

The Profit-maximizing Non-profit

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Abstract

Consider an organization that solicits private contributions, which will partly be used to provide a public good. The organization's goal is to maximize its profits, namely the difference between aggregate contributions and the amount it spends on providing the public good. An equilibrium exists in which many persons contribute, each contributor enjoys zero consumer surplus from contributing, and the organization takes as a profit the contributions of all but one donor. Such behavior by the organization is consistent with incomplete crowding out of governmental grants. Furthermore, when the organization is constrained to spend at least a fraction of all contributions on the public good, it can have an incentive to produce inefficiently.

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1 Introduction

A dominant assumption in the theory of the private provision of public goods is that voluntary contributions sum to the aggregate amount of the public good provided. This model has interesting features: income redistribution among contributors affects neither consumption of the private good nor aggregate provision of the public good, and only the rich contribute. The standard model also implies that governmental contributions of the public good are fully offset by private agents contributing less (Warr 1982, 1983; Bernheim 1986; Bergstrom, Blume, and Varian 1986). The result on perfect crowding out is theoretically robust, with strong policy implications regarding the desirability of government intervention for the provision of public goods.

The full crowding out result, however, is not verified by empirical observations. A study of three hundred British charities found no significant evidence that public donations crowded out private donations, (Posnett and Sandler 1989); other studies in the U.S. find that crowding out is only partial (Steinberg 1989), with an additional governmental dollar spent on charity crowding out only 28 cents (Abrams and Schmitz 1978).

Such evidence led some theorists to suppose that donations enter directly into a person's utility function (see, e.g., Andreoni 1989). Crowding out will also be reduced if provision of the public good involves discontinuities or if tax subsidies for contributions are discontinuous (see Glazer and Konrad 1993).

Moreover, studies of organizations receiving private contributions usually assume that the organization spends all the money either on fund-raising, or on fixed costs necessary to provide the public good, or on the public good. Not considered is the possibility that the leader of the organization may steal the money, or use it for purposes not favored by the contributors.

Consider some counter-examples. American University (a non-profit) dismissed its president, Ben Ladner, after his profligate spending was revealed. He had used university money on a French chef, on weekends abroad, and on extravagant parties for friends and family. The university paid for an estimated \$200,000 in renovations and improvements on the president's house; landscape designers created a waterfall and pond behind the patio at a cost of about \$30,000. On a two-day trip to London, the president and his wife billed the university \$2,352 for hotel, and \$2,513 for other expenses, including a car and driver. A personal chef was paid \$88,000 annually by the university. This was on top of annual compensation of over a \$800,000.¹

In 2007 the president of the private (non-profit) Adelphi University was fired. His compensation was over \$800,000, plus \$2 million in retirement entitlements. The president's official residence on the edge of the campus was a Tudor house with maid service. The university had also bought a \$1.2 million Manhattan condominium for his use, spending \$196,275 to upgrade and furnish it, including an electrified system to melt snow on the terrace and \$1,800 for towel racks and soap dishes.²

¹Harry Jaffe (2006) "Ben Ladner's years of living lavishly," *Washingtonian*, April 1.

²Bruce Lambert, "University enjoys a renaissance after 90's strife." *New York Times*,

William Aramony, who built the United Way of America into an empire of charitable giving during his 20 years as its president, was jailed in 1995 for defrauding the organization of more than \$1 million. Among other abuses, he had used United Way funds to pay for extramarital affairs, and craps games in Las Vegas. The United Way paid more than \$90,000 for his limousine.³

Misuse of contributions can also arise when they are not used for the purposes contributors intended. In 1961, Princeton University accepted a \$35 million gift to benefit the university's Woodrow Wilson School of Public and International Affairs, with the endowment eventually growing to over \$900 million. Descendants of the contributor claimed that the the money was to be used only to educate men and women for government careers in international affairs, that the school dishonored its vision and that only 5 percent of the Wilson School's alumni work for the federal government in international relations.⁴ Following the September 11 terrorist attacks, the Red Cross raised more than \$564 million for the Liberty Fund to aid families of the victims, but distributed only \$154 million on that purpose. At a congressional hearing on this topic, New York Attorney General Eliot Spitzer testified that "I see the Red Cross, which has raised hundreds of millions of dollars that was intended by the donating public to be used for the victims of September 11—I see those funds being sequestered into long-term plans for an organization."⁵

Given such theft or misuse of funds, why do people continue to contribute, knowing that perhaps half or more of the total money contributed will be wasted? The following analysis considers the behavior of contributors and of heads of organizations providing a public good financed by private contributions, when all realize that the head wants to maximize the equivalent of profits—the difference between aggregate contributions received, and spending on the public good the contributors value. For succinctness, call the organization an NGO (or non-governmental organization). The decision maker for the NGO, its head, is called L (standing for leader, or for Leviathan). The difference between contributions the NGO receives and its spending on the public good can be for L's personal use. But the same analysis applies if L has the NGO spend some of its money on a public good that contributors little value. We may think that contributors to a university want to improve undergraduate education, while the president of the university wants to attract star researchers who teach little.

September 4, 2006.

³"William Aramony, United Way leader who was jailed amid fraud scandal, dies at 84." *Washington Post*, November 14, 2011.

⁴Oliver Staley and Janet Frankston Lorin, "Princeton settles lawsuit over \$900 million endowment," <http://www.bloomberg.com/apps/news?sid=afniBOTc9ehs&pid=newsarchive>, December 10, 2008, retrieved March 5, 2013, and Tamara Lewin "Princeton settles money battle over gift," *New York Times*, December 10, 2008.

⁵"Red Cross defends handling of Sept. 11 donations." November 06, 2001 http://articles.cnn.com/2001-11-06/us/rec.charity.hearing_1.liberty-fund-red-cross-relief-agency?_s=PM:US Retrieved March 5, 2013.

2 Literature

The literature on the private provision of a public good is vast, with no need to review its essentials here. Of more interest here are studies of the behavior of a charity. The standard model simply assumes that the output of the public good equals the sum of contributions by individuals, with no consideration of how the non-profit works. Andreoni (1998) considers a charity with fixed costs, showing how a lead gift can coordinate a move away from a Nash equilibrium with no donations to an equilibrium with aggregate contributions sufficiently high to more than cover the fixed costs. Other work, such as Andreoni and Payne (2003) considers the fund-raising activity of charities, allowing the heads to find fund-raising costly or unpleasant, but not allowing for the non-profit to use contributions only for fund-raising and for provision of the public good.

Another form of fixed costs arises when when the public good is discrete. An equilibrium with efficient provision of the good can then exist: the discreteness creates a positive threshold for contributions, below which the project is infeasible. This principle is established in theory (Palfrey and Rosenthal 1984), Bagnoli and Lipman 1989) and confirmed in both laboratory and natural experiments (Bagnoli and McKee 1991, and Albert 1972). Each participant prefers the project to no project, even if each would also prefer a smaller project funded only by everyone else's contribution. If the good is discrete, an equilibrium with full (efficient) funding exists where each beneficiary is decisive, so that free-riding results in no spending, rather than in smaller spending. This essential idea of making each contributor decisive is described by Tabarrok (1998) in discussing assurance contracts: a discrete public good will be provided if and only if each person contributes the amount the fund-raiser specifies. (Organizations like Groupon and Kickstarter work on this principle).

Consideration of an NGO with preferences different from those of contributors (including budget maximization and quality maximization) is found in Hansmann (1981). But that paper does not look at profit-maximizing behavior of the NGO in attracting contributions.

Much work examines how a profit-maximizing firm can extract consumer surplus, as by price discriminating or using a two-part tariff. But surprisingly little work has explored how an organization which raises money from voluntary contributions can maximize its profits and extract consumer surplus. This paper does.

3 Assumptions

Head of the NGO The NGO has a monopoly on the provision of the public good under consideration, though I shall later consider competition. Its head, or leader, L , aims to maximize revenue net of spending on the public good, subject to the condition that individuals have an incentive to make donations to the NGO. To use the term introduced by Hansmann (1981), I consider donative non-profits.

The NGO can commit to a schedule, specifying the amount it will spend on providing the public good for any given set of contributions. It is simplest to think of the amount of the public good provided as equal to the amount spent on its provision, or that the marginal cost of producing the public good is 1. But the analysis below also applies to increasing marginal cost of production—any amount spent on the public good determines the amount of the public good produced, and so a consumer can view spending on the public good as determining provision of the public good, and so his marginal valuation of spending on the public good.

The difference between total contributions and spending on the public good is net revenue, available to L to use as his wishes. He therefore aims to maximize net revenue.

Contributors The number of potential contributors is N . All contributors have the same preferences. A person's utility increases with the aggregate provision of the public good, and increases with his consumption of other, private goods. Given a fixed income, consumption of the private goods is larger the smaller the contribution to the NGO. For simplicity, let utility be separable between consumption of the public good and the other goods. That allows us to speak of an individual's marginal benefit from the public good, MV , which is a positive but declining function of total provision, and of the marginal cost of a contribution, $MC(q)$, which is a positive and increasing function of the contribution. Speaking of MV and MC instead of utility functions makes it easier to illustrate the analysis. This can be interpreted as arising from a separable utility function, $v(G) + u(c)$, where G is provision of the public good, $v' > 0$, $v'' < 0$, c is consumption of the private good, $c' > 0$, and $c'' < 0$.

Commitment The NGO's ability to attract contributions depends critically on its ability to commit. I shall start by assuming unlimited commitment, subject to donations being voluntary. The head of the NGO cannot, for example, commit to killing anyone who gives him less than one million dollars. Contributors can make no commitments, and cannot coordinate among themselves; that is, the behavior of contributors is described by a Nash equilibrium.

Timeline The timeline is as follows

1. L commits to a schedule relating contributions to provision of the public good.
2. Contributors simultaneously make their contributions.
3. L implements his commitment to spending on the public good.
4. Payoffs are realized.

4 Exploiting a single contributor

Consider first the standard story of private provision of a public good, with two donors. The equilibrium condition is that each person's contribution, q , satisfy $MV(2q) = MC(q)$ Figure 1 shows an individual's marginal valuation of the public good (MV), and marginal cost (MC) of a contribution. In equilibrium, each contributes q_A ; his marginal cost of a contribution (which can be the marginal utility from the reduced consumption of a private good) is the height of point A . Total provision of the public good is $2q_A$, so that the marginal valuation of the public good given that level of provision is the height at point B . At this solution a person's marginal cost of a contribution equals his marginal benefit from a contribution, and so each person is maximizing his utility given what the other person does.

I shall later make use of the behavior of an individual contributor; call him D . That is, think that contributions by others exactly cover fixed costs. So D behaves as if his contribution fully determines the provision of the public good. Figure 2 shows D 's marginal valuation (MV) and marginal cost (MC) of a contribution. The marginal valuation is evaluated under no provision by the NGO when D 's contribution is zero.

If the NGO spends all of D 's contribution on the public good, then D will contribute that amount, q , such that $MV(q) = MC(q)$. Call this level q_0 , as shown in Figure 2. In this case, L gets no net revenue from D . But, as will be seen below, because each contributor sees himself as pivotal, each contributes q_0 , for total contributions of Nq_0 , while the NGO spends only q_0 on the public good.

The profit-maximizing NGO can do better by using a take-it-or-leave-it offer of the following form: contribute q_M , and L will spend $q_0 < q_M$ of the public good. As shown in Figure 2, L can set q_M to be sufficiently large so as to make the contributor indifferent about taking up this offer: his benefit from consuming the public good in the amount q_0 equals his cost of paying q_M . That is, the area under the marginal valuation curve between 0 and q_0 (the area of the roughly rectangular region with vertices $0ABq_0$) equals the area under the marginal cost curve (the area of the region with vertices $0CDq_M$). Recall that because a donation is voluntary, D must enjoy non-negative consumer surplus. Because provision in the amount of q_0 maximizes the consumer surplus that could be generated, and demanding a payment of q_M transfers that consumer surplus to L , this strategy maximizes the profit L can make from this contributor. This solution resembles the behavior of a perfectly price discriminating monopolist who sells a private good.

5 Exploiting multiple contributors with take-it-or-leave-it offers

I had considered above the strategies that L could use in exploiting a single contributor. What can L do when he faces an exogenously fixed number, N , of

identical contributors? Consider the solution above, where L gets q_M from each contributor. Let L make the following commitment. With N contributions each of q_M , L will provide q_0 of the public good. Otherwise, he will provide nothing. If the contributions are made, then L would make a profit of $(N - 1)q_M - q_0$.

Given this commitment by L, it is indeed an equilibrium for each person to contribute q_M . For suppose that each contributor believes that each other person will make such a contribution. Consider any one contributor, say D. He knows that a contribution of q_M makes provision of the public good be q_0 , generating no consumer surplus for him. If D contributes less than q_M , then provision of the public good is 0, again generating 0 consumer surplus. Because D is indifferent between contributing q_M and contributing 0, and the same applies for all other contributors, then it is an equilibrium for each to contribute q_M . Of course, if the contributor's take-it-or-leave-it offer is for a tiny bit below q_M , say $q_M - \epsilon$, then a person would strictly prefer contributing that amount over contributing nothing, making the equilibrium discussed more plausible.

It must be noted that another equilibrium exists, with no contributions. That is an equilibrium because any one person, say D, would realize that given the commitment L made, provision of the public good would be zero, and so D would get nothing by contributing anything. Essentially, L makes $(N - 1)q_M$ a fixed cost, generating the multiple equilibria, a problem examined by Andreoni and Payne (2003), who also show how leadership gifts can make the equilibrium with positive contributions the unique equilibrium.

The solution given above can generate a large profit for L, but he can do even better, by recognizing that an increase in q_0 increases D's contribution, and also increases the contributions by all others. An increase in q_0 , or in the quantity of the public good provided, increases the benefit to D by $MV(q_0)$. If D must pay q_M to get any of the public good provided, then D's marginal cost of increasing his contribution is $MC(q_M)$. Recall that the value of q_M is determined by the condition that the marginal contributor enjoys zero consumer surplus, or $\int_0^{q_0} MV(x)dx = \int_0^{q_M} MC(x)$. For any q_0 , this expression determines q_M , determining the function $q_M(q_0)$.

So an increase in q_0 allows L to collect an additional $MV(q_0)/MC(q_M(q_0))$ from each contributor, for a total increase of $(N)MV(q_0)/MC(q_M(q_0))$. The head of the NGO will choose q_0 to satisfy $(N)MV(q_0) = MC(q_M(q_0))$.

The solution is depicted in Figure 3. Each q_0 (or total provision of the public good) determines q_M (or the amount that each contributor, including the marginal one, must give). The condition is that q_M be sufficiently large so that each contributor enjoys zero consumer surplus. L's profits are then $Nq_M - q_0$, with $Nq_M - q_0$ the fixed cost that must be covered. Thus, each q_0 determines a marginal cost to the contributor of giving an additional dollar, where this marginal cost is evaluated at q_M . Dividing this by N gives the curve MC_M/N . The head, L, maximizes his profits by providing that level of the public good where $MV(q) = (1/N)MC(q_M)$.

5.1 Insufficient provision

This solution might appear efficient, with the the level of q set so that the marginal cost of a contribution equals the marginal benefit enjoyed by all contributors. But it differs from the standard efficiency solution in several ways. First, the marginal cost is evaluated at q_M , not at q_0 . That does not make for inefficiency, but reflects an income effect, with a contributor essentially being poorer because of the money taken by L. Second, and most importantly, total provision is not Nq_M , but only q_0 , with L taking the contributions of the $N - 1$ contributors for his own purposes instead of using them to provide the public good. Thus, provision of the public good is less than the welfare-maximizing level.

6 Proportional theft

The analysis above considered a head of the NGO who can commit to a schedule of not providing the public good at all if aggregate contributions fall below a critical level. That can make each contributor's behavior the same as when he is the only contributor, with L exploiting him alone. But L may find it difficult to make such a commitment, and the existence of an equilibrium with no contributions may hurt L.

So L may be constrained (perhaps also because of governmental oversight) to having his profit consist of a share, t , of total contributions. We can think that L steals this fraction of contributions. Clearly, some value of $t > 0$ maximizes L's profits. Or, it may be that L is constrained, perhaps by governmental regulations, perhaps by the effectiveness of auditing by contributors, in the value of t he can impose. Consider then a fixed value of t .

6.1 Inefficient production

For additional spending of q by the NGO, the contributor must contribute $q/(1-t)$, leading to a marginal cost function to the contributor of $MC_t(q)$, where for any q , $MC_t(q) = MC(q/(1-t))$. The marginal benefit function to a contributor when spending is q and production is efficient is $MV(q)$. The marginal valuation can depend on aggregate contributions by others, and on his own contribution, q . But for simplicity here we shall suppose D is the sole contributor.

Though, by assumption, t is fixed, L may control the production function, determining the amount of the public good provided for each level of spending. Denote the efficiency of production by α , which is positive but less than or equal to 1. A value of 1 denotes full efficiency. A value less than 1 means that spending of q results in only an additional αq of the public good. Note that this differs from a tax—L does not get the difference between q and αq , and increased α reduces production of the public good for any amount of money spent on it.

For a given α , a person will contribute the amount q that satisfies $\alpha MV(\alpha q) = MC_t(q)$. In the following write the function $MV(\alpha q)$ as $MV_\alpha(q)$. Taking the

total derivative yields the first-order condition for α : $q\alpha MV'_\alpha + MV_\alpha = 0$. Note that $MV'_\alpha < 0$, so this expression can be satisfied. For intuition, L's goal is to increase the marginal gain to an individual of increasing his contribution at any given q , which is $q\alpha MV'_\alpha + MV_\alpha$. This expression is not necessarily positive at $\alpha = 1$; it may well be negative. That is, L can generate greater profits by producing the public good inefficiently.

For a numerical example, let $MC = 1$, $t = 1/2$, and $N = 2$. Let a contributor's marginal valuation, as a function of output of the public good, q , be 6 for $q \leq 5$, and 0 for $q > 5$. Then when $\alpha = 1$, an equilibrium has a person contribute 10; so that provision of the public good is $10(1 - t) = 5$, and L's profits are 5. Now let L set α to $1/3$. Then the equilibrium has aggregate contributions of 30 (spending on the public good is $(30)(1/2) = 15$, and output is $(15)(1/3) = 5$).

An individual is willing to contribute to the public good because the marginal benefit of a dollar spent on the public good for $q \leq 5$ is $(6)(1/3) = 2$, which equals the marginal cost to a contributor of $(1)/(1/2) = 2$. L's profit is $(30)(1/2) = 15$, which exceeds the profits of 10 when production is efficient.

A graphic depiction is in Figure 4. If production is efficient, L would set the provision of the public good at q_0 , where the marginal valuation to the contributor equals his marginal cost (with both curves already reflecting the proportional theft made by L). Now let efficiency of production decline, say to $\alpha = 1/2$. A contribution of q_0 provides $q_0/2$ of the public good, and the contributor's marginal valuation is MV_A . If the contributor gives an additional \$1, the added output is half of what it would have been under efficient production, and so the marginal benefit to the contributor is $MV_A/2$, which can exceed $MV(q_0)$.

Note that a governmental grant that increases spending on the public good increases the incentives of L to produce inefficiently. The increased spending on the public good increases its provision, thereby reducing the marginal benefit to the contributor of his contribution. By producing inefficiently, the NGO reduces provision, and so increases private contributions.

7 Applications

7.1 Entry

Entry of a new NGO may be difficult because it requires coordination—given a fixed cost, no one contributor wants to move from one NGO to another. Furthermore, suppose that the existing NGO is constrained to a profit of a fraction of contributions, and that it does so by setting a fixed cost. Then no one contributor benefits from moving to a different NGO, because at the existing NGO none of the a marginal contribution goes towards covering the fixed cost.

7.2 Effect of governmental tax and grant

A common question in analyses of the private provision of a public good is the effect of a government grant. In the standard model, a governmental grant financed by a tax perfectly crowds out private contributions. That outcome differs from that with the profit-maximizing non-profit.

Suppose government taxes each person, and uses the revenue to give a lump-sum grant to the NGO. That impoverishes each person, shifting his MC curve to MC' . The new solution has each contributor give q_t to the NGO. The head of the NGO keeps the government grant, and keeps $(N - 1)q_t$. The result here differs from the standard story which has a government grant-cum-tax fully crowding out private donations. In the standard story, the government grant increases provision of the public good, reducing the benefit to an individual of contributing. In contrast, the Leviathan NGO does not use the government grant to increase provision of the public good. The only effect on donations comes from the income effect.

7.3 Contributions by different types of contributors

The standard model has only the rich contributing. A profit-maximizing NGO can further increase its profits by having both the poor and the rich contribute. Suppose contributors belong to one of two types—the rich and the poor, or older alumni and younger alumni. Then on the rich, the procedure described above can be used, with a fixed cost. But the NGO can add the condition that the public good is provided only if at least a specified sum is also raised from the poor. Then each rich person is pivotal, and each poor person is pivotal. In practice, this has the spirit of a matching grant, given if only a specified minimum of alumni made contributions.

8 Conclusion

This paper explored behavior which is the opposite of that usually considered in analyses of private provision of a public good. The charity, rather than aiming to maximize provision of the public good financed by contributions, aims to maximize profits. The charity, unlike a standard firm, does not sell a product. Rather it can commit to a schedule which specifies how much of the public good it will provide for any given amount of contributions, so that the charity must consider the incentives of a contributor to contribute to it.

We saw that an equilibrium can exist in which the charity makes large profits, consisting of the aggregate contributions made by all but one of the contributors. Though we rarely observe such extreme behavior by charities, more commonly a charity uses contributions for purposes other than those contributors prefer, and the profits can then be interpreted as spending on purposes the charity prefers. Such behavior by charities can explain several phenomena which are not as easily explained by a standard model of private contributions to a public

good—in particular that government funding of charities will not lead to full crowding out of private contributions.

9 Notation

MV Marginal Valuation of public good to an individual

MC Marginal cost to an individual of a contribution

N Number of contributors

q Individual's contribution to NGO

α Efficiency of spending by NGO

References

- [1] Abrams, Burton A, and Mark D. Schmitz (1978) “The ‘crowding-out’ effect of government transfers on private charitable contributions.” *Public Choice*, 33: 29-41.
- [2] Albert, William (1972) *The Turnpike Road System in England 1663-1840*. Cambridge: Cambridge University Press.
- [3] Andreoni, James (1989) “Giving with impure altruism: Applications to charity and ricardian equivalence.” *Journal of Political Economy*, 97(6): 1447-1458.
- [4] Andreoni, James (1998) “Toward a theory of charitable fund-raising.” *Journal of Political Economy*, 106(6): 1186-1213.
- [5] Andreoni, James and A. Abigail Payne (2003) “Do government grants to private charities crowd out giving or fund-raising?” *American Economic Review*, 93(3): 792-812.
- [6] Bagnoli, Mark and Barton L. Lipman (1989) “Provision of public goods: Fully implementing the core through private provision.” *Review of Economic Studies*, 56(4): 583-602.
- [7] Bagnoli, Mark and Michael McKee (1991) “Voluntary contribution games: Efficient private provision of public goods.” *Economic Inquiry*, 29(2): 351-366.
- [8] Bergstrom, Theodore, Lawrence Blume, and Hal Varian (1986) “On the private provision of public goods.” *Journal of Public Economics*, 29(1): 25-49.
- [9] Bernheim, B. Douglas (1986) “On the voluntary and involuntary provision of public goods.” *American Economic Review*, 76(4): 789-793.
- [10] Glazer, Amihai and Kai Konrad (1993) Private provision of public goods, limited tax deductibility, and crowding out. *Finanzarchiv*, N.F., 50(2): 203-216.
- [11] Hansmann, Henry (1981) “Nonprofit enterprise in the performing arts.” *Bell Journal of Economics*, 12(2): 341-361.
- bibitem Palfrey, Thomas R. and Howard Rosenthal (1984) “Participation and the provision of discrete public goods: A strategic analysis.” *Journal of Public Economics*, 24(2): 171-193.
- [12] Posnett, John W., and Todd M. Sandler (1989) “Demand for charitable donations in private profit markets, The case of the UK.” *Journal of Public Economics*, 40(2): 187-200.

- [13] Steinberg, Richard (1989) "The theory of crowding out: Donations, local government spending, and the 'New Federalism'," in: Richard Magat, ed., *Philanthropic Giving*, Oxford, Oxford University Press, 143-156.
- [14] abarrok, Alexander (1998) "The private provision of public goods via dominant assurance contracts." *Public Choice*, 96(3/4): 345-362.
- [15] Warr, Peter G. (1982) "Pareto optimal redistribution and private charity." *Journal of Public Economics*, 19(1): 131-138.
- [16] Warr, Peter G. (1983) "The private provision of public goods is independent of the distribution of income." *Economics Letters*, 13(2-3): 207-211.

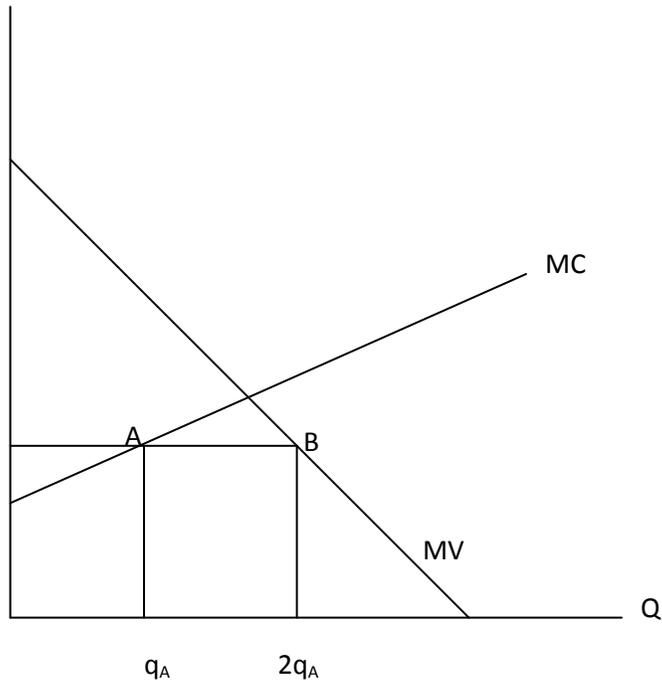


Figure 1: Equilibrium private provision of a public good

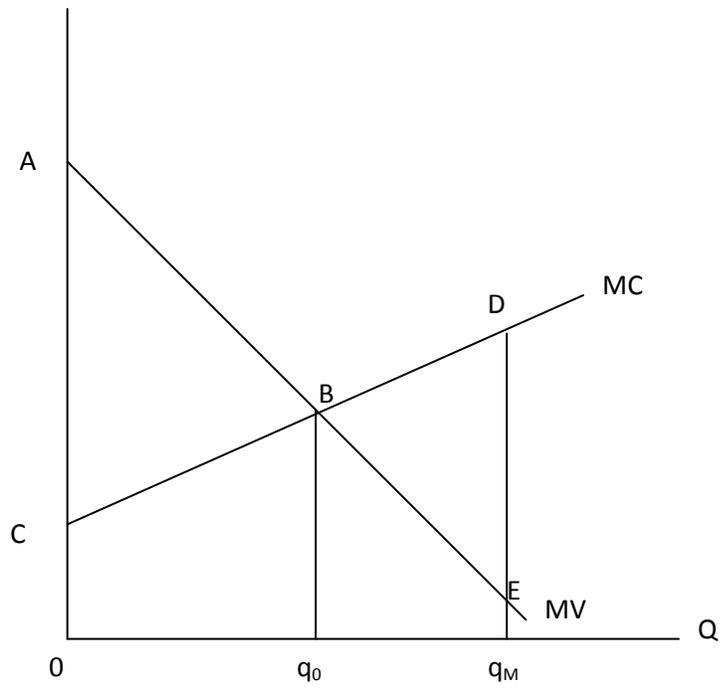


Figure 2: Exploiting a single donor

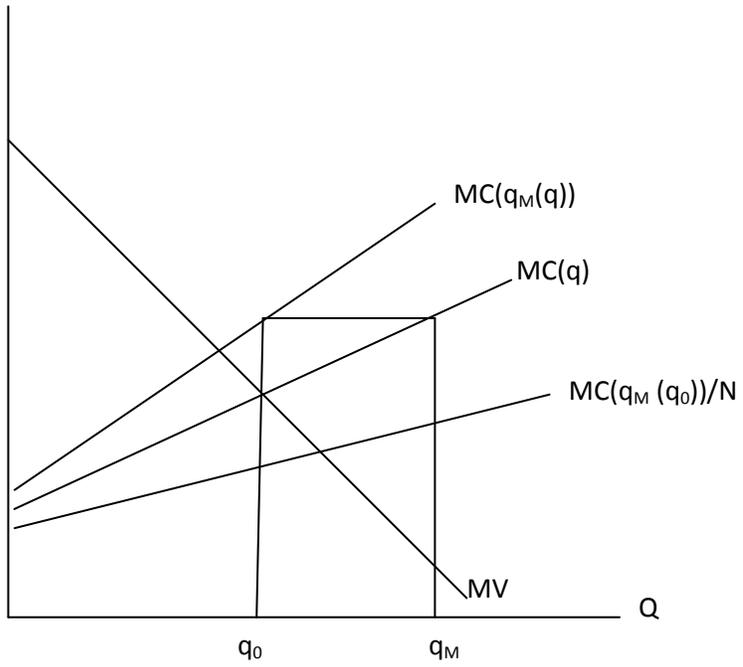


Figure 3: Maximum exploitation

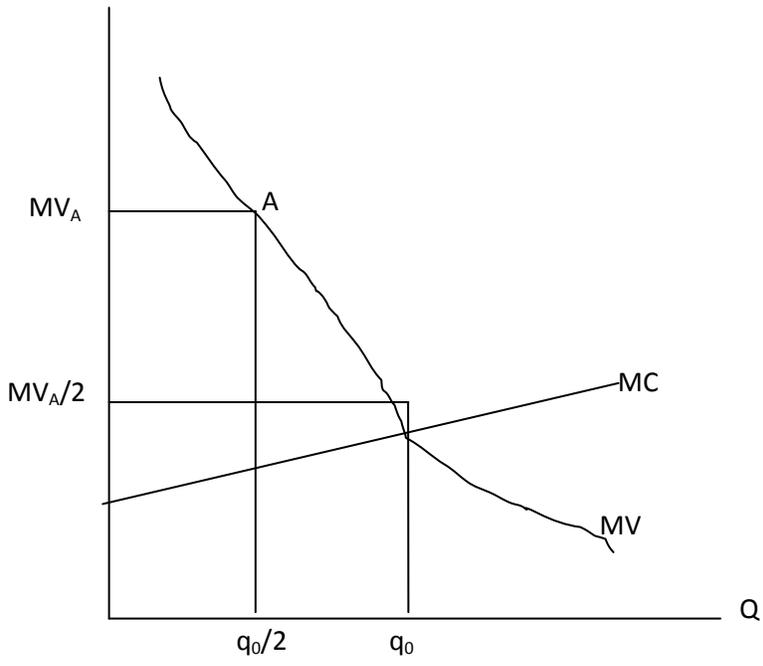


Figure 4: Profitability of inefficiency