Serving the Many or Serving the Most Needy?

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Preliminary Version

Abstract

For free, subsidized or cost-covering? The decision of how much to charge for the good or service is very fundamental in social business planning. The higher the fee paid by the recipient, the more people in need can be served by the additional revenues. But charging a fee means simultaneously to exclude the very poor from consumption. This paper argues that the entrepreneur's trade off between both effects is governed by her level of poverty aversion, i.e., her preference intensity for the service of needy with different incomes. Additionally, we account for the possibility of excess demand and assume that applicants are rationed by non-price allocation mechanisms. We thereby contribute to the extensive literature on the pricing and rationing behaviour of nonprofit firms. Within our theoretical model, we find ambiguous reactions of the entrepreneur on a shortcut of donations. Given a positive level of user fee revenues, entrepreneurs with relatively high levels of poverty aversion tend to increase the project volume while those with relatively low levels show the opposite.

Keywords: non-price allocation mechanism, poverty aversion, project volume, social entrepreneur, user fees

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1. Introduction

Social entrepreneurship takes place where basic human needs are left unsatisfied by the market mechanism. Austin et al. (2006, p. 2) suggest that "this is often due to the inability of those needing the services to pay for them." The entrepreneur satisfies the necessities by offering subsidized goods or services as complements to the market supply. Examples are manifold. Soup kitchens distribute balanced food, homeless shelters offer nighttime residence, charity shops sell donated second hand goods, and micro insurance schemes provide basic health securities. However, the availability of third-party funds to finance those businesses might be insufficient to meet the entire demand. In coping with the arising problems of congestion and rationing the social entrepreneur is confronted with two general decisions: Who and how many needy will be served? The provision of eligible customers must then be ensured through an adequate mix of rationing instruments. According to Steinberg and Weisbrod (1998), such instruments are diverse forms of user fees, the formulation of eligibility criteria, queues, waiting lists, quality dilution, product bundling etc.

In this paper we propose a positive model of the pricing decision of the social entrepreneur in the light of other exogenously given third-party funds[1]. We examine two effects of charging uniform user fees on the composition and quantity of recipients. On the one hand, charging a fee excludes the lowest income individuals who are considered the most needy. On the other hand, the entrepreneur's budget is enlarged and enables her to serve more needy. Given excess demand is not completely dissolved by the user fee, we assume the entrepreneur to have a non-price rationing instrument at hand to achieve a utility maximizing allocation.

A similar approach is taken by Steinberg and Weisbrod (2005). They characterize pricing and rationing decisions of nonprofit organizations which seek to maximize the weighted sum of the consumers' surpluses. In their model they allow for price discrimination and analyze equilibrium prices in comparison to marginal costs and reservation prices. A similarly defined utility function can be found in Le Grand (1975).

[1] Besides user fees, nonprofit organizations typically generate income from additional sources which can be clustered into donations and unrelated business income (Steinberg and Weisbrod 1998). There is a thrust of literature dealing with aspects of each of the sources and the interactions between them. Exemplarily, contributions to the field of public or private donations highlight the role of lead donors (Andreoni 1998 and 2006), fundraising strategies (List and Lucking-Reiley 2002), united charities (Fisher 1977 and Bilodeau 1992), and the interaction between government grants and fundraising success (Rose-Ackerman 1987 and Andreoni and Payne 2003). Work on unrelated business income points to disutility from engaging in commercial activities (Schiff and Weisbrod 1991, Weisbrod 1998) and agency problems within the organization (Du Bois et al. 2004).

However, the proposed distributional objectives inadequately reflect the decision calculus of social entrepreneurs who aim at the satisfaction of basic human needs. Those needs are considered very strong and usually, if the budget is sufficiently large, afforded by every individual at first. Different reservation prices, as a part of consumer surplus, thus, point to different incomes and not to differently intense preferences. It is straightforward to conclude that a given user fee level results in a higher surplus for wealthier recipients. Although the nonprofit organization might weight wealthier consumers less than poorer, it is unclear why it should consider consumer surplus at all, since this is an inadequate proxy for consumer utility in social contexts. In the extreme case, the provision of individuals without any liquidity to bit for the good or service does not help fulfill the firm's goal even if the good is allocated costless to them. Consequently, they are served last if at all.

We overcome the pinpointed problem by assuming the social entrepreneur to simply maximize the aggregated value of served applicants. In addition, the values attributed to each individual reflect the entrepreneur's attitude towards poverty and, thus, are negatively correlated to the recipients' income. This assumption goes in line with Nichols et al. (1971, p. 316), who claim that "[…] the poorer a person is, the more willing the public is to provide him […]". Subsequently, we refer to the entrepreneurial attitude as *poverty aversion*.

In addition to Steinberg and Weisbrod (2005), there are many attempts to reveal or to approach the objectives of social entrepreneurs and nonprofit organizations, ranging from the maximization of service, budget, and usage to the maximization of the number of users (Steinberg 1986, Brooks 2005, and Ansari et al. 1996). However, all these goals likewise own substantial problems in explaining social entrepreneurship practices. They describe a social entrepreneur who extents the project size by charging recipients a fee until all applying individuals are served. While surely explaining some observations, these approaches cannot explain why many organizations charge no user fee but simultaneously face congestion.

As a second modification of the Steinberg and Weisbrod (2005) model, we exclude price discrimination from consideration and instead analyze uniform user fees for a number of reasons. From a pragmatic perspective, one can find many examples of social enterprises typically offering their goods or services at uniform prices, like soup kitchens, charity shops or homeless shelters. From a theoretical perspective, a detection of reservation prices might be prohibitively costly. In those cases, price discrimination is no option and other rationing instruments to implicitly allocate the good to poorer applicants, like queues or waiting lists, constitute alternatives[2]. From a technical perspective, a uniform user fee simplifies the model. As indicated in the subsequent analysis, all derived results can be likewise shown with a consideration of price discrimination.

The organization and results of the paper are given as follows. In section 2 we introduce a model of the entrepreneur's decision calculus which accounts for the level of poverty aversion, the structure of the market for the good and the applicable rationing mechanisms. In section 3 we provide optimality conditions and formally prove the existence of corner solutions and interior utility maxima implying positive user fee levels. Section 4 analyzes a variation in third-party funds. We find three entrepreneurial reactions. First, there is a particular level of poverty aversion at which user fee revenues are reduced to exactly the same amount by which third-party funds are increased. Hence, the project volume remains unchanged. In contrast, entrepreneurs with a higher poverty aversion react with a reduction of the project volume and entrepreneurs with a lower aversion enhance their scope of service. We conclude in section 5 with a discussion of these results.

2. The Model

Consider a group of individuals being unable to satisfy a specific basic human need due to their insufficient incomes. The social entrepreneur discovers the demand and plans to allocate a need oriented and subsidized good on a nonprofit basis. She is characterized as a poverty averse person, therefore valuing the provision of an individual the more, the poorer a person is. This assumption goes in line with the extensive literature on the allocation of public goods which often assumes equity considerations or the desire to reach the poor as the driving force behind this activity.[3] A very close formulation comes from Nichols et al. (1971, p. 316), who claim that "[…] the poorer a person is, the more willing the public is to provide him […]". The social entrepreneur maximizes the aggregated value over all served individuals by choosing the user fee level for the good. In the following, the model is specified in greater detail.

The constant marginal costs of producing the good are $c \in R_{+}^{*}$. They must be covered by the entrepreneur's income which might include third-party funds like government grants, pri-

[2] Nichols et al. (1971), Lindsay and Feigenbaum (1984) and in a later version Cullis and Jones (1986) provide theoretical analyses of the effects of rationing by waiting.

[3] See for example Alderman (1987), Glazer and Niskanen (1997), Kulshreshtha (2007), Le Grand (1975) and Sah (1987).

vate donations or mission unrelated business income. We simply subsume those funds under *donations* $D \in R_+$ and assume that their total level is exogenously given. In case this level is insufficient to serve all individuals, there is a need to ration applicants. We model two rationing instruments: a uniform user fee as the entrepreneur's decision variable and a non-price allocation mechanism which is automatically applied if further rationing arises. The uniform user fee f, with $f \in [0, f_{max}] \subset R_+$ and $f_{max} > c$, mitigates excess demand by excluding individuals with lower reservation prices and enlarging the entrepreneur's budget. The non-price rationing instrument helps the entrepreneur identify and directly serve only the poorest individuals with the ability to pay f.

We do not consider price discrimination for a number of reasons. There are many examples of social businesses typically offering their good at a uniform price. One might hypothesize that those enterprises principally sell low involvement products to a large number of individuals, like food providing services or charity shops. Since here a detection of each applicant's income, or rather reservation price, is prohibitively costly, price discrimination is unfeasible. Even in cases where several income classes can be defined and different user fees are charged, a further segmentation of still heterogeneous subgroups might be impossible, though desirable. Examples are manifold. The allocation of food in a university cafeteria is accompanied by a differentiation of prices between students, members of the university and external visitors. Examination of eligibility is done by student identity cards and service cards. Although students are differently wealthy and poorer students are to be subsidized more, a further segmentation according to income would be too costly. In those cases, other rationing instruments, which implicitly allocate the good to the poorest applicants, like queues, are implemented.[4] A perceptible simplification of the model constitutes another reason for analyzing uniform user fees. Subsequently, we argue that all derived results can be likewise shown with a consideration of price discrimination.

The demand for the good is given by $\overline{n}(f)$, with $\overline{n}:[0,f_{max}] \to R_+$, $\overline{n}(f_{max}) = 0$, $\overline{n}(c) \geq 1$,[5] $\overline{n}(0) < \infty$, $\overline{n}'(f) = \overline{n}_f < 0$ and $\overline{n}''(f) = \overline{n}_{ff} > 0$. It is important to note that reservation prices are uniquely determined by the individual's ability to pay. Microeconomic theory suggests that a low reservation price is the result of a low income or a little intense preference

[4] Nichols et al. (1971), Lindsay and Feigenbaum (1984) and in a later version Cullis and Jones (1986) provide theoretical analyses of the effects of rationing by waiting.

[5] The assumption $\overline{n}(c) \geq 1$ w.l.o.g. simplifies subsequent proofs.

for the good. In contrast, a prerequisite for high reservation prices is a sufficiently large income. However, if basic human needs are concerned, we can assume individuals to satisfy them first. As a consequence, low reservation fees result from limited payment abilities. Although there might be deviations from this suggested behavior, we simplify by implementing a strictly positive correlation between income and payment willingness for the good. The resulting demand curve, therefore, presumes equally intense consumption preferences and solely reflects the wealth of applicants.

We further assume that each applicant intends to consume exactly one unit of the good and that each $n \in [0, \overline{n}(0)]$ indexes one individual with a specific disposable income. According to the previous argumentation, the index is negatively correlated to the individual's reservation fee and wealth, respectively. Stated differently, the higher the index n is, the lower is the individual's income. Exemplarily, the individual $n = 0$ is able to pay the prohibitive price f_{max} whereas the poorest individual $n = \overline{n}(0)$ cannot afford to pay anything. At the same time, a specific element n likewise denotes the total quantity of individuals who own a higher income than n. Concluding, the term $\overline{n}(f)$ provides two important details. It shows the quantity of applicants for the good at a given user fee level and simultaneously indexes the poorest individual being even able to afford it.

The social entrepreneur's non-price rationing instrument ensures that only the poorest applicants out of the quantity $\overline{n}(f)$ receive a unit of the good. This requires a direct or indirect detection of reservation prices. Given the entrepreneur can directly observe reservation prices,[6] she can formulate adequate eligibility criteria and directly exclude wealthier applicants. Even in cases the entrepreneur cannot observe them, theory suggests that there are tools to indirectly exclude the wealthiest applicants, like rationing by waiting. We forego an explicit modeling of direct and indirect non-price allocation mechanisms and instead assume that the entrepreneur has a general non-price tool at hand, which ensures the provision of the poorest applicants. The quantity of the wealthiest individuals being excluded from consumption is denoted by $\underline{n}(f)$, with $\underline{n} \in [0, \overline{n}(f)]$. This term likewise denotes the recipient with the highest income. The combined application of both rationing instruments determines the final quantity of recipients which is given by $\overline{n}(f) - \underline{n}(f)$.

[6] Steinberg and Weisbrod (2005) give several arguments in favor of this assumption.

In allocating the good to the needy, the social entrepreneur is restricted by the nonprofit-condition. With $F(f) = f \cdot [\overline{n}(f) - \underline{n}(f)]$ as total user fee receipts the constraint is given by:

(1) $F(f) + D = c \cdot [\overline{n}(f) - \underline{n}(f)]$.

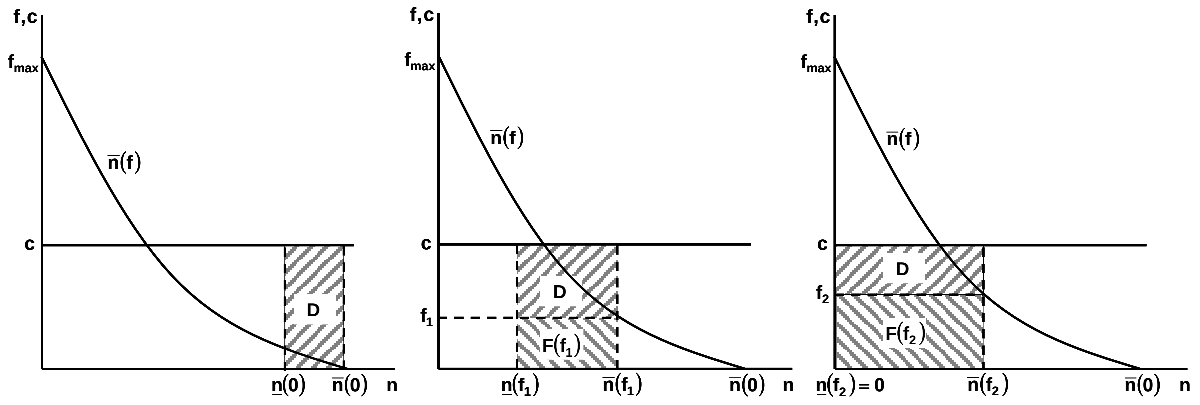
The nonprofit-condition requires the social entrepreneur to spend her total revenues completely on the supply of the good. Rearranging equation (1) yields $\underline{n}(f) = \overline{n}(f) - \frac{D}{c - f}$, which shows the endogenous determination of the wealthiest recipient in dependence on f. Accordingly, based on the poorest individual with the ability to afford the user fee $\overline{n}(f)$, the final quantity of recipients $\overline{n}(f) - \underline{n}(f)$ is achieved when the entire donations D are spent to finance the gap between marginal costs and individual contribution ($c - f$).

Figure 1 summarizes the impact of the entrepreneur's rationing mechanisms on the market. In panel (a) the entrepreneur allocates the good for free. All individuals of the target group are willing to purchase the good but, due to the limited donations, only the fraction $\overline{n}(0) - \underline{n}(0)$ is served and the wealthiest $\underline{n}(0)$ individuals are rationed by the non-price instrument. Since the entrepreneur's budget is not enlarged by additional user fee revenues, the project shows the lowest possible volume. Panel (b) considers the combined use of both rationing instruments. The entrepreneur chooses the user fee level f_1 which rations the poorest $\overline{n}(0) - \overline{n}(f_1)$ applicants who are unable to afford the good. Although this fee increases total revenues at first, the budget remains insufficient to provide all applying individuals $\left(\frac{F(f_1) + D}{c} < \overline{n}(f_1) \right)$. Consequently, the entrepreneur excludes the wealthiest $\underline{n}(f_1)$ applicants by use of the non-price mechanism. In contrast, panel (c) considers the exclusive supply of the most solvent individuals. The entrepreneur chooses the user fee which maximizes her total revenues subject to the nonprofit-condition. This way the maximum quantity of applicants is realized.

An additional effect of the nonprofit-constraint is the unique relationship between user fee level and total user fee revenues. Employing $F(f) = f \cdot [\overline{n}(f) - \underline{n}(f)]$ into equation (1) yields:

(2) $F(f) = \frac{f \cdot D}{c - f}$.

Due to this equation, the entrepreneur's direct choice of her decision variable f determines her total receipts $F(f)$. Subsequently, we take advantage of this relationship and reverse it. We characterize the social entrepreneur's choice in terms of F instead of the individual fee



(a) (b) (c)

Figure 1: The allocative outcome of rationing by user fees and the non-price instrument.

level. At a later stage, this allows for a direct derivation of the project size $F+D$ and, therefore, simplifies the analysis. Rearranging equation (2) yields the implicit function:

$$(3) \quad \mathrm{f}(F)=\frac{c\cdot F}{F+D}$$

with $\mathrm{f}'(F)=\mathrm{f}_F=\frac{c\cdot D}{(F+D)^2}>0$ and $\mathrm{f}''(F)=\mathrm{f}_{FF}=-\frac{2\cdot c\cdot D}{(F+D)^3}<0$.

Employing equation (3) into the demand function yields

$$(4) \quad \overline{n}(\mathrm{f}(F))=\overline{n}\left(\frac{c\cdot F}{F+D}\right),$$

with

$$(5) \quad \overline{n}'(\mathrm{f}(F))=\overline{n}_F=\overline{n}_f\cdot \mathrm{f}_F<0$$

and

$$(6) \quad \overline{n}''(\mathrm{f}(F))=\overline{n}_{FF}=\overline{n}_{ff}\cdot \mathrm{f}_F^2+\overline{n}_f\cdot \mathrm{f}_{FF}>0.$$

The entrepreneur draws a nonnegative level of utility from each allocated unit of the good to a target group individual, which is specified by the value function

$$(7) \quad u(n)=n^{\alpha}.$$

Here, the parameter $\alpha \in R_+$ determines the level of the constant elasticity of marginal utility $\varepsilon = \alpha - 1$ [7] and is likewise a measure for the curvature of the value function. Marginal utility is decreasing with $\alpha \in (0,1)$, constant with $\alpha = 1$, and increasing with $\alpha > 1$. As with the class of Cobb-Douglas utility functions, α characterizes the entrepreneur's preference intensity for recipients with different incomes and will be subsequently interpreted as the entrepreneurial poverty aversion. Specifically, for $\alpha = 0$ the entrepreneur shows no aversion and values the service of each individual equally[8]. However, given a positive level of poverty aversion $(\alpha > 0)$, the entrepreneur obtains a utility surplus from substituting the provision of a lower income for a higher income individual. This surplus increases as α grows and becomes infinite with $\alpha \to \infty$. As will be shown later, entrepreneurs with those extreme aversions are predetermined to serve only the poorest target group individuals.

The entrepreneur maximizes her aggregated utility of served individuals by implicitly choosing total user fee revenues F. According to equation (3), this choice uniquely correlates to a specific price level for the good $(f = \mathrm{f}(F))$. Individuals who cannot afford f are barred from consumption and, if total revenues are insufficient to serve the remaining applicants $\left(\frac{F+D}{c} < \overline{n}(\mathrm{f}(F))\right)$, the non-price allocation instrument is implemented to exclude the wealthiest individuals $\underline{n}(\mathrm{f}(F))$ from consuming the good because they provide least value to the entrepreneur. Finally, only the poorest applicants with the ability to pay f receive a unit. Consequently, with $\underline{n}(\mathrm{f}(F)) = \overline{n}(\mathrm{f}(F)) - \frac{F+D}{c}$, the entrepreneur's maximization problem can be written as

$$(8) \quad \max_F \; U(F;D) = \int_{\overline{n}(\mathrm{f}(F)) - \frac{F+D}{c}}^{\overline{n}(\mathrm{f}(F))} n^{\alpha} dn \, .$$

The first and second derivative of the utility function is given by:

$$(9) \quad \frac{dU(F;D)}{dF} = \left(\overline{n}^{\alpha} - \underline{n}^{\alpha}\right) \cdot \overline{n}_F + \underline{n}^{\alpha} \cdot \frac{1}{c} \gtreqless 0$$ [9]

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[7] The elasticity of marginal utility is defined as $\varepsilon = \frac{du'(n)}{dn} \cdot \frac{n}{u'(n)}$.

[8] With α = 0, the value of serving individual $n = 0$ is not defined. To simplify this case, we set $u(0) = 1$.

[9] In derivations we subsequently simplify the explicit notation $\overline{n}(\mathrm{f}(F))$ and $\underline{n}(\mathrm{f}(F))$ by use of $\overline{n}$ and $\underline{n}$.

and

(10) $$\frac{d^2U(F;D)}{dF^2}=\left(\overline{n}^{\alpha}-\underline{n}^{\alpha}\right)\cdot\overline{n}_{FF}+\alpha\cdot\overline{n}_F^2\cdot\left[\overline{n}^{\alpha-1}-\left(1-\frac{1}{\overline{n}_F\cdot c}\right)\cdot\underline{n}^{\alpha-1}\right]+\frac{\alpha}{c}\cdot\underline{n}^{\alpha-1}\cdot\left(\overline{n}_F-\frac{1}{c}\right)\gtreqless 0\,.$$

In the next section we proof the possibility of interior utility maxima and corner solutions. We therefore define the following terms. The optimal level of user fee revenues will be denoted by F^* and the corresponding user fee level by f^*. Furthermore, the maximum user fee revenues will be denoted by F_{max}. F_{max} is achieved if the entrepreneur's total income suffices to serve all applying needy. Consequently, $\underline{n}=0$ and F_{max} fulfills the reduced nonprofit-condition (1), i.e.

(11) $$F_{max}+D=c\cdot\overline{n}\left(\mathrm{f}\left(F_{max}\right)\right).$$

3. Interior and Corner Solutions

Again, it is important to note that the entrepreneur can solely enhance her user fee revenues through an increase of the user fee level. The unique quantitative relationship between both variables is given by equation (2). Although, this equation comprises additional parameters like the amount of donations or the marginal costs of producing the good as well, they are outside the entrepreneur's scope of influence.

The entrepreneur's mission is achieved best if all individuals of the target group receive one unit of the good. Hence, a costless provision of beneficiaries is required to avoid a rationing of the poorest individuals. Consequently, the production costs of serving the total target group must be completely covered by donations $\left(D=\overline{n}(0)\cdot c\right)$. Given donations are not available $\left(D=0\right)$ and, therefore, the applicants' provision is not externally subsidized, the entrepreneur must decide to refrain from the allocation of the good or, alternatively, to serve only those individuals who can afford a cost covering user fee $\left(f=c\right)$. The dominance of the second option results from value function (7). Since any individual of the target group is assigned a nonnegative value $u(n)$, their provision is preferred to non-provision. Total utility (equation (8)) is maximized if all applicants are served who show a payment ability of at least marginal production costs c.

Proposition 1. Given $D=0$, the entrepreneur charges a cost covering user fee $\left(f^*=c\right)$ and serves all applying needy $\overline{n}(c)$.

Proof. Employing $D=0$ into equation (3) yields $f(F)=c$. Substituting c for $f(F)$ in utility function (8) and deriving with respect to F yields $\frac{dU(F;0)}{dF}=\underline{n}^{\alpha}\cdot\frac{1}{c}\geq 0$. Consequently, utility is maximized if all $\overline{n}(c)$ applicants are served. **Q.e.d.**

Now, suppose total donations amount to $\tilde{D}\in(0,\overline{n}(0)\cdot c)$ which suffices to initially serve $\frac{\tilde{D}}{c}<\overline{n}(0)$ applicants. Confronted with the resulting excess demand, the social entrepreneur determines her optimal level of user fee revenues which is likewise a choice of how many individuals are excluded by the user fee and how many are rationed by the non-price rationing instrument. According to the first derivative (9), the increase of user fee receipts F is accompanied by two effects on the entrepreneur's utility. First, there is a non-positive *crowding-out effect* $\left(\overline{n}^{\alpha}-\underline{n}^{\alpha}\right)\cdot\overline{n}_{F}\leq 0$. Let revenues and, equivalently, the quantity of recipients be constant, then an increase in user fees cuts off the poorest from consumption and shifts the released units of the good to wealthier individuals. This effect is utility neutral only if the entrepreneur values all individuals equally. In contrast, given a positive level of poverty aversion α, the substitution of wealthier for poorer beneficiaries decreases her utility. The second term of equation (9) denotes the non-negative *revenue effect* $\underline{n}^{\alpha}\cdot\frac{1}{c}\geq 0$. The additional user fee receipts enable the entrepreneur to extend the quantity of recipients which increases her utility. The value of the revenue effect becomes zero if all applicants are served.

Dependent on the entrepreneur's poverty aversion, both, interior and corner solutions are possible. Given the crowding-out effect dominates the revenue effect for any level of user fee revenues, the entrepreneur allocates the good for free $\left(F^{*}=0\right)$ and rations applicants by the non-price instrument. Intuitively, the higher the poverty aversion is, the less the entrepreneur is willing to substitute wealthier for poorer individuals and the sooner she foregoes charging a user fee. On the other hand, if the revenue effect exceeds the crowding-out effect independent of the level of user fee receipts, the entrepreneur generates maximum revenues $\left(F^{*}=F_{max}\right)$ and serves the maximum quantity of beneficiaries. This corner solution arises for a non-poverty averse entrepreneur for whom applicants are perfect substitutes. Finally, there are interior utility maxima for moderate levels of poverty aversion $\left(0<F^{*}<F_{max}\right)$. The value of the initially dominant revenue effect is offset by the crowding-out effect at some positive level of user fee revenues and overcompensated for higher levels. Consequently, as exempla-

rily depicted in figure 1 (b), the poorest applicants are rationed by the user fee and the wealthiest applicants are excluded by the non-price allocation mechanism. Subsequently, we prove the possibility of interior and corner solutions.[10]

Proposition 2. Given $D \in (0, c \cdot \overline{n}(0))$, there exists a finite poverty aversion level $\overline{\alpha}$ such that for all $\alpha \geq \overline{\alpha}$, $F^* = 0$.

Proof. For notational clarity, we temporarily expand the term $U(F;D)$ to $U(F;D,\alpha)$. Let $D \in (0, c \cdot \overline{n}(0))$ and $\alpha = \overline{\alpha}$ such that $\frac{dU(F;D,\overline{\alpha})}{dF} = \left(\overline{n}^{\overline{\alpha}} - \underline{n}^{\overline{\alpha}}\right) \cdot \overline{n}_F + \underline{n}^{\overline{\alpha}} \cdot \frac{1}{c} \leq 0$ for all $F \in [0, \overline{n}(0) \cdot c - D]$. Since the revenue effect does not exceed the crowding-out effect for all levels of user fee revenues, an entrepreneur with the poverty aversion level $\overline{\alpha}$ chooses $F^* = 0$. Since $\overline{n}(c) \geq 1$, $\frac{\partial^2 U(F;D,\overline{\alpha})}{\partial F \partial \alpha} = ln\,\overline{n} \cdot \overline{n}^{\overline{\alpha}} \cdot \overline{n}_F - ln\,\underline{n} \cdot \underline{n}^{\overline{\alpha}} \cdot \left(\overline{n}_F - \frac{1}{c}\right) < 0$ and the first derivative (9) is negative for all $F \in [0, \overline{n}(0) \cdot c - D]$ and $\alpha > \overline{\alpha}$. Consequently, $F^* = 0$. **Q.e.d.**

Proposition 3. Given $D \in (0, c \cdot \overline{n}(0))$, there exists a positive poverty aversion level $\hat{\alpha}$ such that for all $\alpha < \hat{\alpha} \leq \overline{\alpha}$, $F^* > 0$.

Proof. Let $D \in (0, c \cdot \overline{n}(0))$ and $\hat{\alpha} = \left[ln\left(1 - \frac{1}{\overline{n}_F \cdot c}\right) \Big/ \left(ln\,\overline{n} - ln\,\underline{n}\right) \right]\Bigg|_{F=0} > 0$. For all $\alpha < \hat{\alpha}$, i.e. $\alpha < \left[ln\left(1 - \frac{1}{\overline{n}_F \cdot c}\right) \Big/ \left(ln\,\overline{n} - ln\,\underline{n}\right) \right]\Bigg|_{F=0}$, we can solve for $\left[\underline{n}^{\alpha} \cdot \frac{1}{c} > -\left(\overline{n}^{\alpha} - \underline{n}^{\alpha}\right) \cdot \overline{n}_F \right]\Bigg|_{F=0}$, which is a necessary condition for the existence of a utility maximum with $F^* > 0$. **Q.e.d.**[11]

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[10] The same results arise with a consideration of price discrimination. Intuitively, since reservation prices, to some extent, are lower than marginal costs, recipients must be subsidized by donations or 'cash cows' (Steinberg and Weisbrod 2005). Given these revenues are insufficient to allocate the good to all applicants the entrepreneur must ration them and decide who and how many needy will be served. If she decides for the poorest applicants the highest individual subsidies are required and the lowest quantity of recipients results. In contrast, the maximum quantity of recipients follows from serving the wealthiest applicants. It is important to note that a change of quantity causes the same qualitative effects on the entrepreneur's utility: a non-positive crowding-out effect and a nonnegative revenue effect. For the same reasoning, interior and corner solutions are possible and depend on the entrepreneur's level of poverty aversion.

[11] The set $[0, \hat{\alpha})$ is far from being complete. One can show that there are global utility maxima for higher levels of poverty aversion which start with a dominant crowding-out effect for the first unit of user fees

Proposition 4. Given $D \in (0, c \cdot \overline{n}(0))$, there exists a strict corner solution with $F^* = F_{max}$ for $\alpha = 0$.

Proof. Consider the first derivative of the utility function (9). Let $D \in (0, c \cdot \overline{n}(0))$ and $F = F_{max}$, then $\underline{n} = 0$ and $\underline{n}^{\alpha} \cdot \frac{1}{c} = 0$. Since $\overline{n} > 0$ and, by definition, $\overline{n}_F < 0$, $\left(\overline{n}^{\alpha} - \underline{n}^{\alpha}\right) \cdot \overline{n}_F < 0$ and $\lim_{F \to F_{max}} \frac{dU(F;D)}{dF} < 0$ and $F^* < F_{max}$ for all $\alpha > 0$. In contrast, $\left(\overline{n}^{\alpha} - \underline{n}^{\alpha}\right) \cdot \overline{n}_F = 0$ and $\lim_{F \to F_{max}} \frac{dU(F;D)}{dF} = 0$ and $F^* = F_{max}$ for $\alpha = 0$. **Q.e.d.**

The findings are graphically presented in figure 2. It contrasts total revenues $F + D$, also considered as *project volume*, and the entrepreneur's overall utility $U(F;D)$. As an important point of reference, the graph $U(0;D)$, with $U(0;D) = \int_{\overline{n}(0) - \frac{D}{c}}^{\overline{n}(0)} n^{\alpha} dn$, $\frac{dU(0;D)}{dD} = \frac{1}{c} \cdot \left[\overline{n}(0) - \frac{D}{c}\right]^{\alpha} \geq 0$ and $\frac{d^2U(0;D)}{dD^2} = -\frac{\alpha}{c^2} \cdot \left[\overline{n}(0) - \frac{D}{c}\right]^{\alpha - 1} \leq 0$, denotes the upper utility boundary for any given project volume. It considers utility as a pure function of donations D, which implies an allocation of the good free of charge. Its concave shape accounts for the impact of the entrepreneur's non-price rationing instrument on the sequence of the applicants' provision. A poorer individual with a likewise higher value is served prior to the next wealthier applicant. The entrepreneur's marginal utility of an additional recipient, therefore, is decreasing. Her aggregated utility reaches a maximum if all applicants are served by donations $\left(D = \overline{n}(0) \cdot c\right)$.

The lower boundary of the utility spectrum is given by $U(F;0)$, which presumes the non-availability of donations. According to equation (3), in this case, the social entrepreneur chooses a user fee equal to marginal costs and allocates the good to applicants, successively. The user fee revenues thereby increase with the quantity of served individuals. The

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$\left[\underline{n}^{\alpha} \cdot \frac{1}{c} \leq -\left[\overline{n}(F)^{\alpha} - \underline{n}^{\alpha}\right] \cdot \overline{n}'(F)\right]\Big|_{F=0}$. The increase of fees initially decreases utility to some minimum before the revenue effect overcompensates the utility loss and induces a global maximum. Since all important results can be proved without an extension to these special cases, we simplify by ignoring them.

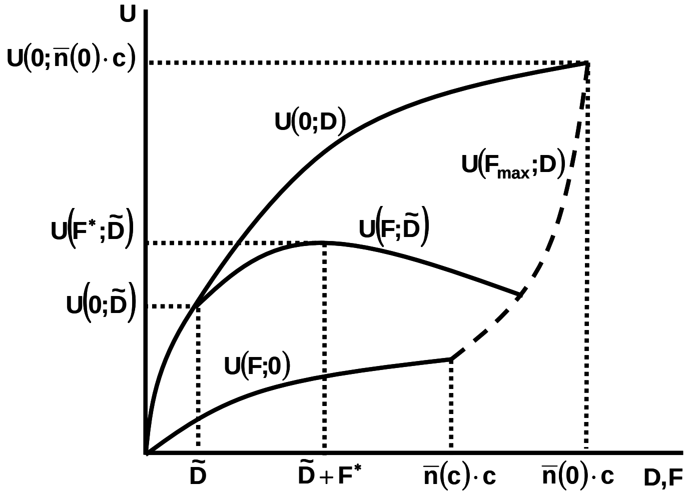

Figure 2: The spectrum of utility functions.

corresponding utility function is given by $U(F;0)=\int_{\bar{n}(c)-\frac{F}{c}}^{\bar{n}(c)} n^{\alpha}dn$, with $\frac{dU(F;0)}{dF}=\frac{1}{c}\cdot\left[\bar{n}(c)-\frac{F}{c}\right]^{\alpha}\geq 0$ and $\frac{d^2U(F;0)}{dF^2}=-\frac{\alpha}{c^2}\cdot\left[\bar{n}(c)-\frac{F}{c}\right]^{\alpha-1}\leq 0$. The maximum project size is reached at $F_{max}=c\cdot\bar{n}(c)$, a significantly lower level compared to the maximum volume resulting from complete donation financing $\bar{n}(0)\cdot c$.

The right increasing dashed graph $U(F_{max};D)$ connects both elements. It depicts the entrepreneur's utility in dependence on the maximum project volume. Since a maximum project size implies $\underline{n}=0$, $U(F_{max};D)$ is obtained by rearranging the reduced nonprofit-condition (11) to $\bar{n}(\mathrm{f}(F_{max}))=\frac{F_{max}+D}{c}$ and employing it into the utility function: $U(F_{max};D)=\int_{0}^{\frac{F_{max}+D}{c}} n^{\alpha}dn$, with $\frac{dU(F_{max};D)}{d(F_{max}+D)}=\frac{1}{c}\cdot\left[\frac{F_{max}+D}{c}\right]^{\alpha}>0$ and $\frac{d^2U(F_{max};D)}{d(F_{max}+D)^2}=\frac{\alpha}{c^2}\cdot\left[\frac{F_{max}+D}{c}\right]^{\alpha-1}\geq 0$. The curvature can be explained as follows. The larger the initial donation D is, the less user fee revenues are needed to reach a certain project volume $F+D$ and, hence, the fewer applicants are excluded. Consequently, more individuals can be served by a further increase of the user fee which extends the maximum project volume.

The three boundaries define the spectrum of possible utility functions. As an example, consider the graph $U(F;\tilde{D})$. At $\tilde{D}$ the entrepreneur charges no user fee and the service of the poorest $\frac{\tilde{D}}{c}$ individuals provides her with utility of $U(0;\tilde{D})$. The introduction of user fees initially enhances the entrepreneur's utility due to a dominating revenue effect. As the project volume reaches $F^* + \tilde{D}$ the crowding-out effect offsets the revenue effect and an interior utility maximum results.

4. Variation in Donations

In figure 2, the social entrepreneur's donations amounted to $\tilde{D}$ and the project volume $F^* + \tilde{D}$ was chosen. In this section, we analyze how the optimal choice of user fee revenues changes given donations increase. We show that three results are possible and that their occurrence strongly depends on the entrepreneur's level of poverty aversion. Specifically, the project volume increases for relatively low levels and it decreases for relatively high levels. Moreover, there is a specific α for which the optimal project size remains unchanged.

The intuition behind these findings is the following. Consider a status quo in which the crowding-out and the revenue effect offset for a particular project volume. After donations have been increased, the entrepreneur uses the additional revenues to serve prior unconsidered applicants with the ability to afford the scheduled user fee. Since the value of the "new" wealthiest recipient will be lower, the marginal utility of charging user fees becomes negative. Consequently, the entrepreneur reduces the user fee revenues until the crowding-out and the revenue effect offset again. In case the increase of donations exceeds the absolute reduction of user fee receipts, the optimal project volume increases. On the other hand, the optimal project size decreases if the opposite relation occurs. Crucial for the latter result is, that the change of the entrepreneur's marginal utility (equation (9)) is larger for an increase of donations than for a reduction of user fee revenues. More explicitly, the increase of donations reduces the marginal utility of charging user fees, but, since the user fee level is held constant, no substitution of recipients takes place. In contrast, an equally large reduction of user fee receipts increases the revenue effect to the same amount. Yet, the project volume remains constant, but, due to the lower user fees, the group of recipients is significantly poorer. However, there exists an additional change of the crowding-out effect. Insofar the poverty-oriented shift of the group of recipients decreases the negative crowding-out effect, the entrepreneur is incited to further reduce user fee revenues and, hence, the project volume.

A relatively high level of poverty aversion fosters a decrease of the crowding-out effect for two reasons. First, the reduction of the user fee enables the entrepreneur to provide poorer recipients. The higher the level of poverty aversion is (provided $\alpha > 1$), the larger is, as a part of the crowding-out effect, the value difference between the marginal poorest and the marginal wealthiest recipient. Second, according to relationship (3), an increase of user fee revenues F by a constant amount requires the increase of the user fee level f to be the larger, the smaller these revenues F are. In both cases the crowding-out effect is intensified and gives reason for a reduction of the optimal project volume.

It is important to note that as a prerequisite for a reduction of the optimal project size the status quo level of donations must be sufficiently low. According to proposition 3, there exists an upper limit to the level of poverty aversion $\hat{\alpha}$ which shortfall is a precondition for the charge of user fees. This limit $\hat{\alpha}$ is negatively correlated to the amount of initial donations,[12] since the crowding-out effect becomes more dominant as donations rise. On the other hand, as indicated before and shown in the subsequent proof, an increase in donations reduces the optimal project size if the poverty aversion level exceeds a lower limit, denoted by $\breve{\alpha}$. Given the status quo level of donations is relatively high and, hence, the limit $\hat{\alpha}$ is relatively low, $\hat{\alpha}$ falls short of $\breve{\alpha}$. Here, all entrepreneurs with a poverty aversion level below $\hat{\alpha}$ charge user fees but none of them reacts with a reduction of the optimal project volume on an increase of donations. In contrast, those entrepreneurs who, in principle, show the propensity to reduce the optimal project size $(\alpha \geq \breve{\alpha})$ do not charge user fees in the status quo. Consequently, only if the status quo level of donations is sufficiently low, there exist entrepreneurs who meet both requirements. They charge user fees in the first instance $(\alpha < \hat{\alpha})$, and, given donations increase, they react with a reduction of the optimal project volume $(\alpha \geq \breve{\alpha})$.

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[12] In proposition 3 the considered upper limit is defined as $\hat{\alpha} = \left[ln\left(1 - \frac{1}{\overline{n}_F \cdot c}\right) \Big/ \left(ln\,\overline{n} - ln\,\underline{n}\right)\right]\Bigg|_{F=0}$, which derivation with respect to D gives $\frac{d\hat{\alpha}}{dD} = -\left[\left[ln\left(1 - \frac{1}{\overline{n}_F \cdot c}\right) \cdot \left(\frac{1}{\underline{n} \cdot c}\right)\right] \Big/ \left(ln\,\overline{n} - ln\,\underline{n}\right)^2\right]\Bigg|_{F=0} < 0$.

Proposition 5. There exists a level of donations $D' < \overline{n}(0)\cdot c$ and a poverty aversion level $\breve{\alpha}$, such that for all $D \in (0, D')$ and $\alpha \in [\breve{\alpha}, \hat{\alpha})$, an increase in donations leads to a reduction of the optimal project volume $F^* + D$.

Proof. Let $D \in (0, \overline{n}(0)\cdot c)$ and $\alpha < \hat{\alpha} = \left[ln\left(1 - \frac{1}{\overline{n}_F \cdot c}\right) \Big/ \left(ln\,\overline{n} - ln\,\underline{n}\right)\right]\Bigg|_{F=0}$, then, according to proposition 3, $0 < F^* < F_{max}$. For notational clarity, we temporarily expand the value of function (2), $F(f) = \frac{f\cdot D}{c-f}$, to $F(f;D)$. With $f = f^*$, an increase in donations enlarges the entrepreneur's total income by $\frac{d\left[F\left(f^*;D\right)+D\right]}{dD} = \frac{f^*}{c-f^*} + 1 = \frac{c}{c-f^*}$. Consequently, an increase in donations leads to a decrease of the optimal project volume if $\frac{dF^*}{dD} < -\frac{c}{c-f^*}$. Applying the implicit functional theorem to the first order condition yields $\frac{dF^*}{dD} = -\frac{\partial^2 U(F;D)/\partial F \partial D}{\partial^2 U(F;D)/\partial F^2}\Bigg|_{F=F^*} < -\frac{c}{c-f^*}$, which can be rearranged to $\left[\frac{\partial^2 U(F;D)}{\partial F^2} - \left(\frac{c-f}{c}\right)\cdot\frac{\partial^2 U(F;D)}{\partial F \partial D}\right]\Bigg|_{F=F^*} > 0$. $\frac{\partial^2 U(F;D)}{\partial F^2}$ is given by equation (10) and $\frac{\partial^2 U(F;D)}{\partial F \partial D}\Bigg|_{F=F^*} = \frac{\alpha}{c-f^*}\cdot \underline{n}^{\alpha-1}\cdot\left(\overline{n}_F - \frac{1}{c}\right)$. Hence, the optimal project volume decreases if

(i) $\left[\frac{\partial^2 U(F;D)}{\partial F^2} - \frac{c-f}{c}\cdot\frac{\partial^2 U(F;D)}{\partial F \partial D}\right]\Bigg|_{F=F^*} = \left[\overline{n}^{\alpha} - \underline{n}^{\alpha}\right]\cdot \overline{n}_{FF} + \alpha \cdot \overline{n}_F^2 \cdot \left[\overline{n}^{\alpha-1} - \left(1 - \frac{1}{\overline{n}_F \cdot c}\right)\underline{n}^{\alpha-1}\right] > 0$.

The first term of condition (i) is positive by definition and the second term is nonnegative for all $\alpha \geq \breve{\alpha} = 1 + \left[ln\left(1 - \frac{1}{\overline{n}_F \cdot c}\right) \Big/ \left(ln\,\overline{n} - ln\,\underline{n}\right)\right]\Bigg|_{F=F^*}$.[13]

Yet, we assumed that $\alpha < \hat{\alpha}$ and derived the requirement, that $\alpha \geq \breve{\alpha}$. Consequently, an increase in donations leads to a reduction of the optimal project volume if $\breve{\alpha} < \hat{\alpha}$ and $\alpha \in [\breve{\alpha}, \hat{\alpha})$. However, $\breve{\alpha} < \hat{\alpha}$ requires a sufficiently low level of donations. Let $D \to \overline{n}(0)\cdot c$,

[13] The reader should note that even for negative values of its second term equation (i) can show a positive sign. This requires the positive first term to be sufficiently large. In those cases the critical value of α can be smaller than 1.

then $\hat{\alpha} \to 0$ and $\breve{\alpha} \to 1$ and $\breve{\alpha} > \hat{\alpha}$. In contrast, let $D \to 0$, then $\hat{\alpha} \to \infty$ and $1 < \breve{\alpha} < \infty$ and $\breve{\alpha} < \hat{\alpha}$. Let D' be the level of donations at which $\breve{\alpha} = \hat{\alpha}$, then an increase in donations leads to a reduction of the optimal project volume if $D < D'$ and $\alpha \in [\breve{\alpha}, \hat{\alpha})$. **Q.e.d.**

A reduction of the optimal project volume as response to increased donations is depicted in figure 3. In the status quo, the social entrepreneur receives the donations D_1 and chooses the optimal level of user fee revenues F_1^*. Now, consider an increase in donations to D_2. Since the entrepreneur shows a relatively high level of poverty aversion, she reduces user fee receipts to an even larger extent $\left(F_1^* - F_2^* > D_2 - D_1\right)$, which decreases the optimal project volume.

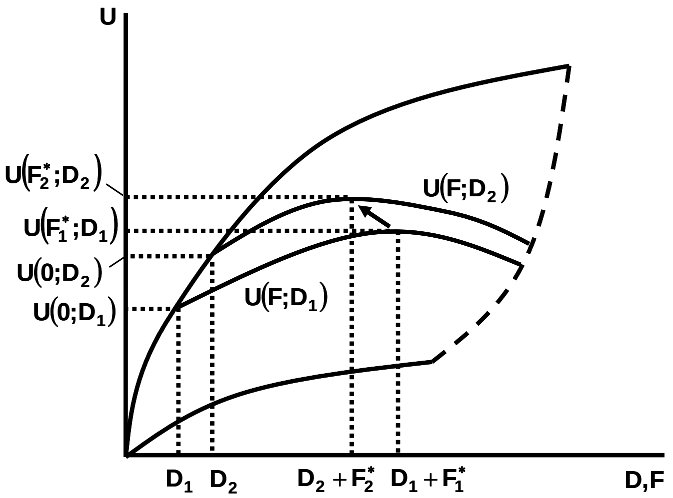

Figure 3: A decrease of the optimal project volume.

5. Conclusion

Our objective in this paper was to develop a positive model of the pricing decision of a social entrepreneur in the light of other exogenous and limited third-party funds. Beside the user fee, we assumed the entrepreneur to handle congestion by applying a non-price rationing instrument. It enables the entrepreneur to provide the good to her most valued applicants with the ability to pay the user fee. Argued in line with the existing literature on the allocation of public goods, we proposed a utility function which accounts for the entrepreneur's level of poverty aversion. A recipient is thereby preferred the more, the poorer the person is. Subject to a nonprofit-condition, the entrepreneur maximizes the aggregated value of served individuals.

Concerning the optimal user fee level and, correlated with it, the optimal project volume, we found three qualitatively different outcomes. First, given the entrepreneur shows no poverty aversion and values all individuals equally, she decides for the user fee which maximizes the project size. Rationing exclusively arises for the poorest applicants who lack the necessary payment ability. Second, if poorer individuals receive a larger value than wealthier applicants, allocations arise in which a moderate user fee level is chosen and applicants on both ends of the income scale are rationed. Finally, given a sufficiently high poverty aversion, the good is allocated for free and the poorest individuals receive the good. In this case, the entrepreneur exclusively rations the wealthiest applicants by use of the non-price allocation mechanism.

As we have shown with our analysis, the integration of a poverty aversion parameter into the entrepreneur's utility function is able to explain observable nonprofit practices. There are social businesses being confronted with substantial congestion but, simultaneously, do not charge user fees at all, like several soup kitchens or doss houses. On the other extreme, in the same branches, nonprofits exist which charge sufficiently high prices to supply all applicants, like some university cafeterias or youth hostels. We can also observe organizations which set positive user fees and face excess demand. Consider micro health insurance schemes in India. Recipients pay relatively low insurance premiums but only certain population groups gain access.[14]

Our analysis additionally showed that an increase of donations might not necessarily lead to an increase of the project volume. Entrepreneurs with relatively high levels of poverty aversion reduce their user fee revenues to an even larger extent. However, yet, this phenomenon has a pure theoretical nature and still needs empirical confirmation. Nevertheless, the result should be of particular interest to lead donors, typically granting a significant and often the largest part of the initial financial need of social entrepreneurs.[15] Given donor and entrepreneur disagree on the optimal quantity and composition of recipients, their regulation in form of a variation of the donation volume can have unintended effects which should be taken into account.

[14] See McCord et al. (2001).

[15] See Andreoni (1998, 2006).

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