연세경제연구 제 Ⅷ 권 제 1 호
Yonsei Economic Studies, Vol. Ⅷ, No. 1 (March 2001)

Charities, Fundraising Contests and Government Grants

Sanghack Lee · Francisco Garcia-Sobrecases

This paper examines the fundraising contest between charity organizations when matching grants are given to one of them. This paper derives a Nash equilibrium fund raised in the contest and then compares it to the socially optimal level. Depending upon the extent of externalities associated with fundraising activities, the Nash equilibrium fund raised in the contest can be greater than, equal to, or smaller than the social optimum. The paper also discusses the possibility of designing the matching mechanism with which the Nash equilibrium corresponds to the socially optimal level.

I. Introduction

The purpose of this paper is to examine the fundraising contest that takes

International Trade Division, School of Economics, Kookmin University, Seoul 136-702, Korea and Department of Applied Economics, University of Valencia, 46022, Valencia, Spain, respectively.

Part of this paper was written when both authors visited Center for Study of Public Choice, George Mason University. The authors wish to thank the hospitality of the researchers and staffs of the Center. Research of the first author was financially supported by Kookmin University. The authors are also grateful to seminar participants at the 1999 Public Choice Society meeting held in New Orleans, Louisiana (USA) for their valuable comments and suggestions. The usual disclaimer applies.

place between charity organizations when the government gives matching grants to one of them. Much attention has been paid to incentives of individuals to voluntarily contribute to the provision of public goods. Examples of important contributions to this area of study include Andreoni [1], [2], [3], Bergstrom, Blume and Varian [4] and Warr [11]. However, relatively little attention has been paid to competition between charity organizations and the supply side of the voluntary contribution. Charity organizations compete for private donations. As Bilodeau and Slivinski [5] have shown, these organizations do not wait for voluntary contributions. They often raise voluntary contributions from the same pool of donors. In this situation a crowding-out effect of fundraising arises as charities compete for the same source of income. This paper examines the role of government matching grant when the fundraising contest between charity organizations generates positive externalities.

This paper is organized as follows. Section Ⅱ sets out the model of charity contest in which the government gives matching funds to one of the charity organizations. As fundraising is costly, rational charities would try to maximize net fundraising, i.e., total fundraising minus the costs of fundraising. Fundraising activities are assumed to generate positive externalities. We derive a Nash equilibrium solution of fundraising and, then, compare this to the social optimum. Section Ⅲ offers concluding remarks.

Ⅱ. The Simple Model of Charity Contest

In this section we set up a simple model of contest among charity organizations for voluntary contributions when the government gives matching grants. As in our companion paper (Garcia-Sobrecases and Lee [6]), we assume that the charities generate externalities through their activities financed by fundraising and government grants.

Many papers in the literature have focused on incentives of individuals for voluntary contribution. This paper complements the existing literature by focusing on the supply-side of voluntary giving. That is, we focus on rivalry between charity organizations. We model the rivalry among the charities as a contest to win the government grant. The government is assumed to grant matching funds to one of the charities. This type of resource allocation by governments is frequently observed in the real world. For example, governments often distribute research grants among research institutions and universities. To obtain the grants, however, the universities and research institutions should win the contests for such grants.

There are N charity organizations. We focus on the fundraising activity of charity organizations. Thus, we abstract from individual incentives to contribute to charities. The amount of voluntary contribution raised by charity i is denoted x_i, for $i=1,2,3,\cdots,N$. Denote by $X(=\sum_i x_i)$ the aggregate fund raised by all the charities. Let X_{-i} denote $X-x_i$. We assume identical individual preferences for all donors. Donors are not concerned as to whether these charities focus on the arts, education, social welfare, or health care programs. In other words, there are no strategic behaviors of the individuals trying to increase the amount received by certain types of charities that they prefer at the expense of the rest of them. In this sense, this paper is different from Bilodeau and Slivinski [5].

All the charities have an identical cost function. Let $G(x_i, X_{-i})$ denote the total cost of fundraising of charity i. Specifically $G(\, , \,)$ is assumed to be given by a product form

$$G(x_i, X_{-i}) = g(x_i) f(X_{-i})$$

Thus, the total cost of fundraising is determined by the level of one's own fundraising, $g(x_i)$, and by the level of aggregate fundraising of the other charities, $f(X_{-i})$. $G(x_i, X_{-i})$ is further assumed to satisfy the following assumptions :

A1 $g'(x_i) = dg(x_i)/dx_i > 0$

$f'(X_{-i}) = df(X_{-i})/d(X_{-i}) > 0$

A2 $g''(x_i) > 0, \quad f''(X_{-i}) > 0$

A3 $\lim_{x_i \to 0} g'(x_i) = 0, \quad \lim_{X_{-i} \to 0} f'(X_{-i}) = 0,$ and

A4 $g(0) = 0$

The assumptions A1 to A4 are easy to understand. The fundraising cost is zero when a charity does not raise any fund, (A4). To obtain more funds, the charities should incur more costs, (A1). Crowding-out in fundraising is also modeled into the cost function. The fundraising cost of a given amount increases as the other charities raise more funds. Of course, costs of fundraising grow slower when the voluntary contributions are small. Let G_i denote the partial derivative of $G(\, , \,)$ with respect to the $i-th$ argument. Then, it is easy to find that

$$G_1 = g'(x_i) f(X_{-i}) > 0$$
$$G_2 = f'(X_{-i}) g(x_i) > 0$$
$$G_{11} = g''(x_i) f(X_{-i}) > 0$$
$$G_{12} = g'(x_i) f'(X_{-i}) > 0, \quad \text{and}$$
$$G_{22} = g(x_i) f''(X_{-i}) > 0$$

⟨The matching grant of government⟩

We now consider the contest between charities for government grants.[1] The government gives grant S to one of the charities. Following Tullock [10], the probability that charity i obtains the government grant is given by a logit-form

$$\Pi_i = (x_i/X)$$

The grant(prize) is assumed to be an additional source of income for charities to carry out their activity. The higher the level of funds raised by the charity, the greater the chance to win the prize. In this sense, the prize encourages the charity organizations to be more active in their fundraising. Specifically, the prize is given by

$$S = (X/N)\delta$$

Note that the role of government is parameterized by δ. The government gives the prize that is δ times the average fund raised. In the case $\delta=1$, one of the charities would receive a prize of the same amount as the fund it has raised. That is, the equal matching fund is given to one of them.

If charity i receives the prize, it spends x_i+S on its own activity. The objective of the risk-neutral charity i is to maximize the expected value of the prize plus the funds raised minus the cost, V_i, given by

$$\begin{aligned} V_i &= \Pi_i[x_i + S - g(x_i)f(X_{-i})] \\ &\quad + (1-\Pi_i)[x_i - g(x_i)f(X_{-i})] \end{aligned} \tag{1}$$

Substituting π_i and S into (1), we obtain

---

1) Nitzan [9] offers a survey of recent literature on the theory of contest.

$$V_i = (x_i/X)[x_i + (X/N)\delta - g(x_i)f(X_{-i})] + (1-(x_i/X))[x_i - g(x_i)f(X_{-i})] \quad (2)$$

Rearranging (2), the objective of charity i is rewritten as

$$Max\ V_i = (x_i/N)\delta + x_i - g(x_i)f(X_{-i}) \text{ with respect to } x_i \quad (3)$$

At an interior solution, the following first-order condition is satisfied.

$$\partial V_i/\partial x_i = \delta/N + 1 - g'(x_i)f(X_{-i}) = 0 \quad (4)$$

Thus, utilizing symmetry, it follows that

$$g'(X/N)f((N-1)X/N) = \delta/N + 1 \quad (5)$$

Eq. (5) shows implicitly the relationship between the government policy parameter δ and the total fund raised, X. For the effect of government policy on total fund raising, we obtain

PROPOSITION 1 An increase in δ increases the total fund raised X. That is, $dX/d\delta > 0$.

proof Total differentiation of Eq. (5) and rearrangement gives

$$d\delta/N = g''dXf((N-1)X/N)/N + g'f'dX$$
$$= (g''f/N + (N-1)g'f'/N)dX$$

Thus, $dX/d\delta = 1/(g''f + (N-1)g'f') > 0$.

We now compare this level of voluntary contributions with the socially optimal level. As in Lee [7], Lee and Kang [8] and Garcia-Sobrecases and Lee [6], we assume that activities of raising voluntary contributions and spending them generate positive externalities to society. For example, they may reduce class tension, increase social stability, reduce crime, and so on. These externalities should be suitably accounted for when examining social welfare. Specifically, we postulate a social welfare function given as follows:

$$W = h(X) - \sum_i g(x_i) f'(X_{-i})$$

where $h(X)$ represents the externalities the charities generate through fundraising and spending. Notice that fundraising costs are suitably considered in the definition of social welfare. This definition of social welfare is general enough to encompass all these possibilities. We adopt the following assumptions on $h(\ )$.

A5 $h'(X) > 0$

A6 $h''(X) \leq 0$

A7 $\lim_{X \to 0} h'(X) = \infty$

A8 $h(0) = 0$

The meanings of these assumptions are easy to understand. When there is no fundraising effort and therefore donations are zero, no externalities are generated.

Utilizing symmetry, W is rewritten as

$$W = h(X) - Ng(X/N)f((N-1)X/N) \tag{6}$$

The socially optimal level of fundraising efforts X^* maximizes $W = h(X) - Ng(X/N)f((N-1)X/N)$. The first-order condition for maximization of W is

$$\begin{aligned} \partial W/\partial X = & \; h'(X) - [g'(X/N)f((N-1)X/N) \\ & + (N-1)g(X/N)f'((N-1)X/N)] = 0 \end{aligned} \tag{7}$$

In Eq. (7), $h'(X)$ denotes the marginal social benefit of fundraising, whereas the terms between brackets denote the marginal social cost of fundraising. Thus, the first term is the direct marginal cost of fundraising. The second term in the bracket is the indirect marginal cost of fundraising. With a given number N of charities, Eq. (7) implicitly defines the social optimum X^*.

We now compare the amount of the Nash equilibrium fundraising X^N with the social optimum X^*. The social optimum indicates that the marginal social cost of fundraising must be equal to the marginal social benefit of fundraising. At the social optimum,

$$\begin{aligned} h'(X^*) = & \; g'(X^*/N)f((N-1)X^*/N) \\ & + (N-1)f'((N-1)X^*/N)g(X^*/N) \end{aligned} \tag{8}$$

On the other hand, at the Nash equilibrium we observe that

$$g'(X^N/N)f((N-1)X^N/N) = \delta/N + 1 \tag{9}$$

Inserting Eq. (9) into Eq. (7) we find that at the Nash equilibrium

$$\partial W/\partial X = h'(X) - [\delta/N + 1 + (N-1)g(X/N)f'((N-1)X/N)]$$

which can be either positive or negative. This ambiguity is quite natural since the Nash equilibrium is not related to the curvature of $h(X)$. Reaching the social optimal level of voluntary contribution (denoted by X^*) indicates that all the externalities have been internalized, so we can argue that a government policy towards increasing these contributions is fully justified. A higher δ would indicate a larger prize S as to increase fundraising and sustain this social optimal level X^*. On the other hand, the expression (9) can also be either positive or negative. However, the government policy can induce the Nash equilibrium to converge to the social optimal level by adjusting the value of δ. That is, δ can be suitably chosen so that, rearranging the last expression, at the Nash equilibrium the following is observed,

$$\begin{aligned} \partial W/\partial X &= h'(X) - [g'(X/N)f((N-1)X/N) \\ &\quad + (N-1)g(X/N)f'((N-1)X/N)] \qquad (10) \\ &= h' - \delta/N - 1 - (N-1)f'g = 0 \end{aligned}$$

By solving Eq. (10) for δ, we obtain

$$\delta^* = N(h' - 1 - (N-1)f'g) \qquad (11)$$

Note that δ^* is unique. If the government sets the prize, S, equal to $(X^N/N)\delta^*$, then the Nash equilibrium is identical to the social optimum. At this point, the prize may also be expressed as follows,

$$\begin{aligned} S &= (X^N/N)\delta^* \\ &= (X^N/N)[N(h' - 1 - (N-1)f'g)] \\ &= X^N[h' - (1 + (N-1)f'g)] \end{aligned}$$

The prize established by the government will depend not only on the amount of the voluntary contribution X^N, but also on the increase of the externalities (h'), marginal social benefits, and the rate of increase of aggregate cost of fundraising $(1 + (N-1)f'g)$. As shown in expression (11) the optimal level of government performance for encouraging charity organizations to increase fund raising will be determined by the increasing rates of externalities and real costs. We can then observe three different scenarios:

In the first place, when $h' > (N-1)f'g + 1$, the externality created by the charities is strong enough to guarantee a positive prize. The government should set a positive prize $(S > 0)$ to encourage a higher level of fundraising. To reach this aim we expect an active government performance as derived from expression (11), in which $\delta^* > 0$.

In the second place, when $h' = (N-1)f'g + 1$, we observe that at Nash equilibrium externalities increase at the same rate as aggregate fundraising costs. In other words, there is no net increase in social benefits of fundraising activity since the increase in the fundraising cost to obtain these voluntary contributions offsets the expansion of the externalities. We can argue that the charity is functioning as a maximizing private firm in which the government's role is not justified. That is, as derived from expression (11), $\delta^* = 0$.

In the third place, when $h' < (N-1)f'g + 1$, i.e., when the increase in externalities is lower than the rate of increase in fundraising costs, a positive government role is not justified, as derived from expression (11) where δ is negative. This indicates that, instead of a prize, the government should penalize the charities. In fact, no social benefits are created since the fundraising costs to capture voluntary contributions create negative external effects.

Ⅲ. Concluding Remarks

This paper has developed a simple model of a fundraising contest between charity organizations. While much attention has been paid to incentives of individuals to contribute voluntarily to public goods, little attention has been paid to the fact that there exists competition between suppliers of public goods. One of the purposes of this paper is to show that competition between charities indeed exists. Governments can either encourage or discourage competition between the charity organizations. This paper offers a simple model to examine the incentives of charities to raise voluntary contributions.

▣ *REFERENCES* ▣

1. Andreoni, J., "Privately Provided Public Goods in a Large Economy: The Limits of Altruism," *Journal of Public Economics*, 35, 1988, pp. 57～73.
2. _______, "Impure Altruism and Donations to Public Goods: A Theory of Warm Glow Giving," *The Economic Journal*, 100, 1990, pp. 464～477.
3. _______, "An Experimental Test of the Public Goods Crowding-out Hypothesis," *American Economic Review*, 83, 1993, pp. 1317～1327.
4. Bergstrom, T., Blume, L. and H. Varian, "On the Private Provision of Public Goods," *Journal of Public Economics*, 29, 1986, pp. 25～49.
5. Bilodeau, M. and A. Slivinski, "Rival Charities," *Journal of Public Economics*, 66, 1997, pp. 449～467.
6. Garcia-Sobrecases, F. and S. Lee, "Art, Museums and Contests: Private vs. Public Provision," *Seoul Journal of Economics*, 13(1), 2000, pp. 1～19.
7. Lee, S., "Contests with Externalities," *Seoul Journal of Economics*, 13(2), 2000, pp. 123～134.
8. ________ and J. H. Kang, "Collective Contests with Externalities," *European Journal of Political Economy*, 14, 1998, pp. 727～738.
9. Nitzan, S., "Modelling Rent-seeking Contests," *European Journal of Political Economy*, 10, 1994, pp. 41～60.
10. Tullock, G., "Efficient Rent Seeking," In J. M. Buchanan, R. D. Tollison and G. Tullock (Eds.), *Toward a Theory of the Rent-seeking Society*, College Station:

Texas A&M University Press, 1980, pp. 97~112.

11. Warr, P. G., "The Private Provision of Public Good is Independent of the Distribution of Income," *Economics Letters*, 13, 1983, pp. 207~211.