

# **Donor-to-Nonprofit Online Marketplace: An Economic Analysis of the Impacts on Fundraising**

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## **Abstract**

Online intermediaries have recently started offering database services to donors and certification services to nonprofit organizations through the Internet. We conceptualize a Donor-to-Nonprofit (D2N) marketplace as an online intermediary that offers these two services and examine its effect on fundraising strategies of nonprofit organizations using an analytical model based on spatial competition under incomplete information with donor search. We characterize the signaling equilibria where certification of quality conveys information about organizational effectiveness in generating socially valuable services. Interestingly, the emergence of the D2N marketplace may lead to a drop in total net fundraising revenues in the market, despite the fact that the intermediary's database service eliminates search costs for some donors. We also explain why such a marketplace may deliberately lower the accuracy of its certification process.

## **1. Introduction**

Nonprofit organizations are voluntary service providers whose primary objective is philanthropy.<sup>1</sup> Each nonprofit identifies itself with a mission such as healthcare, education, environment, human rights, homelessness, women's rights. In order to perform mission-related operations, nonprofits raise capital by soliciting and collecting money from individuals, businesses, and governmental agencies. This process is commonly known as fundraising and is by far the most significant revenue source within the sector. Most of these organizations are small-sized institutions with annual budgets less than \$100,000. Nearly 700,000 of them are classified as 501(c)(3) organizations by the Internal Revenue Service (IRS). The nonprofit sector accounts for 5% of GDP and 8% of wages and salaries paid in the U.S. [17]. With almost \$1

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<sup>1</sup> Following the common practice in the literature, we henceforth refer to nonprofit organizations simply as nonprofits.

trillion assets, nonprofit organizations constitute one of the largest economic sectors in the nation [20]. On average, Americans donate over 2% of their income to nonprofits annually.

Despite its size and importance, surprisingly little research has been published in the Information Systems (IS) field on this sector. What makes the nonprofit sector interesting for IS researchers is that recent developments on the Internet stand to alter fundraising strategies. Of particular interest are emerging online intermediaries that offer information services to nonprofits and prospective donors. One of the pioneering online intermediaries is GuideStar.org, which offers donors a searchable comprehensive database service with information on more than 1.7 million nonprofits established in the U.S. Given the astounding number of nonprofits in the sector, GuideStar's database service offers a unique value by helping donors find the nonprofit with the right mission for them. GuideStar achieves this by summarizing key information on each organization such as the mission, programs, and outcomes. The database enables donors to make more informed decisions and thereby encourages charitable giving.

Another important service that the online intermediaries provide is the evaluation, accreditation, and "seal" programs, which assist donors in making informed donation decisions and help nonprofits in complying with government regulations. These programs are important because they alleviate donors' fundamental problem of verifying the quality and legitimacy of nonprofits and making sure that their donations have the highest impact. Determining which nonprofit serves best to its constituency is not an easy matter and affects the level of giving. According to a 2006 survey by the Center on Philanthropy at Indiana University, a majority of donors would give more if they could determine the impact of their donations.<sup>2</sup>

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<sup>2</sup> See <http://philanthropy.com/free/articles/v21/i03/03001301.htm> [last accessed on January 8, 2010].

The online seal programs essentially provide prospective donors with information about a nonprofit’s governance, fundraising, and other fiscal practices. They also evaluate and rate nonprofits, but the criteria they use can vary substantially. Even though the fees for these services run as high as \$15,000 per year, nonprofits have been reported to use them to differentiate themselves from the competition [31]. Examples include the Maryland Association of Nonprofit Organizations’ accreditation program (*standardsforexcellenceinstitute.org*) which enforces about 55 governance and operation standards, including those on overhead limits, frequency of board meetings, and financial oversight. Nonprofits satisfying these criteria are granted a “Seal of Excellence.” The Better Business Bureau’s (BBB) Wise Giving Alliance (*give.org*) offers nonprofits a voluntary evaluation system and a seal of approval that is granted based on 20 financial and governance standards. Using several financial criteria, such as the cost of raising \$100, the American Institute of Philanthropy’s program (*charitywatch.org*) grades about 500 large nonprofits using a scale from A to F. Perhaps the most notable rating service is that of Charity Navigator (*charitynavigator.org*), which evaluates and rates more than 5,000 of America’s best-know charities on the basis of their financial health, using data from their IRS filings. The rating method depends on a number of organizational metrics, including fundraising efficiency measured by the amount spent for each dollar raised. Charity Navigator has been recognized by BusinessWeek for “revolutionizing the process of giving” and by Time, Forbes, Kiplinger’s Financial magazine and PC World as one of America’s best web sites. Table 1 summarizes the services of some of the online intermediaries [27].

<b>Intermediary Name and Website</b>	<b>Scope of Service Rendered</b>
GuideStar ( <i>guidestar.org</i> )	Online database on program and financial information of 1.7 million nonprofits in the U.S.
The Standards for Excellence Institute ( <i>standardsforexcellenceinstitute.org</i> )	Online voluntary certification program for nonprofits based on 55 governance and operation standards.
The Wise Giving Alliance ( <i>give.org</i> )	A seal of approval program for nonprofits according to 20

	financial and governance standards.
The American Institute of Philanthropy ( <i>charitywatch.org</i> )	Online grading program for large nonprofits based on their financial statements.
Charity Navigator ( <i>charitynavigator.org</i> )	Online charity rating program that evaluates several organizational criteria such as financial health and fundraising efficiency.
The Evangelical Council ( <i>ecfa.org</i> )	Online seal and accreditation program for Christian ministries based on their governance and financial transparency.

Table 1. Prominent online database and certification services

While charity evaluation services had been provided by National Charities Information Bureau long before the Internet, the scope and utilization of the service was such that at most a few hundred nonprofits were being evaluated and most donors were unaware of these evaluations. The Internet allowed the intermediaries to move their certification services online, where certification results can be easily searched and displayed side by side with other relevant information. Combined with the new capability to research, assess, and certify thousands of nonprofits, thanks to information technology, the impact of intermediaries on fundraising markets has grown tremendously. The ability to conveniently search extensive amount of up-to-date data on charities is fundamentally shifting the way donors make their giving decisions. Numerous industry experts have recommended that donors use these online services before they write their checks. Accordingly, more than 5 million donors used Charity Navigator in 2007 and more than 8 million used GuideStar in 2008.<sup>3</sup> The usage of these online services tends to spike especially during emergencies. For example, Charity Navigator’s daily traffic increased tenfold to 50,000 visitors a day during the week following the tsunami tragedy in 2004 [25].

In short, the Internet is enabling the formation of ubiquitous digital marketplaces that stand to wring some of the inefficiencies out of fundraising processes through the dissemination

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<sup>3</sup> See <http://www.charitynavigator.org/index.cfm?bay=content.view&cpid=775> and <http://www2.guidestar.org/RequestForProfileInstructions.aspx> [last accessed on January 8, 2010].

of transparent information about nonprofits. The aim of this paper is to examine the potential consequences of the adoption of online information services on one of the largest sectors of the U.S. We conjecture that the database and certification services will mostly be delivered by a select few major players, which we call Donor-to-Nonprofit (D2N) marketplaces. We define a D2N marketplace as an online intermediary that offers a searchable database service for donors and a certification service for nonprofits. The comprehensive database details the mission, program, and contact information of the nonprofits in the market, whereas the certification service rates the effectiveness of nonprofits in generating social value from donation dollars.

We are primarily concerned with the following research questions: What is the effect of the database and certification services on fundraising strategies of nonprofits as well as total fundraising revenues and fundraising effectiveness in the market? How do the results vary depending on the characteristics of these services? How should the D2N marketplace price and deliver its services? The answers to these questions would be of potential interest to fundraising administrators, managers of D2N marketplaces, and scholars of IS and nonprofit studies.

We provide answers to these questions by analyzing a game theoretic model of fundraising. Strategic players include donors, nonprofits, as well as an online D2N marketplace. The model captures important aspects of today's online intermediaries in fundraising markets in two ways. First, the D2N marketplace offers an searchable online database service that reduces search costs and creates a "digital divide". Second, it offers a certification service that seals (i.e., assures) the quality of nonprofits. A key aspect of online certification is that the outcomes (or lack thereof) appear on the results of the queries submitted to the database, and consequently a larger proportion of the donor population becomes aware of the certification results in

equilibrium compared to what was the case before the emergence of the D2N marketplace. This further highlights the importance of the digital divide generated by the D2N marketplace.

We first establish that a service-maximizing D2N marketplace should provide its database service for free . We find that the certification service may intensify the competition in fundraising markets since nonprofits facing certified competitors would optimally increase their fundraising efforts. We then characterize the signaling equilibria in which certification of quality conveys noisy information about organizational effectiveness in generating socially valuable services. Interestingly, we find that the emergence of the D2N marketplace may lead to a drop in the total net fundraising revenues in the market, as “excessive” costly certification is counter-productive from a social welfare perspective. Finally, we explain when and why a D2N marketplace may be interested in reducing the accuracy of its certification service.

### *Literature Review*

The paper draws upon the literature on online marketplaces and quality certification programs. In one of the earliest studies, Malone et al. [26] recognized the potential of information technology in reducing the costs of coordination, and predicted that economic activity would shift more toward electronic markets than electronic hierarchies. Bakos [5] later argued that the ability of Internet marketplaces to reduce search costs for price and product information would increase competition in prices and reduce the monopoly power enjoyed by sellers in markets for differentiated goods. Campbell et al. [13], however, show that such competitive gains may be difficult to realize if the same technology that eases consumer search also allows firms to monitor each other’s prices more easily and thereby facilitates collusion. Since the D2N marketplaces may potentially charge a fee to both donors and nonprofits, the literature on two-sided markets is also relevant [6, 8, 28, 41].

The research stream on quality certification examines the effect of seals of approval by third-party institutions on markets. It has been argued that such certifications significantly affect consumer perceptions [29] because they are useful mechanisms for communicating a threshold level of quality [7]. Due to consumers' perceived risk of online transactions [3], the use of seals of certification has been found to be especially important for e-commerce companies [18, 22, 32]. For example, by developing an evolutionary game theoretic model, Ba et al. [1] demonstrate that disseminating information on quality through the use of online intermediaries is a stable strategy for e-commerce companies in equilibrium, suggesting that such a strategy will be eventually adopted by most e-commerce companies.

In this paper, we examine the services of an online marketplace and the corresponding impact on the fundraising strategies of horizontally differentiated [12, 14] nonprofits. We contribute to the literature by integrating two major features of online marketplaces (reduction in search costs and the digital divide) with a strategic service (quality certification) in a single analytical framework, and by tailoring our analysis toward an important sector of the economy, namely, the nonprofit sector, that has been generally neglected by IS researchers. We believe that our theory-driven approach that relies on advertising, search, and nonprofit literatures will benefit and facilitate future IS research on the sector.

The paper proceeds as follows. We set up the model in Section 2 and present the analysis in Section 3. The last section provides a discussion of the results and concluding remarks.

## **2. A Model of Fundraising**

### ***Organizational Characteristics***



There are two nonprofits in the market. By analogy to spatial competition, we represent each nonprofit as a point at each end of a line of unit length, which represents differentiation with respect to mission. In other words, the nonprofits have fixed locations (strategic missions) that involve substantial sunk costs. We assume that nonprofits are differentiated with respect to the effectiveness in performing their missions. Factors such as past experience, cost efficiency in managing social projects, and diligent personnel may allow a nonprofit to outperform others. As indicated in a recent Newsweek article [31], many nonprofits simply squander away the donations they collect. Therefore, in our model, nonprofits can have different levels of effectiveness, which we call “quality.” We assume for simplicity that they can be of either high or low quality, denoted by the subscripts  $h$  and  $l$ , respectively. The prior probability of a nonprofit being high quality is common knowledge and denoted by  $\alpha$ .

In line with the empirical economics research on the objective functions of nonprofits, the nonprofits in our model aim to maximize their net fundraising revenues. Steinberg [35] examines the revealed objectives of nonprofits in five industries and sets a tradition in this literature by interpreting *net fundraising revenue maximization* as being equivalent to *charitable output and service maximization*. His results show that nonprofits that specialize in public welfare, education, and arts maximize service and hence net fundraising revenue. In a similar vein, Posnett and Sandler [30] report that nonprofits operating in the U.K. are net fundraising revenue maximizers. Rose-Ackerman [34], Khanna et al. [21], Tinkelman [36], and Brooks [9] all provide evidence for the maximization of net fundraising revenue and service.

### ***Donor Preferences***

Potential donors are differentiated with respect to their mission preferences and are distributed uniformly along the linear market. We define the willingness-to-donate as the amount of money

a potential donor is willing to give to a specific nonprofit, given its mission and expected quality. A potential donor's willingness-to-donate to a nonprofit depends on two characteristics: her mission preference and the expected quality of the nonprofit under consideration. Each potential donor is identified by a point on the unit line that corresponds to her most preferred mission. Potential donors' willingness-to-donate to a nonprofit decreases linearly with their distance from the nonprofit on the unit line. More specifically, a potential donor's willingness-to-donate to a nonprofit, which is expected to be of high quality with probability  $q$  and with a mission  $x$  units away from the donor's most desired mission, is given by  $D(x, q) = \max\{0, \theta(q) - x\}$ , where  $\theta(q) = q\theta_h + (1 - q)\theta_l$  and  $\theta_h > \theta_l \geq 0$ . The function  $\theta$  incorporates the effect of quality expectations into the willingness-to-donate (which increases with expected quality). The nonprofits know only the distribution of the mission preferences of donors in the market. Note that  $q$  equals  $\alpha$  (the prior probability that a nonprofit is of high quality) at the start of the game.

The utility potential donors derive from giving is proportional to the amount of their donation. They also incur a cost when searching for a suitable nonprofit to donate. The net utility is given by  $U(x, q) = uD(x, q) - S$ , where  $u$  is a utility parameter and  $S$  represents the total cost of search associated with learning the existence of the nonprofit and its mission.

### ***Information Structure and Donor Search***

We employ an information structure similar to that in Grossman and Shapiro [16]. Potential donors rely on information garnered from nonprofits' solicitations as well as their own searches. They know the services that are being provided in the market, but they do not know *a priori* which nonprofit provides that service. A solicitation informs a potential donor about the presence of the nonprofit as well as its mission (i.e., its location on the unit line). Potential donors remember all solicitations successfully transmitted to them.

Not knowing the precise mission preferences of individual donors, nonprofits cannot target solicitations towards donors who are likely to donate more (i.e., those nearby on the line). Having limited resources, nonprofits find contacting additional donors increasingly expensive. We, therefore, assume that the total cost of achieving a reach of  $r$ , where  $0 \leq r \leq 1$ , is given by the convex function,  $vr^2/2$ , with  $v$  being a cost parameter [37, p. 292]. A fundraising reach of  $r$  means that a fraction  $r$  of the donor population is exposed to the solicitation at least once. *Potential* donors become *actual* donors when they give a positive amount, and they give only if they are aware of the existence of a nonprofit whose mission they like.

In contrast to Grossman and Shapiro [16], market participants are active, as donors can search, when necessary, for a nonprofit that suits their taste. Through costly offline search, potential donors can find out the mission of a nonprofit. The necessity of search arises especially when a potential donor is not solicited by any of the nonprofits in the market. The search process in our setting is similar to that of Wolinsky [40] in that potential donors can sample nonprofits at a cost  $s$  per nonprofit. The sampling process is without replacement and is assumed to be with perfect recall.<sup>4</sup> In other words, the donor remembers at each stage the previously sampled nonprofit(s) and can pick any of them without incurring another search cost.

### ***The D2N Marketplace***

Following the practices of prominent intermediaries such as GuideStar and Charity Navigator, we consider a D2N marketplace that maintains a database with detailed information about the nonprofits in the market. The marketplace charges a fixed fee (denoted by  $p_d$ ) for subscription to this service. Accessing the database allows the subscriber to learn about both nonprofits

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<sup>4</sup> The sampling process is without replacement when the donor, after contacting a nonprofit, remembers her actions and never contacts the same nonprofit twice. The sampling process is with replacement when the donor may contact the same nonprofit on several occasions. As we show in the Appendix, choosing a sampling process with replacement rather than without replacement in this context is equivalent to increasing the cost of search ( $s$ ).

(contact information and missions), eliminating the need for any offline search on the donor's part. Thus, the total cost of online search is fixed and equals the fee of the service. Only a  $\delta$  proportion of potential donors are aware of the database and have the requisite online access and search skills. The marginal cost of enrolling a new subscriber is normalized to zero.

In line with the current practice, the D2N marketplace also provides a voluntary certification service for the nonprofits. The marketplace charges  $p_c$  for each certification application and incurs a marginal cost  $c$  during the process. A certification may alter donors' perception about the quality of a nonprofit. The certification process is such that high quality nonprofits always get certified, while low quality nonprofits may also manage to be certified with some probability. This noisy setup allows us to examine the effectiveness of certification on equilibrium outcomes. We denote the probability that the marketplace correctly identifies a low quality nonprofit with  $\mu$ , and henceforth refer to this parameter as the accuracy of certification.

Since the current major providers of database and nonprofit certification services are nonprofits themselves, the D2N marketplace in our model is also a nonprofit. Given that we are only concerned with the services provided by the marketplace rather than its possible fundraising activities, we assume that the marketplace is a service maximizer; that is, the marketplace prices its services to maximize usage, while making sure that its costs are covered.<sup>5</sup>

### ***Equilibrium Concept***

The game described above is one of incomplete information, and the Perfect Bayesian Equilibrium [15, pp. 321-330] is the most appropriate game theoretic equilibrium concept that can be utilized in solving it. In such an equilibrium, the strategies of market players are required

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<sup>5</sup> We discuss another objective function for the D2N marketplace toward the end of the next section.

to yield a Bayesian equilibrium at every stage of the game in accordance with the posterior beliefs, which are updated using Bayes' law whenever it is applicable.

The extensive form of the game is as follows. In the first stage, the D2N marketplace announces the prices for its services. In the second stage, nonprofits observe their own qualities and decide whether to apply for certification of quality. Next, the D2N marketplace reviews the applications and announces the certificates it has awarded.<sup>6</sup> In the third stage, nonprofits solicit for donations. The fourth stage features donor search. If not contacted by any nonprofit or after being contacted by an unpreferred nonprofit, potential donors decide whether to search while taking into account the expected value and cost of that search. The search process may continue until a donor finds her preferred nonprofit. Potential donors may either do a traditional (offline) search or subscribe to the marketplace's database and search there. In both cases, donors learn the certification status of the organization(s) they find. Finally, in the fifth stage, each potential donor decides where to donate given the equilibrium beliefs, solicitations, and search results.

### 3. Analysis

#### 3.1. Benchmark Case: Traditional Fundraising Market

For benchmarking purposes, we first analyze the case without the D2N marketplace. We start with potential donors' optimum search behavior, taking as given their expectations and the cost of search. With none of the nonprofits certified ( $q = \alpha$ ), we have

$$\theta_b \equiv \theta(\alpha) = \alpha\theta_h + (1 - \alpha)\theta_l. \quad (1)$$

From the perspective of potential donors, there are three possibilities once solicitations are complete: A potential donor may be contacted by (i) both nonprofits, (ii) only one of the

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<sup>6</sup> Best Business Bureau's Give.org lists the owners of its seal at <http://charityreports.bbb.org/public/participants.asp> [last accessed on January 8, 2010]. Charity Navigator awards four stars to only a quarter of the nonprofits. From a technical point of view of the current model, announcing the names of certified nonprofits is equivalent to announcing the number or proportion of certified nonprofits.

nonprofits, and (iii) neither of the nonprofits. When a potential donor is contacted by both nonprofits, the donor does not need to search because she then identifies her preferred nonprofit (i.e., the closer one on the line) and donates accordingly. When a potential donor is contacted by only one of the nonprofits, there is no need for search if the soliciting nonprofit is the preferred one. Otherwise, the search decision depends on the expected value and cost of search. Suppose that a potential donor is contacted by a nonprofit  $x$  units away from her, where  $1/2 < x < 1$ . She can be better off by finding the other nonprofit which is at a distance  $1 - x$ . Her utility is  $u(\theta_b - x)$  when she does not search versus  $u(\theta_b - (1 - x)) - s$  when she does. Thus, search is preferable when  $x > \frac{1}{2} + \frac{s}{2u}$ . To ensure the presence of at least some search activity in the market, we assume search costs are sufficiently low ( $s < u$ ). Figure 1 illustrates the search strategies for potential donors who are contacted only by their unpreferred nonprofits.<sup>7</sup>

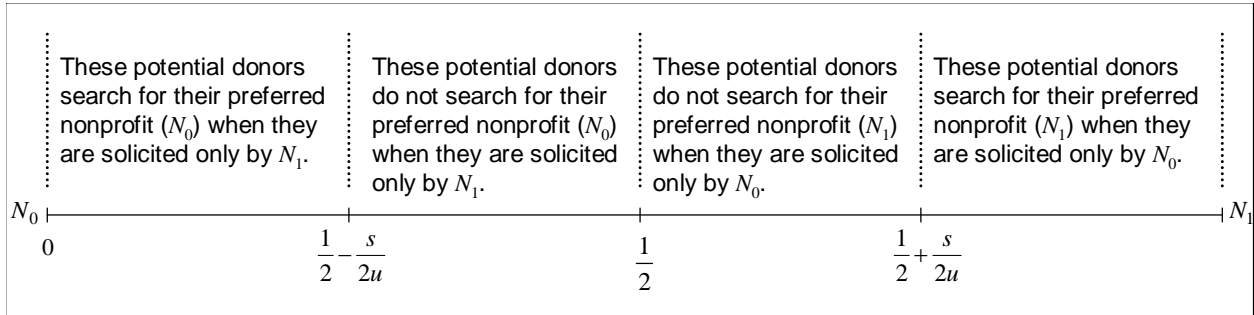


Figure 1. Search strategies when potential donors are contacted only by the unpreferred nonprofit

Consider now the case of potential donors who are not contacted by any of the nonprofits. Following the discussion in the previous paragraph, those that are located within  $[1/2 - s/2u, 1/2 + s/2u]$  search only once regardless of which nonprofit they sample in the first round because continuing the search process after sampling the unpreferred nonprofit is not

<sup>7</sup> For illustrative purposes, the nonprofits located at 0 and 1 are denoted with  $N_0$  and  $N_1$ , respectively.

optimal. Hence, a donor located at  $x$  within that region obtains a utility of  $u(\theta_b - x) - s$  with probability  $1/2$  and  $u(\theta_b - (1 - x)) - s$  with the remaining probability, leading to an expected utility of  $u(\theta_b - 1/2) - s$ . On the other hand, those that are located within  $[0, 1/2 - s/2u]$  or  $[1/2 + s/2u, 1]$  conduct a second search when they sample the unpreferred nonprofit in the first round. Donors located within  $[0, 1/2 - s/2u]$  obtain a utility of  $u(\theta_b - x) - s$  with probability  $1/2$  and  $u(\theta_b - x) - 2s$  with probability  $1/2$ , resulting in an expected utility of  $u(\theta_b - x) - 3s/2$ . Figure 2 illustrates the search strategies and the expected utilities of potential donors who have not been contacted by any nonprofit. We assume  $u(\theta_b - 1/2) > s$  so that the market is covered (i.e., all donors search when they are not contacted by any nonprofit).

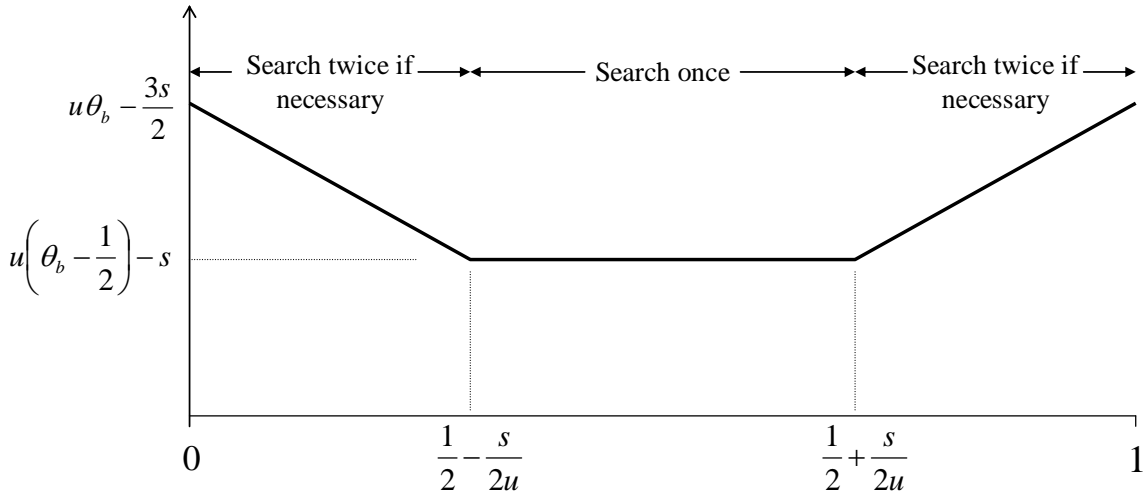


Figure 2. Expected utilities of potential donors who have not been solicited by any nonprofit

We can now derive the optimal fundraising levels. We denote the nonprofits with  $N_0$  and  $N_1$  as before and the reaches of their solicitations by  $r_0$  and  $r_1$ , respectively, and, similar to Grossman and Shapiro [16], assume that the probability of being solicited by one nonprofit is independent of the probability of being solicited by the other. Thus, the probability that a potential donor gets solicited by both nonprofits is  $r_0 r_1$ , that she gets contacted only by  $N_0$  is

$r_0(1-r_1)$ , that she gets contacted only by  $N_1$  is  $r_1(1-r_0)$ , and that she does not get contacted at all is  $(1-r_0)(1-r_1)$ . Figure 3 presents the outcomes of the search process and their likelihood.

$N_0$		$N_1$		Likelihood of the outcome
Solicited by both nonprofits; do not search; donate to $N_0$		Solicited by both nonprofits; do not search; donate to $N_1$		$r_0 r_1$
Solicited by $N_0$ only; do not search; donate to $N_0$		Solicited by $N_0$ only; search once; donate to $N_1$		$r_0(1-r_1)$
Solicited by $N_1$ only; search once; donate to $N_0$	Solicited by $N_1$ only; do not search; donate to $N_1$			$r_1(1-r_0)$
Not solicited; find $N_0$ in 1 <sup>st</sup> search; donate to $N_0$		Not solicited; find $N_0$ in 1 <sup>st</sup> search; donate to $N_1$ after 2 <sup>nd</sup>		$\frac{(1-r_0)(1-r_1)}{2}$
Not solicited; find $N_1$ in 1 <sup>st</sup> search; donate to $N_0$ after 2 <sup>nd</sup>	Not solicited; find $N_1$ in 1 <sup>st</sup> search; donate to $N_1$			$\frac{(1-r_0)(1-r_1)}{2}$

Figure 3. Search outcomes

Each nonprofit raises a fundraising revenue of  $\int_0^{1/2} (\theta_b - x) dx = \theta_b / 2 - 1/8$  from those

contacted by both nonprofits,  $\int_0^{\frac{1}{2} + \frac{s}{2u}} (\theta_b - x) dx = \theta_b (1 + s/u) / 2 - (1 + s/u)^2 / 8$  from those contacted

by itself only,  $\int_0^{\frac{1}{2} - \frac{s}{2u}} (\theta_b - x) dx = \theta_b (1 - s/u) / 2 - (1 - s/u)^2 / 8$  from those contacted by the other

nonprofit only, and  $\int_0^{\frac{1}{2} + \frac{s}{2u}} (\theta_b / 2 - x / 2) dx + \int_0^{\frac{1}{2} - \frac{s}{2u}} (\theta_b / 2 - x / 2) dx = \theta_b / 2 - 1/8 - s^2 / 8u^2$  from those

not solicited by any nonprofit (see the Appendix for the solution details).

We obtain fundraising revenues of the two nonprofits by multiplying these expressions with the likelihood of the outcomes shown in Figure 3. The optimal fundraising reach satisfies the condition that the marginal expected increase in fundraising revenue equals the marginal



increase in solicitation costs. Optimizing net fundraising revenues with respect to  $r_0$  and  $r_1$ , we find the optimal (symmetric) fundraising reach to be

$$r_0 = r_1 = r_b = \frac{2us(2\theta_b - 1)}{8vu^2 - s^2}. \quad (2)$$

Using equation (2), we obtain fundraising revenue  $R_b$  and net fundraising revenue  $NR_b$  for each nonprofit in the benchmark case as

$$R_b = \frac{\theta_b}{2} - \frac{1}{8} - \frac{s^2(1 - r_b^2)}{8u^2} \quad \text{and} \quad NR_b = R_b - \frac{v}{2}r_b^2. \quad (3)$$

Total fundraising revenues in the market are twice the expressions presented in equation (3). As expected, fundraising revenues increase with the expected quality of nonprofits and fundraising reach, and decrease with search and contact costs.

### 3.2. Market with the D2N Marketplace

#### *Database Service Only*

We now determine the optimal fundraising reach when the D2N marketplace offers only the database service. Given that the marketplace is a service maximizer, and because price reductions always increase usage, the optimal database subscription fee is zero.

**Lemma 1.** *The D2N marketplace provides the database service free of charge.*

This result is consistent with current practice; prominent players such as GuideStar.org and Give.org make search functionality and mission and contact information of nonprofits freely available. With free database access, a  $\delta$  fraction of the donor population finds its preferred nonprofit via the database service without having to go through a costly offline search. The remaining donor population relies on solicitations or offline search. Equation (4) presents the optimal fundraising reach in the presence of the database service (see the section titled “Database Service Only” in the Appendix for further details).

$$r_{db}^* = \frac{2us(1-\delta)(2\theta_b - 1)}{8vu^2 - s^2 + \delta s^2}. \quad (4)$$

Note that equation (4) reduces to (2) when  $\delta = 0$ . As expected, the optimal fundraising reach decreases with the accessibility of the database service.

### ***Both Database and Certification Services***

With the availability of the certification service, there arises the possibility of different certification outcomes for the applicants, hence the need to define the equilibrium beliefs and the associated notation. Nonprofits can have two posterior types: those that successfully obtained certification (denoted by  $C$ ) and those that either did not apply for certification or could not obtain one (denoted by  $NC$ ). Denote the equilibrium belief that the posterior type  $C$  (certificate holder) is of high quality by  $\rho_C$  and that the posterior type  $NC$  (no certificate) is of high quality by  $\rho_{NC}$ . Note that in any equilibrium where high quality nonprofits apply for certification, a non-certified nonprofit will always be of low quality with certainty. This is because low quality nonprofits can manage to get certified with some probability only (less than one), while high quality nonprofits always get certified when they apply. Since high quality nonprofits always apply for certification in all the three equilibria that will be discussed next, the equilibrium belief that a nonprofit without a certificate is of high quality equals zero. That is, a non-certified nonprofit is always believed to be of low quality with certainty. We therefore drop  $\rho_{NC}$  from fundraising revenue expressions that follow for simplicity of notation. Correspondingly, given these equilibrium beliefs, we denote the net fundraising revenue of the nonprofit of posterior type  $i \in \{C, NC\}$ , facing a competing nonprofit of posterior type  $j \in \{C, NC\}$  by  $NR(i, j | \rho_C)$ .

The optimal fundraising reach thus equals (see the Appendix for further details).

$$r(i, j | \rho_c) = \frac{2us(1-\delta)(\theta(\rho_i) + \theta(\rho_j) - 1)}{8vu^2 - s^2 + \delta s^2}. \quad (5)$$

Note that (5) reduces to (4) when  $\theta(\rho_i) = \theta(\rho_j) = \theta_b$ . We can now state our first proposition, which shows that the availability of certification services may spur fundraising activity.

**Proposition 1.** *The optimal fundraising reach of a nonprofit increases with the equilibrium belief that it is of high quality, and is higher when the competing nonprofit is certified than when it is not. (The proof is in the Appendix.)*

The intuition is that the prevailing information asymmetry works to the advantage of the higher quality nonprofit, as it leads to search activity more of which ends in favor of the better organization. By increasing fundraising, a nonprofit can in a sense “preempt” potential donors’ finding out about the high quality alternative in the market. This result is parallel to that of Rose-Ackerman [34] who demonstrated that competition among nonprofits can force them to fundraise excessively, although her result is driven primarily by the absence of entry barriers.

We distinguish three types of Perfect Bayesian Equilibria (PBE) with the certification activity: separating, pooling, and hybrid. In a separating equilibrium, only high quality nonprofits seek certification, and donors expect the holder of the certification to be of high quality with certainty ( $\rho_c^S = 1$ ). In a pooling equilibrium, both types of nonprofits apply for certification, and hence certification is noisy but still informative as donors use Baye’s rule to update their beliefs on quality ( $\alpha < \rho_c^P < 1$ ). In a hybrid equilibrium, high quality nonprofits always get certified, while low quality nonprofits randomly apply for certification. Since low quality nonprofits do not always apply for certification as in the pooling equilibrium, certification is more informative in a hybrid equilibrium although still not as informative as it is

in a separating equilibrium ( $\rho_C^P < \rho_C^H < 1$ ). Again, nonprofits which cannot obtain certification are believed to be of low quality with certainty in all equilibria ( $\rho_{NC}^S = \rho_{NC}^P = \rho_{NC}^H = 0$ ).

For a separating equilibrium to exist, not applying for certification should be preferable for a low quality nonprofit. In other words, the expected increase in net fundraising revenues should be less than the certification cost. Given the accuracy of certification  $\mu$ , the following two equations show the expected increases in net fundraising revenues for high and low quality nonprofits, respectively, in a separating equilibrium.

$$\Delta NR_h^S = \alpha(NR(C, C | \rho_C^S) - NR(NC, C | \rho_C^S)) + (1 - \alpha)(NR(C, NC | \rho_C^S) - NR(NC, NC | \rho_C^S)) \quad (6)$$

$$\Delta NR_l^S = (1 - \mu)\Delta NR_h^S \quad (7)$$

Certification impacts net fundraising revenues the most in a separating equilibrium because of the clarity of the signal on quality. Suppose the following is true.

$$\frac{c}{1 - \mu} > \Delta NR_h^S \geq c \quad (8)$$

No matter what the D2N marketplace charges for certification at or above its cost, a low type nonprofit is never interested in applying for it. A high quality nonprofit, on the other hand, will always get certified as long as the price  $p_c$  is less than the expected benefit ( $\Delta NR_h^S$ ). Clearly, these strategies and beliefs form a PBE; so, equation (8) is necessary and sufficient for the existence of a separating equilibrium.

Let us now consider the pooling equilibrium where both types of nonprofits apply for certification. In this case, the expected increase in net fundraising revenues due to applying for certification should be positive for both nonprofits. Since a low quality nonprofit will obtain the certificate with probability  $1 - \mu$ , according to Bayes' rule, the holder of a certificate will be expected to be of high quality with probability  $\rho_C^P = \alpha / [\alpha + (1 - \mu)(1 - \alpha)]$ . The following two

equations provide the expected increases in net fundraising revenues for high and low quality nonprofits, respectively, in a pooling equilibrium.

$$\begin{aligned} \Delta NR_h^P &= (1 - \mu(1 - \alpha))(NR(C, C | \rho_c^P) - NR(NC, C | \rho_c^P)) \\ &\quad + \mu(1 - \alpha)(NR(C, NC | \rho_c^P) - NR(NC, NC | \rho_c^P)) \end{aligned} \quad (9)$$

$$\Delta NR_l^P = (1 - \mu)\Delta NR_l^P \quad (10)$$

Suppose the following is true.

$$\Delta NR_h^P > \frac{c}{1 - \mu} \quad (11)$$

If the price of certification  $p_c$  is less than the expected benefit for a low quality nonprofit  $((1 - \mu)\Delta NR_h^P)$ , both types of nonprofits will apply for certification. Equation (11) ensures the existence of a feasible price range that would allow the D2N marketplace to cover its cost while serving both types of nonprofits, and is, therefore, a necessary condition for the pooling equilibrium. If the condition in (8) is violated, these strategies and beliefs form a pooling PBE.

The third is the hybrid equilibrium. Suppose that both conditions in (8) and (11) are violated. Given appropriate pricing by the marketplace, this implies that a low quality nonprofit would want to deviate from its strategy of not applying for certification in a separating equilibrium, yet it would not be interested in getting certified in a pooling equilibrium. The course of action for a low quality nonprofit under these circumstances is to randomize between applying and not applying for the certificate. Let  $\beta \in (0, 1)$  denote the probability that a low quality nonprofit applies for certification. Then, the nonprofit will obtain the certificate with probability  $\beta(1 - \mu)$ , and, using Bayes' rule, the holder of a certificate will be of high quality with probability  $\rho_c^H = \alpha / [\alpha + \beta(1 - \mu)(1 - \alpha)]$ . The following are the expected increases in net revenues for high and low quality nonprofits, respectively, in a hybrid equilibrium.

$$\begin{aligned} \Delta NR_h^H = & [\alpha + (1 - \alpha)\beta(1 - \mu)](NR(C, C | \rho_C^H) - NR(C, NC | \rho_C^H)) \\ & + (1 - \alpha)[1 - \beta(1 - \mu)](NR(C, NC | \rho_C^H) - NR(N, N | \rho_C^H)) \end{aligned} \quad (12)$$

$$\Delta NR_t^H = (1 - \mu)\Delta NR_h^H \quad (13)$$

For randomization to be an optimal strategy, a low quality nonprofit should be indifferent between these two choices in the proposed equilibrium. In other words, the expected net increase in fundraising revenues due to certification for a low quality nonprofit should equal the price of the service. Equation (14) is, therefore, a necessary condition for the hybrid equilibrium.

$$\Delta NR_h^H = \frac{P_c}{1 - \mu}, \quad p_c \geq c \quad (14)$$

If the conditions in (8) and (11) are violated while that in (14) is satisfied, these strategies and beliefs form a hybrid PBE. The next proposition characterizes the equilibria discussed above.

**Proposition 2a.** (Separating equilibrium) *When  $\frac{c}{1 - \mu} > \Delta NR_h^S \geq c$ , the cost and the accuracy of certification are high (but not prohibitive) such that only high quality nonprofits get certified.*

**2b.** (Pooling equilibrium) *When  $\Delta NR_h^P > \frac{c}{1 - \mu}$ , the cost and the accuracy of certification are low such that both types of nonprofits apply for certification.*

**2c.** (Hybrid equilibrium) *When  $\Delta NR_h^S > \frac{c}{1 - \mu} > \Delta NR_h^P$ , the cost and the accuracy of certification take intermediate values. In this case, high quality nonprofits get certified, while low quality*

*nonprofits randomly apply for certification such that  $\Delta NR_h^H = \frac{P_c}{1 - \mu}$ .*

A service maximizing D2N marketplace will keep its certification fee sufficiently low to increase usage by its nonprofit clientele. However, if the accuracy and the cost of certification

are both high, low quality nonprofits may not find applying for a certificate economically feasible. Figure 4 illustrates the parametric regions that produce the equilibria characterized by Proposition 2.<sup>8</sup> Note that the separating equilibrium is more likely to arise with high certification accuracy and high certification cost, because both of these factors limit low quality organizations' incentive to apply (both types pay for the certification cost, but low types get a benefit only  $1 - \mu$  of the time). The hybrid equilibrium is more likely to arise when the cost of certification is high and the accuracy is low since such conditions render low quality nonprofits "undecided".

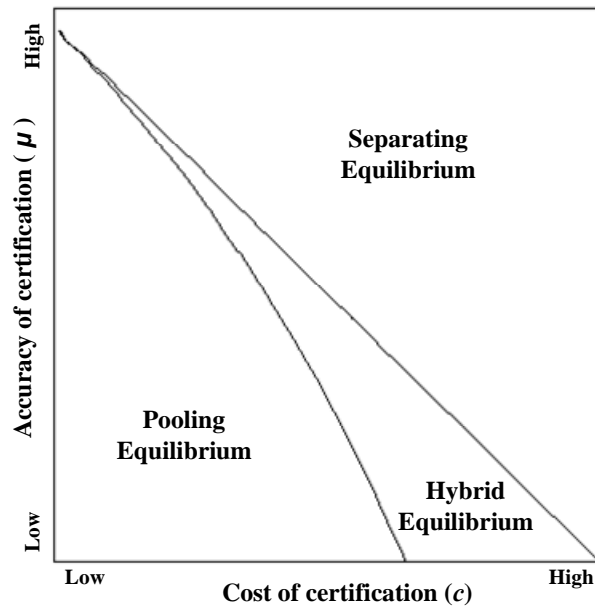


Figure 4. The equilibria outlined in Proposition 2

Drawn with the assumption that the certification fee is set at the marginal cost, Figure 5 below provides a comparison of total fundraising revenues and total net fundraising revenues in the market in separating and pooling equilibria. Note that both total fundraising revenues and their net amounts increase with the accessibility of the database ( $\delta$ ) in both types of equilibria. As more potential donors become aware of the nonprofits in the market using the database service, more of them find their preferred nonprofits and thereby donate more.

<sup>8</sup> The parameter values used in plotting the figure are:  $v = 1$ ,  $s = 1$ ,  $\theta_l = 1$ ,  $\theta_h = 1.5$ ,  $u = 3$ ,  $\alpha = 0.75$ , and  $\delta = 0.5$ .

Figure 5 also shows that total net fundraising revenues in both equilibria increase with the emergence of the D2N marketplace provided that the cost of certification is sufficiently low.<sup>9</sup> On the other hand, high levels of certification costs may reduce total net fundraising revenues to levels even below that in the benchmark case. This is because gains from the database service and the certifications of high quality nonprofits can be more than offset by the cost of certification and the loss in low quality nonprofits' fundraising revenues due to changes in donors' beliefs on their organizational effectiveness. Proposition 3 formalizes this result.

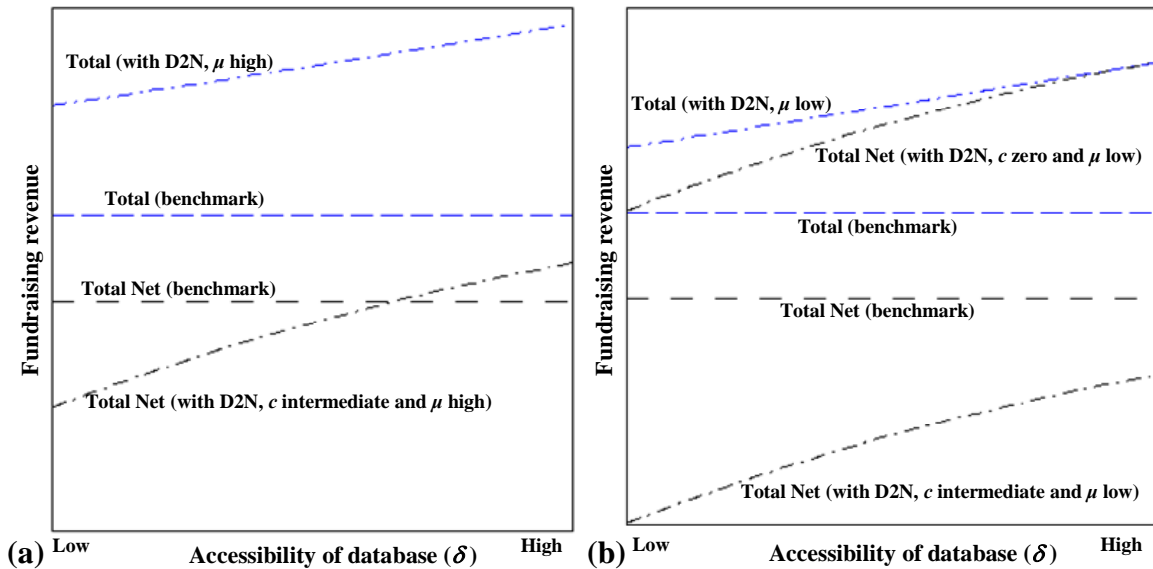


Figure 5. Total (net) fundraising revenues in the (a) separating and (b) pooling equilibria

**Proposition 3.** *Despite the comprehensive and free database service, the total net fundraising revenue in the market drops after the emergence of the D2N marketplace if the cost of certification is sufficiently high and the accessibility of the database service is sufficiently low. Otherwise, the D2N marketplace induces an increase in the total net fundraising revenue. (The proof is in the Appendix.)*

<sup>9</sup> The following parameter values were used in plotting the figures:  $v = 1$ ,  $s = 1$ ,  $\theta_l = 1$ ,  $\theta_h = 1.5$ ,  $u = 3$ ,  $\alpha = 0.75$ ,  $c = 0.04$  (intermediate value),  $\mu = 0.95$  (high value), and  $\mu = 0.6$  (low value).



Also of interest is the marketplace’s impact on nonprofits’ fundraising effectiveness, which is measured by the amount of revenues available for social services as a proportion of total revenues. Nonprofits receive negative publicity when they spend a disproportionate amount of their revenues on fundraising and administrative expenses, even though this may sometimes be induced by intense competition [34]. Experts recommend spending of at least 70 percent of fundraising revenues on mission-related social services and operations. Figure 6 shows that the fundraising effectiveness of nonprofits increases with the accessibility of the database service and decreases with the cost of certification in both separating and pooling equilibria.

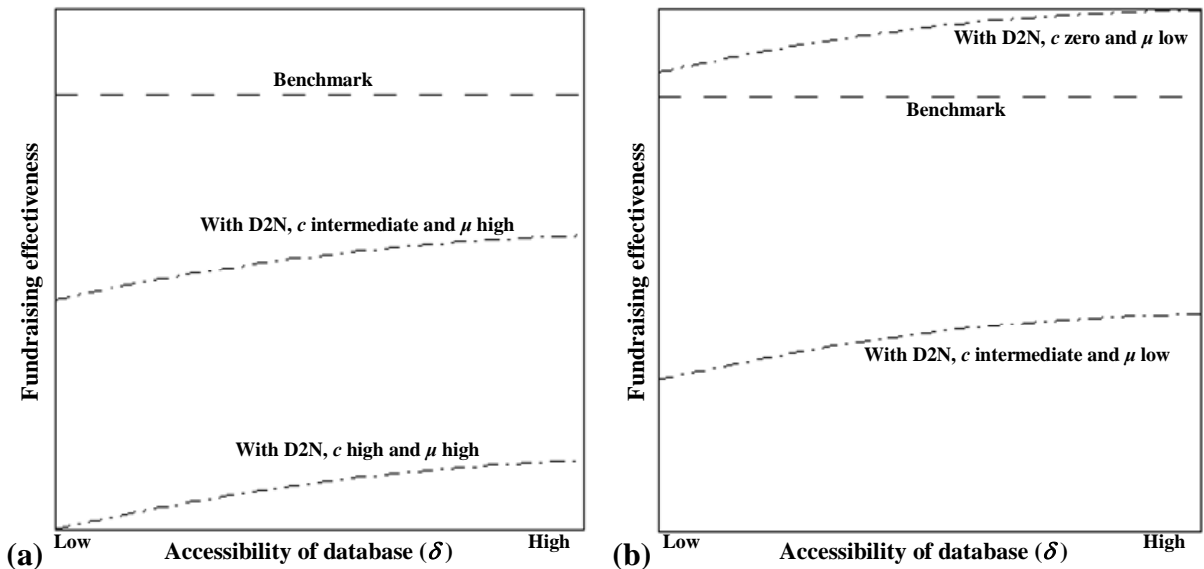


Figure 6. Proportion of fundraising revenues available for social services in the (a) separating and (b) pooling equilibria

Recall that the pooling equilibrium is more likely when the cost of certification is low. Because a reduction in certification cost raises net fundraising revenues, we expect nonprofits to be more effective fundraisers in a pooling equilibrium than in a separating equilibrium in general. However, given the same level of certification cost, fundraising effectiveness is likely to be higher in a separating equilibrium than in a pooling equilibrium because the certification service is used by more nonprofits (and hence the cost is incurred more) in the latter case. For the same

reason, a reduction in certification cost impacts fundraising effectiveness to a greater extent in the pooling equilibrium than in the separating equilibrium. These ideas are also illustrated in Figures 6a and 6b. Note that a similar increase in certification cost has a more dramatic impact on fundraising effectiveness in the pooling equilibrium than in the separating equilibrium.<sup>10</sup>

### *Endogenizing Certification Accuracy*

So far, we have assumed an exogenous level of certification accuracy. In reality, a marketplace may vary the level of rigor for the certification process. For example, Charity Navigator takes into account only financial criteria in its ratings, while the Better Business Bureau (BBB) imposes various additional controls over the use of funds, the nature of fundraising practices, and governance.<sup>11</sup> Obviously, the D2N marketplace's cost to review and assess the applications would rise with every additional criterion. One can capture the relationship between certification accuracy and cost by taking  $\mu$  as a function of  $c$  and assuming  $d\mu/dc > 0$  and  $d^2\mu/dc^2 < 0$ . In other words, the D2N marketplace can increase certification accuracy by raising the cost of the process, but with decreasing returns to scale since 100 percent accuracy is probably impossible to achieve regardless of the cost involved. Thus, when the marketplace's sole aim is to maximize the usage of the service, the obvious choice is to reduce the cost of the certification process to be able to charge a sufficiently low price such that all nonprofits apply. Given the relationship between accuracy and cost, certification accuracy would consequently drop, and the resulting conditions would allow the marketplace to attain the pooling equilibrium it prefers.

While the economics literature strongly supports "service maximization" as the objective function for nonprofits, there may be situations where a nonprofit may wish to maximize the

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<sup>10</sup> The following parameter values were used in plotting the figures:  $v = 1$ ,  $s = 1$ ,  $\theta_l = 1$ ,  $\theta_h = 1.5$ ,  $u = 3$ ,  $\alpha = 0.75$ ,  $c = 0.04$  (intermediate value),  $c = 0.08$  (high value),  $\mu = 0.95$  (high value), and  $\mu = 0.6$  (low value).

<sup>11</sup> See <http://www.bbb.org/us/Charity-Standards/> [last accessed on January 8, 2010].

“value” of the service instead. In our setting with the certification service, the marketplace serves both donors (by improving transparency in the market) and nonprofits (by allowing them provide evidence that they spend donation dollars responsibly and effectively). If the marketplace is concerned with the value of its service, it may consider the impact of the accuracy and cost of the service on donors and nonprofits. On one hand, lower accuracy will lead donors to view the service more negatively in the long run. On the other hand, a higher certification cost will have a more negative impact on the fundraising effectiveness of its clientele (see Figures 6a and 6b). The optimal accuracy/cost choice will depend on the relative importance of these two factors for the D2N marketplace. Proposition 4 discusses the optimal strategy in general terms assuming that the marketplace aims to maximize the value of its certification service.

**Proposition 4.** *In a pooling equilibrium, as the proportion of low quality nonprofits increases, issuing accurate certifications becomes more important for the D2N marketplace. The marketplace should then raise the cost of certification to improve accuracy, potentially tipping the scale in favor of a separating equilibrium. As the fundraising effectiveness of the nonprofits become more important with respect to the accuracy of certifications, the marketplace should lower the cost of the service and compromise certification accuracy. Such a strategy would lend further support to the pooling equilibrium. (The proof is in the Appendix.)*

The sole reliance on financial statements is the key for Charity Navigator’s ability to track and rate more than 5,000 nonprofits. The American Institute of Philanthropy (*charitywatch.com*) follows a similar set of criteria in its evaluations. While rating nonprofits based solely on financial metrics allows these entities to expand their customer base, this practice renders the reliability of their ratings suspect, especially considering the reported inaccuracies and manipulations in the financial statements of nonprofits [24, 38]. In evaluating the processes

of major online certification providers, Lowell et al. [25] criticize the low-cost approach taken, in particular, by Charity Navigator and the American Institute of Philanthropy, and conclude that these services exhibit serious shortcomings in correctly identifying a nonprofit as an effective one. Further, comparing charities with a single set of criteria assumes that all charities are similar enough in their operating expenses, which is not the case in reality [33]. Proposition 4 suggests a viable explanation as to why these intermediaries may have chosen a simplistic approach to certification. Unlike the certification service of the BBB, the simplistic approach minimizes the negative impact on the fundraising effectiveness of the nonprofits being rated. That being said, these intermediaries could still utilize more stringent criteria for certain segments of the nonprofit sector where transparency and quality is a real issue. Although the cost of the process would likely increase, the intermediaries should be able to cover their costs with the fees high quality institutions in those segments would be willing to pay.

#### **4. Conclusion**

Fundraising is by far the most significant revenue source for nonprofits. We analytically examine the impact of database and certification services of a D2N marketplace on nonprofits' fundraising strategies. Our model incorporates the salient aspects of fundraising markets, such as the extensive variety of missions (through horizontal differentiation), differences in organizational effectiveness (through vertical differentiation), fundraising expenditures, and donor search. To the best of our knowledge, this is the first study that analytically explores the impact of third-party online services on fundraising markets.

We find that, as is the case in the real world, the D2N marketplace should provide the database service free of charge. Second, the emergence of the D2N marketplace generally allows nonprofits to generate larger fundraising revenues than what they can do traditionally.

Interestingly, the total net revenue in the market may actually drop when the database is not widely accessible and obtaining a certificate of quality is costly. Third, while high quality nonprofits are more likely to apply for certification, low quality ones may also follow suit when both the cost and accuracy of the certification are low. Fourth, a D2N marketplace may deliberately lower the rigor and cost of its certification process to maximize the usage of the service and to limit the associated negative impact on the applicants' fundraising effectiveness. It appears that, despite the reservations expressed by critics such as Lowell et al. [25], the low-cost, no-frills approach taken by Charity Navigator and the American Institute of Philanthropy is, in fact, good for the overall fundraising effectiveness of the sector, as funds are better spent on socially valuable projects than on certification. For the marketplace to provide more value, it needs to adopt an accurate and costly certification process so that donors can more clearly see which nonprofits are effective service providers rather than just which of them are effective fundraisers. This may, however, reduce the actual usage of the service. We conjecture that the best course of action will depend on the prevailing level of donor concern about organizational effectiveness regarding the delivery a particular social service.

Our main contribution to the information systems literature is the analytical study of online marketplaces in the context of the nonprofit sector. In doing so, we borrowed elements from the advertising literature to model fundraising, search literature to model information asymmetries and donor behavior, and economics literature to model objective functions of nonprofits. This theory-driven approach allowed us to study the role of online marketplaces in reducing search costs and creating a digital divide, as well as to examine the impact of quality certification services on fundraising in this sector. Future IS research on nonprofits could selectively use the elements of this framework to study other IT-related issues.

From a search cost perspective, a common result on online marketplaces in for-profit markets is that consumers benefit and sellers suffer from the emergence of online marketplaces due to the intensified competition [4, 10, 11, 23, 39]. In the nonprofit sector, however, we find that both donors and nonprofits may benefit from the emergence of the online marketplace. The transparency introduced by the marketplace may benefit nonprofits through an increase in total and net fundraising revenues; it also benefits donors by helping them find the right nonprofit and informing them about its performance. On the other hand, similar in spirit to [13], our analysis shows that the emergence of the online marketplace in this specific context does not always lead to gains from a social welfare perspective, as costly certification is non-productive.

There are important issues that we may not have addressed adequately. For example, the continuous use of certification services may gradually diminish the uncertainty on organizational qualities. In such a case, the D2N marketplace can still provide value by continuously tracking the performances of established nonprofits and rating new entrants.<sup>12</sup> In addition, we have not considered the possibility of donors donating to multiple nonprofits. Still, the model presented here captures the essence of fundraising markets and the new online services, while maintaining analytical tractability. Another potential limitation is that the model does not capture each nonprofit's pre-existing established donor pool. Conceivably, the incentive for certification may depend on the size of the pre-existing donor pool that has a favorable view of the organization. We have decided not to model this specific characteristic of nonprofits in order to be able to capture other more interesting features of online intermediaries. Finally, we have not considered abusive strategic behavior by the D2N marketplace such as deliberately assigning erroneous ratings (in order to force all nonprofits to use its certification service) because the marketplace itself is a nonprofit that aims to encourage charitable giving, and such abusive behavior would

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<sup>12</sup> Between 25,000 and 30,000 new nonprofits are established every year [2].

not help that mission. From a technical point of view, such abusive behavior would not change our results, because the nonprofits which do not obtain certification are already believed to be of low quality with certainty in all three types of equilibria outlined in Proposition 2.

There are interesting avenues for future IS research in this context. For instance, the current model, which features a monopolist D2N marketplace, can be extended to an oligopolistic setting where multiple marketplaces compete to serve potential donors and nonprofits. Such an analysis can help us understand how multiple marketplaces can co-exist through differentiation in database and certification services. We conjecture that the competing marketplaces will offer certification services that employ different criteria with varying levels of difficulty. Segmentation would occur in equilibrium (as in the case of Hvide [19]), where nonprofits with a high unobservable quality apply for a certification that is harder to obtain, while nonprofits with a relatively lower unobservable quality apply for an easier one. Also, the optimal design of certification criteria deserves further examination as it could provide more insights about the effective management of D2N marketplaces. Finally, the effect of certification services on nonprofit and for-profit institutions may be contrasted using a model that incorporates the essential elements of both types of market participants. We expect third-party online certification services to be used less in for-profit markets since the performances of for-profit firms are more observable than the performances of their nonprofit counterparts.

## References

1. Ba, S., Stinchcombe, M., Whinston, A.B., and Zhang, H. Trusted third parties in the electronic marketplace: An evolutionary game approach. *Proceedings of the 5<sup>th</sup> Americas Conference on Information Systems*. Milwaukee: Association for Information Systems, 1999, pp. 238-240.
2. Bailey, M. Charity checkups watchdog groups stress importance of becoming educated contributors. *The Boston Globe*, April 19, 1999.
3. Bailey, J., and Bakos, Y. An exploratory study of the emerging role of electronic intermediaries. *International Journal of Electronic Commerce*, 1, 3 (1997), 7-20.

4. Bakos, Y. Reducing buyer search costs: Implications for electronic marketplaces. *Management Science*, 43, 12 (1997), 1676-1692.
5. Bakos, Y. The emerging role of electronic marketplaces on the Internet. *Communications of the ACM*, 41, 8 (1998), 35-42.
6. Bakos, Y., and Katsamakas, E. Design and ownership of two-sided networks: Implications for Internet platforms. *Journal of Management Information Systems*, 25, 2 (2008), 171-202.
7. Bennett, J.T., and McCrohan, K.F. Public policy issues in the marketing of seals of approval for food. *Journal of Consumer Affairs*, 27, 2 (1993), 397-415.
8. Bhargava, H.K., and Choudhary, V. Economics of an information intermediary with aggregation benefits. *Information Systems Research*, 15, 1 (2004), 22-36.
9. Brooks, A.C. What do nonprofit organizations seek? (And why should policymakers care?). *Journal of Policy Analysis and Management*, 24, 3 (2005), 543-558.
10. Brynjolfsson, E., Hu, Y., and Smith, M.D. Consumer surplus in the digital economy: Estimating the value of increased product variety at online booksellers. *Management Science*, 49, 11 (2003), 1580-1596.
11. Brynjolfsson, E., and Smith, M.D. Frictionless commerce? A comparison of Internet and conventional retailers. *Management Science*, 46, 4 (2000), 563-585.
12. Byers, R.E., and Lederer, P.J. Retail bank services strategy: A model of traditional, electronic, and mixed distribution choices. *Journal of Management Information Systems*, 18, 2 (2001), 133-156.
13. Campbell, C., Ray, G., and Muhanna, W.A. Search and collusion in electronic markets. *Management Science*, 51, 3 (2005), 497-507.
14. Dewan, R., Jing, B., and Seidmann, A. Product customization and price competition on the internet. *Management Science*, 49, 8 (2003), 1055-1070.
15. Fudenberg, D., and Tirole, J. *Game Theory*. Cambridge: The MIT Press, 1991.
16. Grossman, G.M., and Shapiro, C. Informative advertising with differentiated products. *Review of Economic Studies*, 51, 1 (1984), 63-81.
17. Gutierrez, O., and Zhang, W. Information systems research in the nonprofit context: A new frontier. Working Paper, University of Massachusetts Boston, 2007.
18. Hoffman, D.L., Novak, T.P., and Peralta, M. Building consumer trust online. *Communications of the ACM*, 42 (1999), 80-85.
19. Hvide, H.K. Oligopolistic certification. *The B.E. Journal of Theoretical Economics*, 9, 1 (2009), Article 5.
20. Jansen, P.J., and Katz, D.M. For nonprofits, time is money. *The McKinsey Quarterly*, 1 (2002), 124-133.
21. Khanna, J., Posnett, J., and Sandler, T. Charity donations in the UK: New evidence based on panel data. *Journal of Public Economics*, 56 (1995), 257-272.
22. Kim, D. (2003). Short arguments for seals of approval and portal affiliation: Building consumer trust in online shopping. *Proceedings of the 9<sup>th</sup> Americas Conference on Information Systems*. Tampa: Association for Information Systems, August 4-6, 2003, pp. 2194-2198.



23. Kocas, C. Evolution of prices in electronic markets under diffusion of price-comparison shopping. *Journal of Management Information Systems*, 19, 3 (2002), 99-119.
24. Krishnan, R., Yetman, M.H., and Yetman, R.J. Expense misreporting in nonprofit organizations. *The Accounting Review*, 81, 2 (2006), 399-420.
25. Lowell, S., Trelstad, B., and Meehan, B. The ratings game: Evaluating the three groups that rate the charities. *Stanford Social Innovation Review*, Summer (2005), 39-45.
26. Malone, T.W., Yates, J., and Benjamin, R.I. Electronic markets and electronic hierarchies. *Communications of the ACM*, 30, 6 (1987), 484-497.
27. Ozcelik, Y. Globalization and the Internet: Digitizing the nonprofit sector. *Journal of Global Business Issues*, 2, 1 (2008), 149-152.
28. Parker, G.G., and Van Alstyne, M.W. Two-sided network effects: A theory of information product design. *Management Science*, 51, 10 (2005), 1494-1504.
29. Parkinson, T.L. The role of seals and certifications of approval in consumer decision-making. *Journal of Consumer Affairs*, 9 (1975), 1-16.
30. Posnett, J., and Sandler, T. Demand for charity donations in private non-profit markets: The case of the U.K. *Journal of Public Economics*, 40 (1989), 187-200.
31. Quinn, J.B. Giving freely-and wisely. *Newsweek*, December 18, 2006, p. 51.
32. Rees, J., Koehler, G.J., and Ozcelik, Y. Information privacy and e- business activities: Key issues for managers. In S.K. Sharma, and J.N.D. Gupta (eds.), *Managing e-Business in the 21st Century*, Australia: Heidelberg Press, 2003, pp. 139-151.
33. Rooney, P.M., Hager, M.A., and Pollak, T.H. Research about fundraising and administrative costs. *Giving USA Update*, 2 (2003). Indianapolis: AAFRC Trust for Philanthropy.
34. Rose-Ackerman, S. Charitable giving and 'excessive' fundraising. *The Quarterly Journal of Economics*, 97, 2 (1982), 193-212.
35. Steinberg, R. The revealed objective functions of nonprofits. *The RAND Journal of Economics*, 17, 4 (1986), 508-526.
36. Tinkelman, D. Using nonprofit organization-level financial data to infer managers' fund-raising strategies. *Journal of Public Economics*, 88 (2004), 2181-2192.
37. Tirole, J. *The Theory of Industrial Organization*. Cambridge, MA: The MIT Press, 1988.
38. Trussel, J. Assessing potential accounting manipulation: The financial characteristics of charitable organizations with higher than expected program-spending ratios. *Nonprofit and Voluntary Sector Quarterly*, 32, 4 (2003), 616-634.
39. Viswanathan, S. Competing across technology-differentiated channels: The impact of network externalities and switching costs. *Management Science*, 51, 3 (2005), 483-496.
40. Wolinsky, A. Product differentiation with perfect information. *Review of Economic Studies*, 51, 1 (1984), 53-61.
41. Yoo, B., Choudhary, V., and Mukhopadhyay, T. A model of neutral B2B. *Journal of Management Information Systems*, 19, 3 (2002), 43-68.

## Appendix

### List of Notation

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$\alpha$	Prior probability that a nonprofit is of high quality
$\theta_j$	Maximum willingness to donate to a nonprofit of type $j \in \{h, l\}$ , where $h$ and $l$ denote high and low quality, respectively
$\theta_b$	Maximum willingness to donate in the absence of certification information
$u$	Utility parameter
$s$	Offline search cost to sample one nonprofit
$N_i$	Nonprofit located at $i \in \{0, 1\}$ on the unit line
$r_i$	Fundraising reach for the nonprofit located at $i \in \{0, 1\}$ on the unit line
$v$	Parameter for the cost of contacting donors
$R$	Total fundraising revenue
$NR$	Total net fundraising revenue
$\delta$	Proportion of potential donors who are aware of the database service and have internet access and search skills to use the service
$\mu$	Accuracy of certification service
$c$	Cost of certification
$p_d$	Price of database subscription
$p_c$	Price of the certification service
$\rho_k$	The equilibrium belief that the posterior type $k$ is of high quality, where $k \in \{C, NC\}$ ( $C$ and $NC$ stand for availability and lack of certification, respectively.)

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### Proofs of Results

**The Benchmark Case.** For the ease of exposition, we will focus on  $N_0$ 's strategy;  $N_1$ 's strategy is similar. Please refer to Figure 3 for an illustration of search outcomes. Given the reach decisions  $r_0$  and  $r_1$ , the probability that a potential donor gets contacted by both nonprofits is  $r_0 r_1$ . Such donors are completely informed about both nonprofits and their missions, and thus they all donate to their preferred nonprofits, yielding a fundraising revenue of

$$r_0 r_1 \int_0^{1/2} (\theta_b - x) dx = r_0 r_1 \left( \frac{\theta_b}{2} - \frac{1}{8} \right) \text{ for } N_0.$$

With probability  $r_0(1-r_1)$ , donors will be contacted by  $N_0$  only. For half of such donors, the contacting nonprofit will be the preferred one, and they will not search. They may or may not search if it is the unpreferred one. Suppose that  $N_0$  contacts a potential donor  $x$  units away from it, where  $x > 1/2$ . As discussed in Section 3.1, in this case search is preferable when  $x > \frac{1}{2} + \frac{s}{2u}$  (assuming a sampling process without replacement).<sup>13</sup>  $N_0$ 's fundraising revenue from potential donors solicited by itself only equals

$$r_0(1-r_1) \int_0^{\frac{1}{2} + \frac{s}{2u}} (\theta_b - x) dx = r_0(1-r_1) \left[ \theta_b \left( \frac{1}{2} + \frac{s}{2u} \right) - \frac{1}{2} \left( \frac{1}{2} + \frac{s}{2u} \right)^2 \right].$$

Similarly, the fundraising revenue

from those solicited only by  $N_1$  (who then search to find and donate to  $N_0$ ) equals

$$r_1(1-r_0) \int_0^{\frac{1}{2} - \frac{s}{2u}} (\theta_b - x) dx = r_1(1-r_0) \left[ \theta_b \left( \frac{1}{2} - \frac{s}{2u} \right) - \frac{1}{2} \left( \frac{1}{2} - \frac{s}{2u} \right)^2 \right].$$

Potential donors are not solicited by any nonprofit with probability  $(1-r_0)(1-r_1)$ . When conducting a search, the first nonprofit to be found will be the preferred one (i.e., less than  $1/2$  units away) with probability  $1/2$ , in which case there will not be a need for further search, and

the nonprofit will obtain a fundraising revenue of  $\frac{(1-r_0)(1-r_1)}{2} \int_0^{\frac{1}{2} + \frac{s}{2u}} (\theta_b - x) dx$  from such donors

(see Figure 3). With the remaining probability, the nonprofit will be the unpreferred one,

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<sup>13</sup> When the sampling process is with replacement, the potential donor can repeatedly sample the same nonprofit. If she continues sampling until finding the preferred nonprofit, the expected utility with search becomes  $u(\theta_b - x) - 4s$  because the donor will search once with probability  $1/2$ , twice with probability  $1/4$ , three times with probability  $1/8$ , etc. Using the properties of the geometric series, the expected total search cost can be found as  $4s$ . Compared with the utility of not searching at all, namely  $u(\theta_b - (1-x))$ , search will be profitable as long as  $x > \frac{1}{2} + \frac{2s}{u}$ . If the donor stops after the first search, she will find the preferred nonprofit with probability  $1/2$ , and the expected utility will be  $\frac{1}{2}u(\theta_b - x) + \frac{1}{2}u(\theta_b - (1-x)) - s$ , and search will be preferable when  $x > \frac{1}{2} + \frac{s}{u}$ . Recall that search is preferable when  $x > \frac{1}{2} + \frac{s}{2u}$  for a sampling process without replacement. Hence, it is easy to see that sampling with replacement is identical to a higher cost of search compared to sampling without replacement.

yielding a fundraising revenue of  $\frac{(1-r_0)(1-r_1)}{2} \int_0^{\frac{1-s}{2u}} (\theta_b - x) dx$ . The sum of these two integrals

(after some simplification) equals  $(1-r_0)(1-r_1) \left[ \frac{\theta_b}{2} - \frac{1}{8} - \frac{s^2}{8u^2} \right]$ .

Thus, the benchmark net fundraising revenue of  $N_0$  equals

$$\begin{aligned} NR_b^0(r_0, r_1) = & r_0 r_1 \left( \frac{\theta_b}{2} - \frac{1}{8} \right) + r_0 (1-r_1) \left[ \theta_b \left( \frac{1}{2} + \frac{s}{2u} \right) - \frac{1}{2} \left( \frac{1}{2} + \frac{s}{2u} \right)^2 \right] \\ & + r_1 (1-r_0) \left[ \theta_b \left( \frac{1}{2} - \frac{s}{2u} \right) - \frac{1}{2} \left( \frac{1}{2} - \frac{s}{2u} \right)^2 \right] + (1-r_0)(1-r_1) \left[ \frac{\theta_b}{2} - \frac{1}{8} - \frac{s^2}{8u^2} \right] - \frac{v}{2} r_0^2. \end{aligned}$$

Replacing  $r_0$  with  $r_1$  and  $r_1$  with  $r_0$  provides the net fundraising revenue for  $N_1$ . We maximize  $N_0$ 's net fundraising revenue with respect to  $r_0$  and  $N_1$ 's net fundraising revenue with respect to  $r_1$ . Since the nonprofits are symmetric in terms of expected qualities, the optimal fundraising levels are also symmetric. After simultaneously solving for the first order conditions and using some simplification, we obtain the optimal fundraising reach given in equation (2) and the expressions for total fundraising and net fundraising revenues given in equation (3). The

second order conditions are satisfied since  $\frac{\partial^2 NR_b^0}{\partial r_0^2} = \frac{\partial^2 NR_b^1}{\partial r_1^2} = -v$ .

**Database Service Only.** The solution methodology is similar to the approach used in the benchmark case, except that now a  $\delta$  fraction of donors can find their preferred nonprofit using the database service free of charge. The fundraising revenue of both nonprofits from such

donors is  $\delta \left( \frac{\theta_b}{2} - \frac{1}{8} \right)$ . On the other hand, the fundraising revenue of  $N_0$  from donors not using

the database service equals  $(1-\delta) \left( r_0 r_1 \left( \frac{\theta_b}{2} - \frac{1}{8} \right) + r_0 (1-r_1) \left[ \theta_b \left( \frac{1}{2} + \frac{s}{2u} \right) - \frac{1}{2} \left( \frac{1}{2} + \frac{s}{2u} \right)^2 \right] \right.$   
 $\left. + r_1 (1-r_0) \left[ \theta_b \left( \frac{1}{2} - \frac{s}{2u} \right) - \frac{1}{2} \left( \frac{1}{2} - \frac{s}{2u} \right)^2 \right] + (1-r_0)(1-r_1) \left[ \frac{\theta_b}{2} - \frac{1}{8} - \frac{s^2}{8u^2} \right] \right)$ . The net fundraising

revenue is the sum of these two expressions less total solicitation costs  $(vr_0^2/2)$ . The net

fundraising revenue for  $N_1$  can be obtained by replacing  $r_0$  with  $r_1$  and  $r_1$  with  $r_0$ . Maximizing net fundraising revenues with respect to  $r_0$  and  $r_1$  by simultaneously solving for the first order conditions, we obtain the expression for the optimal (symmetric) fundraising reach given in equation (4). Second order conditions are satisfied. The optimal fundraising reach decreases with the accessibility of the database service since  $\frac{\partial r_{db}^*}{\partial \delta} = -\frac{16u^3sv(2\theta_b - 1)}{(8vu^2 - s^2 + \delta s^2)^2} < 0$ .

**Proof of Proposition 1.** Suppose, without the loss of generality, that  $N_0$  and  $N_1$  are of posterior types  $i \in \{C, NC\}$  and  $j \in \{C, NC\}$ , respectively. Consider a potential donor located at  $x$  on the line, who is aware of both nonprofits. The gross utilities of donating to  $N_0$  and  $N_1$  are  $u(\theta(\rho_i) - x)$  and  $u(\theta(\rho_j) - (1 - x))$ , respectively. Correspondingly, the location of the potential donor who is indifferent between donating to either one is given by  $\frac{1}{2} + \frac{\theta(\rho_i) - \theta(\rho_j)}{2}$ . Because all potential donors who search the D2N database know both nonprofits (including certifications), they follow the search strategies shown in Figure A1. Potential donors who do not have internet access or who are not aware of the D2N marketplace rely on solicitations and offline search as before, but now they take into account the differences in quality expectations. Their search strategies are illustrated in Figure A2, which is a modified version of Figure 3.

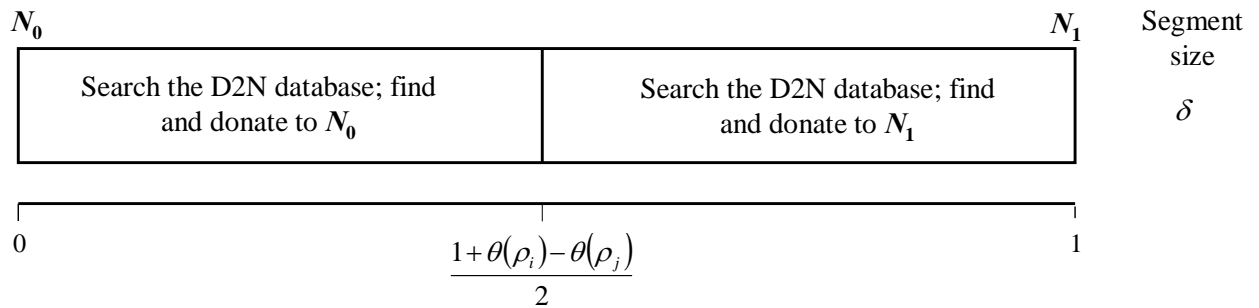


Figure A1. Search outcomes for donors who use the D2N marketplace database

$N_0$		$N_1$	Segment size
Solicited by both nonprofits; do not search; donate to $N_0$		Solicited by both nonprofits; do not search; donate to $N_1$	
Solicited by $N_0$ only; do not search; donate to $N_0$		Solicited by $N_0$ only; search once; donate to $N_1$	
Solicited by $N_1$ only; search once; donate to $N_0$		Solicited by $N_1$ only; do not search; donate to $N_1$	
Not solicited; find $N_0$ in 1 <sup>st</sup> search; donate to $N_0$		Not solicited; find $N_0$ in 1 <sup>st</sup> search; donate to $N_1$ after 2 <sup>nd</sup>	
Not solicited; find $N_1$ in 1 <sup>st</sup> search; donate to $N_0$ after 2 <sup>nd</sup>		Not solicited; find $N_1$ in 1 <sup>st</sup> search; donate to $N_1$	
		$(1-\delta)r_0r_1$	
		$(1-\delta)r_0(1-r_1)$	
		$(1-\delta)r_1(1-r_0)$	
		$\frac{(1-\delta)(1-r_0)(1-r_1)}{2}$	
		$\frac{(1-\delta)(1-r_0)(1-r_1)}{2}$	
0		$\frac{1+\theta(\rho_i)-\theta(\rho_j)}{2} - \frac{s}{2u}$	$\frac{1+\theta(\rho_i)-\theta(\rho_j)}{2}$
		$\frac{1+\theta(\rho_i)-\theta(\rho_j)}{2}$	$\frac{1+\theta(\rho_i)-\theta(\rho_j)}{2} + \frac{s}{2u}$
		1	

Figure A2. Search outcomes for donors who do not use the D2N marketplace database

The fundraising revenue of  $N_0$  from donors that use the database equals

$$\delta \int_0^{\frac{1+\theta(\rho_i)-\theta(\rho_j)}{2}} (\theta(\rho_i) - y) dy = \delta \theta(\rho_i) \left( \frac{1}{2} + \frac{\theta(\rho_i) - \theta(\rho_j)}{2} \right) - \frac{\delta}{2} \left( \frac{1}{2} + \frac{\theta(\rho_i) - \theta(\rho_j)}{2} \right)^2. \text{ As before,}$$

fundraising revenue from donors who do not use the database service can be segmented into four types based on search outcomes. First, the revenue from donors contacted by both nonprofits

$$\text{equals } (1-\delta)r_0r_1 \left( \theta(\rho_i) \left( \frac{1}{2} + \frac{\theta(\rho_i) - \theta(\rho_j)}{2} \right) - \frac{1}{2} \left( \frac{1}{2} + \frac{\theta(\rho_i) - \theta(\rho_j)}{2} \right)^2 \right). \text{ Second, the revenue}$$

from donors contacted only by  $N_0$  equals

$$(1-\delta)r_0(1-r_1) \left( \theta(\rho_i) \left( \frac{1}{2} + \frac{\theta(\rho_i) - \theta(\rho_j)}{2} + \frac{s}{2u} \right) - \frac{1}{2} \left( \frac{1}{2} + \frac{\theta(\rho_i) - \theta(\rho_j)}{2} + \frac{s}{2u} \right)^2 \right). \text{ Third, the}$$

revenue from donors contacted only by  $N_1$  equals

$$(1-\delta)r_0(1-r_1) \left( \left( \frac{1}{2} + \frac{\theta(\rho_i) - \theta(\rho_j)}{2} - \frac{s}{2u} \right) - \frac{1}{2} \left( \frac{1}{2} + \frac{\theta(\rho_i) - \theta(\rho_j)}{2} - \frac{s}{2u} \right)^2 \right). \text{ Finally, the revenue}$$

from donors not contacted by any nonprofit equals (after some simplification)

$$(1-\delta)(1-r_0)(1-r_1) \left( \theta(\rho_i) \left( \frac{1}{2} + \frac{\theta(\rho_i) - \theta(\rho_j)}{2} \right) - \frac{1}{2} \left( \frac{1}{2} + \frac{\theta(\rho_i) - \theta(\rho_j)}{2t} \right)^2 - \frac{s^2}{8u^2} \right). \text{ The net}$$

fundraising revenue is obtained from adding all of the above expressions and subtracting the cost of fundraising,  $vr_0^2/2$ . The net fundraising revenue of  $N_1$  is derived in a similar fashion.

Maximizing with respect to  $r_0$  and  $r_1$  by simultaneously solving for the first order conditions, we find the optimal fundraising reach for the nonprofit of posterior type  $i \in \{C, NC\}$ , facing a competing nonprofit of posterior type  $j \in \{C, NC\}$  under the equilibrium belief  $\rho_C$ . to be

$$r_0^* = r(i, j | \rho_C) = \frac{2us(1-\delta)(\theta(\rho_i) + \theta(\rho_j) - 1)}{8vu^2 - s^2 + \delta s^2}. \text{ Second order conditions are satisfied. The}$$

proposition follows from the partial derivatives:

$$\frac{\partial r(i, j | \rho_C)}{\partial \theta(\rho_i)} = \frac{\partial r(i, j | \rho_C)}{\partial \theta(\rho_j)} = \frac{2us(1-\delta)}{8vu^2 - s^2 + \delta s^2} > 0.$$

**Proof of Proposition 3.** When  $\delta = 0$ , the database service provides no benefit to nonprofits. In a separating equilibrium, the implication is that low quality nonprofits are worse off (in terms of net fundraising revenues) compared to the benchmark case because of the revelation of their qualities. Meanwhile, if the cost of certification takes a high value such as  $c = NR_h^S - NR_b$ , then high quality nonprofits are just as well off compared to the benchmark case because their fundraising revenue less solicitation costs and the certification fee equals their net fundraising revenue in the benchmark case. Hence, total net fundraising revenue will drop after the emergence of the marketplace. It is easy to see that this will still be true for small, but positive, values of  $\delta$  or for values of  $c$  slightly lower than  $NR_h^S - NR_b$ .

**Proof of Proposition 4.** Suppose that the prevailing conditions support the pooling equilibrium. Since there are two nonprofits in the market and the probability of being high quality is  $\alpha$ , the expected number of low quality nonprofits that will apply for certification is  $2(1-\alpha)$ , and the expected number of false positives (certification of low quality nonprofits) is  $2(1-\alpha)(1-\mu(c))$ . The D2N marketplace will weigh the negative effect of false positives on donors against the negative impact of certification costs on the fundraising effectiveness of nonprofits, and will seek to optimize the following objective function

$$\text{Min}_c 2(1-\alpha)(1-\mu(c))K_1 + 2cK_2,$$

where  $2c$  is the total certification cost in the pooling equilibrium, and  $K_1$  and  $K_2$  denote the relative importance of false positives and the fundraising effectiveness of nonprofits, respectively. The first order condition suggests that the optimal certification accuracy satisfies the following condition.

$$\frac{d\mu(c^*)}{dc} = \frac{K_2 / K_1}{1 - \alpha}$$

The second order condition is satisfied since  $\frac{d^2\mu}{dc^2} < 0$ . The above condition suggests that, the higher the proportion of low quality nonprofits in the market, the lower  $\frac{d\mu(c^*)}{dc}$  will have to be at optimality. Because  $\mu$  is an increasing convex function of  $c$  given  $\frac{d\mu}{dc} > 0$  and  $\frac{d^2\mu}{dc^2} < 0$ , this implies that  $\mu(c^*)$  increases with the proportion of low quality nonprofits in the market. Following a similar logic, the higher is  $K_2$  with respect to  $K_1$ , the lower the cost of certification should be. The last argument in Proposition 4 is a corollary of Proposition 2 in that lowering the accuracy and cost of certification lends support to the pooling equilibrium.