



Strategic environmental corporate social responsibility in a differentiated duopoly market



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HIGHLIGHTS

- Effects of competition modes on a NGO certifier's standard setting are examined.
- Effects of certification on firms' strategic incentives for ECSR are also examined.
- The NGO certifier will set a standard lower than the optimal one.
- The standard in Cournot competition is higher than that in Bertrand competition.
- Firms and consumers both benefit from firms' certified ECSR.

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ABSTRACT

This paper investigates the impacts of competition structures on firms' incentives for adopting strategic environmental corporate social responsibility (ECSR) certified by a Non-Governmental Organization. We show that, to induce firms to adopt certified ECSR, the certifier will set a standard lower than the optimal one, and the standard in Cournot competition is higher than that in Bertrand competition. Finally, we show that firms and consumers benefit from firms' certified ECSR.

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1. Introduction

Corporate social responsibility (CSR), originating from the expectations of the society for business adopting appropriate business behavior and outcomes (Wood, 1991), has received increasing attention from firms and researchers in the past few decades. An extensive global survey found that over half of the reporting companies worldwide now include their CSR information in their annual financial report. Fifty-nine percent of the world's largest

companies (G250) invest in external assurance to provide stakeholders credibility of their CSR reputation (KPMG, 2013).

The perspectives of CSR have evolved from whether CSR should exist (for example, Friedman, 1970; Freeman, 1984; Wood, 1991) to why it does exist and how it affects the economy (for example, Baron, 2001, 2009; Porter and Kramer, 2006; Benabou and Tirole, 2010).¹ Due to the credence feature of CSR activities, recent literature, such as Manasakis et al. (2013, 2014), emphasizes the importance of a credible information disclosure mechanism for a

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¹ Kitzmueller and Shimshack (2012) offer a thorough survey on the economic perspectives of CSR.

sustainable CSR related good market. In general, they find that CSR activities with a credible information disclosure system are welfare enhancing for consumers and firms and should be encouraged.

Third-party certification, which transforms the credence features of CSR activities into observable search attributes, has emerged as an information disclosure mechanism to ensure a sustainable development. In the meantime, the label competition among certifiers resulting from the dilemma regarding the stringency of a standard and the compliance rate of firms has also emerged. In particular, Manasakis et al. (2013) investigate the impacts of alternative certifying institutions on firms' incentives to undertake CSR activities and their relative market and societal implications.

Vermeer and Michalko (2010) report that NGOs are the most prevalent ecolabelers.² Departing from the label competition, in this paper, we investigate a NGO certifier's rationale on standard setting and firms' strategic incentives of adopting pollution abatement as environmental CSR (ECSR) in alternative competition structures. The NGO certifier sets an ECSR standard and verifies the fulfillment of firms to maximize net consumer surplus (NCS), which is defined as the gross consumer surplus net off the environmental damage resulting from firms' emission.

Our results contribute to the literature studying NGOs' certification in credence good markets under alternative competition structures. We find that, to induce firms to adopt certified ECSR, the certifier will set a standard that is lower than the optimal one, both in Cournot and in Bertrand competition. We also find that the certifier will set a higher standard in Cournot competition than in Bertrand competition. Finally, we find that certified ECSR benefits firms and consumers and should be encouraged.

2. The model

Following Singh and Vives (1984) and Manasakis et al. (2013, 2014), the utility function of a representative consumer is

$$U = (A + e_1\alpha s_1)q_1 + (A + e_2\alpha s_2)q_2 - \frac{1}{2}(q_1^2 + q_2^2 + 2\gamma q_1q_2)$$

where q_i is firm i 's output and s_i is the level of ECSR firm i undertakes, $i = 1, 2$. The parameter $\gamma \in (0, 1)$ measures the intensity of market competition between firms, where a higher γ represents a more competitive market. The parameter $\alpha \in (0, 1)$ represents the consumer's preference for firms' ECSR. Here, we consider each firm uses costly pollution abatements s_i as its strategic ECSR.

Because the credence feature of CSR may result in a moral hazard problem, following Manasakis et al. (2013), we consider a NGO certifier, which seeks to maximize NCS, serves as a credible information disclosure mechanism of firms' ECSR. In particular, suppose that $\underline{s}$ is the minimum level of ECSR specified by the certifier for a firm eligible of receiving an ECSR certificate, we have

$$e_i = \begin{cases} 0 & \text{if } s_i < \underline{s} \text{ and firm } i \text{ does not receive a certificate,} \\ 1 & \text{if } s_i \geq \underline{s} \text{ and firm } i \text{ receives a certificate,} \end{cases} \\ i = 1, 2.$$

It is noteworthy that if a firm adopts the "doing-well-by-doing-good" strategy, then its ECSR would be either $s_i = 0$ or $s_i = \underline{s}$. On the one hand, a firm has no incentive to undertake a level of ECSR lower than $\underline{s}$ since it will not receive a certificate and its ECSR efforts will not be recognized by consumers. On the other hand, a firm will not undertake a level of ECSR greater than $\underline{s}$ since its ECSR effort beyond $\underline{s}$ causes more cost without bringing the firm further

benefits from demand. Thus, for any given α and $\underline{s}$, a representative consumer's utility can be rewritten as

$$U = (A + e_1\alpha\underline{s})q_1 + (A + e_2\alpha\underline{s})q_2 - \frac{1}{2}(q_1^2 + q_2^2 + 2\gamma q_1q_2).$$

The utility function generates the system of demand functions

$$q_i = \frac{(1 - \gamma)A + e_i\alpha\underline{s} - \gamma e_j\alpha\underline{s} - P_i + \gamma P_j}{1 - \gamma^2}, \\ i, j = 1, 2; i \neq j$$

which can be inverted to get the system of inverse demand functions

$$P_i = A + e_i\alpha\underline{s} - q_i - \gamma q_j, \quad i, j = 1, 2; i \neq j.$$

We assume that firms use an identical technology with a constant marginal production cost, which is normalized to be zero for simplicity. Consider one unit of output results in one unit of emission. To focus on the impacts of competition structures on the specified standard, we assume that each firm would be certified free of charge by the certifier if it complies with the standard. Firms' inputs in ECSR exhibit decreasing returns to scale, which is captured by the quadratic cost function of ECSR. Thus, a firm's profit is given as

$$\pi_i = \begin{cases} (A + \alpha\underline{s} - q_i - \gamma q_j)q_i - \underline{s}^2 & \text{if } e_i = 1, \\ (A - q_i - \gamma q_j)q_i & \text{if } e_i = 0, \end{cases} \\ i, j = 1, 2; i \neq j.$$

Finally, given the linear specification of demand, NCS is given as

$$NCS = \frac{q_1^2 + q_2^2 + 2\gamma q_1q_2}{2} - \frac{d(q_1 + q_2 - e_1\underline{s} - e_2\underline{s})^2}{2},$$

where $d > 0$ is the marginal environmental damage of firms' emission.

In the following subsections, we examine firms' incentives of adopting ECSR and its market and societal implications. For the symmetry between firms, we focus on symmetric equilibrium only.

2.1. Cournot competition

Let superscript CN denote the equilibrium outcome with firms not adopting ECSR in Cournot competition. Standard calculation gives

$$q^{CN} = \frac{A}{2 + \gamma}, \quad P^{CN} = \frac{A}{2 + \gamma}, \\ \pi^{CN} = \frac{A^2}{(2 + \gamma)^2}, \quad NCS^{CN} = \frac{(1 + \gamma - 2d)A^2}{(2 + \gamma)^2}. \quad (1)$$

Let superscript CC denote the equilibrium outcome with firms adopting certified ECSR in Cournot competition. Standard calculation gives

$$q^{CC} = \frac{A + \alpha\underline{s}}{2 + \gamma}, \quad P^{CC} = \frac{A + \alpha\underline{s}}{2 + \gamma}, \\ \pi^{CC} = \frac{(A + \alpha\underline{s})^2}{(2 + \gamma)^2} - \underline{s}^2, \\ NCS^{CC} = \frac{(A + \alpha\underline{s})^2(1 + \gamma) - 2d[A - \underline{s}(2 + \gamma - \alpha)]^2}{(2 + \gamma)^2}. \quad (2)$$

For $q^{CC} \geq \underline{s}$, $\underline{s} \leq \frac{A}{2 + \gamma - \alpha}$ must be satisfied.

Comparing firms' equilibrium profits with and without adopting ECSR, we have

$$\pi^{CC} - \pi^{CN} = \frac{2A\alpha\underline{s} - \underline{s}^2[(2 + \gamma)^2 - \alpha^2]}{(2 + \gamma)^2}.$$

² The website www.ecolabelindex.com tracks 458 ecolabels in 25 industry sectors worldwide.

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