Altruism and Firm Profits*

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Abstract

Firms' donations are pervasive, but do they increase profits? Theoretical studies attribute higher profits if consumers display warm-glow preferences and exhibition value. The two models differ in the way consumers perceive direct donations to charities. Under warm-glow, indirect donations by purchasing charity-linked products act as discounts, resulting in no extra profits. Under exhibition value, indirect donations can increase profits because consumers' own purchases and direct donations are not perfect substitutes. Indirect contributions can also generate a larger public good, but this necessarily implies lower profits. Thus, markets cannot adequately incentivize firms to promote greater individual contributions.

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1 Introduction

Returning from a trip to India, Brook Eddy, a Colorado resident, started brewing her own chai tea. Friends and families enjoyed the tea so much that her Indian adventure soon became a start-up, Bhakti Chai, with projected revenues in 2018 of $7 m. While increasing capital through angel investors and observing revenues growing overtime, Bhakti Chai has also been an active donor. Since its inception the company granted over $ 500,000 in donations to charities and non-profit organizations.[1]

Donating a portion of the revenues to charities is quite common both among start-ups as well as established firms in the US. For example, the chain store Target donates 5% of its operating profits to the communities where it operates, while for each pair of TOMS Shoes purchased, the company gives a pair to children in needs in developing countries.

Different theories have been advanced to explain this phenomenon. These papers blend the idea that consumers have a taste for the mere act of giving or *warm-glow* (e.g., Becker, 1974 and Andreoni, 1989) with a penchant for *exhibiting* their charitable purchases (e.g., Glazer and Konrad, 1996 and Harbaugh, 1998a). For example, Bagnoli and Watts (2003) and Pecorino (2016) demonstrate that donations can increase profits to sellers either in both competitive or monopolistic markets where consumers cannot donate directly to their favorite charities. Similarly, in Ghosh and Shankar (2013) exhibiting charitable purchases give consumers additional utility which firms can capture through advertisements.

In this paper we study the diverging implications for consumer choice and firm profits under warm-glow and exhibition value. In both models, consumers benefit from their indirect giving. The case of exhibition utility is intuitive – the purchase of charity linked goods provides consumers with a chance to exhibit their charitable acts (e.g., wearing a pair of TOMS Shoes to "inform" others of their pro-social behavior). Warm-glow consumers instead equally care for both *their own* direct and indirect giving. These consumers experience an intrinsic benefit of self-fulfilment through their own actions, while exhibition consumers derive utility from their peers or the surrounding environment.

Under both specification pledging indirect contributions can increase the total amount donated beyond what consumers would otherwise contribute in the absence of charity-linked goods. This extends the analysis in Kotchen (2006), where public good provision does not react to changes in prices or the amount donated. However, profits increase only if consumers display exhibition utility. This depends on the limited substitutability between the direct and indirect donations in the exhibition model. Furthermore, firms and societal gains cannot be achieved simultaneously: donations increase either profits or public goods. Finally, although we focus on

[1] The company not only donates part of its revenues, but it offers a platform for consumers to directly donate to a number of charities. For more information refer to https://www.inc.com/una-morera/on-a-whim-this-hippie-founder-packed-her-bags-for-india-now-shes-made-35-million-selling-chai-tea.html?cid=cp01002quartz, and http://www.prweb.com/releases/gita/giving/prweb12808032.htm.

the case of the monopolist, we extend our analysis to competition across multiple sellers.

An immediate application of this paper is that exhibition value would be low when consumers do not share the cause championed by the charity. This is in line with a body of empirical work evidencing the non-profitability of charity-linked goods in such a situation (e.g., Arora and Henderson, 2007 and Winterich and Barone, 2011). Our results suggest that a price discount can be more profitable than tying a product to a charitable cause if consumers do not enjoy exhibition value.

2 Model

We consider an economy with two types of consumers and a multi-product monopolist. Consumers derive utility from a basket of private goods and a single public good. There are $J+1$ varieties of private goods, denoted as x_j for $j = \{0, .., J\}$. We refer to x_j ($j > 0$) as the *inside goods* that are only available to inside consumers I. The numeraire good x_0 is the *outside good* available to all consumers. There are n_I inside and n_O outside consumers, and a total of $n_I + n_O = N$ consumers.

The public good can be funded in two ways through both direct and indirect contributions. All consumers can make a direct contribution y_i to the public good. Consumers can also contribute indirectly by purchasing any inside goods x_j ($j > 0$). The monopolist then donates a portion q of the price paid ($x_{ij} \cdot p_j$).[2] Let Y denote the total contribution to the public good – the sum of the *direct* (i.e., $\sum_{i=1}^{N} y_i$) and *indirect giving* (i.e., $\sum_{i=1}^{n_I} q \cdot \sum_{j=1}^{J} x_{ij} \cdot p_j$).

The utility to a consumer i takes the following form

$$u_i = v\left(\vec{x}_i\right) + g\Bigg(\underbrace{\sum_{i=1}^{N} y_i + q\sum_{j=1}^{J} x_{ij} p_j}_{Y}\Bigg) + f\left(y_i, \vec{x}_i\right)$$

where $\vec{x}_i$ denotes the vector of purchases by consumer i. The first term $v(\vec{x}_i)$ is utility derived from consumption of the private goods. The second term $g(Y)$ is utility derived from total public good consumption, which correspond to *pure altruism* as it is independent on the identity of the donor. The last term $f(\cdot)$ is utility derived from each consumer's *own contribution*, which will be referred to as *self-reference* utility.

Assumption 1. *$v(\cdot)$, $g(\cdot)$ and $f(\cdot)$ satisfy the Inada Conditions.*

Inada conditions impose monotonicity and concavity with respect to individual goods, but no additional restrictions of the relationship between the private goods $\vec{x}$. Assumption 1 implies

[2] In this paper it is common knowledge that the firm donates a fraction q of its revenues. Besley and Ghatak (2007) consider also the opportunity for sellers to cheat on their donations.

that consumers have decreasing marginal return for the outside good, which contrasts the other standard approach of quasilinear utility.[3]

We consider two cases of self-reference utility, namely warm-glow and exhibition. The warm-glow models commonly analyzed in the literature strip consumers from the right to directly contribute to a public good (e.g. Bagnoli and Watts, 2003, Besley and Ghatak, 2007, Pecorino, 2016),[4] while models with exhibition utility allow direct donations but maintain that consumers only selfishly benefit from their own indirect contribution (e.g., Ghosh and Shankar, 2013) .[5,6]

This paper identifies the specific assumption that allows firms to profit by donating. We distinguish between the case where consumers selfishly benefit from their own direct contribution or not by characterizing the equilibrium for two different specifications of $f(\cdot)$.[7] We demonstrate that the profitability of indirect contribution depends on where consumers derive utility from and not on consumers' ability to make direct contributions. The goal of this study is to resolve the seemingly incoherent results where some models predicted indirect contribution cannot improve profits and others do. The two specifications of self-reference utility $f(\cdot)$ are given below,

$$f\left(y_i, \vec{x}_i\right) = \begin{cases} f(y_i + q\sum_{j=1}^{J} x_{ij}p_j) & \textit{Warm-Glow utility} \\ f(q\sum_{j=1}^{J} x_j p_j) & \textit{Exhibition utility} \end{cases}$$

Warm-Glow consumers derive selfish benefits from both their own direct and indirect contributions. Instead, *Exhibition* consumers derive selfish benefits only from charity-linked products, and not from direct contributions. We do not impose any restrictions on consumers to contribute directly.

We provide an example with the CES-Cobb-Douglas functional form to illustrate our discussion.

Example 1. *Consumers have CES-preference between private goods, and a Cobb-Douglas relationship between private and public goods. The structure is similar to Dixit and Stiglitz (1977), where r measure*

[3]Quasi-linear utility is common in standard public good settings (e.g., Besley and Ghatak, 2007), and charity auction literature (see for example Goeree *et al.*, 2005 and Engers and McManus, 2007).

[4]This effectively means that $y_i = 0\ \forall i$ in our model. Warm-glow models of giving have been found to have good explanatory power in a number of empirical studies (e.g., Crumpler and Grossman, 2008, DellaVigna *et al.*, 2012, 2013 and Dwenger *et al.*, 2016), and in the neuroeconomic literature (Harbaugh *et al.*, 2007).

[5]Intuitively, exhibition-consumers derive the benefit from displaying the products (which proves their indirect-contribution), which cannot be replicated through direct contribution.

[6]Signaling is a related explanation. Consumers donate to signal their wealth (Glazer and Konrad, 1996, Harbaugh, 1998b and Harbaugh, 1998c). Pro-social preferences can be interpreted as a result of intent to signal.

[7]The Warm-glow and exhibition models are equivalent if we impose no direct contributions.

the strength of substitution across x_{ij}. The utility functions for the warm-glow case are given by,

$$u_i = \frac{1}{r}\ln\left(\sum_{j=0}^{J} x_{ij}^r\right) + a\ln\left(\sum_{i=1}^{N} y_i + \sum_{i=1}^{n_I} q \sum_{j=1}^{J} x_{ij}p_j\right) + b\ln\left(y_i + q\sum_{j=1}^{J} x_{ij}p_j\right) \qquad i \in \{1, ..., n_I\}$$

$$u_i = \frac{1}{r}\ln\left(x_{i0}^r\right) + a\ln\left(\sum_{i=1}^{N} y_i + \sum_{i=1}^{n_I} q \sum_{j=1}^{J} x_{ij}p_j\right) + b\ln(y_i) \qquad i \in \{n_I + 1, ..., N\}$$

We assume that $0 < r < 1$, so that the $J+1$ goods are substitutes with each other. In particular, as $r \to 1$, the private goods become perfect substitutes. Consumers preference for the public good is weighted by a, and self-reference utility is weighted b.[8]

Consumers face a budget constraint,

$$M = x_{i0} + y_i + \sum_{j=1}^{J} x_{ij}p_j$$

Prices are measured in terms of the numeraire good x_{i0}. The price of the inside good j is p_j per unit. Both inside and outside consumers face the same budget constraint, however the outside consumers cannot purchase the inside goods (i.e., $x_{Oj} = 0$ for $j > 0$).

The multi-product monopolist chooses a vector of prices $\vec{p}$ and pledges a proportion q of its revenues to be donated to the public good. The monopolist's problem is given by,

$$\max_{\vec{p},q} \sum_{j=1}^{J} x_j \cdot \left(p_j \cdot (1-q) - c\right)$$

where c is a constant marginal cost for all inside goods. We investigate whether the monopolist has profit incentives to set q positive under the warm-glow utility and exhibition-utility.

Our model is closest to Besley and Ghatak (2007) who considered both competition between donating and non-charitable firms, and the size of the public good generated when consumers cannot donate directly. However, due to the Bertrand competition assumption, their model imposes a zero-profit condition and cannot provide predictions on firm profits. Our paper complements their work by showing that firms can profit from indirect donations if consumers have exhibition utility. We show in Section 4 that our results are robust to competition among firms and endogenous entry among consumers.

[8]Cobb-Douglas is a standard formulation in modeling public good expenditure in macro and urban economics (e.g., Krugman, 1991). In the exhibition value case, the utility of a consumer I would replace the term $b\ln(y_i + q\sum_{j=1}^{J} x_{ij}p_j)$ by $b\ln(q\sum_{j=1}^{J} x_{ij}p_j)$.

3 Results

The model is solved using the standard Lagrangian approach. The unique equilibrium is symmetric across consumer types, so to simplify the notation, agent-specific subscript i are replaced with I for inside or O for outside consumers. For exposition simplicity (and at cost of theoretical rigor), we write the self-referencing utility generally as $f(\gamma y_I + q\sum_{j=1}^{J} x_{Ij}p_j)$: when $\gamma = 1$ consumers have warm-glow utility and when $\gamma = 0$ consumers have exhibition utility. The inside consumer chooses $\{\vec{x}_I, y_I\}$ to maximize

$$\mathcal{L}_I = v(\vec{x}_I) + g(Y) + f(\gamma y_I + q\sum_{j=1}^{J} x_{Ij}p_j) - \lambda_I \cdot \left(x_{I0} + y_I + \sum_{j=1}^{J} x_{Ij}p_j - M\right)$$

The first order conditions (FOCs) are given by

$$\{x_{I0}\} \qquad \frac{\partial v}{\partial x_0} = \lambda_I \tag{3.1}$$

$$\{x_{Ij}\}(j = \{1, 2, ..., J\}) \qquad \frac{\partial v}{\partial x_j} + g'(Y)qp_j + f'(\cdot)qp_j = \lambda_I p_j \tag{3.2}$$

$$\{y_I\} \qquad g'(Y) + \gamma f'(\cdot) = \lambda_I \tag{3.3}$$

Outside consumers solve a similar problem with $x_{Oj} = 0, \forall(j > 0)$ as these goods are not available to them. An equilibrium in this market is described by five objects

$$\{x^*_{I0}, \{x^*_{Ij}\}_{j=1}^{J}, y^*_I, x^*_{O0}, y^*_O\}$$

Existence and uniqueness of this equilibrium follows directly from Kotchen (2007). We analyze the monopolist profit through consumers demand under various choices of $(\vec{p}, q)$.

Lemma 1. *Assume that consumers can make direct contribution to the charity. Then, there exists*

$$\hat{q} : U \times \vec{p} \to [0, 1]$$

such that if $q < \hat{q}$:
(i) Under warm-glow utility indirect contribution is equivalent to a price discount;
(ii) Under both specifications there exists a desired total contribution level y^* which each consumer will contribute to (directly and indirectly) regardless of $(\vec{p}, q)$.

Proof. See Appendix A.1.

To illustrate point *(i)*, we manipulate the FOCs (3.2) and (3.3) to yield,

$$\frac{\partial v}{\partial x_j} = \lambda_I \cdot (1 - q) \cdot p_j$$

where λ_I is the shadow price for a consumer I. Under warm-glow utility, for every purchase of a private good, each consumer pays $p \cdot (1 - q)$ for the private good and $p \cdot q$ for the public good. As a result, the consumer is effectively choosing x_{Ij} as if the private good costed $p \cdot (1 - q)$, a *discount*. Furthermore, Lemma 1 *(ii)* extends a result in Kotchen (2006) to warm-glow, as total public good contribution is invariant to prices and to the percentage of revenue donated.[9] This mirrors Kotchen's analysis of pure altruistic giving when public good provision is a percentage of the price paid.[10] However, under impure altruism, this invariance result only holds when indirect contribution is less than y^*. This happens only if $q < \hat{q}$, as each consumer I complements its indirect contributions by donating directly until reaching y^*. An example illustrates this discussion.

Example 2. *(Continued) Using the CES-CD utility function form, total contribution by inside and outside consumers are given by,*

$$\begin{aligned} y^* = y_O = & y_I + q \sum_{j=1}^{J} x_{Ij} p_j \\ = & \frac{a + N \cdot b}{a + N \cdot b + N} \cdot M \end{aligned}$$

The total contribution level y^* is invariant to the consumer type, prices and fraction donated.

Example 2 shows that given the purchase decisions, the inside consumers make additional donation until y^* is reached.[11] Intuitively, when consumers have low desire to contribute, purchasing private goods can generate indirect donations that can potentially be greater than the consumers total contribution amount. This case is illustrated in the following example.

Example 3. *(Continued) Using the CES-CD example, we compare the desired total contribution y^**

[9] Kotchen (2006) also considers non-linear production technologies where the firm is more efficient in producing the public good, resulting in the break down of the aforementioned invariance of public goods.

[10] Another related result is in the seminal paper of Bergstrom *et al.* (1986), who demonstrate that the aggregate public good spending does not change with (moderate) wealth redistributions. The authors show that the neutrality result still holds under mild wealth redistributions (such that the set of donors does not change). We show in Section 4 that our result is also robust to variation in the extensive margin.

[11] A similar result holds for the exhibition utility case.

from Example 2 with the indirect contribution,

$$\underbrace{\frac{a + N \cdot b}{a + N \cdot b + N} \cdot M}_{y^*} < \underbrace{\frac{N}{a + N \cdot b + N} \cdot M \cdot \frac{q}{1-q} \cdot \frac{\sum_{j=1}^{J} [p_j \cdot (1-q)]^{\frac{r}{r-1}}}{1 + \sum_{j=1}^{J} [p_j \cdot (1-q)]^{\frac{r}{r-1}}}}_{\text{indirect contribution}}$$

The indirect-contribution term is strictly increasing in q and approaches infinity as $q \to 1$. Fixing prices and increasing q results in more purchases of the inside goods, and thus in more indirect giving. Therefore, there exist $\hat{q}$ such that the indirect contribution exceeds the desired level y^* if $q > \hat{q}$.

Figure 1 plots the total contribution level of the inside consumers for a fixed price p. The horizontal line indicates the original desired level of contribution (y^*). The increasing curve is the indirect contribution for different values of q. The trajectory of total individual public good contribution follows the solid line. When $q < \hat{q}$, consumers complement indirect with direct giving to reach the level y^*. When $q \geq \hat{q}$, they donate too much through the charity linked products. In this case no direct contribution is made and the equilibrium considered in Lemma 1 is no longer valid.

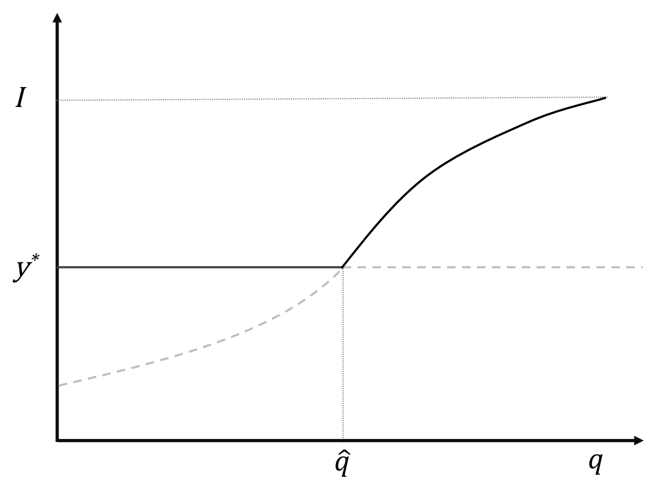

Figure 1: Individual contribution by consumer I for different q.

The figure shows that when the monopolist pledges $q \geq \hat{q}$, the individual indirect contribution exceeds the desired amount y^*, forcing consumers to give zero directly (as negative direct contributions are not possible). Therefore, as opposed to the finding in Kotchen (2006), we show that it is possible for the monopolist to induce higher total public good contribution by setting large enough q.

The following lemma investigates consumers' behavior when $q \geq \hat{q}$.

Lemma 2. *Under warm-glow or exhibition utility, if $q \geq \hat{q}$:*

(i) Inside consumers make zero direct contribution;

(ii) Inside consumers make (weakly) higher total contribution than y^*;

(iii) Total public good contribution is higher compared to the $q < \hat{q}$ case.

Proof. See Appendix A.2.

When $q > \hat{q}$, warm-glow consumers no-longer treat the donation as if it were a discount and the resulting consumer choices describe a corner solution with y_I set at zero.[12] Consumers do not give directly because their indirect contribution already (more than) satisfies their desired contribution. Moreover, when consumers I increase their total contribution as a result of the large q, giving from consumers O is *crowded out*. Yet, total contribution still increases overall because the larger donations by inside consumers more than compensate for the lessened donations from consumers O. Thus, the contribution invariance finding in Kotchen (2006) no longer holds when q is high enough.

While most earlier results hold generally for both warm-glow and exhibition consumers, the two utility specifications have different implications for profits. The next propositions investigate whether consumer purchases can siphon enough spending from the outside good into the inside goods so that both profit and public good spending are higher in this new equilibrium. We first analyze the warm glow model.

Proposition 1. *Under warm glow utility, profits are weakly maximized at $q = 0$.*

Proof. See Appendix A.3.

When consumers have warm-glow utility, no choice of q can induce warm-glow consumers to increase their spending enough to boost profits beyond the no donation case. When $q < \hat{q}$, indirect donations are equivalent to discounts, so profits cannot exceed $q = 0$. When $q \geq \hat{q}$, consumers' excessive donations decrease the marginal benefit from consuming the inside goods relative to the outside good. Combining this observation with the lower private good spending, it implies that consumers buy less of the inside private good and the monopolist's profit decreases.

Proposition 1 does not imply that consumers are not willing to pay more for the charity linked good, but only that sellers would not find it profitable to bundle the private and public good together.[13] If the monopolist chooses $q > \hat{q}$ to raise public good contributions, profits will be hurt. This result is related to a recent literature investigating the lower financial performance demanded by socially responsible investors. Riedl and Smeets (2017) suggest that social responsible investors have pro-social preferences that makes them willing to forego higher returns from

[12]Similar to the previous case, existence and uniqueness of this symmetric equilibrium follows directly from Kotchen (2007) and we refer the reader to that paper for a proof.

[13]Increased willingness to pay for private and public goods is common in green markets. See for example the surveys in Roe *et al.*, 2001 and in Menges *et al.* (2005) which emphasizes the role of impure altruism.

alternative investments in order to fund firms granting social returns.

We now turn to profits under exhibition utility.

Proposition 2. *Under exhibition utility, profits are maximized at* $0 < q < \hat{q}$.

Proof. See Appendix A.4.

We sketch the proof here. Compare two pricing schemes (p, q) and $(\tilde{p}, 0)$, where $\tilde{p} = p \cdot (1 - q)$ and q is small. First, the monopolist receives the same profit per unit of sales from either pricing scheme. Second, the altruistic utility $g(\cdot)$ treats indirect donations as discounts, thus, both schemes yield the same purchases. Finally, indirect donations in the exhibition framework yield additional utility under the (p, q) scheme through the self-reference term $f(\cdot)$. Therefore, indirect contribution leads to more purchases and profits increase as a result.

The critical difference between warm-glow and exhibition utility that gives rise to firm's profitability stems from the substitutability between direct and indirect contributions in the two models. When consumers have warm-glow utility, y^* is determined by the purely altruistic utility $g(\cdot)$ and the self-reference utility $f(\cdot)$. In this case, (small) indirect and direct contributions are perfect substitutes. This relation breaks down when q is high, as excessively large indirect contributions cannot be offset by negative direct contributions. In this case, y^* is just a contribution target, and utility maximizer consumers do not yield extra profits for a charitable monopolist. In the exhibition utility case, y^* is only determined by $g(\cdot)$ – not by $f(\cdot)$ – implying that direct and indirect giving are not perfect substitutes. Thus, small indirect contributions can generate extra utility to the consumers because they do not view the purchase of charity-linked products as just another way to hit the contribution target y^*. The monopolist can capture this extra utility by setting $q > 0$.

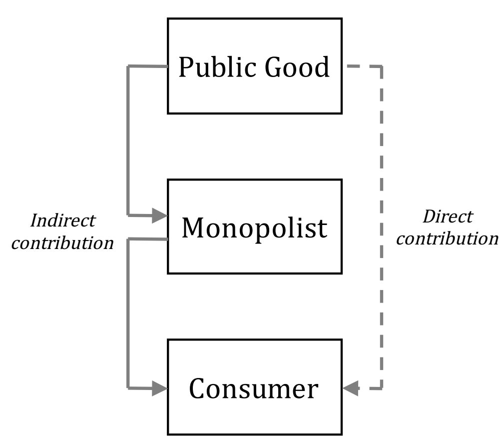

Figure 2: The analogy with double marginalization.

An analogy with the problem of double marginalization from the industrial organization literature provides a simple intuition to the previous results. Figure 2 shows the flows of public good utility to the consumers either indirectly (solid lines) or directly (dashed line). Double marginalization arises with the indirect channel, where the upstream firm (public good) sells products at a mark-up to a downstream firm (monopolist), which subsequently charges an additional mark-up to the consumers. When consumers have exhibition utility the direct channel is weak. This allows the monopolist to extract rents by supplying public good utility. Instead, when consumers have warm-glow utility the direct channel is a strong competitor to the indirect channel, eroding the monopolist's rent. Therefore, the monopolist profits through indirect contributions if it generates additional utility which is not available through direct contributions.

We have shown that profits as well as public good contributions can increase as a result of the indirect contributions. Can they both increase simultaneously?

Corollary 1. The monopolist cannot increase both profits and public good contribution.

The corollary follows directly from Proposition 2. Monopolist's donations lead to either greater profits or greater public goods, but cannot achieve both objectives at the same time. This means that business donations can be driven by either profit motives or social responsibility. However, firms donating a small amount view donations merely as a mean to extract surplus from consumers, with no real impact on the public good. Alternatively, firms may effectively expand public good contributions at the expense of lower profits. Our analysis exposes the limits of markets in providing firms with sufficient incentives to generate greater public goods.

4 Extensions

This section provides two robustness checks of the main theorems in Section 3 by considering (1) endogenous selection into inside or outside consumers, and (2) market competition.

Endogenous entry. We endogenize the choices to go "inside" or to stay "outside" of the monopolist's store. This allows indirect-contribution to additionally impact profits through the extensive margin. We assume that ex-ante homogeneous consumers receive a random utility shock to their inside option, such that consumers purchase the inside good if

$$u_I + \epsilon \geq u_O$$

The firm's choice of prices and donation $(\vec{p}, q)$ now impacts both the extensive and intensive margin. The intensive margin refers to each individual quantity purchased, while the extensive margin considers the number of consumers who chooses to go "inside" and purchase the firm's products.

Proposition 3. *If consumers endogenously choose their type:*
(i) Under warm-glow utility, the monopolist's profit is weakly maximized when $q = 0$*;*
(ii) Under exhibition utility, the monopolist's profit is maximized for some $\hat{q} > q > 0$*.*

Proof. See Appendix A.5.

Endogenizing the consumers' type does not change the outcome – the monopolist can improve profits only when consumers have exhibition utility. While the quantitative results does not change, the intensity of the outcome changes as consumers have an extra action to reflect on the total surplus created by the shopping experience. This exacerbates any gains or losses for the firm. With warm-glow consumers, if the monopolist sets $q > \hat{q}$, it incurs in a bigger loss (than in the exogenous entry case) because less consumers will shop from the monopolist. Instead, when the monopolist faces exhibition consumers, the profit gain from small direct contributions is higher (than in the exogenous entry case) as consumers are more inclined to visit the store.

Competition. We consider the effect of competition by replacing the multi-product monopolist with multiple single-good sellers. In this case, we revert back to the exogenous consumer entry case.

Proposition 4. *There are J competing firms, each firm* $j \in \{1, 2, ..., J\}$ *chooses price* p_j *and* q_j *to maximize profits:*
(i) Under warm-glow utility, each seller's profit is weakly maximized when $q_j = 0$*;*
(ii) Under exhibition utility, at least some seller will optimally choose $q_j > 0$*.*

Proof. See Appendix A.6.

Allowing for competition does not affect our results. The key driver of the propositions in Section 3 relies on the lowered marginal benefit from indirect contributions, so it is not surprising that the analysis carries over. For the case of exhibition consumers, if we consider only symmetric equilibria, the optimality of $q > 0$ still holds. However, we cannot rule out the possibility of asymmetric q_j in equilibrium.[14]

This extension provides a microfoundation for the analysis in Lai *et al.* (2017), who demonstrate that producing a public good can be profitable under competition across sellers if consumers hold valuations for a *bundled* good composed by a private and a public good. Our paper

[14] A plausible candidate for an asymmetric equilibrium is one where some sellers set high contribution percentage q_j such that consumer donate exactly y^* through indirect contribution. As a result, other sellers will be unable to pledge any extra contributions. Thus, there exists a series of asymmetric equilibrium with varying number of contributing sellers and level of contribution. The exact qualitative feature of the equilibrium is not the focus of this paper, as we focus only on the effect of indirect donations on profits.

complements their analysis by naming the factor making donations fruitful, namely the exhibition value.

5 Discussion

Friedman (1970) famously argued that the moment firms stop maximizing profits by employing resources on other objectives (such as donating towards a public good) they would jeopardize their future. However, there is empirical evidence showing that donations can benefit sellers (e.g., Gneezy *et al.*, 2010), and that consumers have higher willingness to pay for charity linked products (e.g., Elfenbein and McManus, 2010 and Leszczyc and Rothkopf, 2010). A growing literature has emerged to reconcile theory with empirics, by considering altruism in markets.

A number of studies focus on the way indirect contributions can improve profits and advanced different explanations ranging from signaling and exhibition utility (e.g., Glazer and Konrad, 1996, Ghosh and Shankar, 2013) to warm-glow and the impossibility of direct giving (e.g., Bagnoli and Watts, 2003, Besley and Ghatak, 2007 and Pecorino, 2016). In this paper, we build a general model of public good donations to show that giving by firms positively impact profits only if consumers derive exhibition utility from their purchases. Firms capture rents from the poor substitutability between direct and indirect donations, which resembles the double marginalization problem.

Finally, the size of the public good can be greater than that from direct donation alone. This is not possible without a market providing indirect contributions – a qualitatively different solution than that in Kotchen (2006). This highlights that public good contributions through markets may lead consumers to give beyond their liking, encouraging pro-social behavior. Yet, this outcome is only possible if firms sacrifice profits, revealing the incompatibility between profit maximization and social responsibility.

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Appendix

A Proofs

A.1 Proof of Lemma 1

(i) Warm-Glow Equivalence with Discount. First order conditions can be rewritten as,

$$\{x_{I0}\} \qquad \frac{\partial v}{\partial x_0} = \lambda_I \tag{A.1}$$

$$\{x_{Ij}\}(k = \{1, 2, ..., J\}) \qquad \frac{\partial v}{\partial x_j} = \lambda_I \cdot p_j \cdot (1 - q) \tag{A.2}$$

$$\{y_I\} \qquad g'(Y) + f_1(y_I + \sum q \cdot p_j \cdot x_{Ij}) = \lambda_I \tag{A.3}$$

Substitute $\tilde{p}_j = p_j \cdot (1 - q)$, $\tilde{y} = q \sum x_j p_j + y$,

$$\{x_{I0}\} \qquad \frac{\partial v}{\partial x_0} = \lambda_I \tag{A.4}$$

$$\{\tilde{x}_{Ij}\}(j = \{1, 2, ..., J\}) \qquad \frac{\partial v}{\partial x_j} = \lambda_I \cdot \tilde{p}_j \tag{A.5}$$

$$\{\tilde{y}_I\} \qquad g'(Y) = \lambda_I \tag{A.6}$$

The second set of FOC matches the case with $q = 0$, and trivially satisfies the budget condition. This shows that the indirect contribution induces the same consumer choices as a price discount.

(ii) Contribution Invariance. (a) Warm-Glow: Define $U_1 = v(\cdot)$ as the private utility and $U_2 = f(\cdot) + g(\cdot)$ as the public utility. Let $\tilde{x} = x \cdot (1 - q)$. The FOCs of this new system are the same as those for the original FOCs, meaning that the equilibrium choice of total contribution (direct+indirect) is the same for any q. Next, to compare across prices of good j from p_j to $\tilde{p}_j$, we similarly let $\tilde{x} = \frac{\tilde{p}}{p} x$. Combining the two observations, total contribution is invariant to the choice of (p, q). *(b)* Exhibition: Let $U_1 = v(\cdot) + f(\cdot)$ as private utility and $U_2 = g(\cdot)$ as public utility. The same argument for warm glow holds.

(iii) Existence of $\hat{q}$. For either utility: the total desired level of contribution y^* is determined independently of (p, q). Consider (A.2), where p_k is arbitrarily high and q arbitrarily close to 1, consumer pours almost all income into good k given the Inada conditions. This shows that total contribution can always exceed y^* for some (p, q). Define $\hat{q}$ as the minimal level of indirect contribution required to induce enough spending from consumers to hit y^*. Therefore, $\hat{q}$ is a function of y^* and p, since y^* is a result of consumer utility and independent of (p, q), it follows that $\hat{q} : U \times p \to [0, 1]$. ■

A.2 Proof of Lemma 2

(i) & (ii) By definition of $\hat{q}$, consumers indirectly contribute more than y^*. Consumers would prefer to "take back" some indirectly contributed amount (if we assumed an interior equilibrium), but cannot. As a result, $y_I = 0$. When $q = \hat{q}$ consumers make the same total contributions; when

$q > \hat{q}$ consumers make more total contribution than desired.

(iii) Increased Total Contribution. Given that type I consumers increase their individual contribution to $y_I > y^*$, consider the FOCs for type O consumers,

$$\{x_{O0}\} \qquad \frac{\partial v}{\partial x_{O0}} = \lambda_O \tag{A.7}$$

$$\{y_O\} \qquad g'(m_I y_I + m_O y_O) + f(y_O) = \lambda_O \tag{A.8}$$

When $y_I > y^*$, maintaining $y_O = y^*$ and $x_O = 1 - y^*$ makes the marginal benefit of public good contribution lower than private good spending. Optimality requires redistributing spending from public to private goods. Assume that outside consumers select direct contribution y_O such that total public contribution remain the same as before and spend the rest of the budget in outside goods. As a result y_O decreases, f_1' increases and $\frac{\partial v}{\partial x_{O0}}$ decreases, hence spending must be redirected towards public contributions. It follows that total public contribution increases. ■

A.3 Proof of Proposition 1

From Lemma 1, if $q < \hat{q}$, indirect contribution is equivalent to some no contribution prices, hence the same profit is achievable, i.e. $\pi(p, q) = \pi(p \cdot (1-q), 0)$ so the maximum profit that can be obtained by $q > 0$ must be attainable by $q = 0$.

If $\hat{q} < q < 1$, from Lemma 2, a consumer's individual public contribution is higher than y^* and sets $y_I = 0$. Compare the spending between inside and outside private goods under (p, q) and $(p \cdot (1-q), 0)$. The FOCs for (p, q) is,

$$\{x_0\} \qquad \frac{\partial v}{\partial x_0} = \lambda_I \tag{A.9}$$

$$\{x_j\} \qquad \frac{\partial v}{\partial x_0} + q \cdot p_j \cdot \underbrace{(g' + f')}_{\substack{\text{marginal benefit} \\ \text{of contribution}}} = \lambda_I \cdot p_j \tag{A.10}$$

Assume consumer spends as if prices are $(p \cdot (1-q), 0)$. This spending scheme resulting in strictly higher marginal benefit of x_0 and lower marginal benefit of x_j, as the return from contribution is lower since total contribution exceeded y^*. Inada conditions implies equilibrium marginal benefit of x_j with (p, q) must be lower than in case of $(p \cdot (1-q), 0)$. This implies that if the monopoly sets (p, q) with $q > \hat{q}$, compared to $(p \cdot (1-q), 0)$, it earns the same margin per sales, but loses in quantity sale. Hence $\pi(p, q) < \pi(p \cdot (1-q), 0)$, and profits are dominated by the $q = 0$ case. ■

A.4 Proof of Proposition 2

(i) Compare $\pi(p \cdot (1-q), 0)$ and $\pi(p, q)$ for a sufficiently small $q < \hat{q}$. Consumer derive additional benefits from $f(\cdot)$ per purchase if monopoly sets (p, q), so consumers purchase more while the monopolist receives the same margin per sales. Thus, profits increase.

(ii) When $q > \hat{q}$. Follow the same proof as Proposition 1 but replace v with $v + g$ and replace $v + f$ with f. The intuition is to separate the terms that can be "filled" by direct contribution and

those that cannot. ■

A.5 Proof of Proposition 3

(i) Warm Glow Utility. If consumers have exhibition utility. Compare price scheme $(p \cdot (1-q), 0)$ to (p, q). Small donation q results in higher increases consumer utility to go inside (compared to discount of q). More consumers enter, more sales per consumer, profits strictly dominate $\pi(p \cdot (1-q), 0)$.

(ii) Exhibition Utility. If consumers have warm glow utility. When $q < \hat{q}$, no different from price discounts. When $q > \hat{q}$, consumers receives less additional utility from going 'inside' compared to $(p \cdot (1-q), 0)$. Profits bounded by above by $\pi(p, 0)$. ■

A.6 Proof of Proposition 4

(i) Warm Glow Utility. When total indirect contribution is below y^*, the parallel with price discounts applies. When total indirect contribution is above y^*, consumers receives less additional utility from the particular product compared to a discount. Hence $\pi_j(p_j \cdot (1-q_j), 0) \geq \pi_j(p_j, 0)$.

(ii) Exhibition Utility. Compare the following price schemes $(p_j \cdot (1-q_j), 0)$ to (p_j, q_j). A mall donation q results in higher marginal utility per unit, resulting in strictly more sales per consumer. Profits strictly dominate $\pi_j(p_j \cdot (1-q_j), 0)$. It follows that $q_j = 0, \forall j$ for any p does not constitute an equilibrium: at least some sellers will set $q_j > 0$. It follows that in any symmetric equilibria $q^* > 0$. ■

B Solution of the example in the main text

This appendix solves the model first introduced in Example 1 under warm glow utility. For consumer type I,

$$\begin{aligned}\mathcal{L}_I =& \frac{1}{r} \ln \left(\sum_{j=0}^{J} x_{ij}^r \right) + a \ln \left(\sum_{i=1}^{N} \left[y_i + q \sum_{j=1}^{J} x_{ij} p_j \right] \right) + b \ln \left(y_i + q \sum_{j=1}^{J} x_{ij} p_j \right) \\ & - \lambda_I \cdot \left(x_{i0} + y_i + \sum_{j=1}^{J} x_{ij} p_j - M \right)\end{aligned} \tag{B.1}$$

The inside consumers maximize their utility by spending their budget on public and private goods. The relevant FOCs are,

$$\{x_{i0}\} \qquad \frac{x_{i0}^{r-1}}{\sum_{k=0}^{J} x_{ik}^{r}} = \lambda_I \tag{B.2}$$

$$\{x_{ij}\}(j=\{1,2,...,J\}) \qquad \frac{x_{ij}^{r-1}}{\sum_{k=0}^{J} x_{ik}^{r}} + \frac{a \cdot q \cdot p_j}{\sum_{i=1}^{N}\left[y_i + q\sum_{k=1}^{J} x_{ik}p_k\right]} + \frac{b \cdot q \cdot p_j}{y_i + q\sum_{k=1}^{J} x_{ik}p_k} = \lambda_I p_j \tag{B.3}$$

$$\{y_i\} \qquad \frac{a}{\sum_{i=1}^{N}\left[y_i + q\sum_{k=1}^{J} x_{ik}p_k\right]} + \frac{b}{y_i + q\sum_{k=1}^{J} x_{ik}p_k} = \lambda_I \tag{B.4}$$

The Lagrangian of the outside consumer is given by,

$$\mathcal{L}_O = \ln\left(x_{ij}\right) + a\ln\left(\sum_{i=1}^{N}\left[y_i + q\sum_{j=1}^{J} x_{ij}p_j\right]\right) + b\ln(y_i) - \lambda_O\left(x_{i0} + y_i - I\right) \tag{B.5}$$

Note that $\lambda_I \neq \lambda_O$ (shadow value of income), since the two types of consumers face different choice sets which changes their marginal benefit of income. Outside consumers only choose between the outside good, x_0, and the direct public good contribution, y_i. The relevant FOC are,

$$\{x_{i0}\} \qquad \frac{1}{x_{i0}} = \lambda_O \tag{B.6}$$

$$\{y_i\} \qquad \frac{a}{\sum_{i=1}^{N}\left[y_i + q\sum_{k=1}^{J} x_{ik}p_k\right]} + \frac{b}{y_i} = \lambda_O \tag{B.7}$$

Using the FOCs of the I type, (B.3) and (B.4) can be combined,

$$\frac{x_{ij}^{r-1}}{\sum_{k=0}^{J} x_{ik}^{r}} = \lambda_I p_j \cdot (1-q) \tag{B.8}$$

showing that the true "price" of each inside product is $p_j \cdot (1-q)$. This along with (B.2) determines how the budget is spent across the private goods. Summing (B.8) for all j products with (B.2) gives

$$1 = \frac{a(x_{I0} + \sum_{k=1}^{J} x_{Ik}p_k(1-q))}{\sum_{i=1}^{N}\left[y_i + q\sum_{k=1}^{J} x_{ik}p_k\right]} + \frac{b(x_{I0} + \sum_{k=1}^{J} x_{Ik}p_k(1-q))}{y_i + q\sum_{k=1}^{J} x_{Ik}p_k} \tag{B.9}$$

In equilibrium consumers of the same type makes the same choices, yielding

$$1 = \frac{a\left(x_{I0} + \sum_{k=1}^{J} x_{Ik}p_k(1-q)\right)}{n_I y_I + n_O y_O + q \cdot n_I \sum_{k=1}^{J} x_{Ik}p_k} + \frac{b\left(x_{I0} + \sum_{k=1}^{J} x_{Ik}p_k(1-q)\right)}{y_I + q\sum_{k=1}^{J} x_{Ik}p_k} \tag{B.10}$$

The FOCs for the type O consumers can be rearranged as

$$1 = \frac{a x_{O0}}{n_I y_I + n_O y_O + q \cdot n_I \sum_{k=1}^{J} x_{Ik}p_k} + \frac{b x_{O0}}{y_O} \tag{B.11}$$

and, further, combining (B.10) and (B.11) implies that,

$$\frac{bx_{O0}}{y_O} - \frac{b \cdot \left(x_{I0} + \sum_{k=1}^{J} x_{Ik} p_k (1-q)\right)}{y_I + q \sum_{k=1}^{J} x_{Ik} p_k} = \frac{a \cdot \left(-x_{O0} + x_{I0} + \sum_{k=1}^{J} x_{Ik} p_k (1-q)\right)}{n_I y_I + n_O y_O + q \cdot n_I \sum_{k=1}^{J} x_{Ik} p_k} \tag{B.12}$$

This equation holds with equality only if

$$x_{O0} = x_{I0} + \sum_{j=1}^{J} x_{Ij} p_j \cdot (1-q) \tag{B.13}$$

which, by substituting the budget constraint of either consumer type, gives

$$y_O = y_I + q \sum_{j=1}^{J} x_{Ij} p_j \tag{B.14}$$

This result would not change for the pure altruism case (i.e., $b = 0$). Consumers of either type make the same total contribution to the public good regardless of the choice set. Standard procedure to solving the CES-system yields the optimal consumption sets. The optimal choice for the outside consumer is found by combining (B.6), (B.7), (B.14) and the budget constraint:

$$x_{I0}^* = \frac{N}{a + Nb + N} M \tag{B.15}$$

$$\tilde{y}_I^* = \frac{a + Nb}{a + Nb + N} I \tag{B.16}$$

Similarly, we obtain the optimal choices for the inside consumers:

$$x_{I0}^* = \frac{N}{a + Nb + N} \cdot M \cdot \frac{1}{1 + \sum_{k=1}^{J} [p_k (1-q)]^{\frac{r}{r-1}}} \tag{B.17}$$

$$x_{Ij}^* = \frac{N}{a + Nb + N} \cdot M \cdot \frac{1}{1 + \sum_{k=1}^{J} [p_k (1-q)]^{\frac{r}{r-1}}} \cdot \left(p_j (1-q)\right)^{\frac{1}{r-1}} \tag{B.18}$$

$$\sum_{j=1}^{J} x_{Ij}^* p_j = \frac{N}{a + Nb + N} \cdot M \cdot \frac{1}{1-q} \cdot \frac{\sum_{j=1}^{J} [p_j \cdot (1-q)]^{\frac{r}{r-1}}}{1 + \sum_{k=1}^{J} [p_k (1-q)]^{\frac{r}{r-1}}} \tag{B.19}$$

$$y_I^* = \frac{a + Nb}{a + Nb + N} \cdot I - \frac{N}{a + Nb + N} \cdot M \cdot \frac{q}{1-q} \frac{\sum_{j=1}^{J} [p_j \cdot (1-q)]^{\frac{r}{r-1}}}{1 + \sum_{k=1}^{J} [p_k (1-q)]^{\frac{r}{r-1}}} \tag{B.20}$$

From here, all our results highlighted in Examples 2 and 3 follow. ■