

Certification of CSR Activities in Oligopolistic Markets.

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Abstract

The present paper examines the conditions under which certification can complement the provision of Corporate Social Responsibility (CSR) activities by private firms in an oligopolistic market. Our main finding is that if there is no credible information disclosure about SR characteristics of the firms' products to consumers, no firm will have incentives to undertake CSR effort in equilibrium. However, if the necessary information about the CSR aspects of each firm's product, otherwise unobservable, becomes available to consumers through certification, provided either by a profit-maximizing certifier or by the regulator, then both firms will have incentives to engage in CSR activities. Hence, under certification consumers' surplus and total welfare increase comparing with the benchmark case without CSR activities. The above results are robust regardless the mode of competition. However, the level of CSR effort set by the regulator is sensitive to the timing of decisions.

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1 Introduction

The large publicity on Corporate Social Responsibility (CSR hereafter) over the last few years has led many companies to account for the social consequences of their activities. As a result,

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CSR has emerged as a prime issue among firms, seeking ways to benefit society and at the same time, receive a benefit from this new challenge.¹ There is no specific definition about CSR. However, one of the most commonly used among economists is the following: "CSR is firms' commitment to social and ecological considerations, beyond the law requirements" (McWilliams and Siegel, 2001) Following the terminology of Porter and Kramer (2006), potential firms' benefits from engaging in CSR actions may be moral obligation, sustainability, "license to operate" and reputation.² Yet, for these benefits to be effective, firms have to convince potential consumers about their social orientation.

Some CSR related activities may be easily observable by consumers, like philanthropy or social charity for example. We rather focus on the credence attributes of CSR. It is fact that CSR effort by firms may involve cost increasing actions within their value chain, which are difficult - if not impossible - to be observed by a large scope of consumers, even after consumption. For instance, the firm may operate with respect to the interests of its stakeholders such as its employees (investing in workplace safety, or improving working conditions for employees in a factory placed in a developing country), suppliers (by supporting local suppliers rather than cheaper alternative sources in order to support the local economy), and the environment (by reducing emissions of pollutants or using environmental friendly input).³ Hence, in numerous cases the SR aspect of a product can be classified as a credence good.

The reason we focus on the credence attributes of CSR is that firms are trying to convince SR conscious consumers about their SR orientation via publishing CSR reports or advertising.⁴ However, those sources of communication are not always considered trustworthy by consumers. The reason is examples like "Phillip Morris" the large tobacco company, which in the year 1999 spent \$79 million to social causes and \$100 advertising it. Another example has been the athletic products giant Nike (See Klein, 1999). They used fake evidence about the working conditions of child employees in its factories in Southeastern Asia, in order to construct a SR

¹More than half of the top 100 corporations that are based in the 16 more industrialized countries published a CSR report in the year 2005 (Becchetti et al., 2006). More recently in a survey on behalf of The Economist, the majority of the firms agreed that CSR "is a necessary cost of doing business" and less than 4% consider CSR as "a waste of time and money" (Corporate Social Responsibility: The next question. The Economist, January 17, 2008).

²For instance, Baron (2001, 2003), Bagnoli and Watts (2003), Manasakis et. al (2006) and Garcia-Gallego and Georgantzis (2008) under the scope of strategic CSR, formalize situations where firms create a socially friendly image in order to obtain a competitive advantage in the market in which they operate.

³See for example Mayer (1999) and Bris and Brisley (2006)

⁴See Becchetti et al. (2006) and Tsoutsoura (2004).

image in the CSR reports they published. Such cases create considerable doubts to consumers about the abovementioned companies' devotion to CSR values (See, Porter and Kramer, 2002).

It becomes apparent that, in the absence of a credible information disclosure system, firms may fail to persuade socially conscious consumers about their true commitment to social values, hence they will have no incentives to undertake any costly CSR activity. Given this evidence, the following questions arise: First, what measures will promote firms' engagement in CSR activities? Is certification of CSR activities an effective way to enhance prosocial behavior by firms? Since CSR is defined as: "firms' commitment to social and ecological considerations, beyond the law requirements" (McWilliams and Siegel, 2001) there cannot be any "command and control" measures, such as compulsory CSR standards, in order to impose socially conscious behavior by firms. We thus consider voluntary certification as a policy instrument, i.e. a certifier (public or private) sets certain social and environmental criteria that should be respected during the firm's operational activities and then provides a certification to any firm that fulfills those criteria.⁵ Following Bottega & De Freitas (2009) we assume that certification from, either a profit-maximizing private organization or the regulator, is an effective system of information disclosure that allows consumers to distinguish the social characteristics of the products they purchase.^{6, 7}

Second, how do alternative types of certification schemes set certification standards of firms CSR activities? How do alternative types certification of CSR affect firms' market performance and social welfare in an oligopolistic environment? The present paper addresses and formalizes these questions in a duopolistic market for a final good, where consumers differ with respect to their valuation towards CSR activities. We consider that consumers are homogeneous regarding

⁵For example, the certification SA8000 (2006) is specialized in the workers' human rights in developing countries and it is developed and overseen by the Social Accountability International (SAI) (<http://www.sai-intl.org/>). Date last visited: May 24, 2008).

Additionally, an example of a public certifier is ISO 26000 which will certify SR activities by firms since 2008. (<http://isotc.iso.org/livelink/livelink/fetch/2000/2122/830949/3934883/3935096/home.html>). Date last visited: May 24, 2008).

According to Bottega & De Freitas (2006), an example of for profit organizations that provides certification is Ecocert (see <http://www.ecocert.com>). Date last visited May 24, 2008). Another example is the Scientific Certification Systems (SCS), which certifies environmental consciousness in product manufacturing and natural resource extraction.

⁶This assumption is in line with recent empirical evidence, according to which, EU citizens trust better a certification labeled on the product, comparing with other forms of information about the social characteristics of the products they purchase (see Fliess et al., 2007).

⁷In the absence of fully informed consumers a "Market of Lemons" problem may arise. See the No Certification case for further analysis.

the physical characteristics of the goods, but heterogeneous towards the valuation of the CSR aspects of each product. More socially conscious consumers have a higher valuation for the product of the firm that engages in CSR activities, hence, they are willing to pay a higher price for the "socially friendly" good. Firms strategically engage in CSR activities in order to create a "socially friendly image" for their product.⁸

Third, when is the right time to implement CSR certification? Does the mode of competition play a significant role on the design and the effectiveness of each certification scheme? Therefore first we compare both the cases of ex-ante and ex post certification that is the certifier sets the certification standards before or after firms have chosen their levels of CSR effort respectively. Second, we discuss both quantity and price competition between firms.

We investigate two major scenarios. The first is the "certification by a private organization" one, in which a private organization provides to the firms a certificate, with respect to the former's profits. The second is the "certification by the regulator" one, in which the regulator intervenes in order to solve the ensuing informational problem, by proposing a certain standard of CSR effort to the firms with respect to the social welfare. We also briefly discuss the case in which the certifier is a Non Governmental Organization.

Regarding the first question, our main finding is that if there is no credible information disclosure about SR characteristics of the firms' products to consumers, no firm will have incentives to undertake CSR effort in equilibrium. However, if the necessary information about the CSR aspects of each firm's product, otherwise unobservable, is revealed to consumers through certification either by the regulator or by a private certifier, then both firms' endogenous choice is to engage in CSR activities. The reason behind this result is that socially conscious consumers will increase their willingness to pay for the product of any firm that is certified as socially responsible. Therefore, both firms will seek for certification that will allow them to increase the demand for their product and obtain a competitive advantage in the market. Hence, the existence of certification enhances firms' CSR actions in both scenarios.

Regarding the second question we find that the regulator will set a standard of CSR effort higher than the one set by the private certifier. Hence, in the "certification by the regulator" scenario, equilibrium output is always lower comparing to the "certification by a private organization" scenario, yet higher comparing to the benchmark case without CSR activities. Gross

⁸Elfenbein and McManus (2007) along with Hiscox and Smyth (2006) find that consumers are willing to pay a higher price for the goods produced by socially responsible firms.

profits in the "certification by the regulator" scenario are equal to the benchmark and lower than in the "certification by a private organization" scenario. Net firms' profits are equal in all scenarios. The reason behind this result is that the private certifier extracts all the extra firms profits from their engagement in CSR activities in the form of a certification fee, while the regulator sets firms participation constraint to CSR as the certification standard of CSR. Finally, consumers' surplus and social welfare are higher (lower) under the private rather than under the public certifier if and only if the public certifier's monitoring cost is low (high) enough.

Regarding the third question we find that if the certification standard is determined ex post, that is after firms have chosen their levels of CSR effort then the regulator will set as certification standard the firms' optimal CSR effort level, since he cannot credibly commit to any higher standard. Hence, in this case the regulator and the private certifier will set the same standard. Moreover, our results are qualitatively robust regardless the mode competition. However, if firms compete in prices rather than in quantities, the regulator will set lower CSR certification levels.

Our paper built on a recent branch of the certification literature, which examines the effects of alternative certification regimes, considering that the true quality of the final products is difficult to be observed by consumers. The closest to our paper is Bottega and De Freitas (2009). They examine the welfare implications of the interaction among public, non governmental and private environmental quality certification schemes, in which the certification standard is determined ex ante. They consider a monopolistic market in which the monopolist produces up to two environmental quality variants of its product, assuming that the utility of individual consumers depends on the average environmental quality in the market. Our work is different in four ways. First, we assume an oligopolistic market in which the strategic interactions between the competing firms are investigated. Second, we examine the case in which the certification standard is determined ex post, that is after firms choose their CSR effort. Third, in our context competing firms produce a single product quality either connected to CSR or not, and the utility of individual consumers is connected only to their preferences towards CSR.⁹In a similar vein, Bottega et al. (2009), consider a Bertrand duopoly in which asymmetric firms

⁹CSR by definition includes a much broader set of operations within the value chain of the firm than strictly environmental quality. Therefore, a firm has to adjust its overall internal value chain in order to be perceived by consumers as CSR oriented. Thus, in the present context, by definition firms produce a unique variant of a product, either connected to CSR or not.

regarding their production costs decide whether or not to be certified for their CSR activities. There is only one type of certifier (public) who faces two alternative objectives when he sets the certification standard *ex ante*: either to maximize the utility of all consumers, or the utility of only socially conscious consumers. We depart from this paper in four dimensions. First, we consider three alternative types of certifiers with different objectives: a private-for profit certifier, a public one, and non governmental organization one. Second, both quantity and price competition are considered. Third, we also examine the case in which the certification standard is determined *ex post*. Fourth, we assume that firms are symmetric and both the firms and the certifiers consider the median type of consumer when they maximize their objectives.

Our work is also close to Bonroy and Constantatos (2008), in the sense that an oligopolistic market for final products is assumed. They examine the certification of credence goods' quality, in a Bertrand competition context, in which competing firms produce different levels of quality. They focus on the difference between mandatory and voluntary certification, where labelling does not always reveal perfect information. Conversely, in the present paper we examine firms' incentives to engaging in CSR (hence providing a credence attribute of a higher quality to their final product), focusing on different sources of certification (public or private) and assuming that certification is always voluntary and reveals perfect information.

Our work also contributes to the existing literature regarding "strategic CSR", a term that was introduced by Baron (2001) and refers to the case where firms are assumed to be socially responsible because they anticipate a benefit from such a behavior. Baron (2001, 2003) examines CSR under the prism of a strategic choice between public and private politics. In a similar vein, Calveras et al. (2006), assuming a perfectly competitive supply of inputs, compare the effects of formal regulation to firms' incentives to provide socially friendly goods as a response to increased activism from the consumers. Nevertheless, the above literature focuses on the difference between the provision of CSR by private firms and by the regulator (in the form of regulation regarding law requirements that are mandatory for firms). The present work examines CSR under a different prism. More specifically, it concentrates on the conditions under which the regulator or a private certifier can complement the provision of CSR by private firms, via the provision of certification to the firms that engage in CSR. We find that certification, public or private, enhances the participation of firms to CSR activities, while the lack of certification may discourage firms from engaging in CSR.

The rest of this paper is organized as follows: Section 2 presents the model. In Section

3 the different scenarios are solved and a detailed equilibrium analysis is conducted, whereas Section 4 examines the case of ex post determination of the certification standards. Section 5 briefly discuss Section 6 provides some concluding remarks.

2 The Model

We consider a market that consists of two firms, denoted by $i, j = 1, 2, i \neq j$, with each firm producing one brand of a differentiated good. The objective of each firm is profit maximization. In order to attain this objective, each firm has the option to follow a “doing well by doing good” strategy, through its engagement in *missioned* CSR activities. We consider that the latter take the form of investments in production technologies and business processes, along the value chain, that are employee and environmentally friendly (Porter and Cramer, 2002).

On the demand side there is a *unit mass* of consumers who have identical preferences regarding the physical characteristics of the two goods. Yet, they are heterogeneous regarding their valuation of the CSR activities undertaken by each firm. In particular, following Häckner (2000), the utility function of the θ -type consumer is given by:

$$U = (a + \theta s_i)x_i(\theta) + (a + \theta s_j)x_j(\theta) - [x_i^2(\theta) + x_j^2(\theta) + 2\gamma x_i(\theta)x_j(\theta)]/2 + m(\theta) \quad (1)$$

where $x_i(\theta)$, $i = 1, 2$, represents the quantity of good produced by firm i bought by the θ -type consumer and $m(\theta)$ is the respective quantity of the “composite good”. The parameter $\gamma \in (0, 1]$ is a measure of the degree of substitutability, with $\gamma \rightarrow 0$ corresponding to the case of almost independent goods and $\gamma = 1$ to the case of homogeneous goods. Hence, γ can also be interpreted as a measure of the intensity of competition between firms, with a higher γ corresponding to fiercer competition. In this context, we argue that the SR attributes attached to products, through the firms’ CSR activities, are *unobservable* by consumers, even after consumption. Thus, the SR attributes of a product are classified as a *credence good* with $s_i \geq 0$ representing the CSR effort that firm i undertakes, which, in turn, increases the θ -type consumer’s valuation for its good by θs_i . In other words, θ represents the increase of the θ -type consumer’s willingness to pay for the firm i ’s good, per unit of CSR effort undertaken by this firm. Thus, the more socially conscious a consumer is, the higher is his θ . A consumer who

does not value the CSR activities at all is then of type $\theta = 0$. We assume that θ is distributed uniformly with $\theta \in [0, 1]$ with a density function $f(\theta) = 1$. Then $\bar{\theta} = 1/2$ represents the average type of consumer in the population.

Maximization of (1) with respect to $x_i(\theta)$, $x_j(\theta)$ gives the (inverse) demand functions for the θ -type consumer:

$$p_i = a + \theta s_i - x_i(\theta) - \gamma x_j(\theta), \quad i, j = 1, 2, i \neq j \quad (2)$$

By inverting (2) we obtain the θ -type consumer's demand functions:

$$x_i(\theta) = \frac{a(1 - \gamma) + \theta(s_i - \gamma s_j) - p_i + \gamma p_j}{1 - \gamma^2} \quad (3)$$

where p_i and p_j are the firms' prices, while the price of the composite good has been normalized to unity.

By integrating (3) with respect to θ and setting $\bar{\theta} = 1/2$, we get firm i 's demand function:

$$q_i(p_i, p_j) = \int_0^1 x_i(\theta) d\theta = \frac{a(1 - \gamma) + \frac{1}{2}(s_i - \gamma s_j) - p_i + \gamma p_j}{1 - \gamma^2} \quad (4)$$

Finally, by inverting (4), we obtain the firm i 's (inverse) demand function:

$$p_i(q_i, q_j) = a + \frac{1}{2}s_i - q_i - \gamma q_j, \quad i = 1, 2, i \neq j \quad (5)$$

Observe that firm i 's inverse demand is positively related to the average consumer type $\bar{\theta}$ and firm i 's CSR effort level s_i . This reflects the main idea of our model, that is, socially conscious consumers increase their valuation for the product a firm undertaking CSR efforts. This, in turn, increases the demand for this firm's product.

We assume that firms are endowed with identical constant returns to scale production technologies. Firm i 's total cost function is given by $C_i(q_i, s_i) = c(1 + s_i^2)q_i$ with $0 < c < a$. This implies that, for a given CSR effort s_i , the firm i 's marginal (and unitary) cost is constant and equal to $c(1 + s_i^2)$. Yet, a higher CSR effort level increases, at an increasing rate, firm i 's unitary costs. This is justified on the grounds that an individual firm's level of CSR activities, such as improving working conditions for employees, buying more expensive inputs from local suppliers, financing recycling and other SR campaigns or introducing "green" technologies, has

an increasingly negative impact on the firm’s unit production costs.¹⁰

The following assumption guarantees interior solutions in all cases.

Assumption 1 $c(a - c) \geq \frac{1}{4}$

Assumption 1 requires that the marginal production cost c whenever firm i undertakes zero CSR effort is neither too low nor too high.¹¹

Firm i ’s profits can then be expressed as:

$$\Pi_i = (a + \frac{1}{2}s_i - q_i - \gamma q_j)q_i - c(1 + s_i^2)q_i \quad (6)$$

Therefore, firm i ’s CSR activities s_i lead to higher consumers’ valuation for its product and thus to higher demand. At the same time, CSR activities increase firm i ’s unit and total production costs.

In our setup, given the credence aspect of the CSR efforts, a “market of lemons” problem may arise. In particular, once consumers have been convinced that firm i has undertaken the missioned CSR effort s_i , they have increased their willingness to pay for the firm’s good. However, given the credence aspect of the CSR efforts, in the absence of any credible information disclosure mechanism, firm i has incentives to cheat consumers and avoid any spending on costly CSR activities. In such a situation, consumers anticipate firm i ’s incentives to cheat them and rationally believe that there will be zero CSR activities ($s_i = 0$). The firm, in turn, spends zero on CSR in equilibrium. Hence, it is precisely this imperfect information that will cause that complete breakdown of the SR related goods’ market.

In order to avoid the collapse of the SR related goods’ market, there is need for an information disclosure mechanism to credibly signal the firms’ CSR efforts to consumers. In this context, certification by a third party, verifying “the fulfillments of a firm to certain criteria or

¹⁰One could argue that CSR activities could also have benefits on firms’ costs, e.g. through the introduction of “green” technologies leading to decreased expenses for costly inputs such as electricity or petrol in the long term. Incorporating these cost reductions due to firms’ CSR activities will not qualitatively change our main results. However, our results may be sensitive to the existence of high sunk costs related with CSR. Such examples could be the installation of filters in a polluting facility in order to abate externalities caused by its operation, or the deployment of a production process that decreases labor accidents so as to ensure working safety for employees. Such fixed costs may affect firms decision to engage in CSR.

¹¹In fact, a too low or too high per unit of output CSR cost c may, under some circumstances, lead firms not to engage in CSR. Relaxing Assumption 1 would create unnecessary analytical complications without qualitatively altering our main results.

standards” (Bottega and De Freitas, 2009), serves as a credible information disclosure mechanism of firms’ CSR activities that are unobservable by consumers. As Auriol and Schillizzi (2003) mention, “*certification may be defined as a process whereby an unobservable quality level of some product is made known to the consumer through some guarantee system, usually issued by a third independent party. In other words, certification is a process for transforming a credence attribute into a search attribute*”.

The certification process can be undertaken by alternative organizations that differ with respect to their objective. In the present paper, we consider the following three organizational forms: In the first case, the certifier is a private company that sets a CSR certification standard and charges the respective fee so as to maximize its profits. The second is the case where the standard and the fee are set by a public certifier motivated by social welfare maximization. Note that in this case too, the CSR certification standard is voluntarily purchased by firms and the public certifier can not exclude from the market any firm not complying with it. This is in contrast to Bottega and De Freitas (2009), where, the regulator sets compulsory standards and has the possibility to exclude from the market products that do not fulfill these standards. In the third case, the certifier is a NGO that sets a CSR certification standard and the respective fee so as to maximize consumers’ surplus. This is justified on the grounds that NGOs behave in a way trying to meet consumers’ “demand for corporations to behave prosocially on their behalf” (Benabou and Tirole, 2010) because of their “impure altruism” (Andreoni, 1990). Qualitatively, in the present paper, the NGO’s objective is similar to the respective of Bottega and De Freitas (2009). There, the NGO’s objective is to maximize the average environmental quality, which is their model’s vertical differentiation variable, purchased by consumers. As in Heyes and Maxwell (2004), here too, since environmental quality is a component of social welfare, one can also consider that the public certifier and the NGO maximize a differentially weighted social welfare function.

Following Bottega and De Freitas (2009), we make two more assumptions: First, the certification technology is the same for all the different certification agents; which, moreover, face the same fixed monitoring cost. Second, monitoring is almost perfect, i.e., the probability that the certifier catches the firm when cheating consumers is almost one. Hence, if consumers notice the CSR certification of a product, they are aware that the respective firm is socially responsible.

2.1 The sequence of moves

We consider a three-stage game. In the first stage, the certifier sets the CSR certification standard and the respective fee, based on its objective. In the second stage, firms simultaneously and independently, either undertake the CSR efforts complying with the standard set and purchase the certificate at the given fee or do not engage in CSR activities at all. In the last stage, firms compete in the market by setting quantities, while consumers make their purchases according to their type towards CSR and the firms' CSR certificates realized in the previous stage.¹² We solve the games by employing the Subgame Nash Perfect Equilibrium (SPNE) solution concept.

2.2 The Benchmark case: No-certification

We begin our analysis by briefly presenting the benchmark case where there is no certification mechanism to disclose credible information to consumers regarding the firms' CSR activities. As mentioned above, in this case, consumers rationally believe that firms undertake zero CSR activities ($s_i = 0$, $i = 1, 2$). This turns out to be a standard Cournot game with horizontally differentiated goods, where each firm chooses output to maximize profits:

$$\Pi_i = (a - q_i - \gamma q_j)q_i - cq_i \quad (7)$$

From the first order condition, the reaction function of firm i is:

$$q_i = R_i^N(q_j) = \frac{a - \gamma q_j - c}{2} \quad (8)$$

By symmetry, we obtain each firm's equilibrium output, price and profits, respectively:

$$q^N = \frac{a - c}{2 + \gamma}; \quad p^N = c + \frac{a - c}{2 + \gamma}; \quad \pi^N = (q^N)^2 \quad (9)$$

Finally, since all consumers have identical preferences over the physical characteristics of the two goods and there is a unit mass of them in the population, it turns out that each consumer buys quantity $x^N = q^N$ from each good. Moreover, using (1) and (9), it can be

¹²The decisions over CSR effort and output levels are taken in subsequent stages because although CSR efforts are unobservable, if a firm is certified in the second stage, its CSR efforts are guaranteed by the certifier before this firm set its quantity.

checked that the consumers' surplus and social welfare are given by $CS^N = (1 + \gamma)(q^N)^2$ and $TW^N = (3 + \gamma)(q^N)^2$, respectively.

Note that, as γ increases, the brands sold become closer substitutes and market competition becomes fiercer. As a result, the size of the market and the segment that each firm exploits decrease. Hence, as $\gamma \rightarrow 1$, this negative product differentiation effect becomes more severe and firm i 's output level and profits decrease too. An immediate consequence is that consumers' surplus and social welfare also decrease in γ .

3 Private certifier

We now consider the case in which firms' CSR efforts are certified by a private profit-maximizing certifier that sets the CSR standard and the respective certification fee. As a candidate equilibrium, we assume that both firms undertake CSR efforts complying with the standard and purchase the certificate. We then ask whether this is an equilibrium configuration.

In the last stage of the game, firms anticipate that their CSR efforts have been credibly disclosed to consumers, via certification. Then, firm i , taking as given the output of the rival firm q_j , chooses q_i to maximize its profits, given by (6).

The first order condition of (6) leads to firm i 's reaction function:

$$q_i^P = R_i^P(q_j) = \frac{a - c - \gamma q_j}{2} + \frac{s_i^P(\frac{1}{2} - cs_i^P)}{2} \quad (10)$$

Comparing $R_i^P(q_j)$ with the benchmark case with no certification $R_i^N(q_j)$, the following observations are in order: First, $R_i^P(q_j)$ has an additional term capturing the two effects of CSR efforts s_i^P on firm i 's output level, depicted by $\frac{\partial q_i^P}{\partial s_i^P} = \frac{\frac{1}{2} - 2cs_i^P}{2}$. On the one hand, CSR efforts increase the demand for firm i 's good by $\bar{\theta} = 1/2$, i.e., the average type of consumer's willingness to pay. Thus, CSR efforts tend to increase equilibrium output and profits. On the other hand, CSR efforts increase firm i 's unit costs, tending to decrease equilibrium output and profits. Second, output level has an inverted U-shaped relation with CSR efforts, with the maximum attained at $s_i^P = 1/4c$. The intuition goes as follows. For a relatively low level of CSR efforts, i.e. when $s_i^P < 1/4c$, its further small increase leads to an increase in q_i^P (since $\frac{\partial q_i^P}{\partial s_i^P} > 0$) because the positive demand increase effect dominates the negative unit cost effect. This reasoning is reversed for relatively higher levels of CSR efforts, i.e. when $s_i^P > 1/4c$, in which case the CSR efforts' further increase induces an increase in unit costs and a reduction in

output level, as compared to the benchmark case with no certification. Third, firm i 's reaction function $R_i^P(q_j)$ depends on the rival firm's CSR effort s_j , but only through q_j .

Solving the system of first order conditions, we obtain firm i 's output and gross profits, respectively:

$$q_i^P(s_i^P, s_j^P) = \frac{a(2 - \gamma) + \frac{1}{2}(2s_i^P - \gamma s_j^P) - c \left[2 \left[1 + (s_i^P)^2 \right] - \gamma \left[1 + (s_j^P)^2 \right] \right]}{(4 - \gamma^2)}$$

$$\Pi_{ig}^P(s_i^P, s_j^P) = [q_i^P(s_i^P, s_j^P)]^2 \quad (11)$$

Π_{ig}^P represents firm i 's gross profits from engaging in CSR, before the payment of the certification fee.

In the second stage, firms simultaneously and non-cooperatively decide whether to undertake the CSR efforts complying with the standard, set by the private certifier in the first stage, and purchase the respective certificate. Firm i engages in CSR only if its profits, net from the certification fee (F), are equal or higher than the net profits in the benchmark case with no certification, i.e., iff: $\Pi_{in}^P = \Pi_{ig}^P(s_i^P, s_j^P) - F \geq \pi^N$.

Following Bottega and De Freitas (2009) and Hardling and Alexander (2003), we assume that the private certifier, when setting the CSR certification standard and the respective fee, has all the bargaining power and hence is in position to extract all the extra profits from each firm's CSR activities, i.e. $\Pi_{ig}^P(s_i^P, s_j^P) - \pi^N$.¹³ This implies that the objective of the private certifier coincides with the maximization of firm i 's extra profits because of its CSR activities. The latter is equivalent to $\partial \left[\Pi_{ig}^P(s_i^P, s_j^P) - \pi^N \right] / \partial s_i^P = 0$.

Hence, in the first stage, the certifier sets the CSR standard at the level that maximizes firm i 's gross profits, i.e., $\partial \Pi_{ig}^P(s_i^P, s_j^P) / \partial s_i^P = 0$. This implies that the fee charged by the certifier to each firm will be precisely equal to the same firm's extra profits because of its CSR

¹³This assumption is based on the fact that the market for certifiers is not perfect, because in the real world, consumers will not trust any certifier. Yet, there may be cases where the certifiers are competing with each other in order to win the certification contracts, which lead to an alternative distribution of the bargaining power between the firms and the private certifier. It is easy to check that this will not change the level of CSR that the private certifier will set in order to provide the certificate, since the objective of the private certifier is still profit maximization. However, in this case firms would obtain higher net profits.

activities, i.e., $F = \Pi_{ig}^P(s_i^P, s_j^P) - \pi^N$.^{14,15}

Taking the first order conditions and exploiting symmetry, we obtain the CSR certification standard that the private certifier will set in equilibrium:

$$s^P = \frac{1}{4c} \quad (12)$$

Observe that the equilibrium CSR certification standard is set at the level maximizing the positive effect of CSR efforts on output and profits. Moreover, s^P is the level of CSR efforts that each firm will undertake in equilibrium. If a firm undertake a CSR effort level lower than s^P then, this firm simply does not comply with the standard and cannot be certified. On the other hand, no firm has incentives to undertake a CSR effort level higher than s^P because this higher effort level would be inconsistent with the certification fee F corresponding to a CSR effort level equal to s^P . Note also that the equilibrium CSR effort level decreases as the CSR (and output) “production technology” becomes less efficient, as captured by a higher c .

Substituting s^P into (11), (5) and (6), we obtain firm i 's equilibrium output, price, gross and net profits, as well as the fee that the private certifier charges, respectively:

$$q^P = \frac{1 + 16c(a - c)}{16c(2 + \gamma)}; p^P = \frac{3 + \gamma + 16c[a + c(1 + \gamma)]}{16c(2 + \gamma)}; \Pi_g^P = (q^P)^2; \Pi_n^P = \pi^N$$

$$F = \Pi_g^P - \pi^N = \frac{1 + 32(a - c)c}{256c^2(2 + \gamma)^2} \quad (13)$$

Given the CSR certification standard $s^P = \frac{1}{4c}$, in equilibrium, both firms will endogenously choose to engage in CSR activities. The following Proposition summarizes:

Proposition 1 *In equilibrium, the private certifier sets the CSR certification standard at a level $s^P = \frac{1}{4c}$, such that both firms engage in CSR activities. This standard is the equilibrium level of CSR efforts that each firm undertakes.*

The intuition goes as follows. By being certified, a firm credibly discloses information to

¹⁴This formalization allows us to consider that the private certifier can spend part of F on monitoring as well as on persuasive advertising, in order to increase consumers' awareness for CSR related products and hence, promote the certificate (Bottega and De Freitas, 2009).

¹⁵Obviously, the fee cannot exceed $\Pi_{ig}^P(s_i^P, s_j^P) - \pi^N$, because then no firm will have any incentives to engage in CSR and seek for certification.

consumers that it has truly undertaken the missioned CSR efforts. Hence, consumers increase their willingness to pay for this firm's product and the firm obtains a competitive advantage in the market, increasing its profits, provided that the rival firm does not engage in CSR. Moreover, when firm i is being certified, firm j 's decision either to abstain from CSR activities or, equivalently, to undertake but without being certified, signals to consumers that firm j has not undertaken any CSR activities at all, thus conceding competitive advantage to its rival. Now, the cost savings on CSR effort do not compensate for the revenue losses due to the decreased consumers' valuation for the firm j 's product. Thus, firm j 's decision either to abstain from CSR or to undertake but without being certified is unprofitable and hence, in equilibrium, both firms undertake CSR efforts complying with the standard and purchase the CSR certificate.

The above analysis suggests that an asymmetric configuration in which firm i is being certified while firm j does not, will never arise in equilibrium. It can be easily verified that in this case, firm j 's profits will be lower than the respective ones when both firms are certified. Moreover, the non-certified firm ends up with quantity and profits lower than the respective in the no-certification benchmark. Note also that the case in which none firm is being certified is not an equilibrium configuration. Firm i 's optimal response to the non-certified firm j is to be certified.

It can easily be checked that equilibrium output, price, gross and net profits decrease as products become closer substitutes ($\gamma \rightarrow 1$) and competition becomes fiercer. Moreover, equilibrium values decrease as the CSR (and output) "production technology" becomes less efficient (captured by a higher c). Since gross and net profits decrease with γ and c , it is easy to see that the fee F charged by the certifier, follows the same pattern.

We next compare the equilibrium outcomes in case of a private certifier with the respective in the benchmark case with no certification. The following Corollary summarizes:

Corollary 1 *(i) Equilibrium firm i 's output level and price are higher than the respective in the benchmark case with no certification.*

(ii) Equilibrium firm i 's net profits are equal to the respective in the benchmark case with no certification.

Intuitively, since $s^P = \frac{1}{4c}$, CSR activities shift the firms' output reaction curves outwards, implying a more aggressive behavior during the quantity setting stage which results in increased

equilibrium output, i.e. $q^P > q^N$. Moreover, since consumers' willingness to pay for CSR related products increases as firms undertake higher CSR efforts, it is clear that $p^P > p^N$. Since the private certifier charges a fee extracting all the extra profits from firm i 's CSR activities, firm i ends up with net profits equal to the respective in the no-certification benchmark, i.e., $\Pi_n^P = \pi^N$.

3.1 Welfare analysis

Next, we investigate the welfare effects of firms' CSR activities when these are certified by a private firm. Social welfare is defined as the sum of consumers' surplus, firms' profits and the certifier's fees:

$$SW^P = CS^P(\theta) + 2\Pi_n^P + 2F = CS^P(\theta) + 2\Pi_g^P \quad (14)$$

The consumer surplus of a θ -type consumer is given by:

$$CS^P(\theta) = (a + \theta s_1)x_1(\theta) + (a + \theta s_2)x_2(\theta) - [x_1^2(\theta) + x_2^2(\theta) + 2\gamma x_1(\theta)x_2(\theta)]/2 - p_1x_1(\theta) - p_2x_2(\theta) \quad (15)$$

In equilibrium, due to symmetry, we have $s_i^P = s_j^P = s^P$ and $p_i^P = p_j^P = p^P$. Hence, using (3) and after computations, (15) reduces to:

$$CS^P(\theta) = (1 + \gamma)[x^P(\theta)]^2 \quad (16)$$

where

$$x^P(\theta) = \frac{a + \theta s^P - p^P}{1 + \gamma} = q^P + \frac{(\theta - \frac{1}{2})s^P}{(1 + \gamma)} \quad (17)$$

because $p^P = a + \frac{1}{2}s^P - (1 + \gamma)q^P$. Hence, the consumers' surplus is given by:

$$CS^P = (1 + \gamma) \int [x(\theta)]^2 f(\theta) d\theta \quad (18)$$

Using (17), (18) becomes:

$$\begin{aligned}
CS^P &= (1 + \gamma) \left[\int_0^1 (q^P)^2 f(\theta) d\theta + \int_0^1 2 (q^P)^2 \frac{(\theta - \frac{1}{2}) s^P}{(1 + \gamma)} f(\theta) d\theta + \int_0^1 \frac{(\theta - \frac{1}{2})^2 (s^P)^2}{(1 + \gamma)^2} f(\theta) d\theta \right] \\
&= (1 + \gamma) (q^P)^2 + \frac{(s^P)^2}{(1 + \gamma)^2} var(\theta) = (1 + \gamma) (q^P)^2 + \frac{(s^P)^2}{12(1 + \gamma)^2} \geq (1 + \gamma) (q^N)^2 \quad (19)
\end{aligned}$$

because the second term is zero and the third term is proportional to the variance of θ . The last inequality is then due to $var(\theta) \geq 0$ (with the equality holding only for degenerate distributions $f(\theta) = \bar{\theta}$, for all θ).

Then, comparing CS^P with the respective one in the no-certification benchmark, we observe that the former is always higher. This is so because $CS^P \geq (1 + \gamma)(q^P)^2 > (1 + \gamma)(q^N)^2 = CS^N$. The intuitive explanation behind this result is similar to that regarding the higher output level under a private certifier, relative to the respective under no-certification. Since the certifier's profits are equal to the firms' extra profits because of their CSR activities, social welfare is higher too. Moreover, since output and profits decrease with c and increase with γ , it is easy to see that CS^P and TW^P follow the same pattern.

Note also that, ceteris paribus, an increase in the variance of social consciousness in the population of consumers increases both the consumers' surplus and social welfare. This is due to the fact that a more heterogeneous consumer population makes more dissimilar purchasing decisions. The utility gain of the highly conscious consumers overcompensates for the utility loss of the low consciousness consumers and consumer surplus is higher than under a more homogeneous population.

The following Proposition summarizes:

Proposition 2 *Consumers' surplus and social welfare:*

- (i) *Are always higher under a private certifier rather than under no-certification.*
- (ii) *Increase when the production technology becomes more efficient, as captured by a lower c .*
- (iii) *Decrease when the goods are less differentiated and the market competition becomes fiercer (higher γ).*
- (iv) *Increase when the variance of social consciousness in the population of consumers*

increases.

A number of observations are in order. First, there is alignment of market and social incentives for certifying firms' CSR activities. Firms, by engaging in CSR activities, obtain higher profits due to consumers' increased willingness to pay for their products. Moreover, consumers' surplus increases because firms are satisfying their demand for socially responsible products. The above Proposition offers a number of policy implications as well. It suggests that policy makers should take measures to promote CSR activities, e.g. by raising firms' awareness regarding social and environmental issues. Raising consumers' awareness, through informational campaigns, can also play an "important role in providing incentives for responsible production and responsible business behaviour. Consumers are expected to exercise critical choice and encourage good products and good companies." (European Commission, 2006).

4 Public certifier

In this section we examine the case in which a public certifier sets an industry-wide CSR certification standard, so as to maximize social welfare, and provides the respective certificate to the firms complying with the standard.¹⁶ Similarly to the previous case, the public certifier monitors and certifies firms' CSR efforts, given that the probability of tracing a firm revealing untruthful information is almost unity. The cost of monitoring is fixed M and is paid by each firm that wishes to be certified. Here too, we assume that both firms comply with the CSR standard. We then ask whether this is an equilibrium configuration.

In the last stage of the game, firms anticipate that their CSR efforts have been credibly disclosed to consumers, via certification. Then, firm i , taking as given the output of the rival firm q_j , chooses q_i to maximize its profits, given by (6).

The first order condition of (6) leads to firm i 's reaction function:

$$q_i^R = R_i^R(q_j) = \frac{a - c - \gamma q_j}{2} + \frac{s^R(\frac{1}{2} - cs^R)}{2} \quad (20)$$

Note that (??) is algebraically the same with (??). Moreover, in the present case, symmetry ($s_i^R = s_j^R = s^R$) can be exploited ex-ante. This is so because the CSR certification standard

¹⁶In Bottega and De Freitas (2009), the respective public certifier is a regulator who sets a compulsory standard. On the contrary, we consider that the certificate is voluntarily purchased by firms.

set by the public certifier is ex-ante industry-wide and uniform for both firms.¹⁷

Solving the system of first order conditions and exploiting symmetry, we obtain firm i 's output and gross profits, respectively:

$$q_i^R(s^R) = \frac{a + \frac{1}{2}s^R - c \left[1 + (s^R)^2 \right]}{(2 + \gamma)}; \quad \Pi_{ig}^R(s^R) = [q_i^R(s^R)]^2 \quad (21)$$

Π_{ig}^R represents firm i 's gross profits from engaging in CSR, before the payment of the monitoring cost.

In the second stage, firms simultaneously and non-cooperatively decide whether to undertake the CSR efforts complying with the standard, set by the public certifier in the first stage, and purchase the respective certificate. Firm i engages in CSR only if its profits, net from the monitoring cost, are equal or higher than the net profits in the benchmark case with no certification, i.e., iff: $\Pi_{in}^R = \Pi_{ig}^R(s^R) - M \geq \pi^N$. Hence, firm i engages in CSR iff: $\frac{s^R(\frac{1}{2} - cs^R)}{(2+\gamma)^2} [2(a-c) + s^R(\frac{1}{2} - cs^R)] \geq M$, which gives:

$$\bar{s}^R \leq \frac{1 + \sqrt{1 + 16c \left(a - c - \sqrt{(a-c)^2 + M(2+\gamma)^2} \right)}}{4c}, \quad 0 \leq M \leq \frac{1 + 32c(a-c)}{256c^2(2+\gamma)^2} \quad (22)$$

The above inequality represents the CSR effort participation constraint for firm i . Note that when the public certifier charges the minimum monitoring cost, i.e., $M = 0$, then \bar{s}^R is maximized ($\bar{s}^R = 1/2c$) and $q^R = q^N$. The latter equality holds because at $\bar{s}^R = 1/2c$, the two opposing effects of CSR efforts on firm i 's output (the positive demand increase effect and the negative unit cost effect) neutralize each other and hence, there is no shift on the firms's output reaction functions. Observe also that the maximum monitoring cost that the public certifier can charge is equal to the optimal fee that the private certifier sets (see 13). In this case, the public certifier has no consideration for consumers' surplus in its objective function and behaves as the private one, i.e., sets the standard at a level maximizing the firms' extra profits from their CSR activities. An immediate consequence of $M = F$ will be that $q^R = q^P$ and $\Pi_g^R = \Pi_g^P$. We also identify that $\frac{\partial \bar{s}^R}{\partial M} < 0$, implying that each firm's incentives to spend in

¹⁷This was not the case when the standard was set by a private certifier, where, the solution concept of backwards induction implies that at the first stage of the game there are two candidate optimal CSR effort levels (s_i^{PC} and s_j^{PC}) and symmetry is exploited ex-post.

CSR efforts become weaker as the monitoring cost for being certified increases.

In the first stage, the public certifier sets the CSR standard so as to maximize social welfare given by:

$$TW^R = CS^R(s^R) + 2\Pi_n^P(s^P) + 2M = CS^R(s^R) + 2\Pi_g^P(s^P) \quad (23)$$

where, with respect to (17) and (19) $CS^R(s^R)$ is given by:

$$CS^R(s^R) = (1 + \gamma) (q^R)^2 + \frac{(s^R)^2}{12(1 + \gamma)^2} \quad (24)$$

From the first-order condition $\partial TW^R / \partial s^R = 0$, we obtain the socially optimal (first-best) CSR certification standard s_o^R .¹⁸ Note that if $s_o^R > \bar{s}^R$, s_o^R is inapplicable because the CSR effort participation constraint can not be fulfilled by any firm. This is precisely the case here. Hence, the public certifier will set $s^R = \bar{s}^R < s_o^R$, i.e. at the maximum level allowing the CSR effort participation constraint to be fulfilled by both firms. This is so because the public certifier's objective is to improve social welfare through giving incentives to both firms to undertake CSR efforts and comply with the standard.

Note also that s^R is the level of CSR efforts that each firm will undertake in equilibrium. Moreover, s^R decreases as the CSR (and output) "production technology" becomes less efficient. The above hold for reasons similar to those stated in the case of the private certifier.

Substituting s^R into (21), (5) and (6), we obtain firm i 's equilibrium output, price, gross and net profits, respectively:

$$q^R = \frac{\sqrt{(a - c)^2 + (2 + \gamma)^2 M}}{2 + \gamma}; p^R = a + \frac{1}{2}s^R - (1 + \gamma)q^R; \Pi_g^R = (q^R)^2; \Pi_n^P = \pi^N \quad (25)$$

Given the CSR certification standard s^R , in equilibrium, both firms will endogenously choose to engage in CSR activities. The following Proposition summarizes:

Proposition 3 *In equilibrium, the public certifier sets the CSR certification standard at a level $s^R = \bar{s}^R$, such that both firms engage in CSR activities. This standard is the equilibrium level of CSR efforts that each firm undertakes.*

¹⁸Due to space limits, the analytical formulas are presented in the Appendix.

The intuitive arguments are along the lines of the analysis for the private certifier. Note that in the present case too, an asymmetric configuration in which firm i is being certified while firm j does not, will never arise in equilibrium. Regarding consumers' surplus and social welfare, the qualitative analysis for the private certifier case (see Proposition 2) holds under the public certifier too.

4.1 Comparison

We next compare the equilibrium outcomes under the two different certification regimes, in order to capture their relative effects on market and societal outcomes.

The following Proposition summarizes our findings:

Proposition 4 *(i) The equilibrium level of CSR efforts is always higher under the public rather than under the private certifier.*

(ii) Firm i 's output level and gross profits are higher under the private rather than under the public certifier.¹⁹

(iii) The equilibrium price is always higher under the public rather than under the private certifier.

(iv) Consumers' surplus and social welfare are higher (lower) under the private rather than under the public certifier if and only if the public certifier's monitoring cost is low (high) enough, i.e., $M < \widetilde{M}$ ($M > \widetilde{M}$).

According to the first part of Proposition 4, the intuition goes as follows. The private certifier sets the standard at a level maximizing the firms' extra profits from their CSR activities, so as to charge the highest certification fee possible, maximizing its profits too. In this case there is no consideration for consumers' surplus in the private certifier's objective function. On the contrary, the public certifier sets the standard at a level giving incentives to both firms to spend on CSR efforts and comply with its standard, attaining the maximum level of social welfare. In the present case, the certifier incorporates socially conscious consumers' preferences and demand for firms' CSR activities. This implies that, besides firms' profits, the public certifier weights consumers' surplus positively, in its objective function. This results in a CSR standard

¹⁹ In the polar case where the monitoring cost set by the public certifier equals the private certifier's fee ($M = F$), firm i 's output level and gross profits under the public certifier are equal to the respective under the private one.

higher than the respective maximizing the firms' profits solely. Hence, the equilibrium level of CSR efforts is always higher under the public rather than under the private certifier.

This latter result has two opposing effects on firm i 's output level and gross profits. It induces a relatively larger outward shift of firm i 's output reaction curve as well as a relatively larger unit cost increase. Our analysis suggests that the former positive effect on output and gross profits is dominated by the latter negative effect. This happens because $s^R > s^P = 1/4c$, i.e., s^R ranges in the area where $\frac{\partial q}{\partial s} < 0$, while s^P is set at a level maximizing firm i 's output level. Hence, firm i 's output level and gross profits are higher under the private rather than under the public certifier, except if $M = F$, in which case they are equal.

According to the third part of Proposition 4, the equilibrium price is always higher under the public rather than under the private certifier. This is because even in the polar case where $M = F$ and $q^R = q^P$, according to Proposition 4(i), the equilibrium level of CSR efforts will be higher under the former rather than under the latter certification regime.

Regarding consumers' surplus, one can easily check that $(1 + \gamma) (q^P)^2 \geq (1 + \gamma) (q^R)^2$ and $\frac{(s^P)^2}{12(1+\gamma)^2} < \frac{(s^R)^2}{12(1+\gamma)^2}$. Thus, the quantity effect under the private certifier is higher than (or, in the polar case where $F = M$, equal to) the respective under the public one. On the contrary, the CSR effect is always lower under the private certifier. Our analysis suggests that if the public certifier's monitoring cost is low enough, i.e., $M < \widetilde{M}$, the quantity effect dominates the CSR effect and consumers' surplus is higher under the private certification regime.²⁰ This counterintuitive result is explained as follows. For a relatively low monitoring cost, i.e., $M < \widetilde{M}$, its small increase leads to a decrease in the CSR effect (since $\frac{\partial s^R}{\partial M} < 0$) that induces an increase in the quantity effect (since $\frac{\partial q^R}{\partial s^R} < 0$). Nevertheless, this quantity effect increase does not compensate for the CSR effect decrease. As a consequence, consumers' surplus under the public certifier decreases and becomes lower than the respective under the private certifier. This reasoning is reversed if the monitoring cost is relatively high, i.e., $M > \widetilde{M}$, and increases, in which case the output effect increase compensates for the CSR effect decrease. As a consequence, consumers' surplus under the public certifier increases and becomes higher than the respective under the private certifier.

Regarding social welfare, we know that whether consumers' surplus under the private certifier is higher than the respective under the public one depends on the level of monitoring cost.

²⁰Due to space limits, the analytical formula of \widetilde{M} is available from the authors upon request.

Moreover, gross profits under the private certifier are higher than (or, in the polar case where $F = M$, equal to) the respective under the public one. Hence, social welfare is higher under the private rather than under the public certifier if and only if the public certifier's monitoring cost is relatively low, i.e., $M < \widetilde{M}$.

The above analysis suggests the crucial effects of the public certifiers' monitoring cost on the market and societal outcomes under the different certification regimes.

Now, let us focus on consumers' surplus. This is increasing in CSR effort. Hence, since $s^{RC} > s^{PC}$, then consumers' surplus in the "certification by the regulator" scenario is higher than the alternative ones. It is obvious from the above analysis that social welfare is analogous to consumers surplus.

5 Extensions-Discussion

In this section we examine a number of modifications of the basic model in order to briefly discuss the robustness of our main results.²¹

5.1 Price Competition

In the basic model we have assumed that firms compete in quantities. Consider now the case where firms compete in prices. Our results remain qualitatively robust under this scenario too. Similarly to the case discussed above, in the present case too, we find that in the presence of either certification status, both firms will engage in CSR activities, hence consumers' surplus and social welfare increase comparing to "no certification". We also find that the regulator will set higher standards of CSR effort relative to the profit-maximizing certifier.

Moreover we compare how the mode of competition may alter the main equilibrium results in each certification scenario. We find that when firms compete in prices rather than quantities then in both certification scenarios, equilibrium output, consumers surplus and social welfare are higher, while firms prices and profits are lower. The reason is that competition in prices is fiercer than competition in output.²² Additionally, under price competition, when there is public certifier, firms' CSR effort certification standard is lower. The intuition is that, in the public certifier scenario the regulator will set the standards of CSR effort with respect to firms'

²¹For each extension discussed below, the detailed analysis is available from the authors upon request.

²²See the seminal paper by Singh and Vives (1984).

participation constraint to CSR in both modes of competition. Hence, lower profit margins under price competition will lead to lower levels of firms' participation constraint to CSR and therefore to lower firms' CSR effort certification standard, than in output competition.

5.2 Timing of the Game

In the basic model we have assumed that the certifier commits to CSR certification standard in the first stage, and then firms decide if they comply to the standard or not. Under this timing the certifier is regarded as the Stackelberg leader that chooses the CSR effort level *ex ante*. On the other hand, firms are considered as Stackelberg followers that take CSR effort as given.²³ We now examine the case where the *ex post* configuration of the CSR standard is configured *ex post*, that is after firms have chosen optimally their CSR effort. We undertake this task by considering a three-stage game. Given the firms decisions over CSR effort in the first stage, under this alternative specification, in the second stage, the certifier public or private sets the CSR certification standard with respect to its objective. In the last stage, firms compete in the market by setting quantities, while consumers make their purchases according to their type towards CSR and the firms' CSR certificates realized in the previous stages. Interestingly, all our results remain unaltered under the private certifier scenario. However, this is not the case in the public certifier scenario. Now the public certifier will set the same certification standard to the private one. The intuition behind this result is that the objective function maximized by both firms and the private certifier is the same in both timing configurations, that is firms gross profits. Therefore, in the *ex post* game the private certifier is able to credibly commit to the same CSR standard level as in the *ex ante* game. Hence, the timing of the certification makes no difference here. Yet, this does not hold for the public certifier scenario. Now, when firms, which are Stackelberg leaders commit first to their optimal level of CSR effort, their objective is different (profit maximization) than the private certifiers' which now is Stackelberg follower (total welfare). Hence under this alternative timing, firms will choose less CSR effort than the corresponding value that the public certifier. Then, any attempt by the public certifier to commit to a higher CSR certification level is not credible, because after firms have set their CSR effort levels, the public certifier's best response is to certify this positive effort. Otherwise, firms maybe discouraged from engaging in any CSR activities. Since welfare is higher if firms

²³See for instance, Petrakis and Xepapadeas (2003).

engage in positive CSR than engage in zero CSR, then the regulator can only credibly commit to firms optimal CSR effort as a certification standard.²⁴

5.3 Certification by a Non Governmental Organization

An interesting extension of the present model is the scenario in which the CSR certification is provided by a Non Governmental Organization (NGO). The objective of a non for profit NGO is to maximize consumers utility²⁵. This can be formalized by our basic model by assuming that the objective function of the NGO coincides with the consumers' surplus, or alternatively, the NGO maximizes a total welfare function with higher weight on consumers' surplus comparing to the public certifier. Hence, given the positive relationship between consumers surplus and CSR efforts, the NGO optimal certification standard for CSR activities will always be higher than the corresponding values the public certifier would set. Yet, given firms participation constraint CSR levels and by considering Proposition 3, then the NGO will set exactly the same CSR certification standard as the public certifier and all equilibrium outcomes coincide to the latter scenario.

5.4 The role of persuasive advertising

Furthermore, we examine how an additional policy instrument, like persuasive advertising, can be used by the regulator in order complement the provision of CSR by private firms. More specifically, we assume that information provision is conducted via persuasive advertising by the certifier, which will increase the fraction of socially conscious consumers in the market. This is formalised in the present model in the present model as an increase in $\bar{\theta}$.²⁶ ²⁷ There are two opposite effects on welfare from the use of persuasive advertising. First, from (6) and (??) it is easy to check that persuasive advertising has a positive effect on firms profits. Since an increase in $\bar{\theta}$ enhances the increase in demand for the final good of the firms that engage

²⁴The rationale behind this result can also be applied in a monopolistic context. Bottega and De Freitas (2009) find that in a monopoly the regulator will set higher quality certification standard for a credence good, than a private certifier, in an ex ante certification game. This changes if one assumes ex post determination of the certificate. In the latter case the regulator will set the same quality standard as the private certifier.

²⁵See for instance, Benabou and Tirole (2010), Bottega and De Freitas (2009) and Alexander and Harding (2003).

²⁶For instance, Garcia-Gallego and Georgantzis (2008) examine how changes in $\bar{\theta}$ may influence the competition status in a market.

²⁷In the present model, for this increase to be effective, information provision should be combined with certification, or else a "market of lemons problem" will be in effect.

in CSR, firms benefit from CSR activities increases. This also leads to the increase of CSR effort undertaken by firms in both scenarios, which amplifies Consumers' surplus and social welfare, as well. Second, there is also a negative effect of persuasive advertising, since investing in persuasive advertising imposes an additional cost which decreases social welfare. Thus, the final outcome from information provision via persuasive advertising depends on the relative weights of each effect on total welfare.

6 Conclusions

The present paper examines the conditions under which the provision of CSR by private firms can be complemented via certification. We consider two alternative scenarios: The first, refers to the case in which a private, profit-maximizing organization provides firms with a credible certificate about their SR activities. The second, considers the case in which the regulator intervenes, by providing the certification himself with respect to social welfare.

We find that if there is no credible information disclosure about SR characteristics of the firms' products to consumers, no firm will have incentives to undertake CSR effort in equilibrium. However, if the necessary information about the CSR aspects of each firm's product, otherwise unobservable, is revealed to consumers through certification, then the opposite holds. More specifically, in equilibrium, both firms' endogenous choice is to engage in CSR activities, hence consumers' surplus and social welfare increase comparing to the benchmark case without CSR activities. We find that the regulator will set higher standards of CSR effort with respect to firms' participation constraint to CSR comparing to the profit-maximizing certifier. Finally, consumers' surplus and social welfare are higher (lower) under the private rather than under the public certifier if and only if the public certifier's monitoring cost is low (high) enough. The above results are robust qualitatively if the firms compete in prices. However, the above results change significantly, if we reconsider the timing of the game and assume that the regulator sets the CSR certification level ex post. In this case the regulator will have to set firms optimal effort to CSR as the certification level, since he cannot credibly commit to any higher certification level.

In the above analysis we have assumed that consumers are heterogeneous, regarding their valuation of the CSR activities undertaken by firms, with the continuous measure θ capturing the degree of consumers' social consciousness.

We believe that our framework provides all the essential insights about the firms' incentives to spend on CSR and the effects of the alternative certification regimes to their CSR activities. A generalization to an oligopolistic market structure with general demand and unit cost functions would not qualitatively alter our results as the driving forces of firms' CSR activities are, to a major extent, already captured in our simple model.

Given the current debate about the market and welfare implications of Corporate Social Responsibility the present paper sheds light on how certification may enhance firms' incentives to engage in CSR activities in oligopolistic markets.

Appendix

Socially optimal level of CSR

$$s^{R*} = \frac{1}{12c\Xi} [3c(1+\gamma)(3+\gamma) + \frac{c^2(1+\gamma)(3+\gamma)\Psi}{\sqrt[3]{Z}} + \sqrt[3]{Z}]$$

$$s^{R*} - \frac{1}{2c} = \frac{1}{12c} \left\{ \frac{1}{\Xi} [3c(1+\gamma)(3+\gamma) + \frac{c^2(1+\gamma)(3+\gamma)\Psi}{\sqrt[3]{Z}} + \sqrt[3]{Z}] - 6c \right\} > 0, \text{ given Assumption 1.}$$

since $\bar{s}^R < \frac{1}{2c}$, then $s^{R*} - \bar{s}^R > 0$ also.

where:

$$\Xi = \gamma^2 + 4\gamma + 3,$$

$$\Psi = \gamma^2 + 4\gamma + 1 + 48c(A - c) * \Xi \text{ and}$$

$$Z = c^3 \left[\sqrt{81(3+\gamma)^4(2+3\gamma+\gamma^2)^4 - \Xi * \Psi^3} - (324 + 1188\gamma + 1737\gamma^2 + 1296\gamma^3 + 522\gamma^4 + 108\gamma^5 + 9\gamma^6) \right].$$

Proof of Proposition 4

If the participation constraint CSR effort is set by the regulator,

$$\text{then } \bar{s}^R - s^{PC} = \sqrt{\frac{1}{4} + 4c(a-c) - 4c\sqrt{(a-c)^2 + M(2+\gamma)^2}} > 0, M \in [0, \frac{[8c(a-c) + \frac{1}{4}]}{32c^2(2+\gamma)^2}].$$

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