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Charitable Contributions by Businesses: A Tax Policy Perspective

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Charitable Contributions by Businesses: A Tax Policy Perspective

Abstract

Empirical evidence suggests that charitable contributions to public goods by businesses may be driven not only by the familiar warm-glow of giving motive but also as a means for businesses to signal high product quality. Building on this finding, we present an analytical framework that demonstrates that the optimal degree of subsidization should decrease with the extent to which the signal is informative, and may even turn into a tax when the signal is sufficiently strong. Finally, we compare the current practice in the US, a charitable contribution deduction provided by Section 170 of the US Tax Code, with the design suggested by our normative analysis.

JEL-Codes: H200, H400, K300.

Keywords: public goods, Pigouvian taxation, warm glow, signaling.

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1. Introduction

Efficient provision of a public good requires that its amount be set to the level that equates the marginal cost of provision and the sum of the marginal benefits derived by all consumers. The private market is unlikely to provide the optimal level of public goods due to several reasons. Foremost among them are: (i) the free-rider problem: public goods are typically non-excludible; hence, individuals are tempted to benefit from them without paying their fair share, or paying at all; (ii) a standard externality problem: self-interested individuals tend to ignore the benefit derived from the public good by other individuals. This leads to under-provision of public goods and calls for government intervention.

Assuming plausibly, in line of (ii) above, that individuals disregard the effect of their contributions on the aggregate level of public good provision, private provision of public good can take place only when people derive utility, known as ‘warm glow,’ from the act of contribution itself; namely, from being generous towards worthy causes (the sheer joy-of-giving).² This may often be the case, but warm-glow does not solve the under-provision problem, as the donors account only for their utility from giving. The utility derived by the beneficiaries is not accounted for.³

In light of the above, under-provision of public goods emerges in an unfettered equilibrium. This may be a rationale for the government to subsidize private provision of public goods.

² See Andreoni (1989, 1990). In this paper we focus our analysis on the warm glow effect. Assuming, alternatively, that individuals do account for the impact of their contributions on the aggregate level of public good provision would complicate the analysis without changing the qualitative nature of our results. See additional related discussion in footnote 1817 below.

³ Even when donors derive utility from their belief that their contributions increase the donees’ utilities, it is nevertheless the utility of the donors, not the donees, that is taken into account.

In this paper, we focus on private provision of public goods by businesses (either incorporated or unincorporated).⁴ We argue that when the donor is a business, charitable contributions may be motivated by the warm glow of the owners, controlling shareholders and top executives. To facilitate the exposition, we will henceforth refer to the warm-glow utility derived by the individuals who own or run the firm as the warm-glow derived by the firm.

Warm glow is not the only possible motivation for business's charitable contributions. Businesses may also engage in charitable giving to maximize profits. According to Besley and Ghatak (2007) businesses may shift their cost of charitable giving to consumers by selling their products at higher prices, allowing consumers to self-select according to their valuation of the public good. Such businesses sell their customers a product or service bundled with an intermediated charitable giving.⁵

In this paper we focus on another profitable use of charitable contributions which is the signaling of high product quality.⁶ The intuition is that businesses that contribute to public goods are perceived by potential customers to be less likely to cheat, say, by renegeing on contracts or using materials of lower than promised quality, compared to businesses that

⁴ In the case of corporations, the private provision of public goods is part of a wider and growing phenomenon referred to as Corporate Social Responsibility (CSR). There is a voluminous literature on CSR. See, e.g., Benabou and Tirole (2010) for a survey of various explanations for the reasons why CSR is growing.

⁵ TOMS shoes, for example, matches every pair of shoes purchased with a pair of new shoes for a child in need. The price they charge for their shoes covers, or even more than covers, their cost of providing shoes to children in need, thereby selling charity intermediation services to their customers.

⁶ The signaling motive for engaging in charitable contributions has been originally highlighted by Glazer and Konrad (1996) who demonstrate that individuals may choose to donate to the provision of public goods in order to signal their unobserved income and thereby gain social status. Glazer and Konrad focus on individuals, whereas the current paper examines the signaling role of charitable contributions by businesses and further examines the tax policy implications.

do not engage in charitable giving. There is ample suggestive evidence consistent with our claim.⁷ The following two studies are especially relevant.

Siegel and Vitaliano (2007) found that businesses that sell experience goods, which are goods one needs to personally experience in order to assess their quality, are more likely to engage in charitable giving than businesses that sell search goods, namely, goods which quality can be easily verified prior to their purchase.

Elfenbein, Fisman and Mcmanus (2012) used data from a diverse group of eBay sellers and found that consumers respond positively to products tied to charity, particularly when the sellers were relatively new and hence consumers had limited alternative means of assuring quality. Moreover, consistent with charity serving as a quality signal, fewer customer complaints were found among charity-intensive sellers.

⁷ Some find that CSR, which is essentially similar to charitable giving, is associated by customers with firm's honesty and reliability. See, for example, McWilliams and Siegel (2001); Fisman, Heal and Nair (2006) (finding that consumers view CSR as a signal that the producing firm is an honest and reliable type that will not skimp on quality). Some find positive correlation between charitable giving (or other forms of generosity) and trustworthiness. When sellers are perceived to be trustworthy (especially when product quality is difficult to verify) it increases their profits. See, for example, Ashraf, Bohnet, Piankov (2006); Chaudhuri and Gangadharan (2007); Albert, Güth, Kirchler, Maciejovsky (2007); Blanco, Engelman and Normann (2011); Kotler, Hessekiel, and Lee (2012); Fehrler and Przepiorka (2013); Gambetta and Przepiorka (2014). Being environmental friendly is also a form of private provision of public good, similar in essence to charitable giving. There is research showing that consumers prefer eco-labeled goods not necessarily because they themselves care about the environment, but because they view it as a signal that the product itself is healthy or energy efficient. See, for example, Leire and Thidell (2005) (finding that personal health rather than environmental preferences are the dominant reason consumers purchase eco-labeled products); Eichholtz, Kok, and Quigley (2010) (finding that tenants and buyers are willing to pay more for energy-efficient buildings but not for buildings that are sustainable in a broader sense). There is research finding that in relatively more competitive markets, that is, where signaling is especially important to sellers, we see more charitable giving. See, for example, Fisman, Heal and Nair (2005) (finding that corporate philanthropy and profits are positively related in industries with high advertising intensity and high competition); Fernandez-Kranz and Santaló (2010) (finding that if all else is constant, doubling competition in the marketplace would increase the CSR ratings of an average company by between 184 percent and 800 percent); Tian, Wang and Yang (2011) finding that Chinese firms selling experience products (vs. search and credence products) are more likely to gain consumers' positive product associations and purchase support through CSR practices.

In the current study, we present an analytical framework that captures both motives for charitable contributions: warm glow and product-quality signaling. We assume that the quality of the product/service provided by the firm is unobserved by the consumers. We further assume, in line with the empirical evidence reviewed above, the existence of a positive correlation between the propensity of the firm to engage in charitable giving (captured by the derived utility from warm glow) and the quality of its product/service. Finally we assume that private provision of the public good is observable by the consumers.⁸ Our assumptions hence imply that firms may choose to use the provision of the public good, not merely due to the warm glow their owners may enjoy, but also in order to signal their product/service quality. We then employ our framework to characterize the optimal government policy, assuming that the government can engage in direct provision of the public good or subsidize its private provision.

We show that due to the presence of a warm-glow motive, the optimal policy would be to subsidize the private provision of the public good. We further show that the degree of subsidization rendered to charitable contributions should vary with the correlation between the propensity of the firm to engage in charitable giving and the quality of its product/service, namely the extent to which the signal is informative.

When the correlation is relatively small, that is, the signal is relatively weak; the provision of the public good would be exclusively driven by warm glow. Firms would then set their

⁸ In making this assumption we rely on the findings in many papers, some of them mentioned above, that the level of charitable giving by businesses, selling experience goods, increases with competition. Presumably, the managers believe that customers can verify charitable giving; and indeed there are means, such as financial reports, media coverage and rating agencies, that help businesses to advertise their charitable giving. In sum, our assumptions can be warranted as, plausibly, charitable giving can be more easily verified, whereas high quality is much more difficult to verify.

contributions at the level that maximizes the warm-glow utility component. In such a case, the level of public good provision would be lower than the socially desirable (efficient) one. A subsidy would hence be called for to internalize the positive externalities and restore efficiency.

In contrast, when the correlation is sufficiently high, namely the signal is relatively strong, the signaling motive would become operative. Firms that derive a utility from warm glow, which, by presumption, are more likely to provide high product-quality, would increase their level of charitable contributions above the level that maximizes their warm-glow utility component. They do so up to the level that deters mimicking by firms that experience no warm glow, which, by presumption, are more likely to provide low product-quality. Namely, firms that derive warm glow make charitable contributions up to the point where firms that derive no such warm glow gains, but engage in charitable giving for strategic reasons only (pretending to provide high-quality product), are discouraged from doing so.

The incentive to engage in signaling induces firms to increase their level of contribution to the public good, and hence, calls for a lower degree of subsidization provided by the government. When the signaling motive is sufficiently manifest, levying a tax on charitable contributions might be warranted.

After characterizing the social optimum, given our suggested framework, we turn to discuss the actual law. Section 170 of the US Internal Revenue Code allows taxpayers to deduct, from their adjusted gross income (AGI), voluntary transfers of cash or property made to organizations formed for religious, educational, medical, scientific and other

charitable purposes.⁹ The charitable contribution deduction is capped at 50 percent of AGI in the case of individual donors,¹⁰ and 10 percent of taxable income for corporate donors. Namely, within the fiscal year, any dollar of contribution exceeding 50 percent of AGI for individual donors and 10 percent of taxable income for corporations, cannot be deducted. Excess contributions can be carried over and deducted in subsequent years.¹¹ This means that in expected present value terms (due to the time value of money and the uncertainties regarding future income from which contributions can be deducted) the effective deduction rate for contributions exceeding the specified caps is less than full.¹²

We then turn to compare our normative findings with the actual law. For this purpose we derive the effective tax rate levied on charitable contributions under the current practice, a regime comprised of a profit tax supplemented by a capped deduction on charitable contributions. We do so by constructing an auxiliary tax regime, which includes a single instrument – a tax on charitable contributions - that precisely replicates the allocation attained under the current practice. We denote the tax on charitable contributions under the auxiliary regime as the effective tax associated with the current practice. We employ this definition to demonstrate that the implications of the current practice qualitatively resemble the patterns of our normative analysis: an effective negative tax (a subsidy), which

⁹ The charitable income tax deduction for individuals became part of the Internal Revenue Code in 1917. Excerpts from the floor debate reveal that the deduction was deemed necessary, on policy grounds, to insulate philanthropic giving from the high income-tax rates that began to emerge during World War I, fearing that otherwise the flow of private philanthropy would dry up. This motive was again explicitly stated when the provision was amended in 1935 to include corporate donors. See also the discussion in Margalioth (2017)

¹⁰ The deduction rate was increased to 60 percent, for any taxable year beginning after December 31, 2017, and before January 1, 2026. See IRC Section 170(b)(1)(G)(i).

¹¹ See IRC Section 170(b)(1)(G)(ii).

¹² We assume that corporations cannot deduct charitable contributions as expenses incurred in the production of income under tax code section 162. Even if it were possible, acknowledging the existence of Section 162 would not have changed the qualitative nature of our results.

increases with respect to the returns on signaling and eventually turning into an effective positive tax. Notably, our analysis alludes to a possible novel normative justification for the existence of a cap on the amount of charitable contributions that can be deducted, admittedly, an unintended one. We show that when charitable contribution is motivated by signaling and the cap on deduction is binding, the effective tax rate levied on charitable contributions is positive. Namely, the cost of signaling is less than fully deducted, although signaling is a cost incurred in the process of generating taxable income. Levying an effective tax on charitable contributions serves to mitigate the excessive use of charitable contributions for quality signaling purposes.¹³

The paper proceeds as follows. Part 2 outlines our model and analyzes the benchmark *laissez-faire* case, absent of government intervention. In Part 3 we offer a normative analysis, characterizing the socially optimal policy. Part 4 compares the socially optimal policy with the current practice of the tax treatment of charitable contributions by businesses in the US (Section 170 of the US Tax Code). Finally we conclude.

2. The Model

We present a simple setting with just the essential ingredients required to demonstrate our argument. Consider an economy with $M > 0$ identical consumers who derive utility from two private goods (denoted x and y) and a single public good (denoted by G). For

¹³ The legislative history indicates that the caps were imposed to limit the possibility of an excessive use of the deduction on charitable contributions as a means to reduce the tax liability. Due to lack of empirical evidence, we are unable to assess the share of firms that actually hit the cap.

tractability we assume a quasi-linear specification for the utility function (shared by all consumers) taking the following form:

$$(1) \quad U(x, G, y, \theta) = v(x, \theta) + h(G) + y,$$

where $x \in \{0,1\}$, θ denotes the quality associated with x , $v(0, \theta) = 0$, $v(1, \theta) = \theta$ and h is increasing, concave and satisfies standard INADA conditions.

Each consumer has, thus, an inelastic demand for one unit of x with an associated reservation price, depending on the quality of the provider, given by θ (measured in y terms, the price of which is normalized to unity, with no loss in generality). We simplify by plausibly invoking a ‘large economy assumption’, letting the amount of public good provision, G , be a fixed parameter from the point of view of the individual consumer (not depending on his private contribution). This assumption introduces an extreme ‘free-rider’ problem associated with under-provision of the public good, implying zero private contributions of the consumers to the public good in equilibrium.¹⁴ Finally, we assume that each consumer is endowed with $Y > 0$ units of the *numeraire* good, y . Denoting the price of x (as a function of its associated quality θ) by $p(\theta)$, the typical consumer’s budget constraint is given by:

$$(2) \quad y + p(\theta) \cdot x = Y.$$

We turn next to the providers of x who are either owners of unincorporated businesses or managers/controlling shareholders of corporations. We assume that there are $N < M$ providers in the market, each producing a single unit of x at zero costs, with no loss in

¹⁴ The ‘large economy assumption’ is tantamount to perfect competition. Relaxing the assumption will not change the gist of our key argument.

generality.¹⁵

Providers differ in their quality, where we assume that a fraction $0 < 1 - \alpha < 1$ of the providers is of low quality [denoted $\theta = \theta^l > 0$], and a complementary fraction of $0 < \alpha < 1$ of the providers is of high quality [denoted $\theta = \theta^h > \theta^l$].¹⁶ We assume that the quality of the provider is private information, unobserved by the consumers. Consumers are nonetheless assumed to be familiar with the distribution of providers' types. We further assume that providers may affect consumers' valuations (thereby, affecting their ultimate choices) via signaling. In particular, we assume that providers may engage in contributions to the provision of the public good. The provider's level of contribution to the public good is assumed to be observable by the consumers (say, via disclosure in financial statements or other publicly available reports) and may therefore serve as a signaling channel about the quality of the provider. We assume that some of the providers derive a warm-glow utility associated with contributing to the public good [as in Andreoni (1989), (1990)]. These providers are referred to as socially-motivated providers. Specifically, we assume that a fraction $0 < q^h < 1$ of the high-quality providers, and, correspondingly, a fraction $0 < q^l < q^h$ of the low-quality providers, are deriving utility from the 'joy of giving' associated with contributions to the provision of the public good. Our parametric assumptions imply, therefore, the existence of a positive correlation between the propensity of the provider to contribute to public good provision and its associated quality (as perceived by the consumers). The existence of this positive correlation implies that in the

¹⁵ The assumptions on the particular forms of the demand and supply functions are made for tractability and can be relaxed without changing the qualitative nature of our results.

¹⁶ The quality attribute of a firm is associated with its business conduct towards consumers. A high-quality firm is, *inter-alia*, more likely to abide by contractual obligations (e.g., timely provision of services) and be more attentive to customers' special needs (e.g., available and efficient customer support services).

signaling equilibrium (*Bayesian*) consumers will (correctly) perceive providers exhibiting a higher extent of charitable contributions to be of higher quality (on average).

Three remarks are in order. First, there is a large body of literature providing suggestive evidence consistent with the existence of the above correlation (see our discussion in the introduction). Second, we offer a simple micro-foundation in which the correlation is derived endogenously, rather than being assumed exogenously. For tractability purposes, we will adhere to the reduced form in the subsequent analysis. The thrust of the argument is as follows (technical details are provided in Appendix E).

The innate level of product quality (low or high) is assumed to be independently distributed across all providers (regardless of their warm-glow characteristic), namely there is no exogenous correlation between product quality and the warm-glow characteristic. However, low-quality providers may choose to enhance the quality of their product (from low to high) at some pecuniary cost, which is also independently distributed across all providers. Due to asymmetric information, consumers cannot observe (and/or verify) the quality of the product but rather infer it from the observed level of charitable contribution. *Prima facie*, providers have no incentive to enhance product quality, as consumers cannot observe nor verify the quality of the product. We assume, however, that low quality providers who refrain from enhancing the quality of their product but choose to engage in charitable activity, thereby signaling high-quality, suffer a moral cost from being mistakenly over-rated by their consumers. A positive correlation between product quality and charitable contributions is derived endogenously in equilibrium, that is correctly perceived by the consumers, by assuming that providers who derive warm-glow from charitable giving suffer relatively higher moral costs than those providers who do not

derive warm glow. This assumption implies that enhancing the quality of the product is less costly for providers who derive warm glow due to the avoided higher moral cost (recalling that the pecuniary costs are the same for all providers).

Finally, our model focuses on the case of experience goods, which quality can only be verified ex-post (and for which we find empirical support of the higher tendency of sellers to engage in charitable giving). In such circumstances, consumers necessarily rely on signals correlated with the unobserved attribute of quality.

Clearly, firms would seek the most cost-effective channel to convey a credible signal about their product's quality to the consumers. They are likely to rely on multiple signals to attain this goal. Our choice to confine attention to a single signaling device (charitable giving) is done in order to facilitate the exposition of our key insight. We briefly discuss the implications of the availability of multiple signals in Appendix F, focusing on the supplementary role of commonly used product warranties. We demonstrate why the presence of warm-glow lends an inherent comparative advantage to charitable giving over other signaling devices.

With slight abuse of notation, the parameter θ in the utility function given in (1) will be replaced by its expected value, conditional on the information available to the consumers (affected by signals conveyed by the providers). The utility of a typical provider is given by the following expression:

$$(3) \quad R(g, G, y) = \beta \cdot w(g) + h(G) + y ,$$

where g is the extent of contribution to the public good, h , as in the consumers' utility

specification, captures the utility from public good provision and $w(g)$ captures the warm glow component, where $\beta = 1$ for providers that derive warm glow and $\beta = 0$ otherwise. Both h and w are assumed increasing, concave and to satisfy INADA conditions. We maintain our ‘large economy assumption’ and assume that all providers ignore the impact of their contribution on the aggregate level of public good, G .¹⁷

Similar to consumers, providers are assumed to be endowed with $Y > 0$ units of the *numeraire* good, y . The typical provider’s budget constraint is given by:

$$(4) \quad y + g = Y + p(g),$$

where $p(g)$ denotes the price of x charged by the provider, depending on his (observable) level of contribution, g . Notice that we normalize the marginal cost of public good provision to unity (measured in units of y), with no loss of generality.

Finally, assuming that the market for x is competitive, the assumption that $N < M$ combined with the fact that the aggregate demand for x is perfectly elastic (by virtue of the reservation property) imply that in equilibrium the price of x , for any level of g , will coincide with the (common) reservation price of the consumers; that is, consumers’ surplus will be fully extracted by the providers. In equilibrium, this reservation price will be equal to the expected quality of the provider conditional on its level of contribution to the public good,

¹⁷ Andreoni (1989) introduces the notion of ‘impure altruism’ which accounts for the presence of ‘warm-glow’ utility associated with the joy of giving per se, **separately and independently** from the utility derived from the **increase** in the level of the public good provided (‘pure altruism’). Our choice to focus solely on the ‘warm-glow’ component is done for tractability purposes. The inclusion of altruism would not change the qualitative nature of our results. The key implication of shutting down the altruistic motive for charitable giving is simply to render the ‘free-rider’ problem associated with under provision of the public good more manifest. Ultimately, what is essential for our analysis to hold, is the co-existence of signaling motive alongside a consumption motive for charitable giving, where the latter motive can be either driven by ‘warm-glow’, pure altruism, or the combination of both.

g. Formally,

$$(5) \quad p(g) \equiv E(\theta|g),$$

with E denoting the (conditional) expectation operator.

Notice that our modeling assumptions capture the two different motives for providers to engage in charitable giving: a social motive, reflected by the warm-glow component in the utility specification in (3); and, a strategic motive, captured by the term $p(g)$ in the budget constraint given in (4), where, in equilibrium, the price will be shown to be an increasing function of g .

We turn next to characterize the equilibrium. As in many other signaling games, two types of equilibria may arise: (i) A separating equilibrium in which only socially-motivated providers make contributions to the public goods; (ii) A hybrid equilibrium in which both socially-motivated and non-socially-motivated providers make contributions to the public good. However, by applying a standard refinement criterion, invoking the ‘Intuitive Criterion’ suggested by Cho and Kreps (1987), one can show that a hybrid-equilibrium is, in fact, unstable (see Appendix A for details). Thus, in the analysis that follows we will confine attention to the (unique) separating equilibrium.

2.1 Separating Equilibrium

In a separating equilibrium providers that derive ‘warm glow’ are the only ones to contribute to the public good. Rational consumers fully anticipate this and update accordingly their perception about the quality of the provider (conditional on its observed

contribution). Let the (common) level of contribution by a typical socially motivated provider be denoted by \tilde{g} .

In order to get some idea about the magnitude of \tilde{g} , it is useful to imagine what happens in case there is full information about the product quality. In this case only socially motivated providers will contribute to the public good. By virtue of the utility specification in (3), as the price of x [in the budget constraint given in (4)] will be independent of g in such a case, each socially-motivated provider will choose the level of provision that solves the following first-order condition:

$$(6) \quad w'(g^*) = 1.$$

Turning back to our model of asymmetric information, it is clear that the level of contribution, \tilde{g} , has to be at least as large as g^* .

Let $\bar{\theta}$ denote the expected quality associated with a typical socially motivated provider (coinciding with the common price charged by all socially motivated providers in equilibrium). Employing *Bayes' Rule* it follows:

$$(7) \quad p(\tilde{g}) = \bar{\theta} = \frac{\alpha \cdot q^h \cdot \theta^h + (1-\alpha) \cdot q^l \cdot \theta^l}{[\alpha \cdot q^h + (1-\alpha) \cdot q^l]}.$$

Similarly, denote by $\underline{\theta}$ the expected quality associated with a provider that does not exhibit warm glow (coinciding with the common price charged by all such providers in equilibrium). Employing *Bayes' Rule* it follows:

$$(8) \quad p(0) = \underline{\theta} = \frac{\alpha \cdot (1-q^h) \cdot \theta^h + (1-\alpha) \cdot (1-q^l) \cdot \theta^l}{[\alpha \cdot (1-q^h) + (1-\alpha) \cdot (1-q^l)]}.$$

It is straightforward to verify that $\bar{\theta} > \underline{\theta}$, by virtue of our assumption that $q^h > q^l$ and the fact that $\theta^h > \theta^l$. Note that the term $\bar{\theta} - \underline{\theta}$ measures the pure returns to signaling. This is also the total gain derived by a non-socially-motivated provider from contributing to the public good.

There are two possible scenarios to consider. One possibility is that the latter gain is smaller than g^* , the lower-bound level of contribution (made by a socially-motivated provider), that is:

$$(9) \quad \bar{\theta} - \underline{\theta} \leq g^*.$$

In such a scenario no signaling will take place in equilibrium. The ‘natural’ level of provision by socially-motivated providers (namely, g^*) suffices to deter all other (non-socially-motivated) providers from making contributions to the public good. Clearly, in such a scenario, the aggregate level of public good provision will be the same under symmetric and asymmetric information regimes – g^* per socially-motivated provider. The only difference between the two regimes will be in the division of the consumers’ surplus across providers. Under symmetric equilibrium high-quality providers (both socially motivated and those exhibiting no warm glow) will charge a price of θ^h , whereas all low-quality providers will charge a price of θ^l . Under asymmetric information socially motivated providers (both high- and low-quality) will charge a price of $\bar{\theta}$; whereas, all other providers that do not exhibit warm glow (both high- and low-quality) will charge a price of $\underline{\theta}$.

A second scenario is one where the inequality in (9) is reversed. In such a case a separating

equilibrium will be characterized by the following condition:

$$(10) \quad \bar{\theta} - \underline{\theta} = \tilde{g} > g^*.$$

Namely, a typical socially-motivated provider will increase its level of provision above that level which maximizes the warm-glow component, g^* , up to the ‘entry-deterrence’ point, where non-socially-motivated providers are just indifferent between whether to contribute to charity or not (that is, between mimicking socially-motivated providers by contributing \tilde{g} or refraining from contributing altogether).

Clearly, in such a scenario, the aggregate level of public good provision strictly exceeds that obtained under symmetric information.

In the normative analysis that follows we consider these two scenarios (“no-signaling” and “signaling”) separately.

3. A Normative Analysis

The government is assumed to have three fiscal instruments at its disposal: (i) direct provision of the public good (G); (ii) a tax (t) on charitable contribution (negative, in the case of a subsidy); and (iii) a lump-sum tax (T) levied on both consumers and providers (negative, in case of a transfer).

An important clarification is in order. The assumption that the government can levy a lump-sum tax implies that regardless of whether the government is choosing to address the under-provision of public goods by direct provision or by subsidizing charity, both can be financed in a distortion-free manner, entailing no deadweight loss. This apparently suggests

that the key policy issue at stake; namely, the desirability of rendering preferential tax treatment to charitable giving, is of little relevance; after all, the government can eliminate the market failure without resorting to subsidizing charity. Notice, however, that this conclusion is wrong. In our setting, as will be shown formally below, the preferred way to address the under-provision market failure is by subsidizing charitable giving by socially motivated providers, as these providers derive warm-glow utility gains from contributing to the public good provision. Clearly, in the absence of distortion-free tax instruments, the government would refrain from implementing the first-best subsidy, which fully internalizes the positive externalities, and compromise on a second-best optimum. Nevertheless, relaxing the assumption of availability of a lump-sum tax, which simplifies our analysis, will not change the qualitative nature of our results.¹⁸

We assume that the government is seeking to maximize a utilitarian social welfare function given by the sum of the utilities of both the consumers and the providers:¹⁹

$$(11) \quad W(G, t, T) =$$

$$(N + M) \cdot h(G) + N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot [w[g(t)] - g(t) \cdot (1 + t)] -$$

$$(N + M) \cdot T + (N + M) \cdot Y + N \cdot [\alpha \cdot \theta^h + (1 - \alpha) \cdot \theta^l],^{20}$$

¹⁸ In particular, even in the case where taxation entails a deadweight loss, subsidizing charitable contributions would still be preferred to government direct provision of the public good, as long as the price-elasticity of charitable contributions would be sufficiently high. Bakija (2013) surveys the empirical literature on the price-elasticity of charitable contributions and concludes that the elasticity is about unity. In Appendix C we demonstrate that with unitary elasticity, subsidization is preferred to direct provision even when government expenditure is financed by distortionary taxation.

¹⁹ Note that the results hold for any individualistic social welfare function.

²⁰ Notice that due to the assumptions on the excess demand for x ($N < M$) and the fact that aggregate demand for x is perfectly elastic, the aggregate (gross) consumers' surplus from x , $\alpha \cdot \theta^h + (1 - \alpha) \cdot \theta^l$, is fully extracted by the firms, which is reflected in the last term of (11) that represents aggregate firms' surplus (recalling our assumption of zero production costs).

where $g(t)$ denotes the level of contribution chosen by a typical socially-motivated provider.

Naturally, the social welfare function is maximized subject to the government revenue constraint:

$$(12) \quad N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot [g(t) \cdot (1 + t)] + (N + M) \cdot T - G \geq 0.$$

There is another constraint, which requires that the government cannot confiscate the contributions and direct them to its general needs (rebating as a lump-sum transfer, in our case). Put differently, the level of public good provision should (weakly) exceed the total amount of contributions:

$$(13) \quad G - N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot g(t) \geq 0.$$

3.1 Separating Equilibrium with No Signaling

Socially-motivated providers choose their level of contribution so as to maximize the warm-glow component in their utility function, that is, $g(t)$ is given by the implicit solution to $w'(g) = 1 + t$, and satisfies $g(t) \cdot (1 + t) \geq \bar{\theta} - \underline{\theta}$.

The inequality condition ensures that the amount contributed by socially motivated providers would suffice to deter other providers from engaging in charitable giving.

Proposition 1 below characterizes the optimal policy regime in the case where no signaling takes place, that is, when the returns to signaling are sufficiently small.

Proposition 1: The optimal level of the public good is fully financed by a subsidy to charitable contribution (that is, there is no direct government provision of the public good).

Proof: see Appendix B.

The proposition is consistent with the standard result in the literature and the common practice of rendering preferential tax treatment to charitable giving. The subsidy is essentially playing a *Pigouvian* role in fully internalizing the positive externalities associated with public good provision. The proposition suggests also that the under-provision of the public good is exclusively addressed by the tax incentives given to socially-motivated providers, and not supplemented by direct provision of public good by the government itself. The reason for the result follows from the warm-glow component in the utility of socially-motivated providers, which makes it more efficient to employ government revenues in order to induce them to increase their private contributions than to provide directly the public good.

Another important clarification is in order. In reality a substantial fraction of public good provision is done directly by the government. Indeed, there are significant reasons to prefer government provision of public goods over private provision. These include economies of scale; the good feeling of entitlement that citizens experience knowing that they paid for a public good through their taxes and are therefore its ‘owners’, and not merely benefit from the public good thanks to the generosity of other individuals; the rent-seeking externalities associated with charitable contributions driven by status concerns, and, notably, the potential misalignment of preferences of business donors and those of the general public, resulting in a disconnect between the warm glow/signaling motives and social welfare.

Proposition 1 states a novel normative justification for rendering preferential tax treatment to private provision of public goods without discounting the role of the government as a primary provider of public goods.²¹

²¹ There are additional normative reasons to justify private provision of public goods. A commonly invoked argument is its role in overcoming the asymmetric information problem faced by the government with respect

3.2 Separating Equilibrium with Signaling

In this case, $g(t)$, the level of contribution chosen by a typical socially-motivated provider, is given by the implicit solution to $g(t) \cdot (1 + t) = \bar{\theta} - \underline{\theta}$.¹⁴

Proposition 2 characterizes the optimal policy regime in the case where signaling does take place, that is, when the returns to signaling are sufficiently large.

Proposition 2: When the price elasticity of charitable contributions is sufficiently large:

(i) there should be no direct provision of the public good by the government; (ii) there exists a unique threshold of the returns on signaling, $(\bar{\theta} - \underline{\theta})$, above which the government levies a tax on charitable contributions, and below which the government subsidizes contributions, albeit at a lower rate than in the no-signaling case; (iii) the tax (subsidy, if negative) on contributions is increasing (decreasing, in the case of a subsidy) with respect to the returns on signaling.

Proof: see Appendix D.

to individuals' preferences over public good provision (an issue we abstract from discussing in the current study). When taxpayers contribute to charitable organizations, they effectively channel tax revenues to their preferred charitable organizations, thereby providing the government with information about their preferences for direct government spending. This information consists not only of the identity of the charitable organization and the preferred public good, but also the intensity of the preference, reflected in the amount they contribute [see the discussion in Levmore (1998)]. Private provision of public goods thus serves as a mechanism to elicit the unobserved preferences of the individuals regarding the choice of public goods provided.

¹⁴ Thus, signaling does take place in equilibrium and contributions are set to the level which renders the non-socially motivated providers just indifferent between contributing or not, $g(t) \cdot (1 + t) = \bar{\theta} - \underline{\theta}$. For the signaling motive to be operative the amount of contributions obtained in equilibrium should exceed the level, which maximizes the warm glow component in the utility of socially motivated providers.

Formally, denoting by $\hat{g}(t)$ the implicit solution to $w'(g) = 1 + t$, the following condition has to hold: $\hat{g}(t) \cdot (1 + t) < \bar{\theta} - \underline{\theta}$. The latter inequality condition will hold when the returns on signaling, captured by the term $\bar{\theta} - \underline{\theta}$, are sufficiently large (see Appendix D for details).

We turn next to interpret proposition 2. As in the previous case with no signaling, the government should refrain from direct provision of the public good, due to the presence of warm glow. Unlike the previous scenario in which the optimal solution unambiguously suggests that the government should subsidize charitable contributions, in the current scenario, whether the government should tax or subsidize contributions depends on the magnitudes of two conflicting effects: (i) a *pigouvian* motive to internalize the positive externalities associated with the provision of the public good, calling for a subsidy; (ii) a corrective motive to mitigate the extent of wasteful contributions driven by pure-signaling, justifying a tax. The balance between these two effects depends on the extent of the returns on signaling, captured by the term $\bar{\theta} - \underline{\theta}$. When the returns on signaling are sufficiently low, the *pigouvian* motive prevails, suggesting the provision of a subsidy (albeit lower than the optimal subsidy provided under the regime with no signaling in place). As the returns on signaling increase, the second effect becomes more manifest, suggesting a decrease in the level of the subsidy provided to charitable contributions. When the returns to signaling are sufficiently large, the market equilibrium results in an excessive level of contributions, reflected in the fact that socially motivated providers set their contributions at a level where the marginal utility derived from an additional dollar contributed to the public good is lower than that associated with an additional dollar spent on the consumption of y . As the government, by assumption, cannot directly confiscate the private contributions, the optimal response would be to levy a tax on contributions.²² By taxing contributions and

²² The desirability of taxing charitable contributions is in contrast to conventional wisdom and the common practice of rendering a favorable tax treatment to donations. The result is similar in spirit to Blumkin and Sadka (2007) that focus on individual donations and show that, in the presence of status signaling concerns, the optimal tax on charitable contributions would be non-negative.

rebating the tax-revenues as a lump sum transfer the government diverts resources from contributions (to the public good) to consumption (of y), and thereby enhances welfare.

3.3 Summary

The following illustrative figure depicts the optimal level of tax levied on charitable contributions, t , as a function of the returns on signaling, captured by the term $\bar{\theta} - \underline{\theta}$:

Figure 1 about here

The flat portion represents a regime in which setting charitable contribution at the level that maximizes the warm-glow component suffices to ‘deter entry’ of non-socially motivated providers. The optimal tax is negative (a subsidy) and fully internalizes the positive externalities associated with the provision of the public good. The rising portion represents a regime in which charitable contributions exceed the level that maximizes the warm-glow component, and hence serve for signaling purposes. With an operative signaling motive in place, the optimal subsidy decreases as the magnitude of the returns on signaling increases. When the returns on signaling become sufficiently manifest, the optimal subsidy on charitable giving turns into a tax, reflecting a scenario in which the public good is over-provided.

4. Implementation

In the previous section we have provided a full characterization of the social optimum and demonstrated the relationship between the optimal tax on charitable contributions and the degree of asymmetric information between providers and consumers, captured by the term $\bar{\theta} - \underline{\theta}$, which measures the magnitude of the returns on signaling. In the current section we turn to compare the current practice in the US with the social optimum characterized in the

previous section by closely examining the policy implications of the deduction on charitable contributions provided by Section 170 under the current US Tax Code.

We let $0 < s < 1$ denote a proportional income tax (either personal income tax or corporate tax). We further assume that charitable contributions are deducted according to Section 170.²³

In order to facilitate the comparison between the current practice and our normative predictions (summarized by figure 1) we express the implications of the current law (Section 170) by inferring the effective tax rate levied on charitable contributions in equilibrium as a function of the term $\bar{\theta} - \underline{\theta}$, which captures the returns on signaling. The effective tax on charitable contributions is an auxiliary measure derived by a simple thought experiment. For any level of returns to signaling, captured by the term $\bar{\theta} - \underline{\theta}$, we replace the current tax system, which is comprised of a flat income tax and a deduction of charitable contributions (up to a cap), by a tax regime with a single instrument: a tax on charitable contributions. We do it in a manner that precisely replicates the equilibrium allocation. Notice that for comparability reasons, the tax rate is not calculated with respect to the tax base, that is the amount of contributions, g , as is commonly done, but rather as a function of the returns on signaling (consistent with the representation in figure 1).

Parallel to our normative analysis, we will separate between two equilibrium configurations: with an operative signaling motive and without it. We turn first to examine the equilibrium configuration in which no signaling takes place.

²³ Clearly, the marginal tax rate is constant only within a specified income range. We simplify our exposition by assuming a flat income tax rate, which is tantamount to focusing on a given income range. Our qualitative insights are not affected by this simplifying assumption.

4.1 Equilibrium with No Signaling

As no signaling takes place, contributions will be set at the level which maximizes the warm-glow component in the utility of socially-motivated providers. Assuming that the level of contributions is lower than the cap stipulated by Section 170, so that the entire amount contributed is fully tax-deductible, we obtain the following modified first-order condition [compare with the *laissez-faire* first-order condition given in (6)]:

$$(14) \quad w'(g) = 1 - s.$$

The effective marginal tax rate levied on charitable contributions, τ , is given by the implicit solution to:

$$(14) \quad w'(g) = 1 + \tau$$

where g is given by the implicit solution to (14). In words, the effective marginal tax on contributions replicates the equilibrium allocation (with no operative signaling motive) under a hypothetical tax regime in which the tax on charitable contributions, τ , is the only tax instrument in place.

It immediately follows that $\tau = -s$, namely, the deduction of charitable contributions is equivalent to an effective subsidy provided to charitable contributions at a rate equal to the proportional income tax, s .

Our presumption that no signaling takes place would be consistent with the definition of the separating equilibrium when the following condition holds:

$$(15) \quad g(s) \geq \bar{\theta} - \underline{\theta},$$

where $g(s)$ is given by the implicit solution to (14). As the term on the left-hand-side of (15) is independent of $\bar{\theta} - \underline{\theta}$, it follows that when the returns on signaling are sufficiently small the deduction policy is indeed equivalent to a flat subsidy rendered to charitable

contributions. The latter serves to internalize the positive externalities associated with the provision of the public good, qualitatively mimicking the pattern suggested by our normative analysis. Notice, however, that only in the (knife-edge) case in which $s = -t^*$, where t^* denotes the socially optimal subsidy (see the derivation in Appendix B), the deduction precisely implements the first-best allocation (under the regime with no signaling in place).²⁴

4.2 Equilibrium with Signaling

We turn now to the case with an operative signaling motive, namely, a regime in which the condition in (15) is violated. Let the cap stated by Section 170 be denoted by $\bar{g} > g(s)$, where $g(s)$ is given by the implicit solution to (14). Under the regime with signaling in place the amount of charitable contributions, g , is set at the level, which renders non-socially motivated providers just indifferent between contributing and refraining from doing so. Formally:

$$(16) \quad (1 - s)[\bar{\theta} - \min(g, \bar{g})] - (1 - s')[g - \min(g, \bar{g})] = (1 - s)\underline{\theta},$$

where $s > s' > 0$.

Notice that the term $[g - \min(g, \bar{g})]$ denotes the level of contributions exceeding the cap (excess contributions). This amount of contributions cannot be deducted within a fiscal

²⁴ Notice the subtle difference between condition (15) and the parallel consistency condition [(B7)] in the normative analysis. Condition (B7) requires that the total amount of contribution net of taxes would exceed the term $\bar{\theta} - \underline{\theta}$, in order to induce no mimicking on behalf of non-socially motivated providers (thereby incentivizing them to refrain from engaging in charitable giving). In contrast, condition (15) requires that the total amount of contributions gross of taxes would exceed the term $\bar{\theta} - \underline{\theta}$. The reason for the difference derives from the fact that non-socially motivated providers exhibit no warm-glow from charity and, hence, a deduction of contributions is in their case equivalent to a full deduction of a business expense, which does not affect the choice of the non-socially motivated provider (between engaging in charitable giving or refraining from doing so). Condition (15) qualitatively mimics, hence, condition (9), which guarantees the existence of a separating equilibrium with no signaling in the absence of government intervention.

year but can be deferred and deducted in subsequent fiscal years. Due to the time value of money and the uncertainty regarding the possibility to deduct against future income, the effective deduction rate is less than 100 percent (less than full deduction) and hence the associated effective subsidy rate provided per dollar of contributions, s' , is lower than the income tax rate s .

We turn next to derive the effective tax rate levied on charitable contributions as a function of the returns on signaling, $\bar{\theta} - \underline{\theta}$. The effective tax rate, τ , is given by the implicit solution to:

$$(17) \quad \bar{\theta} - \underline{\theta} = g(1 + \tau),$$

where g is given by the implicit solution to (16). The effective tax on contributions replicates the equilibrium allocation (with an operative signaling motive) under a hypothetical tax regime in which the tax on charitable contributions is the only tax instrument in place.

The condition states that with a tax on contributions, τ , in place, non-socially motivated providers are indifferent between contributing g and not contributing altogether.

We need to separate between two different cases. Consider first the case in which $g(s) < \bar{\theta} - \underline{\theta} < \bar{g}$. In such a case, the solution to (16) is obtained for $g < \bar{g}$, namely, the amount of contributions is lower than the cap and is therefore entirely deductible. Re-arranging the expression in (16) then yields:

$$(18) \quad g = \bar{\theta} - \underline{\theta}.$$

It therefore follows from (17) that the effective tax rate is zero ($\tau = 0$).

Turning next to the case in which $\bar{\theta} - \underline{\theta} > \bar{g}$, the solution to (16) is obtained for $g > \bar{g}$, namely, the cap is binding and only a fraction of the amount of charitable contributions is fully deductible. Re-arranging the expression in (16) then yields:

$$(19) \quad \frac{(1-s)(\bar{\theta}-\underline{\theta})+(s-s')\bar{g}}{(1-s')} = g < \bar{\theta} - \underline{\theta},$$

where the last inequality follows as $\bar{\theta} - \underline{\theta} > \bar{g}$.

It therefore follows from (17) that the effective tax rate is positive ($\tau > 0$). Moreover, substituting for g from (19) into (17) yields:

$$(20) \quad 1 + \tau = \frac{(\bar{\theta}-\underline{\theta})(1-s')}{(1-s)(\bar{\theta}-\underline{\theta})+(s-s')\bar{g}}.$$

It is straightforward to observe that the expression on the right-hand side of (20) is increasing with respect to the term $\bar{\theta} - \underline{\theta}$.

4.3 Summary

The following illustrative figure summarizes our derivations in subsections 4.1 and 4.2, depicting the effective tax levied on charitable contributions, τ , as a function of the returns on signaling, captured by the term $\bar{\theta} - \underline{\theta}$.

Figure 2 about here

The flat portion represents a regime in which setting charitable contribution at the level that maximizes the warm-glow component suffices to ‘deter entry’ of non-socially motivated providers. That is, there is no signaling in equilibrium. The flat portions reflect the fact that the subsidy rate is independent of the returns on signaling. This results from

the income tax being flat (by presumption) and the level of contributions being constant, determined by the warm-glow motive alone. The effective tax is negative (a subsidy) and equal (in absolute terms) to the income tax rate, s .

When $\bar{\theta} - \underline{\theta} = g(s)$, the signaling motive becomes operative and the effective tax jumps discontinuously to zero and remains constant until the amount of contributions reaches the cap level, \bar{g} . The rising portion represents a regime in which only a fraction of the amount of charitable contributions is fully tax deductible. In this range the effective tax rate is positive and is rising with respect to the term $\bar{\theta} - \underline{\theta}$.

Comparing figures 1 and 2, one can see that the implications of the current practice qualitatively resemble the patterns of our normative analysis: a subsidy decreasing with respect to the returns on signaling, which eventually turns into a tax.

5. Conclusion

In this paper we offer a possible normative rationale for the current practice of allowing businesses to deduct charitable contributions up to a cap, stressing the role of charitable contributions in signaling unobserved product quality.

We argue that, contrary to conventional wisdom, decreasing the subsidy given to charitable contributions made by businesses, potentially levying a tax on such activities, may be warranted when the level of contributions exceeds a certain threshold, reflecting an operative signaling motive. When the level of charitable contributions is sufficiently large, the contribution of the marginal dollar is driven solely by profit maximization consideration (signaling). In such a case, the current practice of setting a cap which limits the deduction is equivalent to levying a tax on charitable contributions, serving to shift

resources away from wasteful signaling ('burning money') towards welfare enhancing activities.

It is important to emphasize that our modeling choices and normative analysis focus on the role played by charitable donations as a quality-signaling device. For tractability purposes, we choose a parsimonious setup, which abstracts from introducing other realistic aspects that would potentially affect the normative implications. Thus, by comparing the current practice with our normative findings, we are not suggesting by any means that the current form of the legislation constitutes the social optimum in a broad sense or calling for drawing policy conclusions directly from our normative analysis.

As a final note we point out that our argument in support of capping the deductibility of charitable contributions can be extended to other forms of business expenses. In general, such expenditures are deductible, as they are incurred in the production of taxable income. However, in some cases, full deductibility could be welfare detrimental. A notable example would be the case of advertising expenditures, when these are not used to provide the consumers with new pertinent information about the product, thereby contributing to an increase in the aggregate surplus. Instead, such advertising expenditures may serve for rent-seeking; namely, aimed at increasing the firm's share in a given market surplus at the expense of other firms, which is wasteful from a social perspective. Limiting the deductibility of advertising expenditures to the extent they involve rent-seeking would therefore be warranted on efficiency grounds.

Appendix A: Hybrid-Equilibrium

The purpose of this appendix is two fold: (i) to characterize the hybrid-equilibrium of the charitable contributions game; (ii) to demonstrate that any hybrid-equilibrium is unstable.

In a hybrid-equilibrium all socially motivated providers as well as a fraction of the non-socially motivated providers will contribute to the public good, and will choose the same level of contribution.²⁵ Let the (common) level of contribution be denoted by \hat{g} and let the fraction of contributing non-socially motivated firms be denoted by $0 < \mu < 1$.²⁶ The complementary fraction of non-socially motivated firms will refrain from contributing, by virtue of our ‘large economy assumption’. In equilibrium, each non-socially motivated provider has to be just indifferent between contributing \hat{g} and not contributing at all.²⁷

Let $\bar{\theta}$ denote the expected quality associated with providers that engage in charitable contributions (coinciding with the common price charged by these providers in equilibrium). Employing *Bayes’ Rule* it follows:

$$(A1) \quad p(\hat{g}) = \bar{\theta} = \frac{\alpha \cdot q^h \cdot \theta^h + (1-\alpha) \cdot q^l \cdot \theta^l + \mu \cdot [\alpha \cdot (1-q^h) \cdot \theta^h + (1-\alpha) \cdot (1-q^l) \cdot \theta^l]}{\alpha \cdot q^h + (1-\alpha) \cdot q^l + \mu \cdot [\alpha \cdot (1-q^h) + (1-\alpha) \cdot (1-q^l)]}$$

Similarly, denote by $\underline{\theta}$ the expected quality associated with providers that do no engage in charitable contributions (coinciding with the common price charged by these providers in equilibrium). Employing *Bayes’ Rule* it follows:

²⁵ A pooling equilibrium in which all firms contribute to the provision of the public good (and choose the same level of contribution) is obtained as a limiting case of the hybrid equilibrium configuration.

²⁶ As, from a consumer’s point of view, high- and low-quality firms choosing the same level of contribution are indistinguishable, we naturally assume that the same fraction of high- and low-quality non-socially motivated firms engages in charitable giving.

²⁷ In a pooling equilibrium each non-socially motivated firm will weakly prefer to contribute \hat{g} to not contributing at all.

$$(A2) \quad p(0) = \underline{\underline{\theta}} = \frac{\alpha \cdot (1-q^h) \cdot \theta^h + (1-\alpha) \cdot (1-q^l) \cdot \theta^l}{[\alpha \cdot (1-q^h) + (1-\alpha) \cdot (1-q^l)]} = \underline{\underline{\theta}},$$

where the last equality follows from (8).

Employing the condition in (7) one can show that:

$$(A3) \quad \bar{\bar{\theta}} = \frac{\bar{\delta} \cdot \bar{\theta} + \mu \cdot \underline{\delta} \cdot \underline{\theta}}{\bar{\delta} + \mu \cdot \underline{\delta}} > \underline{\underline{\theta}},$$

with $\bar{\delta} = [\alpha \cdot q^h + (1 - \alpha) \cdot q^l]$, $\underline{\delta} = [\alpha \cdot (1 - q^h) + (1 - \alpha) \cdot (1 - q^l)]$, and where the inequality sign follows from (A2) and the fact that $\bar{\theta} > \underline{\theta}$.

In a hybrid-equilibrium the common level of contribution of providers that engage in charitable contributions, \hat{g} , has to satisfy:

$$(A4) \quad \bar{\bar{\theta}} - \underline{\underline{\theta}} = \hat{g}.$$

Namely, non-socially motivated providers are just indifferent between contributing \hat{g} and not contributing at all.

Re-arranging (A4), employing (A2) and (A3), yields, following some algebraic manipulations:

$$(A5) \quad \mu = \frac{\bar{\delta} \cdot (\bar{\theta} - \underline{\underline{\theta}} - \hat{g})}{\underline{\delta} \cdot \hat{g}}.$$

A hybrid-equilibrium exists if-and-only-if $0 < \mu < 1$. In addition, as in the case of separating equilibrium, $\hat{g} > g^*$; namely, the common level of contribution has to exceed that level which maximizes the utility from warm-glow [defined implicitly by condition

(6)]. Combining these two conditions, employing (A5), implies that a hybrid-equilibrium exists if-and-only-if:

$$(A6) \quad \max \left[\frac{\bar{\delta} \cdot (\bar{\theta} - \underline{\theta})}{\bar{\delta} + \underline{\delta}}, g^* \right] < \hat{g} < \bar{\theta} - \underline{\theta}.$$

It is straightforward to verify that a hybrid-equilibrium exists if-and-only-if a separating equilibrium with signaling exists; namely, $\bar{\theta} - \underline{\theta} > g^*$.

We turn next to show that any hybrid equilibrium is unstable. In particular we will show that a socially motivated provider would gain by deviating from the common level of provision, \hat{g} , to a higher level of contribution. In contrast, non-socially motivated providers will find mimicking (adopting a similar deviation strategy) unprofitable.

Consider a deviation from the common level of provision, \hat{g} , to some higher level of contribution g' , $\hat{g} < g' \leq \bar{\theta}$, recalling that $\bar{\theta}$ denotes the expected quality of a socially motivated provider in a separating equilibrium, given by condition (7). We will show that such a deviation exists where it will only be profitable for socially motivated providers to deviate. Consumers will then correctly perceive this to be the case; hence, the price charged by a deviating socially motivated provider will be given by $\bar{\theta}$.

A deviation, g' , fulfilling the above conditions has to satisfy the following two strict inequalities:

$$(A7) \quad \bar{\theta} - g' < \bar{\theta} - \hat{g},$$

$$(A8) \quad \bar{\theta} + w(g') - g' > \bar{\theta} + w(\hat{g}) - \hat{g}.$$

Condition (A7) states that a non-socially motivated provider finds it strictly unprofitable to deviate; whereas, condition (A8) states that a socially motivated provider finds it strictly profitable to deviate.

We need to show that there exists such g' that satisfies both (A7) and (A8). There are two scenarios to consider. Suppose, first, that the inequality condition given in (A8) holds for $g' = \bar{\theta}$. Substituting for g' into condition (A7) yields:

$$(A9) \quad \bar{\bar{\theta}} - \hat{g} > 0,$$

where the inequality sign in (A9) holds by virtue of condition (A4), which implies that $\bar{\bar{\theta}} - \underline{\underline{\theta}} = \hat{g}$, and the fact that $\underline{\underline{\theta}} > 0$.

In such a scenario, $g' = \bar{\theta}$ satisfies both (A7) and (A8) as required.

Suppose, alternatively, that for $g' = \bar{\theta}$ the inequality condition in (A8) is reversed. Formally, substituting for g' into (A8), presuming the inequality sign is reversed, yields:

$$(A10) \quad w(\bar{\theta}) \leq \bar{\bar{\theta}} + w(\hat{g}) - \hat{g}.$$

There are two possibilities to consider. Suppose first that the condition in (A10) is satisfied as equality; namely,

$$(A11) \quad w(\bar{\theta}) = \bar{\bar{\theta}} + w(\hat{g}) - \hat{g}.$$

Clearly, by virtue of (A9), the inequality condition in (A7) holds for $g' = \bar{\theta}$. Then, by continuity considerations, one can set the level of contribution to be slightly lower than $\bar{\theta}$;

namely, $g'' = \bar{\theta} - \varepsilon$, where $\varepsilon > 0$ and small, and still maintain the inequality condition in (A7). Furthermore, it follows that:

$$(A12) \quad \bar{\theta} + w(g'') - g'' > w(\bar{\theta}) = \bar{\bar{\theta}} + w(\hat{g}) - \hat{g},$$

where the inequality in (A12) follows as $g^* < g'' < \bar{\theta}$ and by virtue of the fact that the term $[w(g)-g]$ is decreasing in g for $g > g^*$, recalling the concavity of w and the fact that $w'(g^*) = 1$. Thus, both conditions (A7) and (A8) are satisfied for g'' .

Finally, suppose that the condition in (A10) is satisfied as a strictly inequality. Formally,

$$(A13) \quad w(\bar{\theta}) < \bar{\bar{\theta}} + w(\hat{g}) - \hat{g}.$$

Substituting for $g' = \hat{g}$ into condition (A8) yields:

$$(A14) \quad \bar{\theta} > \bar{\bar{\theta}},$$

which holds by virtue of (A3) and the fact that $\bar{\theta} > \underline{\theta}$.

By the continuity of w , invoking the intermediate-value theorem, conditions (A13) and (A14) imply that there exist some level of contribution g' , $\hat{g} < g' < \bar{\theta}$, for which:

$$(A15) \quad \bar{\theta} + w(g') - g' = \bar{\bar{\theta}} + w(\hat{g}) - \hat{g}.$$

As w is increasing and $\hat{g} < g'$, the condition in (A15) implies:

$$(A16) \quad \bar{\theta} - g' < \bar{\bar{\theta}} - \hat{g}.$$

Thus, the inequality condition in (A7) holds for g' given by the implicit solution to (A15).

By continuity considerations, one can set the level of contribution to be slightly lower than

g' ; namely, $g'' = g' - \varepsilon$, where $\varepsilon > 0$ and small, and still maintain the inequality condition in (A7). Furthermore, it follows that:

$$(A17) \quad \bar{\theta} + w(g'') - g'' > \bar{\theta} + w(g') - g' = \bar{\bar{\theta}} + w(\hat{g}) - \hat{g},$$

where the inequality in (A17) follows as $g^* < g'' < g'$ and by virtue of the fact that the term $[w(g)-g]$ is decreasing in g for $g > g^*$, recalling the concavity of w and the fact that $w'(g^*) = 1$. Thus, both conditions (A7) and (A8) are satisfied for g'' . This concludes the proof.

Appendix B: Proof of Proposition 1

The *Lagrangean* of the government optimization problem is given by:

$$L = W(G, t, T) + \lambda_1 \cdot [N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot [g(t) \cdot (1 + t)] + (N + M) \cdot T - G] \\ + \lambda_2 \cdot [G - N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot g(t)],$$

with $\lambda_i, i = 1, 2$, denoting, respectively, the *Lagrange* multipliers associated with the revenue constraint in (12) and the public good provision constraint in (13).

Formulating the first-order conditions with respect to G , t and T , yields, correspondingly:

$$(B1) \quad \frac{\partial L}{\partial G} = (N + M) \cdot h'(G) - \lambda_1 + \lambda_2 = 0,$$

$$(B2) \quad \frac{\partial L}{\partial t} = N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot [w'[g(t)] \cdot g'(t) - g'(t) \cdot (1 + t) - g(t)] \\ + \lambda_1 \cdot N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot [g'(t) \cdot (1 + t) + g(t)] \\ - \lambda_2 \cdot N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot g'(t) = 0,$$

$$(B3) \quad \frac{\partial L}{\partial T} = (N + M) \cdot (\lambda_1 - 1) = 0 \leftrightarrow \lambda_1 = 1.$$

Substituting for λ_1 and λ_2 from (B3) and (B1) and the individual first-order condition, $w'(g) = 1 + t$, into (B2), yields upon re-arrangement:

$$(B4) \quad \frac{\partial L}{\partial t} = N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot [(N + M) \cdot h'(G) + t] \cdot g'(t) = 0.$$

As $g'(t) < 0$,²⁸ it follows that:

$$(B5) \quad t = -(N + M) \cdot h'(G).$$

Notice that the (absolute value of the) term on the right-hand-side of (B5) captures the marginal social-benefit (spillover) derived from provision of an additional unit of the public good. Thus, condition (B5) implies that the tax on charitable contributions is

²⁸ Full differentiation of the individual first-order condition, $w'(g) = 1 + t$, with respect to t , yields, $g'(t) = \frac{1}{w''[g(t)]} < 0$, where the inequality sign follows from the concavity of w .

negative (a subsidy) and fully internalizes the positive externalities associated with the public good provision.

We turn next to show that the government refrains from direct provision of the public good. To do so it suffices to show that the constraint given in condition (13) is binding in the optimal solution. To see this, suppose by negation that the constraint in (13) is not binding; hence, $\lambda_2 = 0$. Substituting into the first order condition in (B2), employing the individual first-order condition, yields upon re-arrangement:

$$(B6) \quad \frac{\partial L}{\partial t} = N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot [g'(t) \cdot (1 + t)] < 0,$$

where the inequality sign follows as $g'(t) < 0$.

We thus obtain a contradiction to optimality [violating the first-order condition in (B2)].

Our final step is to verify that, when the returns on signaling are sufficiently low, our assumption that providers set their contribution at the level that maximizes the warm-glow component in their utility is consistent with the optimal solution for the government problem. Substituting for G , the aggregate level of public good provision, from condition (13) satisfied as an equality into condition (B5), let t^* denote the optimal subsidy given by the implicit solution to (B5), where $g(t^*)$ is given by the implicit solution to the individual first-order condition $w'(g) = 1 + t^*$. It follows that the solution is consistent if-and-only-if the following condition holds:

$$(B7) \quad g(t^*) \cdot (1 + t^*) \geq \bar{\theta} - \underline{\theta}.$$

Condition (B7) implies that the level of contributions that maximizes the warm-glow component in the utility of socially motivated providers (given the optimal subsidy, t^*) suffices to deter mimicking by non-socially motivated providers. Notice that the expression on the left-hand side of (B7) is independent of $\bar{\theta} - \underline{\theta}$. Thus, when the returns on signaling,

as captured by the term $\bar{\theta} - \underline{\theta}$, are sufficiently low, the condition given in (B7) is satisfied.

This concludes the proof.

Appendix C: The Dominance of Subsidization over Direct Provision in the Presence of Distortionary Taxation

In our normative analysis we assume that a lump-sum tax is available to the government and demonstrate that in the social optimum the under-provision of the public good is exclusively addressed by subsidization of socially motivated providers, and not supplemented by direct provision of public good by the government itself. The reason for the result follows from the warm-glow component in the utility of socially motivated providers. In this appendix we extend this result to the case where government expenditure is financed by distortionary taxation.

Notice that although direct provision, by construction, results in no welfare gains from warm glow, it may still be preferred to subsidization when the government can reduce its overall expenditure level by shifting from subsidization to direct provision, thereby mitigating the entailed deadweight loss. If the resulting reduction in the deadweight loss is sufficiently large it will more than offset the forgone gains associated with warm glow. In the presence of distortionary taxation, a sufficient condition for subsidization to dominate direct provision is, therefore, that the government expenditure under a subsidization regime would not exceed the expenditure associated with direct provision, where both regimes yield the same level of public good provision.

Formally, letting $g(1-s)$ denote the demand for charitable contributions by a typical socially motivated provider as a function of the (net-of-tax) price, $1-s$, where $s > 0$ denotes the subsidy level provided by the government, subsidization would be preferred to direct provision when the following condition holds:

$$(C1) \quad s \cdot g(1-s) \leq g(1-s) - g(1).$$

Rearranging yields:

$$(C2) \quad (1-s) \cdot g(1-s) \geq g(1) \leftrightarrow \int_0^s [-g'(1-x) \cdot (1-x) - g(1-x)] dx > 0.$$

Further rearranging the integral expression in (C2) yields:

$$(C3) \quad |\eta_{g,1-x}| \geq 1,$$

where $|\eta_{g,1-x}| = \frac{\int_0^s [-g' \frac{1-x}{g}] g dx}{\int_0^s g dx}$ denotes the (average) price elasticity (in absolute values)

of the demand for charitable contributions over the price range $[1-s, 1]$.

Thus, when the demand for charitable contributions is sufficiently elastic (namely, the elasticity is weakly exceeding unity) subsidization would prevail over direct provision.

Two final remarks are in order. First, by continuity considerations, as providers derive utility from warm glow, the threshold elasticity above which subsidization would be preferred to direct provision would in fact fall below unity. Second, the empirical evidence on the price elasticity of the demand for charitable contributions [see Bakija (2013)] suggests that the elasticity is approximately unitary, supporting the sufficient condition given in (C3).²⁹

²⁹ Condition (C3) implies that subsidization would be preferred to direct provision but does not exclude the possibility of a hybrid optimum combining both direct provision and subsidization. With an iso-elastic utility from warm glow, $w(g) = g^\gamma/\gamma$, with $\gamma < 1$, the price elasticity of the demand for charitable contributions would be given (in absolute values) by $1/(1-\gamma)$, and condition (C3) would be equivalent to $\gamma > 0$. With such a specification condition (C3) would hold for any degree of subsidization s' , $0 < s' \leq s$, hence the social optimum would entail no direct provision of the public good by the government.

Appendix D: Proof of Proposition 2

The *Lagrangian* of the government optimization problem is given by:

$$L = W(G, t, T) + \lambda_1 \cdot [N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot [g(t) \cdot (1 + t)] + (N + M) \cdot T - G] \\ + \lambda_2 \cdot [G - N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot g(t)],$$

with $\lambda_i, i = 1, 2$, denoting, respectively, the *Lagrange* multipliers associated with the revenue constraint in (12) and the public good provision constraint in (13).

Formulating the first-order conditions with respect to G , t and T would yield identical expressions to (B1)-(B3):

$$(D1) \quad \frac{\partial L}{\partial G} = (N + M) \cdot h'(G) - \lambda_1 + \lambda_2 = 0,$$

$$(D2) \quad \frac{\partial L}{\partial t} = N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot [w'[g(t)] \cdot g'(t) - g'(t) \cdot (1 + t) - g(t)] \\ + \lambda_1 \cdot N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot [g'(t) \cdot (1 + t) + g(t)] \\ - \lambda_2 \cdot N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot g'(t) = 0,$$

$$(D3) \quad \frac{\partial L}{\partial T} = (N + M) \cdot (\lambda_1 - 1) = 0 \leftrightarrow \lambda_1 = 1.$$

Substituting for λ_1 and λ_2 from (D3) and (D1) into (D2) yields upon re-arrangement:

$$(D4) \quad \frac{\partial L}{\partial t} = \underbrace{\{N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot [(N + M) \cdot h'(G)] \cdot g'(t)\}}_{\text{Pigouvian Term}} \\ + \underbrace{\{N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot [w'[g(t)] - 1] \cdot g'(t)\}}_{\text{Signaling Correction Term}} = 0.$$

Notice that as $g(t) \cdot (1 + t) = \bar{\theta} - \underline{\theta}$, it follows that $g'(t) < 0$; hence, condition (D4) holds if-and-only-if:

$$(D5) \quad (N + M) \cdot h'(G) + [w'[g(t)] - 1] = 0.$$

As in the previous case with no signaling, one can show that the optimal solution involves no direct provision of the public good by the government. To prove this it suffices to show

that the constraint in (13) is binding. To see this, suppose by negation that the constraint in (13) is not binding; hence, $\lambda_2 = 0$. Notice that as $w'(g) > 0$, it follows from (D5) that $(N + M) \cdot h'(G) - 1 < 0$. Thus, by virtue of conditions (D1) and (D3), it follows that $\lambda_2 > 0$. We therefore obtain the desired contradiction and conclude that constraint (13) is binding. This completes the proof of part (i).

The expression given in (D4) captures two conflicting effects that determine the sign of the optimal tax on contribution. The first term is negative [recalling that $g'(t) < 0$] and works in the direction of granting a subsidy to contributions. This term captures the standard *Pigouvian* motive for subsidizing contributions. The second term is positive [recalling that $w'[g(t)] - 1 < 0$, by virtue of (D5)] and works in the direction of levying a tax on contributions. This term captures the corrective effect of taxing contributions on the wasteful pure-signaling donations. Whether the optimal tax is positive or negative depends on the magnitudes of the aforementioned two conflicting components, reflecting the extent of the returns on signaling, captured by the term $\bar{\theta} - \underline{\theta}$. We turn now to provide a characterization of the optimal tax on contributions as a function of the returns on signaling. Recalling that the public good provision constraint given in (13) is binding, and employing the fact that by construction of the equilibrium with signaling it follows that $g(t) \cdot (1 + t) = \bar{\theta} - \underline{\theta}$, one can re-formulate the condition in (D5) to obtain:

$$(D6) \quad K[(\bar{\theta} - \underline{\theta}), t] \equiv$$

$$(N + M) \cdot h' \left(N \cdot [\alpha \cdot q^h + (1 - \alpha) \cdot q^l] \cdot \frac{(\bar{\theta} - \underline{\theta})}{(1+t)} \right) + \left(w' \left[\frac{\bar{\theta} - \underline{\theta}}{(1+t)} \right] - 1 \right) = 0.$$

Recalling our assumption that both w and h satisfy the INADA conditions, it follows that for any value of t , the following two conditions hold: $\lim_{(\bar{\theta} - \underline{\theta}) \rightarrow 0} K[(\bar{\theta} - \underline{\theta}), t] > 0$ and

$\lim_{(\bar{\theta} - \underline{\theta}) \rightarrow \infty} K[(\bar{\theta} - \underline{\theta}), t] < 0$. Thus by the continuity of K , it follows by the intermediate value theorem that for any value of t there exists a solution to (D6). Furthermore, as $\frac{\partial K}{\partial(\bar{\theta} - \underline{\theta})} < 0$ and $\frac{\partial K}{\partial t} > 0$, by virtue of the concavity of h and w , the solution is unique. Let the (unique) solution for the condition in (D6) be denoted by $k(t)$; namely, $K[k(t), t] = 0$. As $\frac{\partial K}{\partial(\bar{\theta} - \underline{\theta})} < 0$ and $\frac{\partial K}{\partial t} > 0$ it follows that $k'(t) > 0$. We thus conclude that $t > 0$ if-and-only-if $\bar{\theta} - \underline{\theta} > k(0)$ and furthermore that t is increasing with respect to $\bar{\theta} - \underline{\theta}$.

Denoting by t^* the optimal subsidy under the regime where no signaling takes place and by g^* the associated level of contributions by a socially motivated provider, given by the implicit solution to $w'(g) = 1 + t^*$, it follows by virtue of conditions (D6) and (B5) that $k(t^*) = g^* \cdot (1 + t^*)$. Assuming that signaling takes place under the optimal policy regime, it necessarily follows by virtue of (B7) that:

$$(D7) \quad k(t^*) < \bar{\theta} - \underline{\theta}.$$

As $k'(t) > 0$, it follows that the optimal tax on charitable contributions under the regime where signaling takes place, given by the implicit solution to $k(t) = \bar{\theta} - \underline{\theta}$, satisfies $t > t^*$. This completes the proof of parts (ii) and (iii).

Our final step is to verify that when the price elasticity of charitable contributions and the returns on signaling are sufficiently large, our assumption that providers set their contribution above the level that maximizes the warm-glow component in their utility is consistent with the optimal solution for the government problem.

Fix the returns on signaling and let t' denote the optimal tax on charitable contributions with signaling in place and g' denote the implicit solution to $w'(g) = 1 + t'$. Consistency requires that the following condition should hold:

$$(D8) \quad g' \cdot (1 + t') < \bar{\theta} - \underline{\theta}.$$

Namely, socially motivated providers setting their contribution at the level that maximizes the warm-glow component in the utility function (given the optimal tax, t') cannot deter mimicking by non-socially motivated providers.

As the expression on the left-hand side of (D7) is independent of $\bar{\theta} - \underline{\theta}$, it follows that when the returns on signaling, as captured by the term $\bar{\theta} - \underline{\theta}$, are sufficiently large condition (D7) is satisfied. Furthermore, by virtue of part (iii) of the proposition (proved above), it follows that $t' > t^*$. Condition (D7) then implies condition (D8) if the price elasticity of charitable contributions is sufficiently large.³⁰ Thus, in line with the presumption in the statement of the proposition, when the price elasticity of charitable contributions is sufficiently large, the separating equilibrium entails signaling by socially motivated providers. This concludes the proof.

³⁰ A sufficient condition for condition (D8) to hold is that the price elasticity of charitable contributions is unitary, consistent with the existing empirical evidence [see Bakija (2013)].

Appendix E: Micro Foundation

In this sub-section we present a simple and tractable micro foundation for our assumption regarding the existence of a positive correlation between the quality of the provider and the provider's social motivation reflected in the 'warm glow' associated with contributions to the public good.

There are N providers that differ in their innate quality, an exogenously given idiosyncratic attribute of the provider, which is assumed to be private information. We assume that a fraction $0 < 1 - \delta < 1$ of the providers is of low quality ($\theta = \theta^l > 0$), and a complementary fraction $0 < \delta < 1$ of the providers is of high quality ($\theta = \theta^h > \theta^l$). Each provider with (innate) low quality is able to 'upgrade' the quality (from low to high level) at some cost, $c > 0$ (the costly investment is assumed to be private information). Providers also differ in their social motivation reflected in the 'joy of giving' associated with contributions to the public good. We assume that for each quality level, a fraction $0 < \gamma < 1$ of the providers derives a 'warm-glow' utility from contributing to the public good; whereas, a complementary fraction $0 < 1 - \gamma < 1$ derives no such utility. Notice that our assumptions imply the existence of no correlation between the innate quality of the provider and his/her social motivation. We will show that such a correlation will emerge endogenously in equilibrium.

Recalling our analysis of the signaling game, due to the presence of asymmetric information, the perceived quality of the provider, based on which the level of remuneration is determined in the separating equilibrium, is solely determined by the costly signal chosen by the provider; namely, the level of observable contribution of the provider to the public good. In particular, low-quality providers that exhibit 'warm-glow' are perceived as high-quality providers and get remunerated accordingly in equilibrium. We assume that in such circumstances, where there exists a discrepancy between the perceived and the actual quality of the provider resulting in a (misperceived) upward bias of the consumers, the provider entails some psychic costs, denoted by $r > 0$. These costs reflect

feelings of guilt and shame from misrepresenting to the consumers and may also be associated with the ex-post tarnished reputation of the provider from the point of view of the consumers when the true quality is fully, or partially, revealed to them.³¹ One may interpret these moral costs to be a mirror representation of the ‘warm glow’ gains from contributing to the community via the provision of the public good. We assume that r distributes over some support $[0, \bar{r}]$, where $\bar{r} > c$, with CDF denoted by $G^j(r)$, where j is an indicator function obtaining the value of one if the provider exhibits ‘warm glow’ and zero otherwise. We further assume that $G^1(r)$ first-order stochastically dominates $G^0(r)$, so that, plausibly, on average, socially-motivated providers entail larger moral costs than their non-socially-motivated counterparts. To simplify the exposition, we assume that providers exhibiting no ‘warm glow’ entail zero moral costs, namely, $G^0(0) = 1$, and further abbreviate notation by omitting the superscript from the CDF associated with socially-motivated providers [$G^1(r) \equiv G(r)$].

A socially-motivated provider with low innate quality will choose to upgrade his quality if-and-only-if $r > c$. That is, an upgrade will take place only when the moral cost entailed by the provider strictly exceeds the cost of upgrading. By our presumption, providers that do not exhibit ‘warm glow’ entail no moral cost and hence refrain from upgrading. In contrast, a fraction of the socially-motivated (innately) low-quality providers that entail sufficiently large moral costs will choose to upgrade the quality. Maintaining the notation employed in the reduced form setting, in equilibrium, the respective fractions of low- and high-quality providers are, therefore, given by:

$$(E1) \quad \Pr[\theta = \underline{\theta}] = (1 - \alpha) = (1 - \delta)(1 - \gamma) + (1 - \delta)\gamma G(c),$$

³¹ Notice that in addition to the reputational moral cost entailed by the provider, consumers will downgrade their valuation of the quality of product/service provided in response to the revealed quality. The latter will be reflected in reduced equilibrium prices in the periods to follow. These additional (monetary) costs are independent of whether or not the provider exhibits ‘warm glow’. Our model is static and we therefore abstract from embedding these dynamic considerations. These are left for future research.

$$(E2) \quad \Pr[\theta = \bar{\theta}] = \alpha = \delta + (1 - \delta)\gamma[1 - G(c)].$$

Applying *Bays' Rule*, the fraction of high-quality providers that exhibit 'warm glow' is given by:

$$(E3) \quad q^h = \frac{\delta\gamma + (1-\delta)\gamma[1-G(c)]}{\delta + (1-\delta)\gamma[1-G(c)]}.$$

Correspondingly, the fraction of low-quality providers that exhibit 'warm glow' is given by:

$$(E4) \quad q^l = \frac{(1-\delta)\gamma G(c)}{(1-\delta)(1-\gamma) + (1-\delta)\gamma G(c)} = \frac{\gamma G(c)}{(1-\gamma) + \gamma G(c)}.$$

As $0 < \gamma < 1$ and $0 < G(c) < 1$, it is straightforward to verify that $0 < q^l < \gamma < q^h < 1$.

Thus, we have established the existence of a positive correlation between the propensity of the provider to contribute to the public good and his associated quality (as perceived by the consumers).

It is important to notice that the fact that providers exhibiting 'warm glow' are more likely to upgrade their quality is not due to a technological comparative advantage (all providers are faced with the same upgrading costs) but rather is driven by the higher reputational costs they are willing to avoid (via upgrading).

To complete our analysis, we need to confirm that the endogenous formation of the quality distribution is consistent with the separating equilibrium presumption that providers will contribute to the public good if-and-only-if they exhibit 'warm glow'. We need to consider two scenarios. The first scenario is one in which no signaling takes place in equilibrium. That is, the 'natural' level of provision by socially-motivated providers suffices to deter all other (non-socially-motivated providers) from making contributions to the public good. Formally,

$$(E5) \quad \bar{\theta} - \underline{\theta} \leq g^*,$$

where $w'(g^*) = 1$.

Notice that the condition in (E5) is the same as that given in (9), as non-socially-motivated providers suffer no moral costs from consumers' misperception and hence will refrain from upgrading their quality if they choose to mimic their socially-motivated counterparts.

The condition in (E5) does not guarantee, however, that all socially-motivated providers will set their contributions at the level which maximizes the 'warm-glow' component in their utility function, g^* . By choosing to contribute less than g^* , socially-motivated providers with low innate quality will not 'reveal' their 'higher' quality to the consumers and hence suffer a loss of $\bar{\theta} - \underline{\theta}$. On the other hand, they will derive a gain of $\min(r, c)$ associated with either not entailing the moral cost, r , or the upgrading cost, c , whichever is smaller. A sufficient condition that guarantees that all socially-motivated providers will set their contribution level at g^* is, hence:

$$(E6) \quad \bar{\theta} - \underline{\theta} > c.$$

In the second scenario signaling takes place and the contribution level strictly exceeds g^* so as to deter non-socially-motivated providers from mimicking. Formally,

$$(E7) \quad \bar{\theta} - \underline{\theta} = \tilde{g} > g^*.$$

Again, the condition replicates the one given in (10), as non-socially-motivated providers incur no moral costs and refrain from upgrading their quality upon mimicking.

Turning next to socially-motivated providers with low innate quality, signaling will take place if-and-only-if the following condition holds:

$$(E8) \quad \bar{\theta} + w(\tilde{g}) - \tilde{g} - \min(r, c) > \underline{\theta} + w(g^*) - g^*.$$

The condition in (E8) captures that additional moral/upgrading costs entailed by innately low-quality socially-motivated providers that signal in equilibrium. Substitution for the term $\bar{\theta} - \underline{\theta}$ from (E7) into (E8) yields:

$$(E9) \quad w(\tilde{g}) - w(g^*) + g^* > \min(r, c).$$

As $w'(g) > 0$ and $\tilde{g} > g^*$, the expression on the left-hand-side of (E9) is positive. Thus, a sufficient condition for the inequality in (E9) to hold (and hence for the separating equilibrium to exist) would be:

$$(E10) \quad w(\tilde{g}) - w(g^*) + g^* > c.$$

Combining (E10) and (E6) yields the following sufficient condition for the existence of a separating equilibrium:

$$(E11) \quad \min[w(\tilde{g}) - w(g^*) + g^*, \bar{\theta} - \underline{\theta}] > c.$$

It is worth noting that in the reduced form model with an exogenous quality distribution there are no upgrading costs and hence (E11) is immediately satisfied.

Appendix F: The Case of Multiple Signals: An Application to Warranty Contracts

The key premise on which our analysis hinges is the asymmetric information regarding to the quality of the provider. The latter is using the observable act of charitable giving to credibly signal about his unobserved quality. In reality, providers are likely to possess a wider set of potential signaling tools to choose from. The availability of additional tools may call into question the role of charitable contributions in attaining this goal. In this appendix we briefly analyze the case of multiple signals by allowing the provider to use either one (or both) of two signaling tools: (i) charitable contributions; and, (ii) a warranty contract. We will demonstrate that charitable contributions exhibit a comparative advantage in conveying the information to the consumers due to the presence of ‘warm glow’. We therefore argue that even when warranty contracts are available they will complement (rather than substitute for) charitable contributions.

A Simple Setup

Consider an economy with a single (experience) consumption good, which quality can only be verified ex-post by the consumers. Providers differ in the quality of the consumption good, which is reflected in the likelihood that the product will turn out to be damaged, ex-post. A consumer, purchasing a single unit of the consumption good from a provider with quality θ , derives a utility of $H > 0$ from an undamaged product with probability $0 < \pi(\theta) < 1$, and, correspondingly, a utility of $0 < L < H$ from a damaged product, with probability $[1 - \pi(\theta)]$. In particular, quality can take two possible values, $\theta \in \{\underline{\theta}, \bar{\theta}\}$, where $\pi(\bar{\theta}) \equiv \bar{\pi} > \underline{\pi} \equiv \pi(\underline{\theta})$.

To simplify the exposition, we assume the existence of a perfect correlation between the quality of the provider and his propensity to engage in charitable contributions. That is, high-quality providers exhibit ‘warm glow’ from charitable giving; whereas, low-quality providers derive no such utility.

A warranty contract offers the consumer a compensation if, ex-post, the product is verified to be damaged. Denote by a , $a \in [0, H - L]$, the level of compensation to the consumer. That is, the level of compensation can be set anywhere between the two polar cases of no warranty ($a=0$) and full warranty ($a = H - L$), with the possibility for a partial warranty in the interior. It is straightforward to observe why a warranty can serve for credible signaling by high-quality providers. The expected cost entailed by a high-quality provider that offers a compensation of a is strictly lower than that entailed by his low-quality counterpart. Formally,

$$(F1) \quad (1 - \bar{\pi})a < (1 - \underline{\pi})a,$$

which follows as $\bar{\pi} > \underline{\pi}$.

In a separating equilibrium, high-quality providers will choose the optimal combination of the signals; (i) the level of compensation offered to the consumer; and, (ii) the amount of charitable contributions, so as to render low-quality providers just indifferent between mimicking or not. Formally, a typical high-quality provider will solve the following constrained minimization program:

$$(F2) \quad \min_{a,g} [(1 - \bar{\pi})a + g - w(g)]$$

subject to:

$$(1 - \underline{\pi})a + g \geq (\bar{\pi} - \underline{\pi})(H - L).$$

The constraint in (F2) provides a standard no-mimicking condition, which ensures that low-quality providers find it too costly to signal (the cost of signaling on the left-hand-side weakly exceed the returns on signaling on the right-hand side). The minimization with respect to the combination of signals ensures that high-quality providers choose the least costly manner to deter mimicking by their low-quality counterparts.

Implicit in the incentive constraint in (F2) is the presumption that consumers' surplus is fully extracted by the providers, due to the perfectly elastic demand and the fact that providers are on the short side of the market (maintaining our assumptions from the model in the main text).³²

There are two scenarios to consider. The first scenario is the one in which setting the contributions at the level that maximizes the 'warm glow' component in the utility function of high-quality providers suffices to deter mimicking by their low-quality counterparts. Formally,

$$(F3) \quad g^* \geq (\bar{\pi} - \underline{\pi})(H - L),$$

where g^* is given implicitly by $w'(g^*) = 1$.

Clearly, in such a case the warranty contract becomes redundant. The presence of 'warm glow' suffices to separate between the high- and low-quality providers and the incentive constraint in (F2) is not binding.

We turn next to the case in which the incentive constraint binds. Namely,

$$(F4) \quad g^* < (\bar{\pi} - \underline{\pi})(H - L).$$

Formulating the *lagrangean* associated with the constrained minimization in (F2) and differentiation with respect to a and g yields the following first-order conditions ($\mu > 0$ denotes the *lagrange* multiplier associated with the binding incentive constraint):

$$(F5) \quad 1 - w'(g) - \mu = 0,$$

$$(F6) \quad (1 - \bar{\pi}) - \mu(1 - \underline{\pi}) = 0; [\geq 0 \text{ when } a = 0, \text{ and } \leq 0 \text{ when } a = H - L].$$

By virtue of the strict concavity of $w(\cdot)$ and the fact that $\mu > 0$, it follows from (F5) that $g > g^*$.

Namely, the charitable contributions channel of signaling is always operative, possibly

³² Formally, denoting by $p(\theta)$ the price charged by providers with quality θ in a separating equilibrium, it follows that $p(\theta) = \pi(\theta)H + [1 - \pi(\theta)]L$.

supplemented by the provision of a (partial or full) warranty contract. The latter is determined by the condition in (F6).

High-quality providers rely exclusively on signaling via charitable contributions when the following condition holds:

$$(F7) \quad 1 - w'[(\bar{\pi} - \underline{\pi})(H - L)] \leq (1 - \bar{\pi})/(1 - \underline{\pi}).$$

The inequality condition in (F7) states that the marginal cost of signaling via extending the level of charitable contributions, given by the term on the left-hand-side of (F7), is (weakly) lower than the corresponding marginal cost of signaling via expanding the warranty, given by the term on the right-hand-side of (F7). In such a case, $g = (\bar{\pi} - \underline{\pi})(H - L)$ and $a = 0$ and it is straightforward to verify that the two conditions in (F5) and (F6) are satisfied (the latter as a weak inequality due to the corner solution).

When the inequality in (F7) is reversed, both signaling channels are operative; and hence, $g > g^*$ and $a > 0$.

We conclude by reiterating that signaling via charitable activity has an inherent comparative advantage due to the ‘warm glow’ experienced. The latter implies that the marginal cost of contributing (at the level of g^*) is zero and lower than the strictly positive marginal cost associated with the warranty channel).

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Figure 1: The Optimal Tax as a Function of the Returns on Signaling

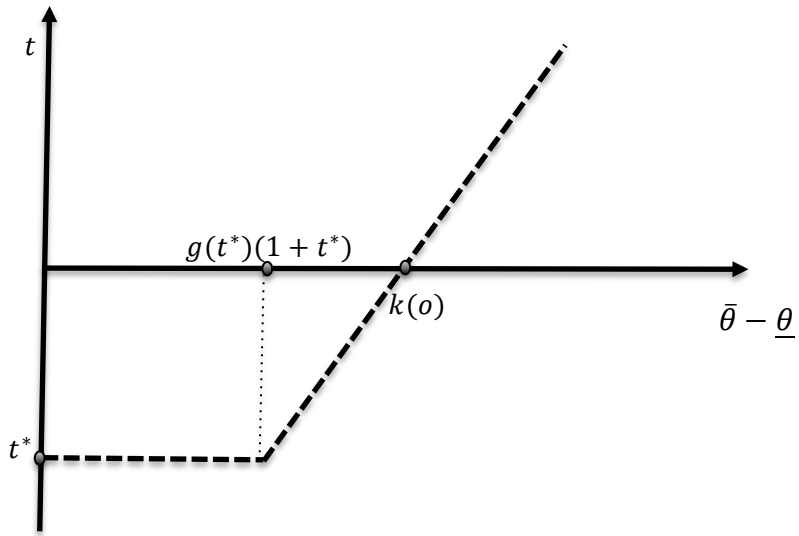


Figure 2: The Effective Marginal Tax as a Function of the Returns on Signaling

