold value of fundraising $\widehat{y}(n, \overline{G}) \in (\overline{y}(n, \overline{G}, \eta), \overline{y}(n, 0, \eta))$ such that for $y < \widehat{y}(n, \overline{G})$, the NGO chooses the optimal regime with $G_i = 0$ and $y_i = \widetilde{y}_i(n, y, 0)$, while for $y > \widehat{y}(n, \overline{G})$, it chooses the optimal regime $G_i = \overline{G}$ and $y_i = \widetilde{y}_i(n, y, \overline{G})$. For $y = \widehat{y}(n, \overline{G})$, it is indifferent between the two regimes. Figure 2 depicts the the reaction curve of NGO i.

3.2.1 Equilibrium fundraising effort

Next, we characterize the nature of equilibria in fundraising effort. To concentrate on the most interesting case, we make the following assumption.

Assumption A1. $\eta \in [\eta_0, \eta_G]$ with η_G determined by

$$\overline{y}(1, \overline{G}, \eta_G) = \frac{1 - c}{3(1 - c) - 2(f + \overline{G})}. \tag{38}$$

In the appendix, we show that such a threshold value η_G exists. Intuitively, Assumption A1 states that η takes intermediate values. This allows for the possibility of existence of both types of equilibria: with no diversion ($G^* = 0$) and with full diversion ($G^* = \overline{G}$)[8].

Proposition 4. If A1 holds, there exist values n_0 and n_1 such that:

[8]When η is small enough, only equilibria with no diversion exist, as NGOs value very little the diversion of funds. On the contrary, when η is close enough to 1, only equilibria with full diversion exist, as the valuation of diverted funds is strong enough to rule out the no-diversion regime for an individual NGO.

- for $n < n_0$, there is a unique symmetric Nash Equilibrium in fundraising effort, $y_i = y_0^*$, with no diversion, $G^* = 0$, and $\widetilde{y_i}(n, y^*, 0) = y_0^* = \frac{1-c}{3(1-c)-2fn}$;

- for $n_0 \leq n < n_1$, there are two stable symmetric Nash Equilibria in fundraising effort, $y_i = y^*$:

- one with no diversion ($G^* = 0$) and $\widetilde{y_i}(n, y^*, 0) = y_0^*(n) = \frac{1-c}{3(1-c)-2fn}$;
- one with full diversion ($G^* = \overline{G}$) and $\widetilde{y_i}(n, y^*, \overline{G}) = y_G^*(n) = \frac{1-c}{3(1-c)-2(f+\overline{G})n}$;

- for $n_1 < n$, there is a unique symmetric Nash Equilibrium in fundraising effort, $y_i = y_G^*$, with full diversion ($G^* = \overline{G}$) and $\widetilde{y_i}(n, y^*, \overline{G}) = y_G^*(n) = \frac{1-c}{3(1-c)-2(f+\overline{G})n}$.

Proof: see Appendix.

Figure 3 depicts Proposition 3. It represents the three possibilities in panels A, B ,and C. In the first case (Figure 3A), the 45° line crosses only the reaction curve $y_i = \widetilde{y_i}(n, y, 0)$ at the point y_0^* and thus the only possible regime is the one with no diversion. In the second case (Figure 3B), the 45° line crosses both reaction curves, $y_i = \widetilde{y_i}(n, y, 0)$ and $y_i = \widetilde{y_i}(n, y, \overline{G})$, respectively at points y_0^* and y_G^* and we have two symmetric pure Nash equilibria. Clearly, in the full-diversion regime, the equilibrium fundraising, y_G^*, is larger than the one in the no-diversion regime, y_0^*. The diversion of funds reduces an NGO's opportunity cost to allocate time to fundraising activities. This leads to more fundraising in equilibrium. There is also the reverse channel. A higher fundraising effort reduces the benefit of investing funds in the development project and therefore increases an NGO's incentives to divert donations for private use. This generates a complementarity between diversion and fundraising. Because of this complementarity, we get multiple equilibria for a certain range of n.

Finally, Figure 3C depicts the third case. Here, the 45° line crosses only the reaction curve $y_i = \widetilde{y}_i(n, y, \overline{G})$ at point y_G^*, with a unique equlibrium with full diversion. Note that this equilibrium exists only when NGOs' valuation of diversion is high enough (i.e., η is larger than the threshold $\overline{\eta}$). Otherwise, the only possible equilibrium is the one with no diversion.

The intuition for this result is the following. When the number of NGOs is relatively small (i.e., $n < n_0$), competition for funds between NGOs is not too intense and the return on investing resources into development projects is high. In this situation, a dominant strategy for each NGO is to invest all available funds into development projects rather than divert funds for private use. Hence, the (unique) equilibrium is the one with no diversion.

However, when the number of NGOs is large (i.e., $n > n_1$), competition for funds between NGOs is intense and consequently the return on investing resources into development projects is low compared to the marginal gain of diverting the funds for private use. Therefore, a dominant strategy for each NGO is to divert resources as much as possible. Consequently, the (unique) equilibrium is the one with full diversion.

Finally, there is the situation when the number of NGOs is in the intermediate range ($n_0 \leq n < n_1$). In such case, the optimal strategy for an NGO in terms of diverting funds depends on the actions of other NGOs. If other NGOs divert funds, little money is invested into projects and the opportunity cost of fundraising is low. Therefore, the competition for funds is a relatively intense. As fundraising efforts are strategic substitutes, the individual NGO increases its' fundraising effort. This, in turn, reduces the individual return on investing funds into projects and increases the incentives to divert resources. Hence when all other NGOs divert resources, it is optimal for an individual NGO to do the same.

By the same token, when all other NGOs do not divert resources, the optimal strategy of a given NGO is to put all collected funds into its' development project. Hence the two equilibria are possible. The first equilibrium is with full diversion, high competition in fundraising, and little money invested into development projects. The second equilibrium is with no diversion, less intense competition on in fundraising, and all collected funds invested into the projects.

3.2.2 Free entry

As in the basic model, we next anallyze the free-entry equilibria. We consider the configuration of parameters that satisfy Assumption A1. The free-entry equilibrium number of NGOs, n^*, is determined by condition

$$V(n, y^*, G^*) = w, \tag{39}$$

where $V(n, y^*, G^*) = \pi(n, \widetilde{y}_i(n, y^*, G^*), y^*, G^*)$ is the payoff from entering the donations market and the Nash equilibrium values y^* and G^*, and w is the (exogenous) outside option of an NGO entrepreneur. The equilibrium number of NGOs depends on the equilibrium regime (no diversion, $G^* = 0$, or full diversion, $G^* = \overline{G}$). The properties of the no-diversion equilibrium have been analyzed in Section 2. Thus, we concentrate on the full-diversion equilibrium.

The following Lemma is true.

Lemma 3. The payoff from entering the donations market at the Nash equilibrium values y^* and G^* decreases with the number of NGOs on the market and with the amount of funds diverted:

$$\frac{dV(n, y^*, G^*)}{dn} < 0, \ \frac{dV(n, y^*, G^*)}{dG} < 0. \tag{40}$$

Proof: see Appendix.

Clearly, the equilibrum payoff $V(n^*, y^*, G^*)$ depends on equilibrium diversion regime. Hence, the equilibrium payoff function has the following shape:

$$\begin{aligned} V(n, y^*, G^*) &= V(n, y^*_G, \overline{G}) \text{ for } n < n_0 \text{ (unique no-diversion equilibrium)} \\ &= V(n, y^*_G, \overline{G}) \text{ for } n > n_1 \text{ (unique full-diversion equlibrium)} \\ &= V(n, y^*_0, 0) \text{ or } V(n, y^*_G, \overline{G}) \text{ for } n_0 \leq n < n_1 \text{ (multiple equil.)} \end{aligned}$$

This is described in Figure 4. Simple inspection of this figure provides the structure of free-entry equilibria, as a function of the opportunity cost of entering the market, w.

Proposition 5. There exist the values of outside option, w_0 and w_1, such that:

- for $w < w_0$, there exists a unique free-entry symmetric equilibrium with full diversion ($G^* = \overline{G}$) and the number of NGOs, $n^*(\overline{G}, w)$, is given by condition $V(n^*, y^*, \overline{G}) = w$;

- for $w_0 \leq w < w_1$, there are two stable free-entry symmetric equilibria:

- one with no diversion ($G^* = 0$) and the number of NGOs, $n^*(0, w)$, is given by condition $V(n^*, y^*, 0) = w$;

- one with full diversion ($G^* = \overline{G}$) and the number of NGOs, $n^*(\overline{G}, w)$, is given by condition $V(n^*, y^*, \overline{G}) = w$;

- for $w_1 < w$, there exists a unique free-entry symmetric equilibrium with no diversion ($G^* = 0$) and the number of NGOs, $n^*(0, w)$, is given by condition $V(n^*, y^*, 0) = w$.

The intuition for this result is essentially the same as for Proposition 4. When the opportunity cost of establishing an NGOs is low (i.e., $w < w_0$), the equilibrium number of NGOs is large. This, in turn, induces the full-diversion equilibrium with intense fundraising competition. On the contrary, when the opportunity cost is high (i.e. $w > w_1$), few NGO entrepreneurs enter the donations market and the resulting outcome is the no-diversion equilibrium with a smaller fundraising effort. Finally, the intermediate range of outside option, $w_0 \leq w < w_1$, induces multiple equilibria, either with full diversion or with no diversion.

Furthermore, note that $n^*(G, w)$ decreases with G and w. Therefore, $n^*(\overline{G}, w) < n^*(0, w)$. The intuition for this result is as follows. Under the soft non-distribution constraint, NGOs have a higher incentive to undertake fundraising activities to attract donations. As the market size is fixed, each NGO creates a strong business-stealing effect on the donations to neighboring NGOs. This fierce competition for funds, in turn, reduces the impact of each individual project, which leads to a lower payoff from entering the market.

3.3 Welfare

Finally, we briefly discuss the welfare implications of the "softness" of the non-distribution constraint. Equilibrium impact of an NGO project is

$$Q(n, G) = \left[(1-c)\frac{2}{n} - f - G\right](1 - y_G^*), \tag{41}$$

which is decreasing in n and G. However, note that

$$Q(n^*(G, w), G) = w - \eta G = Q(n^*(0, w), 0) - \eta G < Q(n^*(0, w), 0). \tag{42}$$

Therefore, the free-entry equilibrium project impact per NGO is smaller under the soft "non-distribution constraint" than in the basic model. This is also true for the total project impact:

$$\begin{aligned} n^*(G, w)Q(n^*(G, w), G) &< n^*(G, w)Q(n^*(0, w), 0) \\ &< n^*(0, w)Q(n^*(0, w), 0). \end{aligned} \tag{43}$$

Hence, in the range of parameters where the two equilibria coexist, the full-diversion equilibruim generates less total impact.

From the welfare point of view, beneficiaries suffer from the presence of the soft "non-distribution" constraint. The warm-glow part of donors' welfare is also reduced. However, the effect on the "transport" cost part is ambiguous, because the total fundraising effort under free entry in this model, $n^*(G,w)y_G^*(n^*(G,w))$, can be larger or smaller than the total fundraising effort under free entry in the benchmark model, $n^*(0,w)y_0^*(n^*(0,w))$.

4 Endogenous market size

4.1 Setup

In the benchmark model of Section 2, the size of the donations market was fixed. Hence, the only effect that one NGO's fundraising has on other NGOs is to reduce their market share. In this section, we reconsider this issue, extending the basic framework to the setup where the market size is endogenous and depends *positively* on the total fundraising effort by NGOs.

We assume that potential donors are unaware (or not informed) of the importance of development problems and have to be "awakened" or "activated" by NGOs. Fundraising has a double function. On one hand, it awakens donors to giving. On the other hand, it influences their choice which NGO to give to.

We assume that even before being awakened, donors know their ideal position. We can explain the rationale behind this assumption as follows. Donors may be well aware of what particular problem (or a set of problems) of developing countries they feel to be the most important ones. However, they may not want to give donations (remain "asleep") until they are aware of a solution that they find satisfactory. Thus, in the context of our model, the projects of different NGOs correspond to different solutions.

The potential donors observe the total fundraising effort (total "voice") of the NGOs, $\sum_{j=1}^{n} y_j$. The degree of "deafness" of a potential donor is a random variable uniformely distributed on the interval $[0, \Theta]$:

$$\theta \sim U_{[0,\Theta]}. \tag{44}$$

The potential donor decides to give if the total "voice" of NGOs is loud enough. In other words, she gives if

$$\theta < \sum_{j=1}^{n} y_j. \tag{45}$$

Formally, all potential donors are uniformly distributed on the circle of unit size. The preferences of a typical donor located at point x on the circle can be written as:

$$U(x, \theta) = I(\sum_{j=1}^{n} y_j < \theta) + \tag{46}$$
$$+[1 - I(\sum_{j=1}^{n} y_j < \theta)] \left\{ \max_k \left(u(\sum_{j=1}^{n} Q_j) - \frac{t}{y_k} \mid x - x_k \mid \right) \right\}.$$

When the total voice of NGOs, $\sum_{j=1}^{n} y_j$, is below the individual parameter θ, the donor remains inactive and enjoys the consumption of the unit of endowment. When, instead, the total voice $\sum_{j=1}^{n} y_j$ is above the threshold θ, the donor enjoys a different preference structure: the one in which she is altruistic towards beneficiaries and receives the utility $\max_k \left(u(\sum_{j=1}^{n} Q_j) - \frac{t}{y_k} \mid x - x_k \mid \right)$. This term represents the maximum utility she can get by giving her endowment to the NGO "perceived" as being closest to her ideal point x on the circle[9].

The timing of the game is as follows. (1) NGO entrepreneurs decide simultaneously on entry. (2) Entering NGOs simultaneously decide on their fundraising expenditures; this detemines the pool of effective donors. (3) Effective donors decide on their preferred NGO to give their donation to, and the resulting donations determine the impact of each NGO.

[9] We assume that, analogously to the basic model, the lower bound of this value is strictly larger than 1. This guarantees that the market is covered.

4.2 Equilibrium

Given our assumptions on the "awakening" process, the effective pool of donors (denoted by S) is:

$$S(\sum_{j=1}^{n} y_j) = \frac{1}{\Theta}(\sum_{j=1}^{n} y_j) \tag{47}$$

The effective pool of donors depends positively on total fundraising effort of the NGOs.

NGOs find themselves in both competition and co-operation. On one hand, they compete for neighboring donors, given the size of the donation market. On the other hand, they co-operate in awakening the "sleeping" donors and in increasing the size of the donation market.

By the same token as in the basic model, an NGO spending fundraising effort y_i will get (given that all other NGOs spend effort y):

$$D_i(y_i, y) = \frac{2}{n}\frac{y_i}{y + y_i} S(y_i + (n-1)y), \tag{48}$$

where $S(.)$ is the effective pool of donors determined by (47).

The NGO's funds devoted to the project are:

$$F_i(y_i) = (1-c)\frac{2}{n}\frac{y_i}{y + y_i} S(y_i + (n-1)y) - f. \tag{49}$$

4.2.1 Equilibrium fundraising effort and project impact

The problem of an NGO is the same as in the basic model. An NGO maximizes its' project impact, subject to (hard) non-distribution constraint (1). The first-order condition of the NGO, though, now changes to[10]:

$$\frac{1-c}{n}\left(2\frac{y}{(y+y_i)^2}S(y_i+(n-1)y)+\frac{2y_i}{y+y_i}\frac{\partial S}{\partial y_i}\right)(1-y_i)-$$
$$-\left[\frac{1-c}{n}\frac{2y_i}{y+y_i}S(y_i+(n-1)y)-f\right]=0. \tag{50}$$

At the symmetric equilibrium, $y_i = y$, and using (47), the first-order condition (50) reduces to:

$$\frac{1-c}{n}\left[\frac{n}{2\Theta}+\frac{1}{\Theta}\right](1-y)-(1-c)\frac{y}{\Theta}+f=0. \tag{51}$$

This implies that the equilibrium fundraising effort, $y^*(n,f,c,\Theta)$, is given by:

$$y^*(n,f,c,\Theta)=\frac{n+2}{3n+2}+\frac{2n}{3n+2}\frac{f\Theta}{1-c}. \tag{52}$$

Using (52), we can find the effective pool of donors in equilibrium, $S^*(n,f,c,\Theta)$:

$$S^*(n,f,c,\Theta)=\frac{1}{\Theta}(\sum_{j=1}^{n}y_j)=\frac{ny^*(n,f,c,\Theta)}{\Theta}, \tag{53}$$

and that the equilibrium project impact, $Q^*(n,f,c,\Theta)$:

$$\begin{aligned}Q^*(n,f,c,\Theta) &= \left[\frac{1-c}{\Theta}y^*(n)-f\right](1-y^*(n))\\ &= \frac{2n(n+2)}{(3n+2)^2}\left[\frac{1-c}{\Theta}-f\right]^2\frac{\Theta}{1-c}.\end{aligned} \tag{54}$$

As in the basic model, we can now analyze the comparative statics properties of the equilibrium. The following proposition summarizes the main results.

Proposition 6: We have:

$$\begin{aligned}\frac{\partial y^*}{\partial n} &< 0, \text{ and } \frac{\partial y^*}{\partial \Theta}>0\\ \frac{\partial S^*}{\partial n} &> 0 \text{ and } \frac{\partial S^*}{\partial \Theta}<0\\ \frac{\partial Q^*}{\partial n} &< 0 \text{ for } n\geq 2, \text{ and } \frac{\partial Q^*}{\partial \Theta}<0.\end{aligned} \tag{55}$$

[10]The second-order condition of this problem writes as:

$$\left[-\frac{4y}{(y+y_i)^3}S+\frac{4y}{(y+y_i)^2}\frac{\partial S}{\partial y_i}+\frac{2y_i}{y+y_i}\frac{\partial^2 S}{\partial y_i^2}\right](1-y_i)-2\left[\frac{2y}{(y+y_i)^2}S+\frac{2y_i}{y+y_i}\frac{\partial S}{\partial y_i}\right]\leq 0.$$

Proof: see Appendix[11].

For equilibrium fundraising effort y^*, the result differs from the basic model. Here, an increase in the number of NGOs n increases the total fundraising effort ny^* and therefore the size of the donations market. Everything else equal, this effect in turn increases the profitability of individial projects and the opportunity cost of undertaking fundraising for an individual NGO. In equilibrium, for the particular specification of the model, this effect overcomes the strategic substituability effect shown in the benchmark model.

Consider now the comparative statics on Θ. An increase in Θ means that the distribution of the "deafness" parameter θ becomes wider and flatter - i.e. there now exists some very "deaf" donors. Potential donors are more difficult to "awake" and less sensitive to total fundraising efforts by the NGO sector. In that case, as NGOs find it harder to get access to (endogenous) donations, competition in fundraising y^* becomes more intense.

An increase in n affects positively the equilibrium number of effective donors S^*. As discussed above, the equilibrium fundraising effort y^* decreases with n, but this reduction is over-compensated by a higher number of NGOs. Hence total fundraising effort ny^* increases and the number of effective donors is consequently enhanced. The impact of an increase in Θ on the donations market size S^* is, however, negative. Though a less "sensitive" donations market triggers a higher fundraising effort by each individual NGO, this increase is not strong enough to overcome the initial fact that donors are more amorphous to the idea of donating to NGOs.

An increase in n impacts negatively on $Q^*$when $n > 2$. This is the result of different effects combining co-operation and competition between NGOs. First, more NGOs on the market for donations imply, everything else being constant, a higher total fundraising. This, in turn, stimulates a higher volume of donations.

[11] Comparative statics with respect to c and f are the same as in the benchmark model.

Second, a larger number of NGOs induces a smaller equilibrium fundraising effort y^*. Hence, more time is allocated to projects, which increases the value of project impact. However, there is also the usual negative "business stealing" effect of an additional NGO on the existing ones. This tends to reduce the profitability of individual projects and therefore the opportunity cost of spending time for fundraising rather than for the project. For our parametrization, the latter effect dominates the other effects and an increase in n leads to a reduction of individual project impact.

Finally an increase in Θ leads to a decrease in equilibrium project impact. On one hand, more time is spent for fundraising (thus less time is left for the project). On the other hand, the donations to an NGO - and thus the available funds for the project - decrease with Θ. The donations to an NGO are $\frac{y^*}{\Theta}$. The denominator grows faster than the numerator, which has the slope in Θ less than one. In other words, as the distribution of donors becomes flatter, the fundraising effort increases, but not as fast as the reduction in the size of the potential market.

4.2.2 Free entry

Since the schedule $Q^*(n)$ is downward sloping, there exists a unique value of n that satisfies the usual free-entry condition, $\delta Q^*(n) = w$. Moreover (and as in the basic model), this equilibrium is stable.

Proposition 7. There exists a unique stable free-entry equilibrium n^* such that the condition

$$\delta \frac{2n^*(n^*+2)}{(3n^*+2)^2} \left[\frac{1-c}{\Theta} - f \right]^2 \frac{\Theta}{1-c} = w \tag{56}$$

is satisfied.

What does this imply for the total impact of NGO projects? One can easily show that

$$\frac{d\{nQ^*(n)\}}{dn} > 0, \tag{57}$$

i.e., the total impact is now *increasing* in the number of NGOs. In other words, the equilibirum impact elasticity with respect to the number of NGOs is less than one in absolute value, $|\varepsilon| < 1$.

Finally, we can perform comparative statics on the free-entry equilibrium number of NGOs. The novel one is with respect to Θ.

Proposition 8. The free-entry equilibrium number of NGOs, n^*, decreases with Θ for $n > 2$:

$$\frac{\partial n^*}{\partial \Theta} < 0 \ \text{ for } \ n > 2.$$

Proof: see Appendix.

Thus, as donors become "more deaf", fewer NGOs enter the market. Intuitively, when donors are more reluctant to donate, the competition for funds becomes more intense and the impact of each project is smaller. This induces fewer NGO entrepreneurs to enter the donations market.

4.3 Welfare

Note that now the total impact of NGOs increases with n:

$$Q^* + n\frac{dQ^*}{dn} > 0. \tag{58}$$

Furthermore, total fundraising effort also increases with n:

$$\frac{d(ny^*)}{dn} = y^* + n\frac{dy^*}{dn} > 0. \tag{59}$$

Given that the market size is endogenous, the number of donors is not fixed as in the basic model. Thus, the welfare of donors (both "awakened" and "sleeping" ones) now becomes:

$$\widetilde{W}^D = S(ny^*)W^D + (1 - S(ny^*)) = 1 + \frac{ny^*}{\Theta}\left(u(nQ^*) - \frac{t}{4ny^*} - 1\right). \tag{60}$$

As in the basic model, the social optimum requires:

$$\frac{dW}{dn} = \frac{d\widetilde{W}^D}{dn} + \frac{dW^B}{dn} + \frac{dW^N}{dn} = 0.$$

Using (60), this implies

$$\frac{dW}{dn} = \frac{dS}{dn}\left(W^D - 1\right) + \{S(n)u'(.) + v'(.)\}\left[\varepsilon - 1\right] - S(n)\frac{d\left(\frac{t}{4ny^*}\right)}{dn} + \\ + n\delta\frac{dQ^*}{dn} + \left[\delta Q^* - w\right] = 0. \quad (61)$$

The first term is the net increase in donors' welfare coming from a larger number of donors "awakened". The second term is the positive effect on the existing donors' and beneficiaries' welfare coming from a larger total impact of NGOs' projects (remember that this impact increases with n). The third term is the positive effect on donors' "transport" costs. The fourth term is the unique negative effect: the effect on NGO entrepreneurs' welfare coming from the negative externality they impose on each others' projects, as in the basic model. Finally the last term in square brackets is zero in the free-entry equilibrium.

It is again unlikely that the the free-entry equilibrium with endogenous market size delivers the socially optimal number of NGOs. Only when the positive effects on the market size, on the warm-glow welfare of donors, on the welfare of beneficiaries, and on the "transport costs" for donors *exactly* match the negative effect on the welfare of NGO entrepreneurs, one should get the market to deliver the socially optimal number of NGOs. Subsidizing or restricting entry as optimal policy will, in general, depend on the comparison of the different effects identified above. Noting that the only negative term in (61) depends on δ (the degree of altruism of donors), we can state the following proposition.

Proposition 9. If the NGO entrepreneurs have a low enough degree of altruism or the negative externality they impose on each other's projects is small enough, the free-entry equilibrium with endogenous market size delivers a number of NGOs *below* the socially optimal number.

Finally, given that the total project impact is increasing in n, the result regarding the welfare of beneficiaries is opposite to that of the basic model.

Proposition 10. An increase in the number of the NGOs with respect to the free-entry equilibrium with endogenous market size increases the welfare of beneficiaries.

5 Conclusion

Is competition between NGOs in the donation market good for welfare? Our results suggest that the answer crucially depends on how effective fundraising efforts are in attracting new donors. If fundraising is relatively ineffective in bringing in new donors, the basic model of Section 2 is a good description of reality. In such case, the competition between NGOs is bad for welfare and should be curbed.

However, is fundraising is relatively effective in awakening potential donors, we are closer to the model with endogenous market size in Section 4. Then, competition is good for welfare and should be fostered.

Second, does a more intense competition lead to a higher diversion of funds, as the quote from *The Economist* states? Our model in Section 3 suggests that it may. This depends on the level of the outside option of NGO entrepreneurs. If it is low enough, the competition between NGOs results in high diversion of funds. Crucially, this happens despite the NGOs care about the impact of their projects.

More generally, this paper shows that modelling the behaviour of development NGOs using the insights from industrial organization approach is a promising avenue of research. The challenge lies in setting up the assumptions of the model in function of the question that one addresses.

References

[1] Barla, N., and Pestieau, P. (2005). Optimal Number of Charities. Mimeo, University of Liège.

[2] Bilodeau, M. and Slivinski, A. (1997). "Rival Charities," *Journal of Public Economics* **66**: 449-467.

[3] Castaneda, M., Garen, J., and Thornton, J. (2004). "Competition, Commitment, and the Market for Donations," University of Kentucky, mimeo. Available at http://gatton.uky.edu/Faculty/castaneda/Research/index.html.

[4] Economides, N., and Rose-Ackerman, S. (1993). Differentiated Public Goods: Provatization and Optimality, Chapter 6 in *Does Economic Space Matter?*, H. Ohta and J.F. Thisse (eds.), St. Martin's Press, London.

[5] Pestieau, P., and Sato, M. (2006). Subsidizing or Limiting the Number of Charities. Mimeo, University of Liège.

[6] Rowat, C., and Seabright, P. (2006). "Intermediation by aid agencies," *Journal of Development Economics* **79**: 469-491.

[7] Salop, S. (1979). "Monopolistic Competition with Outside Goods," *Bell Journal of Economics* **10**: 141-156.

[8] Rose-Ackerman, S. (1982). "Charitable Giving and 'Excessive' Fundraising," *Quarterly Journal of Economics* **97**: 193-212.

6 Appendix

6.1 Proof of Lemma 1

The total project impact is

$$nQ^*(n) = n\left(\frac{1-c}{n} - f\right)(1 - y^*(n)) = (1 - c - fn)(1 - y^*(n)).$$

Deriving with respect to n, we get:

$$\begin{aligned}
\frac{d(nQ^*(n))}{dn} &= -f(1-y^*) + (1-c-fn)\left(-\frac{dy^*}{dn}\right) = \\
&= -f(1-y^*) + (1-c-fn)\left(-\frac{2f(1-c)}{[3(1-c)-2fn]^2}\right) \\
&= -f\left[(1-y^*) + \frac{(1-y^*)^2(1-c)}{2\,(1-c-fn)}\right] = -f(1-y^*)\left[1 + \frac{(1-y^*)\,(1-c)}{2\,(1-c-fn)}\right] \\
&= -f(1-y^*)\left[1 + \frac{1-c}{3(1-c)-2fn}\right] = -f(1-y^*)(1+y^*) \\
&= -f(1-(y^*)^2) < 0.
\end{aligned}$$

Thus, total project impact decreases with n^*.

On the other hand,

$$\varepsilon + 1 = \frac{n}{Q^*}\frac{dQ^*}{dn} + 1 = \frac{1}{Q^*}\left(n\frac{dQ^*}{dn} + Q^*\right) = \frac{1}{Q^*}\frac{d(nQ^*(n))}{dn} < 0.$$

Given that $\varepsilon < 0$, this implies that the absolute value of the elasticity of equilibrium project impact is larger than 1. **QED**.

6.2 Proof of Lemma 2

Applying the implicit finction theorem to the first-order condition (32), we get

$$\frac{\partial \widetilde{y_i}}{\partial n} = -\frac{\frac{\partial^2 \pi(n,y_i,y,G_i)}{\partial n \partial y_i}}{\frac{\partial^2 \pi(n,y_i,y,G_i)}{\partial y_i^2}} > 0, \tag{62}$$

given that

$$\frac{\partial^2 \pi(n, y_i, y, G_i)}{\partial n \partial y_i} = -\frac{2(1-c)}{n^2}\left[\frac{y(1-y_i)}{(y+y_i)^2} - \frac{y_i}{y+y_i}\right] = \frac{1}{n}\left[f + G_i\right] > 0. \tag{63}$$

Similarly,

$$\frac{\partial \widetilde{y}_i}{\partial G_i} = -\frac{\frac{\partial^2 \pi(n,y_i,y,G_i)}{\partial G_i \partial y_i}}{\frac{\partial^2 \pi(n,y_i,y,G_i)}{\partial y_i^2}} > 0, \tag{64}$$

as

$$\frac{\partial^2 \pi(n,y_i,y,G_i)}{\partial G_i \partial y_i} = 1 > 0. \tag{65}$$

Finally,

$$\frac{\partial \widetilde{y}_i}{\partial y} = -\frac{\frac{\partial^2 \pi(n,y_i,y,G)}{\partial y \partial y_i}}{\frac{\partial^2 \pi(n,y_i,y,G)}{\partial y_i^2}} > 0, \tag{66}$$

and

$$\text{sign}\left[\frac{\partial^2 \pi(n,y_i,y,G)}{\partial y \partial y_i}\right] = \text{sign}\left[y_i + y - 2y(1-y_i)\right] = \text{sign}\left[y_i - \frac{y}{1+2y}\right]. \tag{67}$$

Next, substituting $\frac{y}{1+2y}$ in (32), we find

$$(1-c)\frac{2}{n}\frac{y(1-\frac{y}{1+2y})}{\left(y+\frac{y}{1+2y}\right)^2} - (1-c)\frac{2}{n}\frac{\frac{y}{1+2y}}{y+\frac{y}{1+2y}} + f + G.$$

The sign of this expression is the same as that of

$$(1-c)\frac{1}{2n}\frac{1+2y}{y(1+y)} - (1-c)\frac{1}{n}\frac{1}{1+y} + f + G =$$
$$= (1-c)\frac{1}{n(1+y)}\left[\frac{1+2y}{2y} - 1\right] + f + G = (1-c)\frac{1}{n(1+y)}\frac{1}{2y} + f + G > 0.$$

Hence, given that the second-order condition holds for a maximum, this implies

$$\widetilde{y}_i(n,y,G) > \frac{y}{1+2y} \text{ for all } y,$$

and, therefore

$$\frac{\partial^2 \pi(n,y_i,y,G)}{\partial y \partial y_i} > 0,$$

which implies $\frac{\partial \widetilde{y}_i}{\partial y} > 0$.

Given that $\overline{G} + f < \frac{1-c}{n}$, it is also clear that $\widetilde{y}_i(n,0,G) = 0$ and $\widetilde{y}_i(n,1,G) < 1$. **QED.**

6.3 Properties of the threshold function $\overline{y}(n, G, \eta)$

6.3.1 The existence of $\overline{y}(n, G, \eta) < 1$ for η large enough

$\overline{y}(n, G, \eta)$ is the value of y such that $\widetilde{y}_i(n, y, G) = 1 - \eta$. From Lemma 2, $\widetilde{y}_i(1, 1, G) < 1$. Let η_0 be such that $1 - \eta_0 = \widetilde{y}_i(1, 1, G)$. Then for all $\eta > \eta_0$ and $n > 1$, we get than $\widetilde{y}_i(n, 1, G) > \widetilde{y}_i(1, 1, G) = 1 - \eta_0 > 1 - \eta$. Hence, as $\widetilde{y}_i(n, 0, G) = 0$ and $\widetilde{y}_i(1, y, G)$ is increasing in y, it follows that there exists, for all $\eta > \eta_0$ and $n > 1$, a unique value $y = \overline{y}(n, G, \eta) \in]0, 1[$ such that $\widetilde{y}_i(n, y, G) = 1 - \eta$.

6.3.2 Existence of threshold value η_G

Let us denote for convenience

$$y_0^*(n) = \frac{1-c}{3(1-c) - 2fn} \text{ and } y_G^*(n) = \frac{1-c}{3(1-c) - 2(f + \overline{G})n}.$$

The two functions are increasing in n for $n \in [0, \frac{3(1-c)}{2(f+\overline{G})}[$. Moreover, $y_0^*(1) < y_G^*(1) = \frac{1-c}{3(1-c)-2(f+\overline{G})} < 1$. The function $\overline{y}(n, G, \eta)$ is decreasing in n. Consider the function $\Phi(\eta) = \overline{y}(1, G, \eta)$, which is decreasing in η. Then, by definition of the threshold value η_0, $\Phi(\eta_0) = \overline{y}(1, G, \eta) = 1$. From $\widetilde{y}_i(1, 0, G) = 0$, it follows that $\Phi(1) = \overline{y}(1, G, 1) = 0$. Hence, there exists a unique value $\eta_G > \eta_0$ such that $\overline{y}(1, G, \eta_G) = y_G^*(1)$. For all $\eta \in]\eta_0, \eta_G[$, we have $\overline{y}(1, G, \eta) \in]y_G^*(1), 1[$.

6.4 Proof of Lemma 3

For simplicity, let us omit from now on the dependence on η. Differentiating $V(n, y, G) = \pi(n, \widetilde{y}_i(n, y, G), y, G)$ and using the envelope theorem, we get

$$\frac{\partial V}{\partial y} = \frac{\partial \pi(n, \widetilde{y}_i(n, y, G), y, G)}{\partial y} = -(1-c)\frac{2}{n}\frac{y_i}{(y + y_i)^2}(1 - y_i) < 0,$$

$$\frac{\partial V}{\partial G} = -(1 - \widetilde{y}_i(n, y, G)) + \eta,$$

and

$$\frac{\partial V}{\partial n} = \frac{\partial \pi(n, \widetilde{y}_i(n, y, G), y, G)}{\partial n} = -(1-c)\frac{2}{n^2}\frac{y_i}{(y + y_i)^2}(1 - y_i) < 0.$$

$\frac{\partial^2 V}{\partial G \partial y}$ has same sign as $-\frac{1}{\widetilde{y}_i} + \frac{1}{1-\widetilde{y}_i} + 2\frac{1}{y+\widetilde{y}_i} = \frac{2\widetilde{y}_i y + \widetilde{y}_i - y}{\widetilde{y}_i(1-\widetilde{y}_i)(y+\widetilde{y}_i)} = \frac{\widetilde{y}_i(2y+1)-y}{\widetilde{y}_i(1-\widetilde{y}_i)(y+\widetilde{y}_i)}$, and as $\widetilde{y}_i(n, y, G) > \frac{y}{1+2y}$. Thus, we get

$$\frac{\partial^2 V}{\partial G \partial y} > 0, \tag{68}$$

and similarly

$$\frac{\partial^2 V}{\partial G \partial n} > 0. \tag{69}$$

The solution for an individual NGO is

$$\begin{aligned} V(n, \overline{y}(n, \overline{G}), \overline{G}) &= \pi(n, \widetilde{y}_i, \overline{y}(n, \overline{G}), \overline{G}) \\ = \left[(1-c)\frac{2}{n}\frac{\widetilde{y}_i(n, \overline{y}(n, \overline{G}), \overline{G})}{\overline{y}(n, \overline{G}) + \widetilde{y}_i(n, \overline{y}(n, \overline{G}), \overline{G})} - f\right] &(1 - \widetilde{y}_i(n, \overline{y}(n, \overline{G}), \overline{G})) \\ &= \pi(n, 1-\eta, \overline{y}(n, \overline{G}), 0) \\ < \pi(n, \widetilde{y}_i(n, \overline{y}(n, \overline{G}), 0), \overline{y}(n, \overline{G}), 0) &= V(n, \overline{y}(n, \overline{G}), 0). \end{aligned}$$

Similarly,

$$\begin{aligned} V(n, \overline{y}(n, 0), 0) &= \pi(n, \widetilde{y}_i, \overline{y}(n, 0), 0) \\ = \left[(1-c)\frac{2}{n}\frac{\widetilde{y}_i(n, \overline{y}(n, 0), 0)}{\overline{y}(n, 0) + \widetilde{y}_i(n, \overline{y}(n, 0), 0)} - f\right] &(1 - \widetilde{y}_i(n, \overline{y}(n, 0), 0)) \\ &= \pi(n, 1-\eta, \overline{y}(n, 0), 0) \\ = \pi(n, 1-\eta, \overline{y}(n, 0), \overline{G}) &< V(n, \overline{y}(n, 0), \overline{G}). \end{aligned}$$

Hence, the curve $V(n, y, \overline{G})$ crosses once $V(n, y, 0)$ at some point $\widehat{y}(n, \overline{G})$, which is between $\overline{y}(n, \overline{G})$ and $\overline{y}(n, 0)$ as shown in Figure 5. Therefore, for $y < \widehat{y}(n, \overline{G})$, the NGO picks the optimal regime with $G = 0$ and $y_i = \widetilde{y}_i(n, y, 0)$, while for $y > \widehat{y}(n, \overline{G})$, it picks the optimal regime $G = \overline{G}$ and $y_i = \widetilde{y}_i(n, y, \overline{G})$. For $y = \widehat{y}(n, \overline{G})$, it is indifferent between the two regimes and a mixed strategy response is the outcome.The reaction curve of NGO i looks as depicted in Figure 2 in the main text. We get the comparative statics on $\widehat{y}(n, G)$ by simple differentiation:

$$\frac{\partial \widehat{y}(n, \overline{G})}{\partial n} = \frac{\frac{\partial V(n, \widehat{y}(n, \overline{G}), 0)}{\partial n} - \frac{\partial V(n, \widehat{y}(n, \overline{G}), \overline{G})}{\partial n}}{\frac{\partial V(n, \widehat{y}(n, \overline{G}), \overline{G})}{\partial y} - \frac{\partial V(n, \widehat{y}(n, \overline{G}), 0)}{\partial y}} < 0,$$

as from (68) and (69), respectively, we have $\frac{\partial V(n,\widehat{y}(n,\overline{G}),\overline{G})}{\partial y}-\frac{\partial V(n,\widehat{y}(n,\overline{G}),0)}{\partial y}>0$ and $\frac{\partial V(n,\widehat{y}(n,\overline{G}),0)}{\partial n}-\frac{\partial V(n,\widehat{y}(n,\overline{G}),\overline{G})}{\partial n}<0$. **QED**.

6.5 Proof of Proposition 4

Note that $\widehat{y}(n,\overline{G})$ is decreasing in n and that $y_0^*(n)$ and $y_G^*(n)$ are increasing in n and take infinite value, respectively, at $n=\frac{3(1-c)}{2f}$ and $n=\frac{3(1-c)}{2(f+\overline{G})}$. Given that for $\eta\in]\eta_0,\eta_G[$, $\widehat{y}(1,\overline{G})>\overline{y}(1,\overline{G})>y_G^*(1)>y_0^*(1)$, it follows that there exist n_0 and n_1 such that, respectively, $\widehat{y}(n_0,\overline{G})=y_G^*(n_0)$ and $\widehat{y}(n_1,\overline{G})=y_0^*(n_1)$. Also, given that $y_0^*(n)<y_G^*(n)$ for $n\geq 1$, we have $n_0<n_1$.

A pure strategy symmetric Nash equilibrium with no diversion of funds, $G^*=0$ (and, respectively, with full diversion, $G^*=\overline{G}$) provides the fundraising equililbrium effort $y_0^*(n)$ (respectively, $y_G^*(n)$) and exists if and only if $y_0^*(n)<\widehat{y}(n,\overline{G})$ (respectively, $\widehat{y}(n,\overline{G})<y_G^*(n)$). For $n<n_0$, $\widehat{y}(n,\overline{G})>y_G^*(n)>y_0^*(n)$. Hence, only the no diversion equilibrium exists in such case. For $n_0\leq n<n_1$, we have $y_G^*(n)\geq\widehat{y}(n,\overline{G})>y_0^*(n)$, and so the two equilibria with no diversion ($G^*=0$) and with full diversion ($G^*=\overline{G}$) exist. Finally, when $n_1\leq n$, $\widehat{y}(n,\overline{G})\leq y_0^*(n)<y_G^*(n)$. Hence, in this case only the full diversion equilibrium with ($G^*=\overline{G}$) exists. **QED**.

6.6 Free entry equilibria and Properties of Figure 4

We can find that

$$\frac{dV(n,y^*,G)}{dn}=\frac{\partial\pi(n,y_i^*,y_G^*,G)}{\partial n}+\frac{\partial\pi(n,y_i^*,y_G^*,G)}{\partial y^*}\frac{dy_G^*}{dn}<0,$$

as $\frac{\partial\pi(n,y_i^*,y_G^*,G)}{\partial n}<0$, $\frac{\partial\pi(n,y_i^*,y_G^*,G)}{\partial y^*}<0$ and $\frac{dy_G^*}{dn}>0$.

Also,

$$\begin{aligned}\frac{dV(n,y^*,G)}{dG} &= \frac{\partial\pi(n,y_i^*,y_G^*,G)}{\partial G}+\frac{\partial\pi(n,y_i^*,y_G^*,G)}{\partial y^*}\frac{dy_G^*}{dG}<0\\ &= \eta-1+y_G^*-\frac{1-c}{2n}\frac{dy_G^*}{y_G^*dG}.\end{aligned}$$

However,

$$\frac{dy_G^*}{y_G^* dG} = \frac{2n}{3(1-c) - 2(f+G)n} = \frac{2n}{1-c} y_G^*,$$

and thus

$$\frac{dV(n, y^*, G)}{dG} = \eta - 1 + y_G^* - y_G^* = \eta - 1 < 0.$$

The last thing to prove in order to describe fully Figure 4 is to show that

$$V(n_0, y_G^*(n_0), \overline{G}) > V(n_1, y_0^*(n_1), 0)$$

(namely that point A is above point B on Figure 4). Note that

$$y_G^*(n_0) = \widehat{y}(n_0, \overline{G}) = \widetilde{y}_i(n_0, \widehat{y}(n_0, \overline{G}), \overline{G}) < \widetilde{y}_i(n_0, \overline{y}(n_0, \overline{G}), \overline{G}) = 1 - \eta.$$

The first equality comes from the definition of n_0, the second - from the definition of a symmetric Nash equilibium, and the last - from the definition of $\overline{y}(n_0, \overline{G})$. Similarly,

$$y_0^*(n_1) = \widehat{y}(n_1, \overline{G}) = \widetilde{y}_i(n_1, \widehat{y}(n_1, \overline{G}), 0) > \widetilde{y}_i(n_1, \overline{y}(n_1, 0), 0) = 1 - \eta.$$

Now

$$\begin{aligned} V(n_0, y_G^*(n_0), \overline{G}) &= V(n_0, \widehat{y}(n_0, G), G) = V(n_0, \widehat{y}(n_0, G), 0) \\ &> V(n_0, 1-\eta, 0) > V(n_1, 1-\eta, 0) \\ &> V(n_1, \widetilde{y}_i(n_1, \widehat{y}(n_1, \overline{G}), 0), 0) \\ &= V(n_1, \widehat{y}(n_1, \overline{G}), 0) = V(n_1, y_0^*(n_1), 0) \end{aligned}$$

Proposition 5 follows from simple inspection of Figure 4. **QED.**

6.7 Proof of Proposition 6

Differentiation of (52) gives

$$\frac{\partial y^*}{\partial n} = \frac{4}{(3n+2)^2}\left(\frac{f\Theta}{1-c} - 1\right) < 0,$$

since we need to assume that $\frac{1-c}{\Theta} > f$ (to be consistent with $y^*(n, f, c) < 1$).

Also,

$$\frac{\partial y^*}{\partial \Theta} = \frac{2n}{3n+2}\frac{f}{1-c} > 0.$$

For the effective pool of donors S^*, we have:

$$\begin{aligned}
\frac{\partial S^*}{\partial n} &= \frac{1}{\Theta}\left[n\frac{\partial y^*}{\partial n} + y^*\right] \\
&= \frac{1}{\Theta}\left[-\frac{4n}{(3n+2)^2}(1-\frac{f\Theta}{1-c}) + \frac{n+2}{3n+2} + \frac{2n}{3n+2}\frac{f\Theta}{1-c}\right] \\
&= \frac{1}{\Theta(3n+2)^2}\left[n(6n+8)\frac{f\Theta}{1-c} + (3n^2+4n+4)\right] > 0,
\end{aligned}$$

while

$$\frac{\partial S}{\partial \Theta} = n\frac{\partial\left(\frac{y^*(\Theta)}{\Theta}\right)}{\partial \Theta} = -n\frac{n+2}{3n+2}\frac{1}{\Theta^2} < 0.$$

Finally, from

$$Q^* = \frac{2n(n+2)}{(3n+2)^2}\left[\frac{1-c}{\Theta} - f\right]^2\frac{\Theta}{1-c},$$

we get

$$\frac{\partial Q^*}{\partial n} = -\frac{4(n-2)}{(3n+2)^2}\frac{\Theta}{1-c}\left[\frac{1-c}{\Theta} - f\right]^2 < 0,$$

and

$$\frac{\partial Q^*}{\partial \Theta} = -\frac{2n(n+2)}{(3n+2)^2}\left(\frac{1-c}{\Theta} - f\right)\left(\frac{1}{\Theta} + \frac{f}{1-c}\right) < 0.$$

6.8 Proof of Proposition 8

The free-entry condition

$$Q^* - \frac{w}{\delta} = \frac{2n^*(n^*+2)}{(3n^*+2)^2}\left[\frac{1-c}{\Theta} - f\right]^2\frac{\Theta}{1-c} - \frac{w}{\delta} = 0$$

implicitly defines the equilibrium number of NGOs, n^*. Using the implicit function theorem, we find

$$\frac{\partial n^*}{\partial \Theta} = -\frac{\partial Q^*/\partial \Theta}{\partial Q^*/\partial n^*}.$$

$\partial Q^*/\partial \Theta$ has been derived above. The denominator is

$$\frac{\partial Q^*}{\partial n^*} = -\frac{4(n-2)}{(3n+2)^2}\frac{\Theta}{1-c}\left[\frac{1-c}{\Theta} - f\right]^2.$$

Thus the final expression is

$$\frac{\partial n^*}{\partial \Theta} = -\frac{n(n+2)(3n+2)(1-c+f\Theta)}{2\Theta(n-2)(1-c-f\Theta)},$$

which is negative for $n > 2$. **QED.**

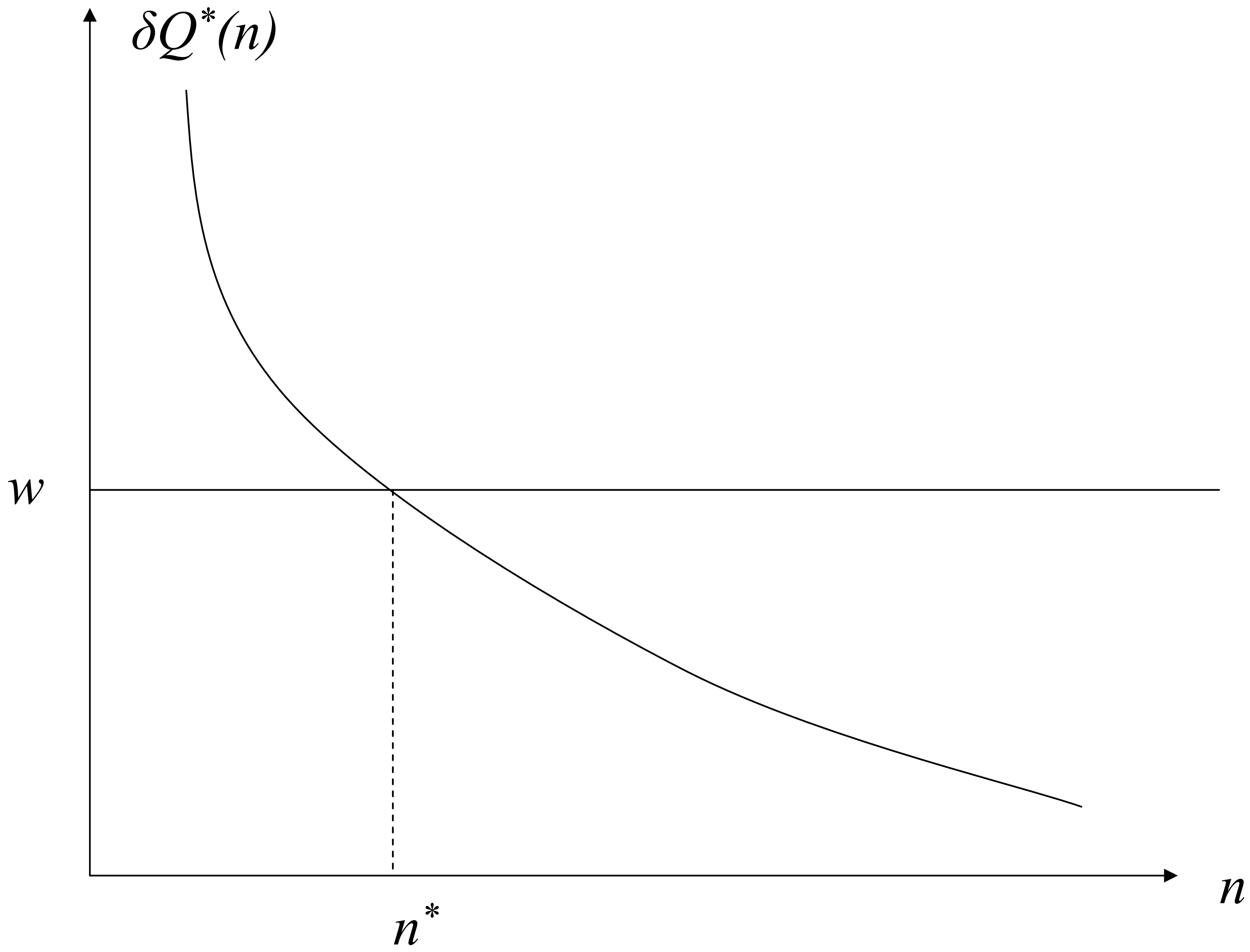

Figure 1. Free-entry equilibrium in the benchmark model

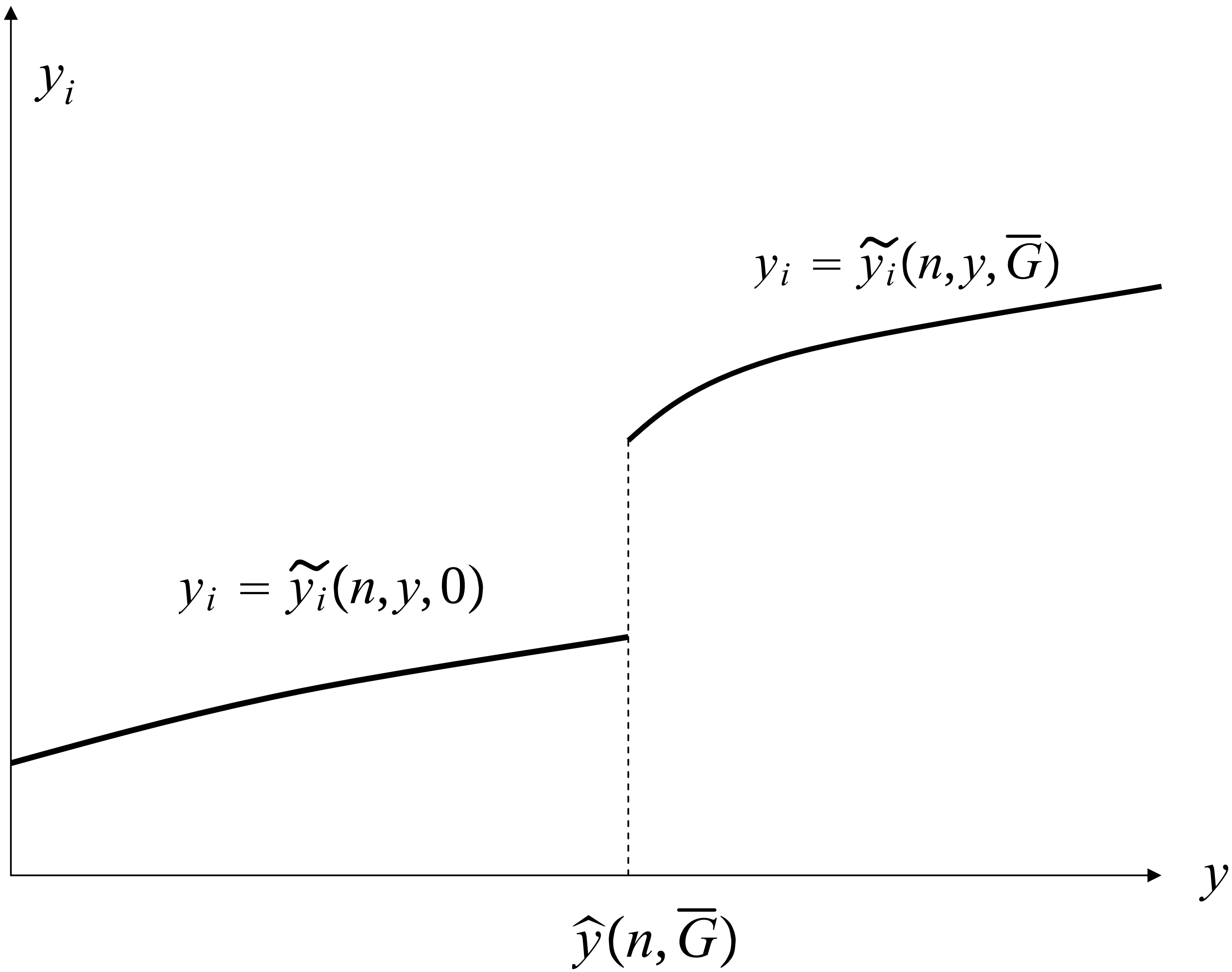

Figure 2. Reaction curve with soft non-distribution constraint

Figure 3A. No diversion equilibrium

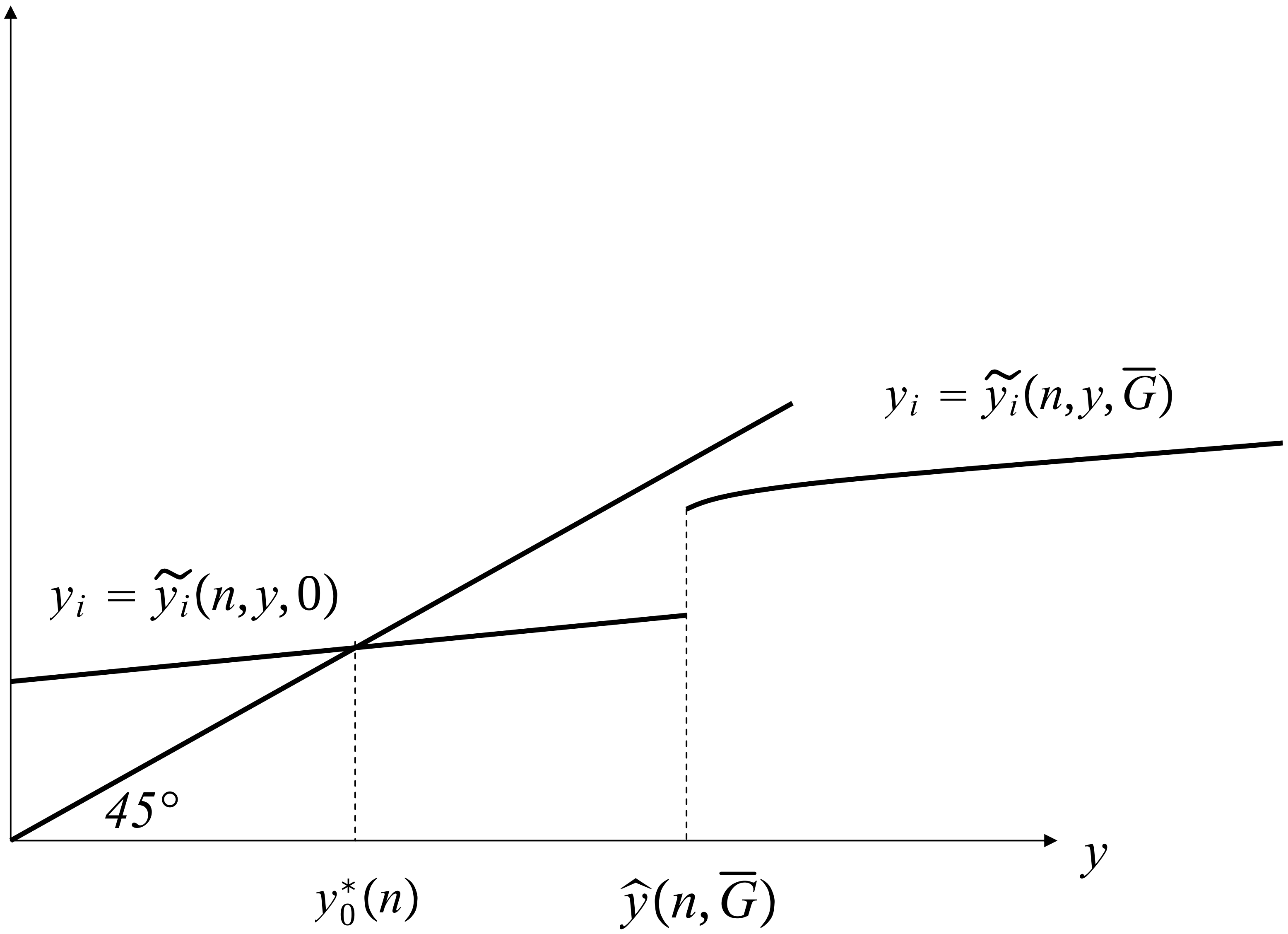

Figure 3B. Multiple equilibria

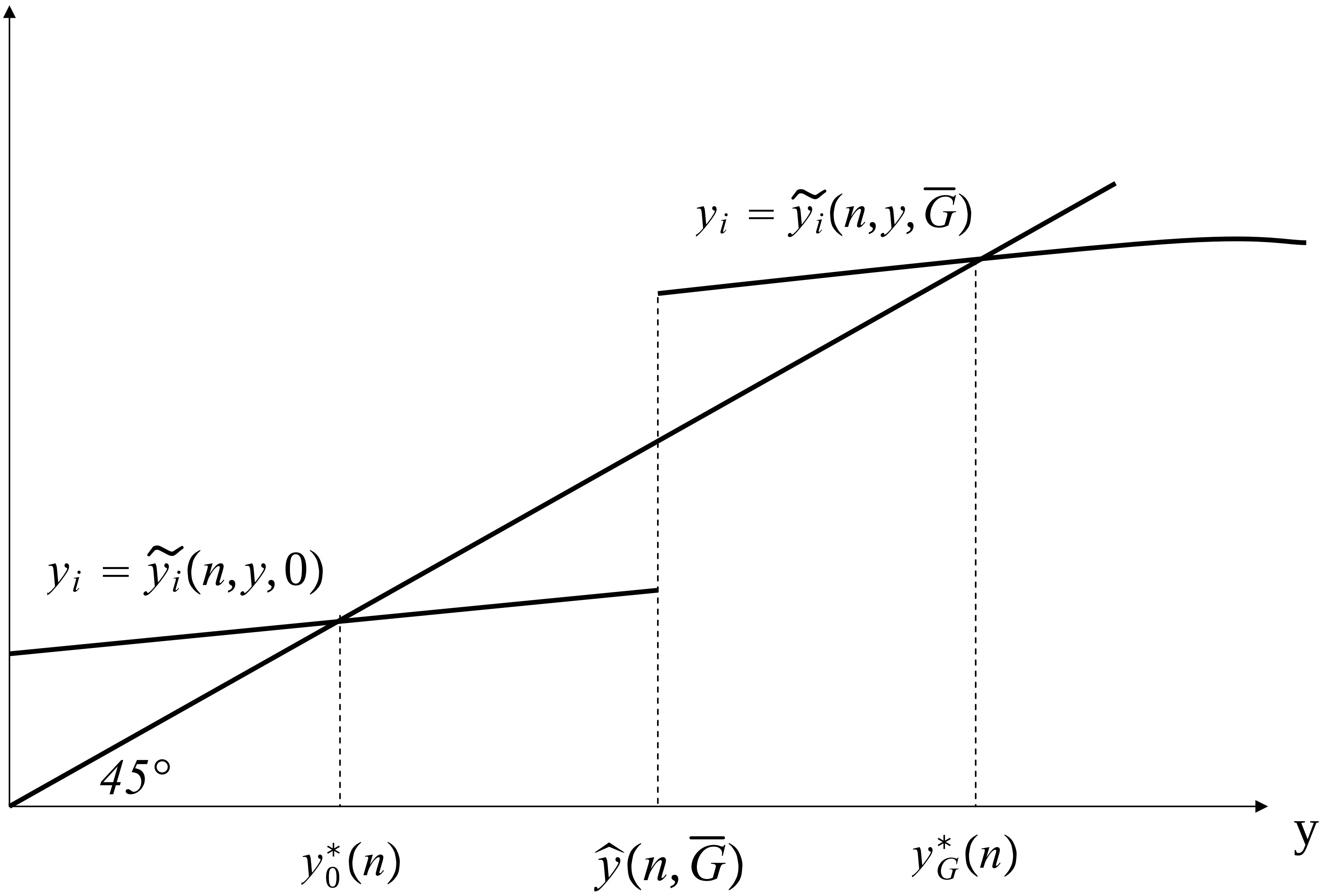

Figure 3C. Full diversion equilibrium

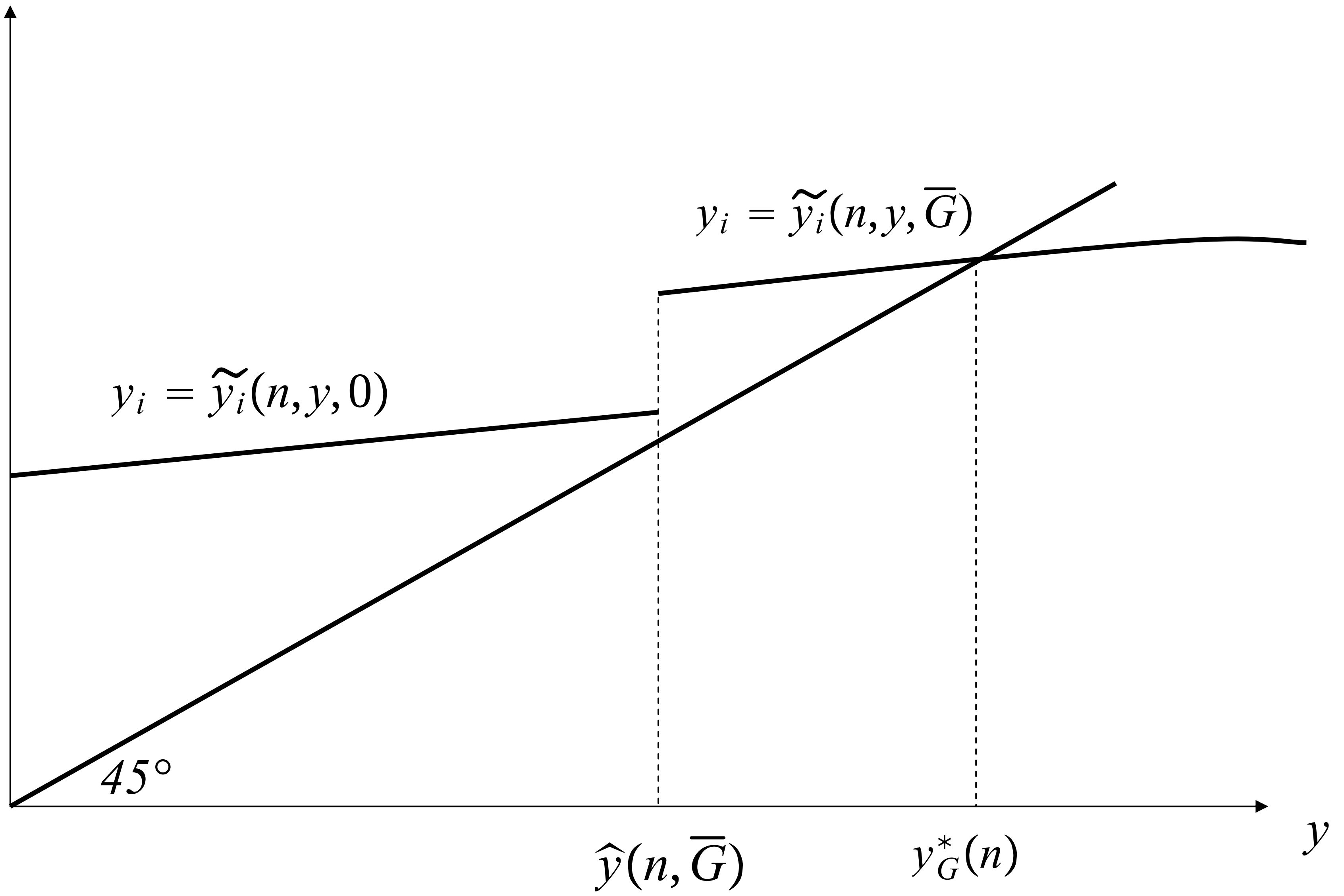

Figure 4. Free entry equilibria

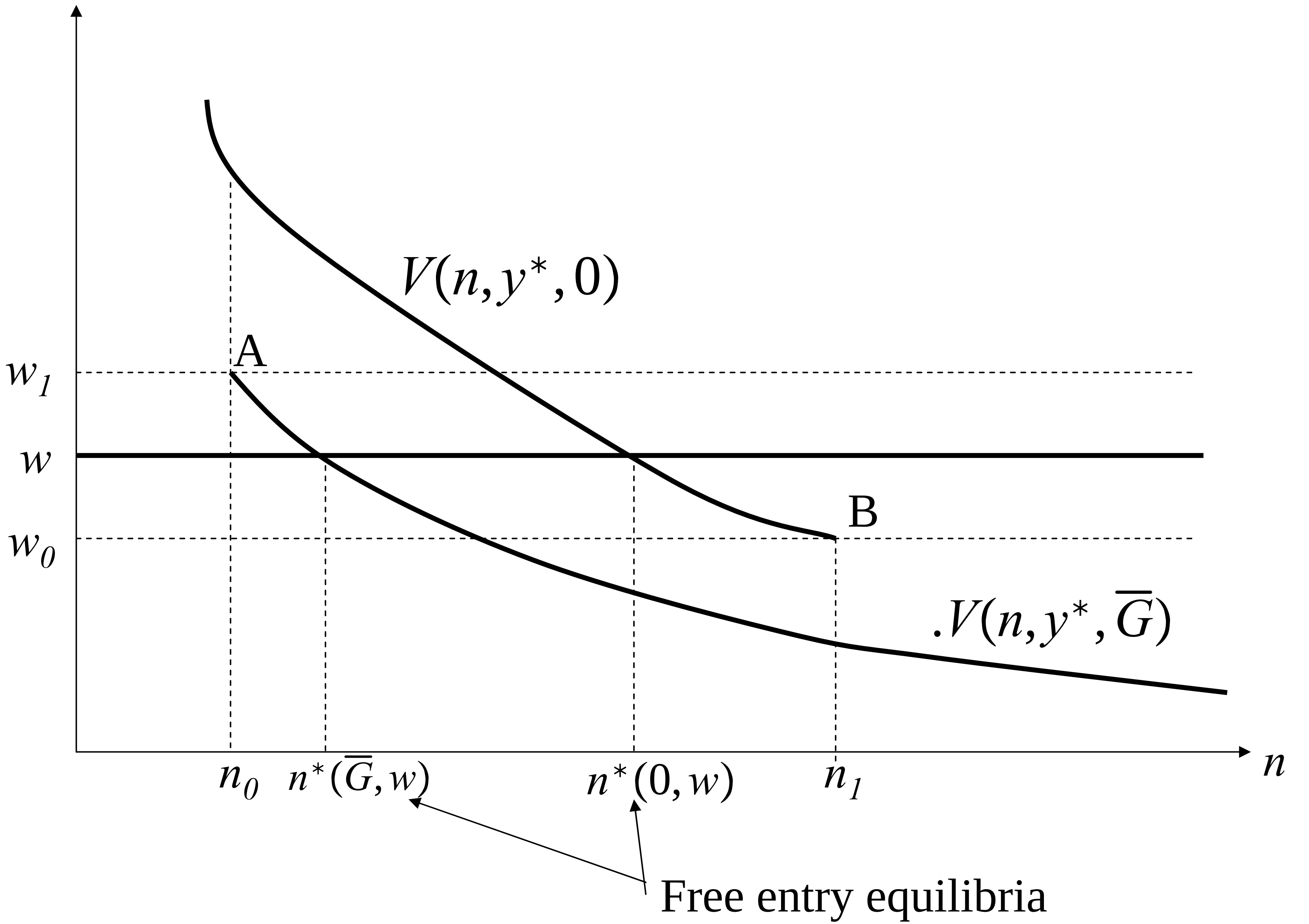

Figure 5. Shape of curves $V(n, y, G)$