Strategic Corporate Social Responsibility

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Abstract

We examine the strategic use of corporate social responsibility (CSR) in oligopolistic markets. In our model, a CSR firm is not only concerned with profits but also with consumer surplus. First, we consider symmetric Cournot competition and show that the evolutionary stable level of CSR is positive for any given number of active firms. However, positive CSR levels imply smaller equilibrium profits. Second, we find that an incumbent monopolist may profitably use CSR as an entry deterrent. Both results indicate that CSR may increase market concentration and possibly be anticompetitive. Third, we show that a CSR firm performs better than a merely customer oriented firm in Cournot duopoly.

Keywords: Corporate Social Responsibility, Market Concentration, Entry Deterrence, Evolutionary Stability
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1 Introduction

Corporate Social Responsibility (CSR) has become a major concern for many firms, particularly large ones (Kopel and Brand, 2012, Kopel et al., 2014, Benn and Bolton, 2011). Among the various motives for CSR, its strategic use in markets with imperfect competition plays an important role (Garriga and Melé, 2004). The basic idea is that even pure profit-maximizing firms engage in CSR because it may serve as a commitment device for their strategy choices in oligopolistic environments. Based on this notion, our paper investigates the interplay between the market structure and the level of firms' social concern. We find a mutual impact: On the one hand, higher market concentration leads to higher levels of CSR. On the other hand, the strategic use of CSR increases market concentration.

To derive these results, we employ a simple model of a market for some homogeneous good with linear demand and constant marginal costs. As usual, we assume that firms have the original goal of profit-maximization. However, we consider competition between them as a two-stage game. In the first stage, firms decide upon their level of CSR modeled as the weight with which consumer surplus enters their objective function in addition to profit. This can be thought of as signing an appropriate corporate charter or employing an executive who is known to have an appropriate social concern. In the second stage, the firms' executives choose their production output in order to maximize their objective function. We examine three different scenarios.

In the first scenario (Section 4), we consider Cournot competition between an exogenously given number of symmetric firms and characterize the subgame-perfect equilibrium (SPE). We find that the equilibrium level of CSR is always positive, but decreases as the number of active firms rises. Moreover, for any given number of firms, the equilibrium profits will be smaller than in the regular Cournot model without CSR. In the presence of fix-costs, this leads to the conclusion that, in the long run, the strategic use of CSR may reduce the number of active firms and foster market concentration. The framework used for the analysis of this first scenario is similar to the one proposed by Kopel and Brand (2012) and Kopel et al. (2014). However, these authors only consider the duopoly case and a discrete choice of a CSR level of either zero or some exogenously given positive value. By contrast, we allow for more than two firms and continuous choices of CSR levels which enables us to study the interdependency of market concentration and CSR. The suggested two-stage game may as well be understood as an indirect evolutionary game (Güth and Yaari, 1992). Following this notion, our results imply that the evolutionary stable level of CSR is positive and

induces a higher market concentration.

Though the strategic use of CSR may reduce the number of active firms and foster market concentration, the implications for consumer surplus and welfare in the long run are less clear-cut. On the one hand, the lower number of active firms, ceteris paribus, reduces overall output. On the other hand, the positive CSR levels, ceteris paribus, increase output. Moreover, the lower number of active firms reduces aggregate fix-costs. Hence, there is no general answer to the question whether strategic CSR is socially desirable or may even be anticompetitive. However, we provide an example in which CSR reduces the equilibrium consumer surplus in the long run.

The same example illustrates that although CSR is associated with equilibrium profits that are smaller than regular Cournot profits in the short run, in the long run the opposite may hold due to the implied market consolidation. This raises the question whether CSR may also be used as a strategy to induce market exit or deter market entry. We address the latter question in Section 5. In this second scenario, we consider a market with an incumbent monopolist and one potential entrant. Here, the first stage of the game is split into two sequences: First the incumbent chooses its CSR level, then the potential entrant decides whether to incur the entry cost and, if so, which CSR level to enter with. Finally, in the case of entry, the second stage of the game again consists in Cournot competition between the two firms. We show that the strategic use of CSR yields a pattern that is well-known in models of entry: If entry costs are sufficiently high, entry will be blockaded and the incumbent will not engage in CSR because CSR is not profitable for a monopolist as such. However, for an intermediate range of entry costs, the incumbent finds it optimal to choose positive levels of CSR in order to deter entry. This observation reinforces our conclusion that the strategic use of CSR increases market concentration. Finally, if entry costs are sufficiently low, the incumbent will prefer to accommodate entry. In this case, both the incumbent and the entrant choose positive CSR levels with the former as the leader setting a higher level than the latter as the follower. Those findings suggest the testable hypothesis that well-established firms exhibit more CSR than market newcomers.

Adopting the indirect evolutionary approach, Königstein and Müller (2001) examine a closely related model in which firms decide upon their level of customer responsibility instead of social responsibility. Formally, the difference between CSR and corporate customer responsibility (CCR) is that CCR refers to the weight firms put on the surplus of their *own customers* whereas CSR refers to the weight they put on the surplus of *all consumers*. In the third scenario (Section 6), we therefore consider Cournot competition between two firms, one of which may choose a CSR level while the other may

choose a CCR level. We characterize the subgame-perfect equilibrium and find that both firms choose positive levels of responsibility. However, the CSR firm earns a higher equilibrium profit than the CCR firm. Thus, social responsibility offers a stronger commitment device than customer orientation.

2 Related Literature

Our paper contributes to the fast-growing literature on CSR. We focus on the work dealing with the strategic use of CSR. Kopel (2009) analyzes in how far CSR can provide a first mover advantage. In his set-up, CSR is modelled as a kind of vertical product differentiation, i.e. CSR is a characteristic of the produced good. The author finds that there is a first mover advantage if the CSR activities are specific to the leader, and the leader will, then, invest more in CSR. If spillovers exist and CSR also has a positive effect on the perceived quality of the follower's product, however, there is a second mover advantage. Goering (2010) introduces the use of CSR as a commitment tool as we do in our approach. In his model, CSR is the commitment to use a costly but environmentally friendly production technology which raises costs in future periods. Goering (2010) shows that the firm can thereby credibly bind itself to a lower production quantity in the future and can overcome the typical sales problems associated with durable goods. As our model, this approach does not rely on socially conscious consumers. Goering (2008b) deals with a non-profit firm which maximizes only its stakeholders' welfare[1] and competes against either a profit-maximizing firm or a public firm or both. His results raise the concern that social responsibility may reduce welfare if the respective firm is less efficient than its competitors. By contrast, we show that CSR may be welfare detrimental even in a perfectly symmetric scenario.

Our research also relates to the literature on strategic delegation. The question of how the owners of a firm may incentivize managers in order to maximize their profit has already been tackled in the seminal papers by Fershtman and Judd (1987) and Sklivas (1987). In a rather similar fashion, both show that profits of a company may be even higher if their managers are motivated to maximize an objective function that includes sales (revenue) in addition to profits. In Cournot competition, the manager's contract is used as a commitment device to expand the own output which then makes the competitors reduce their quantities accordingly.[2]

[1] While we assume that a CSR firm will only partly take consumer surplus into account, Goering (2008b) argue that this part consists of the firm's own stakeholders. Although the interpretation is different, the formulation is the same.

[2] By contrast, in Bertrand competition with differentiated products, incentives must be designed such that they lead to a less aggressive behavior of the manager, because prices

Our concept of strategic CSR may also be interpreted as giving a manager incentives that deviate from the original objective of profit-maximization. Goering (2007) chooses a similar approach where managerial incentives are different from the firm's true objective. However, in his model, the firm's objective actually includes consumer surplus. Still, his paper supports the notion that manipulating incentives may make managers more aggressive, and the firm's goal will be reached more efficiently. Similarly, in Kopel and Brand (2012) firms can choose to hire managers and the level of CSR is chosen endogenously. Again, CSR is assumed to be the firm's true objective and only one firm in the considered duopoly can be socially responsible. However, the authors find that CSR pays off, as long as it is not used too extensively, which is in line with our results. The same is shown by Kopel et al. (2014). Further, the authors adopt a dynamic approach, where the firms can endogenously choose to use CSR (i.e. hire a responsible manager) and switch their objective if they deem it profitable. Depending on the degree of product differentiation and social concern, either the profit-maximizing or the CSR firm or even both types will survive and there may also be unstable equilibria and complicated dynamics. In contrast to our model, the level of CSR is not chosen endogenously in their set-up, though. Baron (2008) investigates a model, where a firm hires a manager, who uses effort to generate income and also gets utility from social expenditures. Citizens may be socially conscious or unconscious consumers and shareholders of the firm in question, again, displaying social concern or not. The authors even control for the economic climate. Among their various findings, they show that a firm may make social expenditure either because it is rewarded by consumers or because the owners and management value social activities (or both). Good economic times may lead to higher social expenditures if valued by the customers, while social expenditures are independent from the climate if mainly driven by the owners' and managers' social concern. This is in contrast to our setting, in which CSR has a strategic function even if neither consumers nor shareholders particularly value social engagement.

Further, we explore the strategic use of CSR as an entry deterrent. To our knowledge, this topic has received little attention so far. Tzavara (2008) interprets CSR as purchasing a "green" license. The incumbent is already socially responsible and there exist socially conscious and unconscious consumers. Hence, the incumbent faces the decision between entry accommodation and entry deterrence. In the former case, the entrant can choose to adopt CSR or to refrain from it. Tzavara (2008) finds that under Bertrand competition the incumbent will usually not deter entry and the entrant will

are strategic complements.

not adopt CSR thereby differentiating itself from the incumbent. If the incumbent can educate unconscious consumers to be more conscious, however, deterrence is more likely the less costly education and the higher the share of unconscious consumers. Also Graf and Wirl (2014) assume that consumers are willing to pay more for a CSR firm's products. Since the CSR activities generate costs for the firm, an uncontested monopolist will only adopt them if costs are low and consumers have a very large willingness to pay for CSR products. In a model of Bertrand competition the authors show that CSR is optimal as a response to entry, but not as an entry deterrent. Different to our approach, it is assumed that only the incumbent can adopt CSR. A related empirical paper by Boulouta and Pitelis (2014) examines the use of CSR in order to deter entry on an international level. The notion is that high CSR levels may constitute non-tariff barriers towards less responsible countries. The authors find that the strategic use of CSR has a higher effect on countries with a low innovation level than on those with a higher level. They suspect that innovative countries can already produce differentiated products and, hence, additional CSR-based differentiation will not have a strong impact.

3 The Model

We consider competition between $2 \leq n \in \mathbb{N}$ profit-maximizing firms on the market for some homogeneous good with (normalized) linear inverse demand

$$p = 1 - \sum_{i=1}^{n} q_i, \tag{1}$$

where p denotes the price of the good and q_i denotes the output of firm $i \in \{1, \ldots, n\}$. Marginal costs of production are assumed to be constant and identical for all firms. For simplicity, we normalize them to zero.[3]

Competition between firms is modeled as a two-stage game. In the first stage of the game, each firm $i \in \{1, \ldots, n\}$ publicly commits to a certain objective function V_i. This can be thought of as signing an appropriate corporate charter or hiring an executive manager known to have appropriate preferences. In particular, for most of our analysis, firm i chooses its level of CSR, i.e. the weight $\theta_i \geq 0$ it puts on consumer surplus CS in addition to profits π_i:

$$V_i = \pi_i + \theta_i \cdot CS = (1 - \sum_{j=1}^{n} q_j)q_i + \frac{1}{2} \cdot \theta_i \cdot (\sum_{j=1}^{n} q_j)^2. \tag{2}$$

[3]In fact, constant marginal costs do not influence the equilibrium level of CSR as long as they are symmetric.

Incorporating consumer surplus into the firm's objective function has recently become a standard way of modeling CSR or, more general, non-profit motives of a firm.[4] In the second stage of the game, firms decide simultaneously on their output levels $q_i \geq 0$ in order to maximize their objective functions V_i. Below we consider three different scenarios and solve each specification of the game for its subgame perfect equilibrium (SPE).

Following an alternative interpretation, our framework may be understood as an indirect evolutionary game with the choices $q_i \geq 0$, the utility functions V_i, the preference types $\theta_i \geq 0$, and the evolutionary success functions π_i (Güth and Yaari, 1992, Königstein and Müller, 2001). In this respect, the SPE entails the evolutionary stable levels of CSR, i.e. nature shapes the firms' preferences such that they are, in the long run, associated with the most profitable levels of CSR.

4 Strategic CSR in Cournot Competition

In the first scenario we consider, $2 \leq n \in \mathbb{N}$ symmetric firms simultaneously choose their level of CSR at the first stage of the game.

Solving the game by backward induction, we start examining the second stage decisions. For any given vector of CSR levels $(\theta_j)_{j=1}^n$, firm $i \in \{1, \ldots, n\}$ chooses its output q_i in order to maximize its objective function V_i as given by (2). From the first-order condition

$$\frac{\partial V_i}{\partial q_i} = 1 - \sum_{j=1}^{n} q_j - q_i + \theta_i \cdot \sum_{j=1}^{n} q_j = 0 \tag{3}$$

we can derive firm i's best response:

$$q_i = \frac{1 - (1 - \theta_i) \cdot \sum_{j \neq i} q_j}{(2 - \theta_i)}. \tag{4}$$

Summing up over all n first order conditions (3) and using (1), we can derive the total quantity $Q := \sum_{i=1}^{n} q_i$ and the price p:

$$\begin{aligned} Q &= \frac{n}{n + 1 - \sum_{i=1}^{n} \theta_i}, \\ p &= \frac{1 - \sum_{i=1}^{n} \theta_i}{n + 1 - \sum_{i=1}^{n} \theta_i}. \end{aligned} \tag{5}$$

[4] See e.g. Kopel and Brand (2012), Kopel et al. (2014), Lambertini and Tampieri (2010), Goering (2008a,b).

Inserting Q into (4) and rearranging terms yields:

$$q_i = \frac{1 - \sum_{j=1}^{n} \theta_j + n \cdot \theta_i}{n + 1 - \sum_{j=1}^{n} \theta_i}. \tag{6}$$

In the first stage of the game, each firm i anticipates this price and quantities and chooses the CSR level θ_i in order to maximize its corresponding profit which, by (5) and (6), equals

$$\begin{aligned} \pi_i = p \cdot q_i &= \frac{(1 - \sum_{j=1}^{n} \theta_j)(1 - \sum_{j=1}^{n} \theta_j + n\theta_i)}{(n + 1 - \sum_{j=1}^{n} \theta_j)^2}, \\ &= \frac{(1 - \theta_{-i})^2 + (1 - \theta_{-i})(n-2)\theta_i - (n-1)\theta_i^2}{(n + 1 - \theta_{-i} - \theta_i)^2}, \end{aligned} \tag{7}$$

where $\theta_{-i} := \sum_{j \neq i} \theta_j$. The first order condition $\dfrac{\partial \pi_i}{\partial \theta_i} = 0$ yields

$$\begin{aligned} &[(1 - \theta_{-i})(n-2) - 2(n-1)\theta_i](n + 1 - \theta_{-i} - \theta_i) \\ &\quad +2[(1 - \theta_{-i})^2 + (1 - \theta_{-i})(n-2)\theta_i - (n-1)\theta_i^2] \;=\; 0. \end{aligned} \tag{8}$$

Symmetry implies that in equilibrium $\theta_i = \theta_j = \theta^*$ for all $i, j \in \{1, \ldots, n\}$, and thus $\theta_{-i} = (n-1)\theta^*$. Using this relation in equation (8) and solving for θ^* yields

$$\theta^* = \frac{n^2 + n - 1}{2n(n-1)} - \sqrt{\left(\frac{n^2 + n - 1}{2n(n-1)}\right)^2 - \frac{1}{n}}. \tag{9}$$

Proposition 1 *In the SPE of the two-stage game between $n \geq 2$ symmetric firms, the CSR level θ^* that is chosen by each individual firm*

(a) is positive for any given number n of active firms,

(b) decreases in the number n of active firms,

(c) converges to zero as the number n of active firms tends to infinity.

Proof. Part (a) follows immediately from equation (9). In order to show part (b), consider θ^* as a function of n. First note that $\theta^*(2) > \theta^*(3)$. Moreover, treating n as a continuous variable, straightforward calculations show that $\partial\theta/\partial n < 0$ for all $n \geq 3$. Using equation (9), it is straightforward to compute $\lim_{n\to\infty} \theta^* = 0$ which proves part (c).

□

Parts (b) and (c) of the proposition show that an increasing competitive pressure decreases the strategic incentives to engage in CSR. In particular, under perfect competition, there is no room for CSR.[5] The intuition for positive equilibrium levels of CSR is pretty much the same as in models with alternative commitment opportunities like strategic delegation (Fershtman and Judd, 1987) or consumer orientation (Königstein and Müller, 2001). Firms engage in CSR in order to commit to higher output levels which, ceteris paribus, reduces the output chosen by their rivals because quantities are strategic substitutes in Cournot competition. As a result, however, they end up in a situation that is similar to a prisoner's dilemma. In fact, inserting (9) into equations (5), (6), and (7) yields the following

Corollary 1 *In the SPE of the two-stage game between $n \geq 2$ symmetric firms,*

(a) the output of each firm $q_i^* = \dfrac{1}{1+n(1-\theta^*)} > \dfrac{1}{1+n}$ *is higher,*

(b) the market price $p^* = \dfrac{1-n\theta^*}{1+n(1-\theta^*)} < \dfrac{1}{1+n}$ *is lower,*

(c) the profit of each firm $\pi_i^* = \dfrac{1-n\theta^*}{[1+n(1-\theta^*)]^2} < \dfrac{1}{(1+n)^2}$ *is lower*

than it would be if all firms abstained from CSR.

So far, all considerations have been short-term taking the number of active firms n as given and neglecting any fixed cost. However, the fact that strategic CSR decreases equilibrium profits in the short run may lead to some market consolidation and increase market concentration in the long run. To be more specific, suppose that there is free market entry and all firms have identical quasi-fixed costs F. Then, Corollary 1 immediately implies

Corollary 2 *In the long run with free market entry and positive fixed costs $F > 0$, the number of firms that are active in the SPE of the two-stage game does not exceed the number of firms that would be active if all firms abstained from CSR.*

On the one hand, the increase in market concentration induced by CSR ceteris paribus reduces aggregate output and thus countervails the direct

[5] Similar results have been found in (other) models of strategic delegation, see e.g. Fershtman and Judd (1987).

quantity-augmenting effect of CSR. On the other hand, the lower number of active firms also reduces aggregate fixed costs. In general, the impact of CSR on welfare is thus ambiguous. The following example illustrates the anticompetitive potential of CSR. To this end we refer to the long-run SPE of the two-stage game between $n \geq 2$ symmetric firms as CSR-equilibrium and asterisk the corresponding equilibrium values. By contrast, the situation in which all firms abstain from CSR is equivalent to the regular Cournot equilibrium with pure profit maximizers, and we indicate the corresponding equilibrium values by superscript C.

Example 1 *Compared to the regular Cournot equilibrium, for fixed costs* $0.034 \leq F < 0.04$ *the CSR equilibrium is characterized by*

(a) higher market concentration: $n^* = 2 < 4 = n^C$,

(b) higher individual and aggregate profits: $2(\pi_i^*(2) - F) \approx 2 \cdot (0.0856 - F) > 4 \cdot (0.0400 - F) \approx 4(\pi_i^C(4) - F)$,

(c) lower aggregate output: $2q_i^*(2) \approx 0.7806 < 0.8000 = 4q_i^C(4)$,

(d) lower consumer surplus and lower (gross) total surplus,

(e) higher total surplus net of aggregate fixed costs.

Proof. The results follow from straightforward calculations using equation (9) and Corollary 1.

□

There is a further insight provided by this example: While CSR decreases profits in the short run, it may well increase profits in the long run due to the associated market consolidation. This gives rise to the idea that (large) solvent firms may use CSR also as a strategy to induce exit and deter entry of (small) firms with tighter financial constraints.[6] In the next section, we elaborate on this idea examining the strategic use of CSR as an entry deterrent.

5 CSR as an Entry Deterrent

In this second scenario, we consider a market with an incumbent monopolist (firm 1) and one potential entrant (firm 2). Here, the first stage of the game is split into two sequences: First the incumbent chooses its CSR level θ_1. Given

[6] We draw up the testable hypothesis that large firms engage more in CSR than small ones.

this decision, the potential entrant then decides whether to incur entry costs $e > 0$ and, if so, which CSR level θ_2 to enter with. In the case of entry, the second stage of the game again consists in Cournot competition with each of the two firms $i \in \{1, 2\}$ choosing its output q_i in order to maximize its objective function

$$V_i = (1 - q_i - q_j)q_i + \frac{1}{2}\theta_i(q_i + q_j)^2.$$

If firm 2 does not enter, the monopoly will persist and firm 1 will choose q_1 in order to maximize its objective function

$$V_1^M = (1 - q_1)q_1 + \frac{1}{2}\theta_1 q_1^2.$$

In order to find out whether firm 1 can indeed deter entry by means of CSR and, if so, under which conditions deterrence is profitable, we proceed in three steps. First, we characterize the conditions for which entry is blockaded in the sense that the incumbent can behave as an unconstrained monopolist who is not threatened by entry. Second, we determine the SPE for the case in which firm 1 accommodates entry of firm 2 and compute the firms' respective profits. Finally, this allows us to determine the minimum CSR level firm 1 must choose to deter entry as a function of entry costs. Comparing firm 1's profit made under entry deterrence with its profit made under entry accommodation, we can then determine the range of entry costs for which entry deterrence is profitable.

Blockaded entry

It is straightforward to show that an unconstrained monopolist who is not threatened by entry will not engage in CSR ($\theta_1^u = 0$) and thus choose the regular monopoly output $q_1^u = \frac{1}{2}$. Conditional on entry, the best response of firm 2 is the output $q_2 = \frac{1}{4}$ yielding profits equal to $\pi_2 = \frac{1}{16} - e$. Hence, entry will be blockaded for all entry costs $e > e^+ := \frac{1}{16}$.

Entry accommodation

Now suppose that firm 1 will choose a CSR level θ_1 such that firm 2 finds it profitable to enter. Solving the game by backward induction, the analysis of the second stage is identical to the second stage analysis in Section 4 with $n = 2$. We can therefore use equation (8) with $n = 2$, $\theta_{-i} = \theta_1$, and $\theta_i = \theta_2$ to compute firm 2's best response to firm 1's CSR level θ_1:

$$\theta_2 = \frac{(1 - \theta_1)^2}{3 - \theta_1}. \tag{10}$$

Moreover, we can use equation (7) with $n = 2$, $\theta_{-i} = \theta_2$, and $\theta_i = \theta_1$ to compute the equilibrium profit of firm 1 anticipating the entrant's best response as given by (10):

$$\pi_1 = \frac{\left[1 - \frac{(1-\theta_1)^2}{3-\theta_1}\right]^2 - \theta_1^2}{\left[3 - \left(\theta_1 + \frac{(1-\theta_1)^2}{3-\theta_1}\right)\right]^2} = \frac{1 + \theta_1 - 3\theta_1^2 + \theta_1^3}{(4-2\theta_1)^2}.$$

Firm 1 initially chooses θ_1 in order to maximize these profits. The first order condition for a maximum

$$\frac{\partial \pi_1}{\partial \theta_1} = \frac{(1 - 6\theta_1 + 3\theta_1^2)(4 - 2\theta_1) + 4(1 + \theta_1 - 3\theta_1^2 + \theta_1^3)}{(4-2\theta_1)^3} = 0$$

yields $\theta_1^A \approx 0.479$ as the optimal level of CSR for the purpose of entry accommodation. Further, this implies $\theta_2^A \approx 0.108$ as well as $\pi_1^A \approx 0.0972$ and $\pi_2^A \approx 0.0446 - e$ in the SPE with accommodated entry.

Entry deterrence

Similar as above, we can use equation (7) with $n = 2$, $\theta_{-i} = \theta_1$, and $\theta_i = \theta_2$ and insert the entrant's best response as given by (10) in order to compute the equilibrium profit of firm 2 conditional on entry:

$$\pi_2 = \frac{(1-\theta_1)^2 - \left[\frac{(1-\theta_1)^2}{3-\theta_1}\right]^2}{\left[3 - \left(\theta_1 + \frac{(1-\theta_1)^2}{3-\theta_1}\right)\right]^2} - e. \tag{11}$$

Since firm 2 enters only for positive profits, firm 1 is able to deter entry by choosing a CSR level of at least

$$\theta_1^D := 1 - 2e - 2\sqrt{e(1+e)}$$

for which $\pi_2 = 0$ by (11).

In order to derive the conditions under which entry deterrence is more profitable than entry accommodation, we now compute firm 1's profit for the case in which it deters entry by the choice of θ_1^D and compare it to its profit in the case of entry accommodation. If firm 2 does not enter, firm 1 behaves like a monopolist and chooses q_1 in order to maximize V_1^M. The first order condition yields

$$\frac{\partial V_1}{\partial q_1} = 1 - 2q_1 + \theta_1^D q_1 = 0 \quad \Leftrightarrow \quad q_1 = \frac{1}{2 - \theta_1^D}.$$

The related profit equals

$$\pi_1^D = \frac{1-\theta_1^D}{(2-\theta_1^D)^2} = \frac{2e+2\sqrt{e(1+e)}}{\left(1+2e+2\sqrt{e(1+e)}\right)^2}.$$

Entry deterrence will be optimal if and only if this profit is at least as large as the profit in the case of entry accommodation, i.e. if $\pi_1^D \geq \pi_1^A$. This condition is equivalent to $e \geq e^*$, where the minimum value of entry costs e^* is implicitly defined by[7]

$$2e^* + 2\sqrt{e^*(1+e^*)} = \left(1+2e^*+2\sqrt{e^*(1+e^*)}\right)^2 \pi_1^A.$$

Our results yield a pattern that is well-known from other models of market entry (Dixit, 1980, Maskin, 1999), and are summarized in

Proposition 2 *The SPE of the two-stage game between one monopolistic incumbent and one potential entrant depends on the level of entry costs.*

(a) For high entry costs $e > e^+$, entry is blockaded and the monopolist does not engage into CSR.

(b) For intermediate entry costs $e^* \leq e \leq e^+$, the incumbent deters entry by means of the positive CSR level $\theta_1^D = 1-2e-2\sqrt{e(1+e)}$ which is decreasing in e.

(c) For low entry costs $e < e^*$, the incumbent accommodates entry and both firms choose positive CSR levels with $\theta_1^A > \theta_2^A$.

Note that in the case of entry accommodation the incumbent chooses its CSR level first. Since CSR levels are strategic substitutes, as implied by (10), this redounds to a first-mover advantage which results in a larger market share and larger profits for the incumbent. Part (b) of Proposition 2 characterizes the situations for which the strategic use of CSR increases the market concentration compared to the case in which firms abstain from CSR. These findings reinforce the validity of Corollary 2 in the present context. By the same arguments that we have discussed at the end of Section 4, the overall impact of CSR on welfare is ambiguous. In particular, we easily find examples for situations in which the use of CSR as an entry deterrent is anticompetitive in the sense that it reduces consumer surplus.

[7] $e^* \approx 0.0034$

6 CSR vs. Customer Orientation

In this section, we compare the profitability of CSR as a mode of commitment with the profitability of consumer orientation or corporate customer responsibility (CCR), which has been proposed by Königstein and Müller (2001) as an alternative commitment device. Formally, CCR differs from CSR in the respective objective function $V_C = \pi_C + \theta_C \cdot CuS$ which, in addition to profits, contains only the surplus of their *own customers* CuS instead of the surplus of *all consumers* CS. For simplicity, we consider competition between two firms, one of which chooses a CSR level θ_S while the other simultaneously chooses a CCR level θ_C in the first stage of the game. In the second stage, the two firms maximize their resulting objective functions

$$\begin{aligned} V_S &= \pi_S + \theta_S \cdot CS = [1 - (q_S + q_C)]q_S + \frac{1}{2} \cdot \theta_S \cdot (q_S + q_C)^2, \\ V_C &= \pi_C + \theta_C \cdot CuS = [1 - (q_S + q_C)]q_C + \frac{1}{2} \cdot \theta_C \cdot q_C^2. \end{aligned}$$

by the simultaneous choice of their outputs q_S and q_C, respectively.

Solving the game by backward induction, the first order condition of the CSR firm

$$\frac{\partial V_S}{\partial q_S} = 1 - q_C - 2q_S + \theta_S \cdot q_S + \theta_S \cdot q_C = 0$$

yields the best response function

$$q_S = \frac{1 - (1 - \theta_S)q_C}{2 - \theta_S}.$$

Similarly, the first order condition of the CCR firm

$$\frac{\partial V_C}{\partial q_C} = 1 - q_S - 2q_C + \theta_C \cdot q_C = 0$$

yields the best response function

$$q_C = \frac{1 - q_S}{2 - \theta_C}.$$

Solving for the second stage equilibrium quantities as functions of θ_S and θ_C yields

$$\begin{aligned} q_S &= \frac{1 - \theta_C + \theta_S}{3 - 2\theta_C - \theta_S + \theta_S\theta_C}, \\ q_C &= \frac{1 - \theta_S}{3 - 2\theta_C - \theta_S + \theta_S\theta_C}. \end{aligned}$$

In the first stage of the game, the firms maximize their anticipated profits

$$\begin{aligned}\pi_S &= (1-\theta_C)\cdot\frac{1-\theta_C+\theta_S\theta_C-\theta_S^2}{(3-2\theta_C-\theta_S+\theta_S\theta_C)^2},\\ \pi_C &= \frac{(1-\theta_C)(1-\theta_S)^2}{(3-2\theta_C-\theta_S+\theta_S\theta_C)^2}.\end{aligned}$$

by the simultaneous choice of θ_S and θ_C, respectively. From the first order conditions

$$\begin{aligned}\frac{\partial\pi_S}{\partial\theta_S} &= \frac{(\theta_C-2\theta_S)(3-2\theta_C-\theta_S+\theta_S\theta_C)}{(3-2\theta_C-\theta_S+\theta_S\theta_C)^3}\\ &\quad+\frac{2(1-\theta_C+\theta_S\theta_C-\theta_S^2)(1-\theta_C)}{(3-2\theta_C-\theta_S+\theta_S\theta_C)^3}=0,\\ \frac{\partial\pi_C}{\partial\theta_C} &= (1-\theta_S)^2\cdot\frac{-(3-2\theta_C-\theta_S+\theta_S\theta_C)+2(1-\theta_C)(2-\theta_S)}{(3-2\theta_C-\theta_S+\theta_S\theta_C)^3}=0\end{aligned}$$

we derive the firms' best responses

$$\begin{aligned}\theta_S &= \frac{2-\theta_C}{6-5\theta_C+\theta_C^2},\\ \theta_C &= \frac{1-\theta_S}{2-\theta_S}.\end{aligned}$$

Solving this system of equations yields

$$\theta_S=\theta_C=\theta:=\frac{3-\sqrt{5}}{2}.$$

Although the two firms are not symmetric, both choose the same level of responsibility in equilibrium. Due to their differing objective functions, however, the firms produce different quantities of the good:

$$q_S=\frac{1}{3(1-\theta)+\theta^2}>\frac{1-\theta}{3(1-\theta)+\theta^2}=q_C.$$

Intuitively, due to $CuS<CS$ and the convexity of CuS and CS respectively, a marginal increase in output is, ceteris paribus, more valuable for the CSR firm than for the CCR firm. Put differently, CSR offers a stronger commitment to increase output than CCR. Consequently, the firms' profits differ as well:

$$\pi_S=\frac{(1-\theta)^2}{(3(1-\theta)+\theta^2)^2}\geq\frac{(1-\theta)^3}{(3(1-\theta)+\theta^2)^2}=\pi_C.$$

We summarize our results in

Proposition 3 *In the SPE of the two-stage game with one CSR firm and one CCR firm which simultaneously choose their levels of responsibility in the first stage and their quantities in the second stage,*

(a) both firms choose positive and identical levels of responsibility,

(b) the CSR firm makes a higher profit than the CCR firm.

Adopting the indirect evolutionary approach, we may interpret the result as an evolutionary advantage of CSR firms over CCR firms.

7 Discussion

In our analysis of the strategic use of corporate social responsibility (CSR) in oligopolistic markets, we considered three different set-ups. For a symmetric Cournot competition of CSR firms, we find that the evolutionary stable level of CSR is positive for any given number of active firms. However, the equilibrium profits are smaller for positive CSR levels as compared to the profits in a Cournot competition of profit-maximizing firms. Further, we find that an incumbent monopolist may profitably use CSR as an entry deterrent. From these results we conclude that CSR may increase market concentration and possibly be anticompetitive. In a duopoly with a CSR firm and a merely customer oriented firm, we show that the CSR firm gains a higher profit. Hence, strategic CSR appears to be preferable to the strategic use of CCR.

Although we analyze various aspects of the strategic role of CSR firms in oligopolies in this paper, there are some possible extensions that are worth to be examined. We believe that heterogeneous costs could play an interesting role. It remains to be analyzed if higher costs lead to a lower equilibrium level of CSR or if the opposite is the case. If the latter proved to be true, the less efficient firm would produce a higher share of the total quantity. This raises the question, whether asymmetric costs in combination with socially responsible firms will reduce welfare, as suggested by the analysis of Goering (2008b).

Further, including product differentiation in our set-up would give us more insight in the effect of CSR on customer choice. While strategic CSR can act as a commitment towards the competitor, it can also signal a certain product characteristic to the consumers and is, in fact, often used in such a way. It remains to be seen if this would reduce competition in our set-up even further.

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