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Marketing Social Responsibility

Sumitro Banerjee, ESMT

Luc Wathieu, Ferrero Chair in International Marketing, ESMT

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Abstract

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Author(s): Sumitro Banerjee, ESMT
Luc Wathieu, Ferrero Chair in International Marketing, ESMT

This paper analyzes the optimal strategy of a profit-maximizing firm in response to social responsibility concerns of consumers. We show that firms will address responsibility demands if consumers are sufficiently motivated and society provides minimal monitoring of false claims. We further show that there is an interaction between the firm's basic positioning and the type of responsibility initiative it undertakes. A firm selling a low quality product commits to social responsibility in the form of good citizenship by investing in compliance with social norms valued by all consumers. In contrast, a firm selling a high quality product tends to contribute to social causes endorsed by its target customers. Under asymmetric information, when consumers cannot observe product quality, we find that a firm can signal its commitment to social responsibility by charging a higher price and by making exaggerated claims that would be too damaging if they were not largely true. Finally, in a vertically differentiated duopoly, we find that only one firm will take on social responsibility initiatives. Overall, these findings suggest that profit-driven competitive marketing strategies can fulfill social responsibility just as much as any other driver of consumer utility.

Keywords: corporate social responsibility, cause marketing, signaling games

JEL Classification: D42, D21, M3, M14

1 Introduction

There is an persistent debate in today's society about the social responsibility of firms and their contributions to concerns such as public health, the environment, scientific research, the development of poor countries or urban poverty. The behavior of firms with regard to such concerns is often viewed with suspicion by the public, and it is not always clear whether firms will find it profitable to undertake sufficiently meaningful and credible investments aimed at the greater good (Vogel 2005).

The present paper assumes that firms are ultimately motivated to address consumer demands such that their willingness to address any of such social concerns, i.e., corporate social responsibility (or CSR) is driven by primarily the expression of these concerns as consumer needs at the marketplace. Indeed, over the years, firms have developed their businesses by progressively addressing extended benefits from functionality to esthetic, convenience, status, and self-expression among others. We analyze a monopolist firm's strategy in the presence of consumer demand for not only product quality but also advancement of social causes and compliance with social norms. Our results show that the overall quality positioning of firms determines their propensity to advertise and deliver real benefits along these dimensions. This sheds light on the current debate on corporate social responsibility that tends to remain inconclusive when posed in terms of a conflict between the imperatives of business and the values of society as a whole.

The following section presents a brief review of the current debate on corporate social responsibility and the pertinent literature.

2 Links to the Current Debate and Prior Literature

Businesses today are increasingly associating themselves in various ways with social concerns (The Economist 2008(2), Cone Cause Evolution Survey 2007). Economists and financial analysts have long cautioned against corporate philanthropy (Friedman 1970), and it is often argued that this trend reflects an altogether new logic of business administration that extends the goals of firms to include serving the interests of multiple "stakeholders", replacing the conventional focus on shareholders' interests (Bhattacharya and Korschun 2007).

Recently a growing literature has appeared that tries to make a more mainstream "business case" for corporate social responsibility (CSR). Some empirical studies have suggested

that CSR initiatives are correlated with market success, profitability (Aupperle, Carroll, and Hatfield 1985, Orlitzky, Schmidt, and Rynes 2003, Berger, Cunningham, and Drumwright 2007), or both and positive consumer perceptions of the socially responsible brands (Sen and Bhattacharya 2001). But despite a growing consensus about the necessity of being a socially responsible firm, the debate on whether CSR leads to higher profits subsists (Vogel 2005). Our analysis addresses this debate by explicitly determining the strategic conditions under which a profit-driven firm will make CSR investments.

In an influential article, Porter and Kramer (2006) have already argued that beyond conventional motives of moral obligation, sustainability, legitimacy, and reputation (which all assume a principally antagonistic relationship between firms and society), firms should re-discover CSR as a strategic opportunity. Different firms might be more or less favorably positioned to create desirable and profitable value propositions to address social concerns. As we formalize this opportunistic approach, we identify the particular relevance of a distinction introduced by Vogel (2005, pp. 4-6). Vogel argues that CSR investments may either enhance a firm's normal business with desirable levels of compliance (such as reducing energy consumption, carbon footprint or occupational hazards for employees) or involve new areas of activities constituting a contribution to social causes (or "cause marketing" or CM as it is popularly known - see for example, Krishna and Rajan 2009). Consistent with Vogel's intuition that compliance to social norm and cause marketing might follow distinct rationales, we show that a firm's strategic decision to be socially responsible in either way depends on factors such as the firm's product quality and market characteristics.¹

When a firm does not invest in compliance to norms (or "corporate citizenship"), besides facing governmental sanctions, it also runs the risk of consumer boycott, backlash or litigation (Smith and Cooper-Martin 1997). Our analysis shows that firms at the low-end of the market (in terms of the quality of their main product offering), due to their low profit margins, have strong incentives to invest in compliance to social norms which is consistent with anecdotal evidence from retail and utility industries (see Delevigne 2009). Luo and Bhattacharya (2006) have shown that contributions to CSR by firms having lower quality products can have an adverse effect on their market value. We however show that this result holds only in the case where firms contribute to social causes (or "cause marketing"). We argue that when CSR

¹Similarly, Bénabou and Tirole (2006) found that pro-social behavior for individuals had a different logic depending on whether the incentive was "honor" (social rewards) or "stigma" (guilt associated with wrong behavior).

involves compliance to social norms and standards equally valued by all consumers, firms selling low quality products will take the lead.

Consistent with the earlier observation by Luo and Bhattacharya (2006), we show that firm incentives for cause marketing are stronger at the high end of the market. Standard marketing texts such as Kotler and Keller (2005) represent products as layers of benefits, with the outer-most layer known as the “potential product”, a range of potential benefits by which the firm can differentiate its offering and give new valuable meanings to consumption. We suggest that corporate social responsibility may be perceived as a layer of benefit of products offered by a firm. Research carried out by Cone in 2008 found that 79 percent of consumers would switch to a brand associated with a good cause, and that 38 percent have bought a product associated with a cause (The Economist 2010, Cone Past. Present. Future. The 25th Anniversary of Cause Marketing 2008). We examine how social responsibility initiatives can bring an additional layer of product benefit in response to the responsibility concerns of consumers. In light of the public outrage at events surrounding the recent financial crisis, and increasingly easier access to information about human condition, social responsibility could only have become more salient as consumer perceived needs which firms can deliver upon in ways that can generate more demand, command higher price premiums or both.

Our model follows the conventional marketing logic that a firm’s primary motivation for CSR arises due to the possibility to increase either the demand or the price of its products and ultimately yield more profits (Varadarajan and Menon 1988). Using the same approach, research has already shown how CSR can be an effective purchase incentive comparable to coupons or promotional discounts (Arora and Henderson 2007). Krishna and Rajan (2009) study how cause-related (CM) expenditures used to market one product have a spill over effect across the product portfolios of competing firms. In contrast, we examine whether a firm selling a single product should address its customers’ responsibility demands by engaging in CM or complying with social norms. Further, if the firm decides to do either of them, we also examine whether it can credibly commit to either of them in the eyes of their consumers in the presence of incomplete information. And finally we examine how competition between two vertically differentiated firms in a market affects their decision to be social responsible.

A related stream of literature in economics examines why individuals and firms donate to charity. It shows that a voluntary motivation for altruism is similar to that of the provision of a public good (reviewed in Glazer and Konrad 1996). Individuals or firms donate to

charity because both the public and the donor derive some value from the public good. This literature assumes that the donations enter the utility function of the individual donor (Glazer and Konrad 1996, and Bénabou and Tirole 2006). We show that even if there are no reputational gains or tax incentives to firms for contributing to social causes or complying with social norms, they may actually do so in markets where consumers sufficiently care about these causes or norms. More recently Besley and Ghatak (2007) have analyzed CSR as the provision of a public good which is provided sometimes by competing firms rather than the government. While their analysis also considers consumer demand as a driver of CSR, they do not examine signaling aspects of provision of CSR by firms endowed with a particular level of product quality.

Transparency of corporate social responsibility projects is an important factor for consumers. According to Cone's research, about 91 percent of American believe that companies should tell them how they are supporting causes and about 50 percent of consumers feel the need for the government or other third parties to regulate cause marketing by companies (Cone Past. Present. Future. The 25th Anniversary of Cause Marketing 2008). Nonetheless, until now there has been no formal study of the mechanisms through which firms can convey their commitment to CSR to its customers and other stakeholders. A signaling explanation of individual donations for charity has provided by Glazer and Konrad (1996) suggests that individuals make charitable donations to demonstrate personal relative wealth. It however remains to be shown that advertised commitment to CSR can act as a signal of other attributes of a firm's offering in a market which values CSR. While civil regulation, threat of litigation, boycotts, or sanctions are viewed as deterrents to firms making false claims of CSR (Vogel 2005), some researchers (Scherer and Palazzo 2007) have even suggested assigning a political role to firms as an inducement to make them socially responsible. We show that the presence of a mechanism to detect and sanction exaggerated claims of investment in CSR is necessary for socially responsible firms to perfectly signal their type which then precludes the application of the mechanism itself. In other words, we show that in the presence of such mechanisms it is possible for markets (consumers) to discipline firms to act responsibly.

In the following sections we present the model to examine a firm's responsibility to comply to social norms (Section 3) and its contribution to social causes (Section 4) both under complete and asymmetric information. Section 5 examines the specific duopoly case where one high type firm competes with one low type firm, to see how compliance to social norms

and cause marketing might (or not) interact in the same market."

3 Responsibility to Comply with Social Norms

Consider a monopolist firm offering a product in a market consisting of a continuum of uniformly distributed consumers each having a utility function given by

$$u = \theta v - p - \delta g .$$

Here v is the product quality, $\theta \sim U [0, 1]$ is the consumer sensitivity to quality, p is the price of the product, δ is the consumers' common subjective belief (probability) that the firm does not comply with some social norm, and g measures the consumers' dis-utility (guilt by association) from the firm's non-compliance with that norm. Each consumer being on the market for one unit of the product at most. At price p the demand is $D(p) = 1 - F(\hat{\theta})$ where F is the cumulative density function of θ , and $\hat{\theta}$ is the lowest consumer type for whom utility is non-negative at that price. The sequence of the game is as follows. The firm's type (product quality) is predetermined by nature, as either high (v_H) or low (v_L) and the firm has a constant marginal cost c . The firm first decides what amount I to invest in technology and other practices that lead to compliance with social norms and standards. We further assume that an investment $I \geq \bar{I}$ results in a complete compliance to social norm such that there is no consumer dis-utility ($g = 0$). Further, we assume that $\bar{I} = \beta(p - c)D(p)$ is the level of investment at which the firm achieves total compliance. Here $\beta \in [0, 1]$ is a proportion of profits if invested is assumed to result in total compliance.² The firm then sets the price p of the product and announces and investment I_a towards compliance to the social norm, which need not necessarily reflect the real investment I . Thereafter consumers choose whether or not to buy the product sold by the firm. The public then discovers with probability $\alpha \in [0, 1]$ (e.g., thanks to the media or governmental enforcement) the firm's true compliance and imposes a proportional penalty $k \in [0, 1]$ for any discrepancy between the announced investment and reality.³ The firm's profit function is therefore given by

$$\pi = (p - c) D(p) - I - \begin{cases} \alpha k (I_a - I) & \text{if } I_a^S > I \\ 0 & \text{otherwise} \end{cases} .$$

²Note that our model also allows compliance to be interpreted simply as a perception. In other words, β can be just a desired investment in compliance at which consumer do not experience any guilt.

³An alternative interpretation could be that the consumers or other plaintiffs could take the firm to court for not keeping its promise. The probability that the court's verdict is against the firm is α while k is the penalty imposed. In other words, the presence of judicial recourse for consumer misinformation is sufficient for this model to apply.

3.1 Complete Information Case

In order to understand the firm's decision to comply with the social concerns of its customers, we consider first a complete information model where consumers observe firm compliance to social norms. In other words firms can make only truthful claims about their CSR, i.e. $I_a = I$. As expected, we show that under complete information consumer disutility associated with non-compliance can motivate firms to act responsibly. In particular, firms offering lower product quality are more likely than those offering higher product quality to strategically comply with social norms.

If the firm does not comply with social norms then consumers observe correctly $I = 0$, then consumer utility and firm profits are respectively

$$u = \theta v - p - g, \pi = (p - c) \left[1 - F(\hat{\theta}) \right], \text{ and } \hat{\theta} = \frac{p + g}{v}.$$

On the other hand, if the firm sufficiently complies with social norms, then consumers again observe correctly $I = \bar{I}$. Consumer utility and firm profit functions are then given by

$$u = \theta v - p, \pi = (p - c) \left[1 - F(\hat{\theta}) \right] - \bar{I}, \text{ and } \hat{\theta} = \frac{p}{v}.$$

Solving the firm's profit maximization problem, we obtain from the first order conditions,

$$\begin{aligned} p_0 &= \frac{v + c - g}{2} \text{ if } I = 0, \text{ and} \\ p_1 &= \frac{v + c}{2} \text{ otherwise.} \end{aligned} \quad (1)$$

The resulting profits from not complying or complying with social norms are respectively

$$\begin{aligned} \pi^0(p_0) &= \frac{1}{v} \left(\frac{v - c - g}{2} \right)^2, \text{ and} \\ \pi^1(p_1) &= \frac{1 - \beta}{v} \left(\frac{v - c}{2} \right)^2. \end{aligned} \quad (2)$$

Note that when $I = 0$, i.e., the firm does not comply with the social norms, the profit margin $(p - c)$ is positive only if $v - c > g$, while there is no such restriction when the firm complies with social norms. The condition $g \geq v - c$ is therefore sufficient to guarantee compliance and the decision to invest is independent of β in that case so that any level of social expectation can be sustained on the basis of the consumer's disutility derived from non-compliance of the firm.

The necessary and sufficient condition for the firm to invest in CSR is that $\pi^1(p_1) \geq \pi^0(p_0)$, i.e.,

$$(1 - \beta)(v - c)^2 \geq (v - c - g)^2. \quad (3)$$

This condition is equivalent to

$$g \geq \underline{g} \text{ where } \underline{g} = (1 - \sqrt{1 - \beta})(v - c) \quad (4)$$

The same condition can also be stated with a bound on quality:

$$v \leq \bar{v} \text{ where } \bar{v} = c + \frac{g}{1 - \sqrt{1 - \beta}}. \quad (5)$$

The higher the guilt g or marginal cost c , the higher is the product quality at which the firm behaves responsibly.

Proposition 1 *When product quality (v) is observable by inspection, for a given consumer dis-utility (g) of non-compliance with social norms, a firm complies with social norms that involve a profit sacrifice no greater than a threshold ($\beta \leq \hat{\beta}$).*

All proofs are stated under the Appendix. Proposition 1 indicates that firms cannot be expected to comply with social norms that impose sacrifices that are too stringent ($\beta > \hat{\beta}$) relative to the actual sensitivity of consumers (g). In other words, the monopolist firm complies with social norms when the cost of compliance is not too high relative to the consumer disutility of noncompliance. Due to the trade-off between the cost of achieving compliance and the loss of revenues due to consumer guilt associated with non-compliance, if the firm investment necessary to comply with social norms is relatively low and consumers can observe product quality by inspection (which allows them to infer correctly firm investment in compliance to social norms), a monopolist invests in compliance. We therefore show that under conditions of observable quality, a monopolist may rationally invest in compliance to social norms.

Proposition 2 *When product quality is observable by inspection, the firm behaves responsibly by complying to social norms only if (holding consumer dis-utility of non-compliance g constant) its product quality is below a threshold ($v \leq \bar{v}$), or (holding quality v constant) the level of consumer dis-utility is above a threshold ($g \geq \underline{g}$).*

Proposition 2 reinforces the notion that a monopolist firm will comply with social norms only under specific conditions. For a given product quality v , a firm invests in compliance with social norms only if consumers in the market care enough for firm compliance with social norms, i.e., $g \geq \underline{g}$. However, lower levels of dis-utility for non-compliance can only help implement lower social expectations. In this model, consumers engage in a “responsibility calculus” when confronted with firms that are non-compliant, such that some consumers reject or refrain from buying the product while others (those with higher θ type) find that the net utility of the product compensates for the non-compliance. Thus compliance is a divisive issue among consumers, particularly when the dis-utility of non-compliance is intermediary or when the product’s value added is high.

On the other hand, the viability of firms with relatively low value added net of marginal cost ($v - c$) depends on their respect for social norms. But firms with high value added engage in conditional compliance, being more likely to be responsible when there is a low social expectation of compliance as implied by the parameter β .

In other words, for a given level of consumer sensitivity towards non-compliance, a firm invests to ensure compliance to social norms only if its product quality is below a threshold. In this framework, quality and responsibility to comply with social norms compensate each other in the utility function of the consumers. A low quality firm can not only increase its price but also increase demand by investments leading to compliance with social norms. The high quality firm, on the other hand, stands to gain less relative to its profits without compliance by investing in the same. The following two lemmas will be useful basis for our analysis of strategic decision making under asymmetric information.

Proposition 3 *When product quality is observable by inspection, a responsible firm which complies with social norms charges a higher price and offers a lower quality than a firm which does not comply with social norms.*

Remarkably, firms with relatively high quality (v) such that $\bar{v} < v \leq \bar{v} + g$ charge a price strictly lower than $(v + c)/2$, which implies that a superior quality product (within that range) is priced cheaper than some lower quality products whose quality deficit is compensated by the absence of guilt attached to consumption. An example of this might be a recycled paper pad that is more expensive despite the rough texture and off-white color of its pages.

Lemma 1 *The higher the quality (v), lower the marginal cost (c) or higher the social norm (β), the higher is the level of consumer dis-utility from non-compliance at which the firm starts acting responsibly by complying with social norms.*

Lemma 1 shows that a firm's incentives to comply with social norms varies with various firm- (e.g., product quality) and market-specific characteristics (e.g., consumer dis-utility of non-compliance). Further if consumers can observe quality by inspection, firm incentives do not depend on the efficacy of the discovery or monitoring mechanisms for detecting non-compliance. However, when consumers cannot observe quality by inspection, the importance of the discovery monitoring mechanisms becomes critical as shown in the asymmetric information model below.

3.2 Asymmetric Information Case

In many situations, consumers cannot observe quality by inspection let alone being able to verify firm claims about compliance to social norms and standards. We analyze the effect of asymmetric information on firm strategies and its ability to credibly commit to responsibility through compliance with social norms. We study the equilibrium strategy of a firm in a world with two possible quality types, v_H and v_L , such that $v_H > \bar{v} \geq v_L$ when at the time of purchase, consumers are unable to test the quality they are confronted with. Of course, if the firms' actual compliance with social norms were observable, given that only firms with low quality (low type) would profit from such compliance under complete information (see previous section), the observed compliance would clearly reveal product quality. In reality however such compliance may not be observed easily by consumers. Here we assume that the advertised or announced claims of compliance to social norms can only be verified and punished if found inaccurate with a certain probability by governmental enforcement, activism or litigation. Therefore, the effectiveness or probability of enforcement and the size of penalties will determine whether firms will be able to credibly commit to compliance with social norms as well as signal their unobserved product quality. When consumers are unable to observe product quality and firm compliance to social norms which as we have shown earlier depends on the firm's product quality, they form beliefs about the firm's type based on firm actions, namely the price and its claims about compliance as announced or advertised. This constitutes a signaling game in which the uninformed player (the consumer) infers the type of the informed player (the firm) based on the latter's observable actions.

3.2.1 The Equilibrium Concept

The Perfect Bayesian Equilibrium (PBE) is the relevant equilibrium concept to solve a signaling game (Mas-Colell, Whinston and Green 1995, Chapt. 13). PBE leads to a unique equilibrium if

(P) The strategies of the informed player (firm) are optimal given the beliefs of the uninformed players (consumers).

(B) The beliefs of uninformed players (consumers) are based on strategies that are consistent with Bayes' Rule.

PBE imposes a rule of “logical consistency” on the beliefs of uninformed players such that the beliefs of uninformed players (consumers) can be derived using Bayes' Rule from the actions of the informed player (the firm) before the uninformed player makes a decision (Fudenberg and Tirole 1991). We assume that $\mu \in [0, 1]$ is the consumers' prior belief and $\hat{\mu}(p, I_a)$ is their posterior belief having observed the firm action or signal (p, I_a) that the firm has a lower quality ($v = v_L$) and therefore has incentives to comply with social norms.⁴ The triplet $\{(p_L^*, I_{aL}^*), (p_H^*, I_{aH}^*), \hat{\mu}\}$ constitutes a Perfect Bayesian Equilibrium (PBE) if and only if it satisfies the following conditions related to sequential rationality **(P)** and Bayesian consistency in beliefs **(B)**.

(P) $(p^*, I_a^*) \in \arg \max_{p, I_a} \pi((p, I_a), \hat{\mu}(p, I_a))$

(B) If $p_L^* = p_H^* = p^*$ and $I_{aL}^* = I_{aH}^* = I_a^*$ then $\hat{\mu}(p, I_a) = \mu$. (Pooling Equilibrium)

If $p_L^* \neq p_H^*$ and $I_{aL}^* \neq I_{aH}^*$ then $\hat{\mu}(p_L^*, I_{aL}^*) = 1$ and $\hat{\mu}(p_H^*, I_{aH}^*) = 0$. (Separating Equilibrium)

PBE only imposes logical consistency on the beliefs of the uninformed players over actions of the informed player on *the equilibrium path*. There are no restrictions on the beliefs of the uninformed players over actions of the informed players off the equilibrium path. In signaling games, freedom in specifying off-equilibrium beliefs can lead to multiple PBE when the off-equilibrium beliefs of uninformed players assign positive probability to the informed player (the firm) choosing an equilibrium-dominated strategy. An action is equilibrium dominated for a player if that action leads to lower profits than another putative equilibrium. The Intuitive Criterion (IC) of Cho and Kreps (1987) eliminates such equilibria by imposing

⁴Note that here $\mu = 1 - \delta$.

a restriction on the uninformed players' beliefs over actions of the informed player off the equilibrium path. A PBE violates the intuitive criterion if there exists an action that yields strictly greater payoffs for a player given that the uninformed players ascribe zero probability to a player's action that is "equilibrium-dominated".

3.2.2 Intuitive Perfect Bayesian Equilibrium

We start by analyzing the optimal actions of a low type firm that has decided to invest in technology or practices to comply with social norms ($I(v_L) = \bar{I}$ and $I(v_H) = 0$). Note that the low-type firm will charge a higher "compliance price" when it complies with social norms which might give an incentive to an irresponsible high-type firm to make a false claim of compliance. Thus, the beliefs of consumers subject to the IC restrict the low-type firm to a set of strategies (p^S, I_a^S) such that a high type firm would make less than its "guaranteed" level of profit were it to implement a strategy from the set. There is a threshold to the expected penalty associated with making false claims of compliance such that the only equilibrium that survives the intuitive criterion is a separating equilibrium with minimal signaling cost. In addition, when signaling is possible, the low-type (responsible) firm can profitably deviate from any possible pooling equilibrium.⁵

The guaranteed profit for the high quality (irresponsible) firm, π_H^0 is the profit it earns when customers can observe (or infer) quality. The high type firm has an incentive to mimic a low type firm if it can increase profit by choosing (p, I_a) , the offer that would be made by a low type firm: $\pi_H((p, I_a), \hat{\mu} = 0) > \pi_H^0$, and the corresponding strategies are therefore ruled out by the low firm, based on the intuitive criterion. In equilibrium, the intuitive criterion rules out these strategies for the low type firm.⁶ In our model, in such an equilibrium $\hat{\mu} = 0$ for the high quality firm implies $\alpha = 1$ since signaling acts as a detection mechanism for non-compliance. This restriction is introduced as a constraint in the low type firm's optimization problem.

Thus the "no-mimic condition" simplifies as

$$(p^S - c) \left(1 - \frac{p^S}{v_H}\right) - kI_a^S \leq \frac{1}{v_H} \left(\frac{v_H - c + g}{2}\right)^2. \quad (6)$$

⁵When a signal is either costless or inexpensive, signaling may be impossible.

⁶This condition also imposes an upper bound on k such that for the high quality firm mimicking in the absence of signaling should be profitable, i.e., $k \leq \bar{k}$ where $\bar{k} = \frac{p-c}{\alpha I_a} \left(1 - \frac{p}{v_L}\right)$. Similarly, the low-type firm should not be able increase profits by pretending to be a high-type firm, i.e., $\pi_L((p, I_a), \hat{\mu} = 0) < \pi_L^1$.

This condition enters as a constraint in the decision problem of the socially responsible firm, which is as follows:

$$\begin{aligned} \max_{p^S, I_a^S} \quad & \pi_L((p^S, I_a^S), \hat{\mu} = 1) = (p^S - c) \left(1 - \frac{p^S}{v_L}\right) - \bar{I} - \begin{cases} \alpha k (I_a^S - \bar{I}) & \text{if } I_a^S > \bar{I} \\ 0 & \text{otherwise} \end{cases} \\ \text{s.t.} \quad & (p^S - c) \left(1 - \frac{p^S}{v_H}\right) - k I_a^S \leq \frac{1}{v_H} \left(\frac{v_H - c + g}{2}\right)^2. \end{aligned} \quad (7)$$

Lemma 2 *An Intuitive (Separating) PBE (Perfect Bayesian Equilibrium) exists if only if the penalty for making exaggerated claims is above a threshold ($k \geq \hat{k}$). Further, more stringent social norms cause signaling to be less likely.*

The low type socially responsible firm is able to signal its type when the penalty to firms making a false claim of social compliance exceeds a threshold. Notice that the threshold as the level of social norms (\bar{I}) increases ($\frac{d\hat{k}}{d\bar{I}} > 0$). In other words, the more stringent the social norms the less likely the socially responsible firms can identify themselves to the consumers.

Proposition 4 *When product quality is not observable by inspection, a low type (responsible) firm signals its compliance to social norms if $k \geq \hat{k}$ by charging a higher price than it charges under complete information and over-claiming its compliance to social norms.*

When the penalty for making false claims is high enough, the low type firm will signal itself by investing in compliance with social norm. This requires charging a higher price than under complete information, causing foregone demand and profits that represent a cost of signaling. The high quality firm will find mimicking more attractive unless the strategy for the low quality firm also involves (in addition to over-pricing) over-claiming its compliance to the norm. Here compliance, to be credible, needs to be accompanied by seemingly exaggerated advertising costs and over-claim. The consumers however will infer correctly the actual level of firm commitment from the advertised claim. A firm that remains silent in this context is signaling high product quality coupled with non-compliance (in contrast with the high-level social norms situation where remaining silent was not diagnostic of (non)compliance). Such a firm avoids over-claiming since it would expose itself to higher expected penalties and therefore does not mimic the compliant firm's strategy.

The threat of penalties therefore leads to a separating equilibrium with a monopolist being able to credibly commit to compliance with social norms. In such a situation the penalties are not required to be enforced. This results captures many situations where firms make

advertising claims that require an investment if they were to be real. If the penalties arising from exaggerated claims are high enough, signaling can lead to credible commitment although the actual claims may be sometimes deliberately exaggerated. The consumers however will infer correctly the actual level of firm commitment from the advertised claim. Further, the high type (irresponsible) firm which does not commit to the social norms in this case is forced truthfully disclose its type, i.e., its lack of investment in compliance to social norms.

We now consider firm strategies under the condition when the expected penalty upon detection of over-claiming is low, i.e., $k < \hat{k}$. The firm decision problems are as follows:

$$\begin{aligned} \max_{p^p, I_a^p} \quad & \pi_i((p^p, I_a^p), \hat{\mu} = \mu) = (p^p - c) \left(1 - \frac{p^p + (1 - \mu)g}{(1 - \mu)v_H + \mu v_L} \right) \\ -I_i - \quad & \begin{cases} \alpha k (I_a^p - \bar{I}) & \text{if } I_a^p > \bar{I} \\ 0 & \text{otherwise} \end{cases} \quad \text{where } i \in \{H, L\} \text{ and } I_i \in \{0, \bar{I}\}. \end{aligned} \quad (8)$$

Proposition 5 *Under incomplete information when product quality is not observable by inspection, both types of firms either remain silent or claim to have invested to comply with social norms and charge the same price (p^p) if $k < \hat{k}$. Under these conditions the consumers are unable to identify the firm with lower (socially responsible) or higher quality prior to purchase.*

When the penalty arising from over-claiming compliance to social norms is below a threshold any announcement and prices can be sustained. Proposition 5 suggests that in markets where such penalty is low even if the consumers have dis-utility for non-compliance with social norms, investment in social compliance cannot be guaranteed. Either type of firms can invest arbitrary amounts in compliance or not invest at all. As we have shown earlier, higher penalty leads to signaling, often without the penalty being ever charged. On the other hand, markets with low penalty for exaggerated claims put the onus of compliance entirely on the enforcement by governments and activists.

In the following sections we consider the context where CSR of firms amounts to their contribution to social causes, i.e., voluntary investments that may motivate certain types of consumers.

4 Responsibility to Contribute to a Social Cause

We now consider the motivations of a firm to engage in “cause marketing” (or CM) by contributing to a social cause which the consumers care about. The firm’s contribution to

the cause is perceived by consumers as an additional consumption benefit of the product sold by the firm (Krishna and Rajan 2009).

4.1 Complete Information Model

We model consumer utility is given by $u = \theta(v + \rho I) - p$ where I is the contribution to the social cause as advertised or announced by the firm and $\rho > 0$ is the consumer valuation of the firm contribution to social causes.⁷ Willingness to pay for social causes is, just like for quality, subject to the consumer's type (presumably capturing a correlation with underlying consumer characteristics such as income). The parameter ρ represents the extent to which consumers value increments in the firm's contribution I to a social cause. This parameter could be called "cause efficiency of the firm" and it is allowed to be greater than 1.

To understand why, consider the situation of a consumer who wants to give \$100 to a cause. To generate this amount outside of the realm of the firm, the consumer will incur a number of costs (identifying a channel for that cause, and contributing to the costs of that channel), so that the necessary expense would be, say, \$200. If the firm is to carry CSR benefits, it needs to be able to guarantee better efficiency, e.g., a \$150 expense. In that case, the consumer is willing to spend $200/150 = 1.33$ for each cause marketing dollar spent by the firm.

The rest of the model remains the same as before. We first consider the complete information case where the consumers are able to observe the firm's actions (so that $I = I_a$). If there is no contribution to social causes ($I = 0$), then

$$u = \theta v - p, \pi = (p - c) \left[1 - F(\hat{\theta}) \right], \text{ and } \hat{\theta} = \frac{p}{v}.$$

If the firm contributes enough to social causes, i.e., $I \geq \bar{I}$, then

$$u = \theta(v + \rho I) - p, \max_p \pi = (p - c) \left[1 - F(\hat{\theta}) \right] - I, \text{ and } \hat{\theta} = \frac{p}{v + \rho I}.$$

Solving, the firm's profit maximization problem, we obtain from the first order conditions,

$$\begin{aligned} p_0 &= \frac{v + c}{2} \text{ if } I = 0, \text{ and} \\ p_1 &= \frac{v + c + \rho \bar{I}}{2} \text{ otherwise.}^8 \end{aligned} \tag{9}$$

⁷Alternatively, we could have $u = \theta_1 v_1 + \theta_2 \rho I - p$. We assume $\theta_1 = \theta_2 = \theta$ to vividly capture the difference with the prior model, that customers view contribution to a social cause as a dimension of product quality. Our findings should generalize to other cases with sufficient positive correlation between product and cause sensitivities, but we don't analyze such cases for tractability reasons.

The resulting profits are respectively

$$\pi^{0A}(p_0) = \frac{1}{v} \left(\frac{v-c}{2} \right)^2, \text{ and } \pi^{1A}(p_1) = \frac{1}{v + \rho \bar{I}} \left(\frac{v + \rho \bar{I} - c}{2} \right)^2 - \bar{I}. \quad (10)$$

Note that a firm contributes to social causes only if $\pi^{1A}(p_1) \geq \pi^{0A}(p_0)$, i.e.

$$v(\rho - 4)(v + \rho \bar{I}) \geq c^2 \rho.$$

Lemma 3 *A necessary condition for the firm to make a positive contribution to a social cause is that the efficiency of this contribution be large enough $\rho > 4$.*

Unless $\rho > 4$, a firm does not contribute to a social cause since there is not enough “bang for the buck” for the money spent on CM. As straightforward as it may seem, this finding has an interesting interpretation. As noted above, consumers would hire the firm as a channel to achieve their cause as long as $\rho > 1$, and it would have seemed that this was also sufficient to make a profit. However, *the cause increases the range of types who buy the good, which causes an inefficiency unless profit from the cause is substantial enough.* This means that there are causes that firms could pursue more efficiently than consumers which would however not be undertaken by profit maximizing firms, because these firms at the same time need to manage their price and the consumer types buying their main product. Therefore in markets where consumers do not care enough about a particular social cause, firms will not make a contribution.

A necessary and sufficient condition for a firm to contribute to a social cause is given by, $(\rho - 4)(v + \rho \bar{I})v \geq c^2 \rho$ must hold which implies $v \geq \underline{v}$ where⁹

$$\underline{v} = \frac{\sqrt{\rho \left(\bar{I}^2 \rho + \frac{4c^2}{\rho-4} \right)} - \rho \bar{I}}{2}. \quad (11)$$

Proposition 6 *When consumers can observe quality, a firm contributes to social causes if $v \geq \underline{v}$. The firm also charges a higher price if it contributes.*

The firm contributes to social causes if the consumer valuation per unit contribution is above a threshold (i.e., $\rho > 4$) and the product quality is above a threshold ($v \geq \underline{v}$). Notice that this result contrasts that in the context of compliance to social norms (Proposition 1). Here the high quality firm contributes to a social cause while a low quality firm does not.

⁹In terms of the spending I , the condition can be restated as $I \geq \frac{c^2}{v(\rho-4)} - \frac{v}{\rho}$.

The high quality firm can not only charge a higher price but also increase its demand by contributing to social causes valued by its consumers. The low quality firm, on the other hand does not contribute to a social cause because it does not generate enough additional revenue due to its lower quality to be able to make a contribution to a social cause which will be valued enough by the consumers.

Further, as we have shown earlier in the case of compliance to social norms since the socially responsible firm makes an additional investment it charges a higher price to recover that additional expense. Thus when consumers can observe quality and care enough about social causes, high quality firms contribute to causes and charge higher prices. As before there are many situations where consumers cannot observe product quality by inspection but can only make an inference about it based on a firm's actions. In the following subsection we analyze the case of asymmetric information to examine whether firms can credibly commit to contribution to social causes when consumer can neither observe quality nor verify the claims made by firms regarding their CM.

4.2 Asymmetric Information Model

As in the asymmetric information model for compliance to social norms, we use the equilibrium concept of PBE. As before we study the equilibrium strategy of a firm in a world with two possible quality types, v_H and v_L , such that $v_H > \underline{v} \geq v_L$. At the time of purchase, consumers are unable to test the quality they are confronted with. Again, if the firms' actual contribution to social causes were observable, given that only firms with high quality (high type) would profit from such a contribution ($I(v_H) = \bar{I}$ and $I(v_L) = 0$) under complete information as shown in the previous section, the observed contribution would clearly reveal product quality. Since we assume contributions are not observed by consumers, as before the probability of detection and penalty on exaggerated claims will have an impact on whether firms can credibly communicate their actual contribution to the consumers in a signaling game. In this section, we assume that $\mu \in [0, 1]$ is the consumers' prior belief and $\hat{\mu}(p, I_a)$ is their posterior belief that the firm has a higher quality ($v = v_H$) and therefore has incentives to contribute to social causes having observed the firm action or signal (p, I_a) . Similar to the results in the previous section, when the expected penalty to firms making exaggerated claims of contributing to social causes exceeds a threshold, the only equilibrium that survives the intuitive criterion is a separating equilibrium with minimal signaling cost. Moreover, a high-

type (responsible) firm has a profit-increasing deviation from all possible pooling equilibria when signaling is possible.¹⁰ The guaranteed profit for the low type (irresponsible) firm, π_L^1 is the profit it earns when customers can observe quality. The low type firm under these conditions has an incentive to mimic a high type firm if it can increase profit by choosing (p, I_a) : the offer that would be made by a high type firm i.e., $\pi_L((p, I_a), \hat{\mu} = 0) > \pi_L^1$.¹¹ Note that the high-type firm will charge a higher “CM price” when it contributes to a social cause under complete information. The beliefs of consumers subject to the Intuitive Criterion (IC) restrict the high-type firm to a set of strategies (p^S, I_a^S) such that a low-type firm would make less than its “guaranteed” level of profit were it to implement a strategy from the set (Cho and Kreps 1987) as discussed in the previous section. As earlier $\hat{\mu} = 0$ for the low quality firm implies $\alpha = 1$ since signaling acts as a detection mechanism for non-compliance.

The “no mimic condition” can be written as

$$(p^S - c) \left(1 - \frac{p^S}{v_L}\right) - kI_a^S \leq \frac{1}{v_L} \left(\frac{v_L - c}{2}\right)^2. \quad (12)$$

This condition enters as a constraint in the decision problem of the high type firm, which is as follows:

$$\begin{aligned} \max_{p^S, I_a^S} \quad & \pi_H((p^S, I_a^S), \hat{\mu} = 1) = (p^S - c) \left(1 - \frac{p^S}{v_H + \rho \bar{I}}\right) - \bar{I} - \begin{cases} \alpha k (I_a^S - \bar{I}) & \text{if } I_a^S > \bar{I} \\ 0 & \text{otherwise} \end{cases} \\ \text{s.t.} \quad & (p^S - c) \left(1 - \frac{p^S}{v_L}\right) - kI_a^S \leq \frac{1}{v_L} \left(\frac{v_L - c}{2}\right)^2. \end{aligned} \quad (13)$$

Lemma 4 *An Intuitive Perfect Bayesian Separating Equilibrium exists if and only if $k \geq \hat{k}_{CM}$.*

The high quality and socially responsible firm contributes to social causes and perfectly identifies itself to the consumers when the penalties arising from false claims of contribution is above a threshold. The low quality firm in this case does not invest in CSR. It also does not make a false announcement. Notice that this result is similar to that under the context of compliance to social norms although the respective thresholds are different in form.

Proposition 7 *When product quality is not observable by inspection, a high type (responsible) firm signals its contribution to social causes if $k \geq \hat{k}_{CM}$, by charging a higher price than it charges under complete information and over-claiming its contribution to social causes .*

¹⁰When a signal is either costless or inexpensive, signaling may be impossible.

¹¹This condition also imposes an upper bound on k such that for the low quality firm mimicking in the absence of signaling should be profitable, i.e., $k \leq \bar{k}$ where $\bar{k} = \frac{p-c}{\alpha I_a} \left(1 - \frac{p}{v_H + \rho I}\right)$. Similarly, the high-type firm should not be able increase profits by pretending to be a low-type firm, i.e., $\pi_H((p, I_a), \hat{\mu} = 0) < \pi_H^1$.

Proposition 7 shows that a high quality (responsible) firm charges a higher price than under complete information but does not truthfully announce its contribution to social causes under a separating equilibrium. The low quality firm which does not contribute to social causes is forced to charge its complete information price and truthfully does not claim to have contributed. Similar to the case of compliance to social norms, markets can induce particular types of firms to contribute to social causes. Although the firm which contributes deviates from truthful disclosure of their actual contribution, consumers can correctly infer the same from their prices and advertised claims.

Next we consider the case where signaling is not possible. When separation is not possible (i.e., $k < \hat{k}_{CM}$), the firm decision problems are as follows:

$$\begin{aligned} \max_{p^p, I_a^p} \quad & \pi^i((p^p, I_a^p), \hat{\mu} = \mu) = (p^p - c) \left(1 - \frac{p^p}{\mu(v_H + \rho\bar{I}) + (1 - \mu)v_L} \right) \\ & - I_i - \begin{cases} \alpha k (I_a^p - \bar{I}) & \text{if } I_a^p > \bar{I} \\ 0 & \text{otherwise} \end{cases} \quad \text{where } i \in \{H, L\} \text{ and } I_i \in \{0, \bar{I}\}. \end{aligned} \quad (14)$$

Proposition 8 *Under incomplete information when product quality is not observable by inspection, both types of firms either remain silent or make claims about contribution to social causes and charge the same price (p^p) if $k < \hat{k}_{CM}$. Under these conditions the consumers are unable to identify the firm with higher or lower quality prior to purchase.*

Proposition 8 shows that the absence of adequate penalty for firms making exaggerated claims about their contribution to social causes may act as a disincentive to firms to contribute. Even when consumers are willing to pay more for products sold by firms who would make a social contribution, firms may not contribute if consumers cannot verify either product quality or firm contribution. It is possible that firms may claim to have contributed to social causes when in reality they have not. In such situations markets cannot regulate responsible behavior of firms and instead the burden of enforcement rests only with government agencies, activists and media. Any contribution to social causes firms under such conditions can only be driven by either non-profit considerations such as philanthropy or the long-term reputation of firms.

We have now established that a low quality firm invests in conformance to social norms and a high quality firm contributes to social causes. Further, under asymmetric information when consumers cannot observe quality by inspection, the firm conforming to social norms or contributing to a social cause can perfectly identify itself to the consumers if the penalty

for making false claims is above a threshold. In the following section, we examine the effect of competition between two vertically differentiated firms on the prices and spending on CSR under complete information (i.e., consumers can observe quality). Consistent with the our previous analysis we further assume that should it decide to be socially responsible, the high quality firm spends on corporate philanthropy whereas the low quality firm spends on corporate citizenship.

5 Asymmetric Competition Between High Quality and Low Quality Firms

In this section, we study a specific duopoly case inspired by the above analysis. We assume two competing vertically differentiated firms that could make use of social responsibility initiatives to further enhance their positioning. We directly assume that consumers expect the high type firm to invest (if at all) in cause marketing, and the low type firm to invest (if at all) in social compliance. In that case the utility function of the consumers for the low and high quality goods are respectively given by

$$\begin{aligned} u_L &= \theta v_L - p_L - \delta g, \\ u_H &= \theta (v_H + \rho I_H) - p_H. \end{aligned}$$

The respective profits using demands arising from the indifference conditions under uniform distribution of taste for quality across consumers and assuming optimum social responsibility spending $I_L \in \{0, \bar{I}_L\}$ and $I_H \in \{0, \bar{I}_H\}$ for both firms, are given by¹²

$$\begin{aligned} \pi_L &= (p_L - c) \left(\begin{array}{l} \left(\begin{array}{l} \frac{p_H - p_L}{v_H - v_L + \rho I_H} - \frac{p_L}{v_L} - \bar{I}_L \text{ if } I_L = \bar{I}_L, I_H = \bar{I}_H \\ \frac{p_H - p_L}{v_H - v_L} - \frac{p_L}{v_L} - \bar{I}_L \text{ if } I_L = \bar{I}_L, I_H = 0 \\ \frac{p_H - p_L - \delta g}{v_H - v_L + \rho I_H} - \frac{p_L + \delta g}{v_L} \text{ if } I_L = 0, I_H = \bar{I}_H \\ \frac{p_H - p_L - \delta g}{v_H - v_L} - \frac{p_L + \delta g}{v_L} \text{ if } I_L = 0, I_H = 0 \end{array} \right) \end{array} \right), \\ \pi_H &= (p_H - c) \left(\begin{array}{l} \left(\begin{array}{l} 1 - \frac{p_H - p_L}{v_H - v_L + \rho I_H} - \bar{I}_H \text{ if } I_H = \bar{I}_H, I_L = \bar{I}_L \\ 1 - \frac{p_H - p_L - \delta g}{v_H - v_L + \rho I_H} - \bar{I}_H \text{ if } I_H = \bar{I}_H, I_L = 0 \\ 1 - \frac{p_H - p_L}{v_H - v_L} \text{ if } I_H = 0, I_L = \bar{I}_L \\ 1 - \frac{p_H - p_L - \delta g}{v_H - v_L} \text{ if } I_H = 0, I_L = 0 \end{array} \right) \end{array} \right). \end{aligned} \quad (15)$$

We derive the Nash Equilibrium strategies $(p_L^*, I_L^*, p_H^*, I_H^*)$ of the two firms who maximize their respective profits given the optimal response of the other firm. The following proposition explains the effect of competitive reactions on firm strategies.

¹²Note that if “quality per dollar” is lower for the product of the low quality firm, i.e., $\frac{v_L}{p_L} < \frac{v_H}{p_H}$, then it has no demand. It has a demand only if $\frac{v_L}{p_L} \geq \frac{v_H}{p_H}$ (see Tirole 1988, p. 97).

Proposition 9 *When a high-quality firm competes with a low-quality firm in a vertically differentiated market where consumers can observe quality by inspection, either the low-quality firm invests to conform to social norms while the high-quality firm does not contribute to social causes if $v_L \geq 2c$, or the low quality firm does not invest to conform to social norms while the high-quality firm contributes to social causes if $v_L < 2c$.*

Proposition 9 suggests that under an asymmetric competition between two vertically differentiated firms, only one of the two firms strategically spends on social responsibility. The necessary condition for the low-quality firm (which would optimally invest in technology to conform to social norms when it is a monopolist as we have shown earlier) to optimally invest in social responsibility is that it earns a high enough profit margin ($v_L \geq 2c$). Under this condition, the optimal competitive response of the high-quality firm is not to contribute to social causes. On the other hand, if the profit margin for the low-quality firm is not high enough ($v_L < 2c$), it does not invest in the technology to conform to social norms, the high-quality firm instead contributes to social causes. The profit margin of the low-quality firm has a critical effect on which one of the two firms spends on social responsibility. Further, we show that only one of the two firms does so. Since competition reduces the total profits that is earned by the two firms, only the more profitable firm has the opportunity to spend on social responsibility. The less profitable firm focuses on delivering its product quality only.

6 Conclusion

Corporate social responsibility (CSR) is often deemed as an additional or even conflicting objective for the firm, arising from non-economic (e.g., social or political) demands. Consequently, there has been considerable debate in the past about the link between firm profitability and CSR. Our analysis shows that social needs when reflected in consumer behavior can lead to a desirable response by firms who service such markets. Our mission has been to define demand and supply conditions such that social responsibility is a feature of the market equilibrium.

Further, the nature of social responsibility has also been a matter of debate. CSR may either imply good “corporate citizenship” whereby the firm business is ethical in its own right such that it conforms to the laws and ethical standards of the society (such as accounting disclosure, pollution or environmental standards, “fair trade” goods) or “corporate philan-

thropy” which implies that firms undertake extraneous social causes to boost the ethical credentials of their regular products (such as cause marketing or CM). For example, companies such as American Express, Apple Inc., Starbucks Converse, Motorola, Gap, Emporio Armani, Hallmark, Microsoft, and Dell partner to license the brand Product Red to offer special editions of their products to raise money for the Global Fund to Fight AIDS, Tuberculosis and Malaria. We show that a firm’s motivation towards these two types of CSR are very different. Firms competing at the low end of the product market tend to emphasize corporate citizenship while high quality firms tend to contribute more to social causes endorsed by their target customers. For example, Wal-Mart aims to become a zero-waste, renewably powered enterprise as a step toward becoming an ethical business in its own right (The Economist 2008(1)). Target, on the other hand, espouses the cause of education using its RED card (Cone Past. Present. Future. The 25th Anniversary of Cause Marketing 2008). Our model provides a theoretical basis for the previous empirical finding that the incentives for cause marketing are stronger at the high end of the market (Luo and Bhattacharya 2006). We in addition show that the incentives for corporate citizenship are higher at the low end of the market which has not been studied earlier. Consumer concern for corporate citizenship essentially constitutes a threat of exclusion (boycott) which is more likely to affect low margin firms, while the pursuit of social causes is an opportunity for higher margins, and is therefore appealing to firms who target price-insensitive consumers.

Our analysis sheds light more generally on firm considerations for adding a layer of consumer benefit (which we assume to be that arising from corporate social responsibility) over existing “quality”. We show the different implications on firm strategy depending on whether the added benefit is valued equally by all consumers (e.g., corporate citizenship) or differently (e.g., cause marketing). When the new benefit is valued equally by all consumers, a firm endowed with lower quality (the other layer of benefit) finds it profitable to provide to its consumers. On the other hand, when the new benefit is valued differently by different consumers and is correlated positively with the valuation of quality, a firm endowed with higher quality finds it more profitable to provide to its customers.

In a context of uncertainty where consumers interpret the market signals emitted by firms, our analysis demonstrates that firms will credibly signal their commitment to social responsibility through over-pricing and advertising CSR claims. Intuitively, overpricing puts the firm at a disadvantage so that consumers should understand that the firm can only

sustain itself because consumers believe that it delivers value through investments in social responsibility. The advertising claims, which we prove to be exaggerated in equilibrium, put the firm in a state of accountability (assuming some social monitoring and punishment for inaccurate claims) that only a responsible firm can sustain. When signaling occurs, firms which are not socially responsible are forced not to claim to engage in CSR. Thus the market equilibrium contributes to enforcing responsible behavior and trustworthy communications, so that the role of government agencies (or activists, or the judiciary) is to be present as a watchdog, a threat that ultimately does not need to be exercised.

Consistent with its title, this paper suggests that social responsibility can and should be an integral part of the value creation process by firms primarily driven by differentiation and the satisfaction of consumer demands. Firms having the capability to efficiently enact the responsibility demands of their customers will respond to (and arguably stimulate) these demands.

Our analysis has several implications for empirical research. For example, it may be possible to empirically test the correlation between product quality tier positioning (low-end vs. high-end) and the type of CSR investment pursued by the firm (compliance vs. causes), moderated by factors such as competition, the presence of sufficient monitoring of false claims, and demand growth (higher demand growth lowers the incentive to spend on responsibility).

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Appendix

Proof of Proposition 1

Equation 3 can be re-written as $\beta \leq \hat{\beta}$ where $\hat{\beta} = 1 - \left(1 - \frac{g}{v-c}\right)^2$. **Q.E.D.**

Proof of Proposition 2

Follows directly from the conditions in equations 4 and 5. **Q.E.D.**

Proof of Proposition 3

Follows directly from the conditions in equation 1. **Q.E.D.**

Proof of Lemma 1

From equation 4, we can see that $\frac{\partial g}{\partial v} \geq 0$, $\frac{\partial g}{\partial c} \leq 0$, and $\frac{\partial g}{\partial \beta} \leq 0$. **Q.E.D.**

Proof of Lemma 2

The Lagrangian for the firm's decision problem (equation 7) is given by:

$$\begin{aligned} \mathcal{L} = & (p^S - c) \left(1 - \frac{p^S}{v_L}\right) - \bar{I} - \begin{cases} \alpha k (I_a^S - \bar{I}) & \text{if } I_a^S > \bar{I} \\ 0 & \text{otherwise} \end{cases} \\ & - \lambda_1 \left((p^S - c) \left(1 - \frac{p^S}{v_H}\right) - k I_a^S - \frac{1}{v_H} \left(\frac{v_H - c + g}{2}\right)^2 \right). \end{aligned}$$

Let us first consider $I_a^S \leq \bar{I}$, the Kuhn-Tucker conditions are:

Marginal Conditions	Complementary Slackness
$\frac{\partial \mathcal{L}}{\partial p^S} = 1 - \frac{2p^S - c}{v_L} - \lambda_1 \left(1 - \frac{2p^S - c}{v_H}\right) \leq 0$	$p^S \frac{\partial \mathcal{L}}{\partial p^S} = 0$
$\frac{\partial \mathcal{L}}{\partial \lambda_1} = (p^S - c) \left(1 - \frac{p^S}{v_H}\right) - k I_a^S - \frac{1}{v_H} \left(\frac{v_H - c + g}{2}\right)^2 \leq 0$	$\lambda_1 \frac{\partial \mathcal{L}}{\partial \lambda_1} = 0$

Solving, we get $\lambda_1 = \frac{2p^S - c - v_L v_H}{2p^S - c - v_H v_L} > 0$ if $p^S > \frac{v_L + c}{2} = p_L^1$ (necessary condition). However there is no real solution since $p^S = \frac{v_H + c + i\sqrt{g(g + 2(v_H - c) + g) + 4v_H k I_a^S}}{2}$ (separating equilibrium does not exist). On the other hand if $I_a^S > \bar{I}$, the Kuhn-Tucker conditions are:

Marginal Conditions	Complementary Slackness
$\frac{\partial \mathcal{L}}{\partial p^S} = 1 - \frac{2p^S - c}{v_L} - \lambda_1 \left(1 - \frac{2p^S - c}{v_H}\right) \leq 0$	$p^S \frac{\partial \mathcal{L}}{\partial p^S} = 0$
$\frac{\partial \mathcal{L}}{\partial I_a^S} = -\alpha k + k \lambda_1 \leq 0$	$I_a^S \frac{\partial \mathcal{L}}{\partial I_a^S} = 0$
$\frac{\partial \mathcal{L}}{\partial \lambda_1} = (p^S - c) \left(1 - \frac{p^S}{v_H}\right) - k I_a^S - \frac{1}{v_H} \left(\frac{v_H - c + g}{2}\right)^2 \leq 0$	$\lambda_1 \frac{\partial \mathcal{L}}{\partial \lambda_1} = 0$

We can see that $\lambda_1 = \alpha$. The separating equilibrium is therefore characterized by

$$p^{S*} = \frac{1}{2} \left(\frac{(1-\alpha)v_H v_L}{v_H - \alpha v_L} + c \right), \text{ and}$$

$$I_a^{S*} = \frac{\frac{1}{2} \left(\frac{(1-\alpha)v_H v_L}{v_H - \alpha v_L} - c \right) \left(1 - \frac{\frac{(1-\alpha)v_H v_L + c}{v_H - \alpha v_L}}{2v_H} \right) - \frac{1}{v_H} \left(\frac{v_H - c + g}{2} \right)^2}{k} > \bar{I}. \quad (16)$$

The separating profits are

$$\pi_L((p^{S*}, I_a^{S*}), \hat{\mu} = 1) = \frac{1}{2} \left(\frac{(1-\alpha)v_H v_L}{v_H - \alpha v_L} - c \right) \left(1 - \alpha - \frac{1}{2} \left(\frac{(1-\alpha)v_H v_L}{v_H - \alpha v_L} + c \right) \left(\frac{1}{v_L} - \frac{\alpha}{v_H} \right) \right) + \frac{\alpha}{v_H} \left(\frac{v_H - c + g}{2} \right)^2 - (1 - \alpha k) \bar{I}.$$

A necessary condition for a separating equilibrium to exist is $\pi_L((p^{S*}, I_a^{S*}), \hat{\mu} = 1) \geq 0$, which simplifies as $k \geq \hat{k}$ where

$$\hat{k} = \frac{1}{\alpha} \left(1 - \frac{\frac{1}{2} \left(\frac{(1-\alpha)v_H v_L}{v_H - \alpha v_L} - c \right) \left(1 - \alpha - \frac{1}{2} \left(\frac{(1-\alpha)v_H v_L}{v_H - \alpha v_L} + c \right) \left(\frac{1}{v_L} - \frac{\alpha}{v_H} \right) \right) + \frac{\alpha}{v_H} \left(\frac{v_H - c + g}{2} \right)^2}{\bar{I}} \right).$$

If $k \geq \hat{k}$, a socially responsible firm is unable to charge its full information price. All Putative Pooling Equilibria are Unstable based on the Intuitive Criterion.

When quality is unobservable, if the socially responsible firm offers the same price and performance guarantee as under complete information, it would violate the “no-mimic condition” (equation 6). This implies that a socially irresponsible will have an incentive to offer the same price and announce the same level of spending on CSR as that of the socially responsible firm. That would result in a pooling equilibrium. Using an approach similar to Soberman (2003), we show below using the Intuitive Criterion that a pooling equilibrium does not exist.

Suppose there is a putative pooling equilibrium (p^*, I_a^*) in which the customers accept the price-spending on CSR combination given the expected quality $E(v) = (1 - \mu)v_H + \mu v_L$. The profit of a firm is given by the equations 2.

Step 1 We can find a deviation combination (p^D, I_a^D) such that $\pi_H^D(p^D, I_a^D, \hat{\mu} = 0) = \pi_H(p^*, I_a^*, \mu)$.

$$\pi_H^D = (p^D - c) \left(1 - \frac{p^D + g}{v_H} \right) - \alpha k I_a^D \quad (17)$$

$$\pi_H^* = (p^* - c) \left(1 - \frac{p^* + g}{v_H} \right) - \alpha k I_a^* \quad (18)$$

From the above, we can for example have $p^D = p^* - D$ and $I_a^D = I_a^* - \left(1 - \frac{2p^* + g - c - D}{v_H} \right) \frac{D}{\alpha k}$. The expression for I_a^D solves $\pi_H^D = \pi_H^*$ by substituting $p^D = p^* - D$. Note that since only a deviation p^D (if I_a^* is unchanged) results in lower than optimal profits $\pi_H(p^*, I_a^*, \mu)$, $I_a^D \leq I_a^*$ is necessary condition for $\pi_H^D(p^D, I_a^D, \hat{\mu} = 0) = \pi_H(p^*, I_a^*, \mu)$ which implies that $\left(1 - \frac{2p^* + g - c - D}{v_H} \right) \frac{D}{\alpha k} \geq 0$. Now, considering a deviation combination (p^{D-}, I_a^{D-})

which is infinitesimally less profitable than (p^D, I_a^D) , i.e., $p^{D-} = p^* - D - \varepsilon$ and $I_a^{D-} = I_a^* - \left(1 - \frac{2p^* + g - c - D}{v_H}\right) \frac{D}{\alpha k} + \varepsilon$, we have the high type firm's profit given by

$$\begin{aligned} \pi_H^{D-} &= (p^* - D - \varepsilon - c) \left(1 - \frac{p^* - D - \varepsilon + g}{v_H}\right) \\ &\quad - \alpha k \left(I_a^* - \left(1 - \frac{2p^* + g - c - D}{v_H}\right) \frac{D}{\alpha k} + \varepsilon\right) \end{aligned}$$

We can see that $\pi_H^* > \pi_H^{D-}$ if $\left(1 - \frac{2p^* + g - c - D}{v_H} + \alpha k + \frac{D + \varepsilon}{v_H}\right) \varepsilon > 0$ which simplifies as $\left(\left(\frac{I_a^* - I_a^D}{D} + 1\right) \alpha k + \frac{D + \varepsilon}{v_H}\right) \varepsilon > 0$ and holds since $I_a^D \leq I_a^*$. Thus at the combination $D-$ the socially irresponsible firm earns strictly less profit than the equilibrium profit $\pi_H(p^*, I_a^*, \mu)$. Thus the combination $D-$ is equilibrium dominated for the socially irresponsible firm. According to the Intuitive Criterion the customers cannot ascribe positive probability to a firm type choosing a strategy that is equilibrium dominated. Therefore the posterior probability of the customers $\hat{\mu}(D-) = 0$.

Step 2 Using this combination (p^D, I_a^D) , the profits of the socially responsible firm is

$$\begin{aligned} \pi_L^D &= (p^* - D - c) \left(1 - \frac{p^* - D}{v_H}\right) - \bar{I} - \alpha k \left(I_a^* - \left(1 - \frac{2p^* + g - c - D}{v_H}\right) \frac{D}{\alpha k} - \bar{I}\right) \\ &= \pi_L(p^*, I_a^*, \mu) \end{aligned} \quad (19)$$

Since $\pi_L(p^*, I_a^*, \mu) > \pi_H(p^*, I_a^*, \mu)$, if the socially responsible firm uses a combination infinitesimally lower, i.e., (p^{D-}, I_a^{D-}) , this combination will still yield a positive profit $\pi_L^{D-} > \pi_H(p^*, I_a^*, \mu)$. Thus the combination (p^D, I_a^D) is not equilibrium dominated for the socially responsible firm. The socially responsible firm can increase its profits by offering a deviation combination (p^{D-}, I_a^{D-}) and convince the customers that it is a socially responsible type and also earn a higher profit. Thus there can be no intuitive pooling equilibrium when $k \geq \hat{k}$. **Q.E.D.**

Proof of Proposition 4

Follows from the Proof of Lemma 2. Comparing with complete information price (equation 1) we find that $p_1(v_L) > p^{S*}$ since $v_L < v_H$, and $I_a^{S*} > \bar{I}$ follows from the Proof of Lemma 2. **Q.E.D.**

Proof of Proposition 5

The solution to the firm's decision problem (equation 8) is:

$$p^{p*} = \frac{(1 - \mu)(v_H - g) + \mu v_L + c}{2}, \text{ and } I_a^p \in \{0, \bar{I}\}. \quad \mathbf{Q.E.D.}$$

Proof of Proposition 6

Follows directly from equation 11. **Q.E.D.**

Proof of Lemma 4

The Lagrangian from equation 13:

$$\begin{aligned} \mathcal{L} = & (p^S - c) \left(1 - \frac{p^S}{v_H + \rho \bar{I}} \right) - \bar{I} - \begin{cases} \alpha k (I_a^S - \bar{I}) & \text{if } I_a^S > \bar{I} \\ 0 & \text{otherwise} \end{cases} \\ & - \lambda_1 \left((p^S - c) \left(1 - \frac{p^S}{v_L} \right) - k I_a^S - \frac{1}{v_L} \left(\frac{v_L - c}{2} \right)^2 \right). \end{aligned}$$

Again, we consider first the case where $I_a^S \leq \bar{I}$. The Kuhn-Tucker conditions are:

Marginal Conditions	Complementary Slackness
$\frac{\partial \mathcal{L}}{\partial p^S} = 1 - \frac{2p^S - c}{v_H + \rho I} - \lambda_1 \left(1 - \frac{2p^S - c}{v_L} \right) \leq 0$	$\frac{\partial \mathcal{L}}{\partial p^S} p^S = 0$
$\frac{\partial \mathcal{L}}{\partial \lambda_1} = (p^S - c) \left(1 - \frac{p^S}{v_L} \right) - k I_a^S - \frac{1}{v_L} \left(\frac{v_L - c}{2} \right)^2 \leq 0$	$\frac{\partial \mathcal{L}}{\partial \lambda_1} \lambda_1 = 0$

Solving, we get $\lambda_1 = \frac{1 - \frac{2p^S - c}{v_H + \rho I}}{1 - \frac{2p^S - c}{v_L}} = \frac{v_H + \rho \bar{I} - 2p^S + c}{v_L - 2p^S + c} \frac{v_L}{v_H + \rho I} > 0$ if either $p^S < \frac{v_L + c}{2}$ (which is the complete information price of the low type and hence ruled out) or $p^S > \frac{v_H + \rho \bar{I} + c}{2}$ which is the complete information price of the high-type firm. Solving we get $p^S = \frac{v_L + c}{2}$ which then contradicts the previous condition ($p^S > \frac{v_H + \rho \bar{I} + c}{2}$) (separating equilibrium does not exist). On the other hand, when $I_a^S > \bar{I}$, the Kuhn-Tucker conditions are:

Marginal Conditions	Complementary Slackness
$\frac{\partial \mathcal{L}}{\partial p^S} = 1 - \frac{2p^S - c}{v_H + \rho I} - \lambda_1 \left(1 - \frac{2p^S - c}{v_L} \right) \leq 0$	$\frac{\partial \mathcal{L}}{\partial p^S} p^S = 0$
$\frac{\partial \mathcal{L}}{\partial I_a^S} = -\alpha k + k \lambda_1 \leq 0$	$\frac{\partial \mathcal{L}}{\partial I_a^S} I_a^S = 0$
$\frac{\partial \mathcal{L}}{\partial \lambda_1} = (p^S - c) \left(1 - \frac{p^S}{v_L} \right) - k I_a^S - \frac{1}{v_L} \left(\frac{v_L - c}{2} \right)^2 \leq 0$	$\frac{\partial \mathcal{L}}{\partial \lambda_1} \lambda_1 = 0$

The above implies that $\lambda_1 = \alpha$. The separating equilibrium is characterized by:

$$\begin{aligned} p^{S*} &= \frac{1}{2} \left(\frac{(1 - \alpha) v_L (v_H + \rho \bar{I})}{v_L - \alpha (v_H + \rho \bar{I})} + c \right), \text{ and} \\ I_a^{S*} &= \frac{\frac{1}{2} \left(\frac{(1 - \alpha) v_L (v_H + \rho \bar{I})}{v_L - \alpha (v_H + \rho \bar{I})} - c \right) \left(1 - \frac{\frac{(1 - \alpha) v_L (v_H + \rho \bar{I})}{v_L - \alpha (v_H + \rho \bar{I})} + c}{2 v_L} \right) - \frac{1}{v_L} \left(\frac{v_L - c}{2} \right)^2}{k}. \end{aligned} \quad (20)$$

The separating profit is given by

$$\begin{aligned} \pi((p^{S*}, I_a^{S*}), \hat{\mu} = 1) &= \frac{1}{2} \left(\frac{(1 - \alpha) v_L (v_H + \rho \bar{I})}{v_L - \alpha (v_H + \rho \bar{I})} - c \right) \\ &\quad \left(1 - \alpha - \frac{1}{2} \left(\frac{(1 - \alpha) v_L (v_H + \rho \bar{I})}{v_L - \alpha (v_H + \rho \bar{I})} + c \right) \left(\frac{1}{v_H + \rho \bar{I}} - \frac{\alpha}{v_L} \right) \right) \\ &\quad + \frac{\alpha}{v_L} \left(\frac{v_L - c}{2} \right)^2 - (1 - \alpha k) \bar{I}. \end{aligned}$$

The necessary condition for the separating equilibrium to exist is $\pi((p^{S*}, I_a^{S*}), \hat{\mu} = 1) \geq 0$, i.e., $k \geq \hat{k}_{CM}$ where

$$\hat{k}_{CM} = \frac{1 - \frac{\frac{1}{2} \left(\frac{(1-\alpha)v_L(v_H+\rho I)}{v_L-\alpha(v_H+\rho I)} - c \right) \left(1 - \alpha - \frac{1}{2} \left(\frac{(1-\alpha)v_L(v_H+\rho I)}{v_L-\alpha(v_H+\rho I)} + c \right) \left(\frac{1}{v_H+\rho I} - \frac{\alpha}{v_L} \right) \right) + \frac{\alpha}{v_L} \left(\frac{v_L-c}{2} \right)^2}{\alpha}.$$

If $k \geq \hat{k}_{CM}$, a socially responsible firm is unable to charge its full information price. All Putative Pooling Equilibria are Unstable based on the Intuitive Criterion.

When quality is unobservable, if the socially responsible firm offers the same price and performance guarantee as under complete information, it would violate the “no-mimic condition” (equation 12). This implies that a socially irresponsible will have an incentive to offer the same price and announce the same level of spending on CSR as that of the socially responsible firm. That would result in a pooling equilibrium. As before, we show below using the Intuitive Criterion that a pooling equilibrium does not exist.

Suppose there is a putative pooling equilibrium (p^*, I_a^*) in which the customers accept the price-spending on CSR combination given the expected quality $E(v) = \mu v_H + (1 - \mu) v_L$. The profit of a firm is given by the equations ??.

Step 1 We can find a deviation combination (p^D, I_a^D) such that $\pi_L^D(p^D, I_a^D, \hat{\mu} = 0) = \pi_L(p^*, I_a^*, \mu)$.

$$\pi_L^D = (p^D - c) \left(1 - \frac{p^D}{v_L + \rho I_a^D} \right) - \alpha k I_a^D \quad (21)$$

$$\pi_L^* = (p^* - c) \left(1 - \frac{p^*}{v_L + \rho I_a^*} \right) - \alpha k I_a^* \quad (22)$$

From the above, we can for example have $p^D = p^* + D$ and $I_a^D = I_a^* - X$ where X solves $\pi_L^D = \pi_L^*$ by substituting $p^D = p^* + D$. Note that since only a deviation p^D (if I_a^* is unchanged) in lower than optimal profits $\pi_L(p^*, I_a^*, \mu)$, $I_a^D \leq I_a^*$ is necessary condition for $\pi_L^D(p^D, I_a^D, \hat{\mu} = 1) = \pi_L(p^*, I_a^*, \mu)$ which implies that $X > 0$ and

$$\alpha k = \frac{(p^* - c) \left(1 - \frac{p^*}{v_L + \rho I_a^*} \right) - (p^D - c) \left(1 - \frac{p^D}{v_L + \rho I_a^D} \right)}{I_a^* - I_a^D}. \quad (23)$$

Now, considering a deviation combination (p^{D-}, I_a^{D-}) which is infinitesimally less profitable than (p^D, I_a^D) , i.e., $p^{D-} = p^* + D - \varepsilon$ and $I_a^{D-} = I_a^* - X + \varepsilon$, we have the low type firm's profit given by

$$\pi_L^{D-} = (p^* + D - \varepsilon - c) \left(1 - \frac{p^* + D - \varepsilon}{v_L + \rho(I_a^* - X + \varepsilon)} \right) - \alpha k (I_a^* - X + \varepsilon)$$

We can see that $\pi_L^*(= \pi_L^D) > \pi_L^{D-}$ if

$$(p^* + D - c) \left(1 - \frac{p^* + D}{v_L + \rho(I_a^* - X)} \right) - (p^* + D - \varepsilon - c) \left(1 - \frac{p^* + D - \varepsilon}{v_L + \rho(I_a^* - X + \varepsilon)} \right) + \alpha k \varepsilon > 0$$

Substituting from equation 23, we have

$$\begin{aligned} & (p^* + D - c) \left(1 - \frac{p^* + D}{v_L + \rho(I_a^* - X)} \right) \left(\frac{p^* + D}{v_L + \rho(I_a^* - X + \varepsilon)} - \frac{\varepsilon}{X} \right) \\ & + \frac{(p^* - c) \left(1 - \frac{p^*}{v_L + \rho I_a^*} + \frac{\varepsilon}{v_L + \rho(I_a^* - X + \varepsilon)} \right)}{X} \varepsilon + \varepsilon \left(1 - \frac{p^* + D - \varepsilon}{v_L + \rho(I_a^* - X + \varepsilon)} \right) > 0 \end{aligned}$$

Each of the individual terms above is positive. Thus at the combination $D-$ the socially irresponsible firm earns strictly less profit than the equilibrium profit $\pi_L(p^*, I_a^*, \mu)$. Thus the combination $D-$ is equilibrium dominated for the socially irresponsible firm. According to the Intuitive Criterion the customers cannot ascribe positive probability to a firm type choosing a strategy that is equilibrium dominated. Therefore the posterior probability of the customers $\hat{\mu}(D-) = 0$.

Step 2 Using this combination (p^D, I_a^D) , the profits of the socially responsible firm is

$$\begin{aligned}\pi_H^D &= (p^* - D - c) \left(1 - \frac{p^* - D}{v_H + \rho(I_a^* - X)} \right) - I - \alpha k (I_a^* - X - I) \\ &= \pi_H(p^*, I_a^*, \mu)\end{aligned}\quad (24)$$

Since $\pi_H(p^*, I_a^*, \mu) > \pi_L(p^*, I_a^*, \mu)$, if the socially responsible firm uses a combination infinitesimally lower, i.e., (p^{D-}, I_a^{D-}) , this combination will still yield a positive profit $\pi_H^{D-} > \pi_L(p^*, I_a^*, \mu)$. Thus the combination (p^D, I_a^D) is not equilibrium dominated for the socially responsible firm. The socially responsible firm can increase its profits by offering a deviation combination (p^{D-}, I_a^{D-}) and convince the customers that it is a socially responsible type and also earn a higher profit. Thus there can be no intuitive pooling equilibrium when $k \geq \hat{k}_{CM}$. **Q.E.D.**

Proof of Proposition 7

Comparing the separating price with the From equations 9 and 20, we get $p^{S*} > p_1(v_H)$ since $v_H + \rho\bar{I} > v_L$ and $I_a^{S*} > \bar{I}$ follows from the Proof of Lemma 4. **Q.E.D.**

Proof of Proposition 8

We need to solve simultaneously the first order conditions from equation 14:

$$p^p = \frac{\mu(v_H + \rho\bar{I}) + (1 - \mu)v_L}{2}, \text{ and } I_a^p \in \{0, \bar{I}\}. \quad \mathbf{Q.E.D.}$$

Proof of Proposition 9

The Nash Equilibrium prices (from first order conditions of equations 15) given the spending on CSR are respectively given by

$$\begin{aligned}\hat{p}_L &= \frac{1}{4} \left(\begin{array}{l} \left(\begin{array}{l} 2c + v_L \left(1 + 3 \frac{2c - v_L}{4(v_H + \rho\bar{I}_H) - v_L} \right) \text{ if } I_L = \bar{I}_L, I_H = \bar{I}_H \\ 2c + v_L \left(1 + 3 \frac{2c - v_L}{4v_H - v_L} \right) \text{ if } I_L = \bar{I}_L, I_H = 0 \\ 2c - 2\delta g + v_L \left(1 + \frac{-6c + 3v_L - 2\delta g}{-4v_H + v_L - 4\rho\bar{I}_H} \right) \text{ if } I_L = 0, I_H = \bar{I}_H \\ 2c - 2\delta g + v_L \left(1 + \frac{-6c + 3v_L - 2\delta g}{-4v_H + v_L} \right) \text{ if } I_L = 0, I_H = 0 \end{array} \right) \end{array} \right), \\ \hat{p}_H &= \left\{ \begin{array}{l} (v_H + \rho\bar{I}_H) \frac{2(v_H + \rho\bar{I}_H) - 2v_L + 3c}{4(v_H + \rho\bar{I}_H) - v_L} \text{ if } I_L = \bar{I}_L, I_H = \bar{I}_H \\ v_H \frac{2(v_H - v_L) + 3c}{4v_H - v_L} \text{ if } I_L = \bar{I}_L, I_H = 0 \\ (v_H + \rho\bar{I}_H) \frac{2(v_H + \rho\bar{I}_H) - 2v_L + 3c + \delta g}{4(v_H + \rho\bar{I}_H) - v_L} \text{ if } I_L = 0, I_H = \bar{I}_H \\ v_H \frac{2(v_H - v_L) + 3c + \delta g}{4v_H - v_L} \text{ if } I_L = 0, I_H = 0 \end{array} \right.\end{aligned}$$

The corresponding profits are given by

$$\begin{aligned}
\pi_L(\hat{p}_L, \hat{p}_H, I_L = \bar{I}_L, I_H = \bar{I}_H) &= (v_H + \rho\bar{I}_H) \left(\frac{v_H + \rho\bar{I}_H}{v_L} - 1 \right) \left(\frac{v_L - 2c}{4(v_H + \rho\bar{I}_H) - v_L} \right)^2 - \bar{I}_L, \\
\pi_L(\hat{p}_L, \hat{p}_H, I_L = \bar{I}_L, I_H = 0) &= v_H \left(\frac{v_H}{v_L} - 1 \right) \left(\frac{v_L - 2c}{4v_H - v_L} \right)^2 - \bar{I}_L, \\
\pi_L(\hat{p}_L, \hat{p}_H, I_L = 0, I_H = \bar{I}_H) &= (v_H + \rho\bar{I}_H) \left(\frac{v_H + \rho\bar{I}_H}{v_L} - 1 \right) \left(\frac{v_L - 2c - \delta g - \delta g \left(1 + \frac{v_L}{v_H - v_L + \rho\bar{I}_H} \right)}{4(v_H + \rho\bar{I}_H) - v_L} \right)^2, \\
\pi_L(\hat{p}_L^*, \hat{p}_H^*, I_L = 0, I_H = 0) &= v_H \left(\frac{v_H}{v_L} - 1 \right) \left(\frac{v_L - 2c - \delta g - \delta g \left(1 + \frac{v_L}{v_H - v_L} \right)}{4v_H - v_L} \right)^2, \text{ and} \\
\pi_H(\hat{p}_L, \hat{p}_H, I_H = \bar{I}_H, I_L = \bar{I}_L) &= \left(\frac{2(v_H + \rho\bar{I}_H) - c}{4(v_H + \rho\bar{I}_H) - v_L} \right)^2 (v_H + \rho\bar{I}_H - v_L) - \bar{I}_H, \\
\pi_H(\hat{p}_L, \hat{p}_H, I_H = \bar{I}_H, I_L = 0) &= \left(\frac{2(v_H + \rho\bar{I}_H) - c + \delta g \left(1 + \frac{v_L}{v_H - v_L + \rho\bar{I}_H} \right)}{4(v_H + \rho\bar{I}_H) - v_L} \right)^2 (v_H + \rho\bar{I}_H - v_L) - \bar{I}_H, \\
\pi_H(\hat{p}_L, \hat{p}_H, I_H = 0, I_L = \bar{I}_L) &= \left(\frac{2v_H - c}{4v_H - v_L} \right)^2 (v_H - v_L), \text{ and} \\
\pi_H(\hat{p}_L, \hat{p}_H, I_H = 0, I_L = 0) &= \left(\frac{2v_H - c + v_H \frac{\delta g}{v_H - v_L}}{4v_H - v_L} \right)^2 (v_H - v_L).
\end{aligned}$$

First we examine the low quality firm's optimum spending on conformance to social norms. Notice that $\pi_L(\hat{p}_L, \hat{p}_H, I_L = \bar{I}_L, I_H = \bar{I}_H) \geq \pi_L(\hat{p}_L, \hat{p}_H, I_L = 0, I_H = \bar{I}_H)$ if

$$\left((v_H + \rho\bar{I}_H) \left(\frac{v_H + \rho\bar{I}_H}{v_L} - 1 \right) \left(\frac{v_L - 2c}{4(v_H + \rho\bar{I}_H) - v_L} \right)^2 - \left(\frac{v_L - 2c - \delta g - \delta g \left(1 + \frac{v_L}{v_H - v_L + \rho\bar{I}_H} \right)}{4(v_H + \rho\bar{I}_H) - v_L} \right)^2 \right) \geq \bar{I}_L$$

The necessary condition for the above to satisfy is

$$v_H + \rho\bar{I}_H \leq v_L \left(1 + \frac{1}{2} \frac{\delta g}{v_L - 2c - \delta g} \right).$$

Since $v_H > v_L$, the above condition cannot hold unless

$$v_L \geq 2c + \delta g. \tag{25}$$

Similarly, $\pi_L(\hat{p}_L, \hat{p}_H, I_L = \bar{I}_L, I_H = 0) \geq \pi_L(\hat{p}_L, \hat{p}_H, I_L = 0, I_H = 0)$ if

$$v_H \left(\frac{v_H}{v_L} - 1 \right) \left(\left(\frac{v_L - 2c}{4v_H - v_L} \right)^2 - \left(\frac{(v_L - 2c - \delta g) - \delta g \left(1 + \frac{v_L}{v_H - v_L} \right)}{4v_H - v_L} \right)^2 \right) \geq \bar{I}_L.$$

The necessary condition for the above is $(v_L - 2c)^2 - \left((v_L - 2c - \delta g) - \delta g \left(1 + \frac{v_L}{v_H - v_L} \right) \right)^2 \geq 0$, i.e.,

$$v_L \geq 2c + \delta g \left(1 + \frac{1}{2} \frac{v_L}{v_H - v_L} \right). \tag{26}$$

Now considering the high quality firm's spending on social causes, we see that $\pi_H(\hat{p}_L, \hat{p}_H, I_H = \bar{I}_H, I_L = \bar{I}_L) \geq \pi_H(\hat{p}_L, \hat{p}_H, I_H = 0, I_L = \bar{I}_L)$ if

$$\left(\frac{2(v_H + \rho\bar{I}_H) - c}{4(v_H + \rho\bar{I}_H) - v_L} \right)^2 (v_H + \rho\bar{I}_H - v_L) - \left(\frac{2v_H - c}{4v_H - v_L} \right)^2 (v_H - v_L) \geq \bar{I}_H.$$

The necessary condition for the above is

$$\left(\frac{1 + \frac{2\rho\bar{I}_H}{2v_H - c}}{1 + \frac{4\rho\bar{I}_H}{4v_H - v_L}} \right)^2 \left(1 + \frac{\rho\bar{I}_H}{v_H - v_L} \right) \geq 1.$$

The above condition holds under the sufficient condition $\frac{2\rho\bar{I}_H}{2v_H - c} \geq \frac{4\rho\bar{I}_H}{4v_H - v_L}$ which simplifies as

$$v_L \leq 2c. \quad (27)$$

Finally we have $\pi_H(\hat{p}_L, \hat{p}_H, I_H = \bar{I}_H, I_L = 0) > \pi_H(\hat{p}_L, \hat{p}_H, I_H = 0, I_L = 0)$ if

$$\begin{aligned} & \left(\frac{(2(v_H + \rho\bar{I}_H) - c) + \delta g \left(1 + \frac{v_L}{v_H - v_L + \rho\bar{I}_H} \right)}{4(v_H + \rho\bar{I}_H) - v_L} \right)^2 (v_H + \rho\bar{I}_H - v_L) \\ & - \left(\frac{2v_H - c + v_H \frac{\delta g}{v_H - v_L}}{4v_H - v_L} \right)^2 (v_H - v_L) > \bar{I}_H. \end{aligned}$$

The necessary condition for the above is

$$\left(\frac{1 + \rho\bar{I}_H \frac{2 - \frac{\delta g v_L}{(v_H + \rho\bar{I}_H - v_L)(v_H - v_L)}}{2v_H - c + v_H \frac{\delta g}{v_H - v_L}}}{1 + \frac{4\rho\bar{I}_H}{4v_H - v_L}} \right)^2 \left(1 + \frac{\rho\bar{I}_H}{v_H - v_L} \right) > 1.$$

The above condition holds under the sufficient condition

$$v_L \leq 2c - \frac{1}{2} \frac{\delta g}{v_H - v_L} \frac{4v_H(v_H + \rho\bar{I}_H) - v_L^2}{v_H + \rho\bar{I}_H - v_L}. \quad (28)$$

From conditions in equations 25, 26, 27, and 28 we have under necessary condition $v_L \geq 2c$, $I_L^* = \bar{I}_L$ and $I_H^* = 0$, $p_L^* = \frac{1}{4} \left[2c + v_L \left(1 + 3 \frac{2c - v_L}{4v_H - v_L} \right) \right]$, and $p_H^* = v_H \frac{2(v_H - v_L) + 3c}{4v_H - v_L}$ while under the necessary condition $v_L < 2c$, $I_L^* = 0$, $I_H^* = \bar{I}_H$, $p_L^* = \frac{1}{4} \left[2c - 2\delta g + v_L \left(1 + \frac{2\delta g - 3(v_L - 2c)}{4(v_H + \rho\bar{I}_H) - v_L} \right) \right]$, and $p_H^* = (v_H + \rho\bar{I}_H) \frac{2(v_H + \rho\bar{I}_H) - 2v_L + 3c + \delta g}{4(v_H + \rho\bar{I}_H) - v_L}$. **Q.E.D.**

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ESMT
European School of Management
and Technology GmbH

Schlossplatz 1
10178 Berlin
Germany

Phone: +49 (0)30 212 31-1279

www.esmt.org