Strategic CSR, Spillovers, and First-Mover Advantage

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Abstract: In this paper we study the conditions under which socially responsible firms can develop a first-mover advantage. We consider a price-setting duopoly market with vertically and horizontally differentiated products, where firms can engage in socially responsible activities and thereby increase the willingness to pay of consumers of their products. It is shown that a CSR leader, i.e. a firm which commits to a level of socially responsible activities prior to its competitor, achieves higher profits. Hence, a first mover advantage arises. If however, the outcomes of investments in CSR are not perfectly specific to the CSR leader, i.e. they spill over to the CSR follower, then a second mover advantage arises for the CSR follower. We characterize the effects of competition and the level of spillovers on the relative and absolute level of CSR activities and the incentive to engage in CSR and thereby derive testable hypotheses.

Keywords: First Mover Advantage, Coporate Social Resposibility,
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1 Introduction

The literature on corporate social responsibility (henceforth CSR) has been primarily concerned with defining and categorizing CSR activities and empirically investigating the link between Corporate Social Performance and financial performance, although without arriving at clear-cut results (McWilliams et al. 2006). In recent years, however, an increasing number of researchers on CSR activities of business firms call for recognizing the long-term investment characteristic of CSR decisions. According to this view, firms should treat CSR

activities like any other economic project weighing benefits and costs, see e.g. McWilliams et al. (2006), Porter and Kramer (2006), Porter and Reinhardt (2007), Burke and Logsdon (1996), or Reinhardt (1998). McWilliams and Siegel (2001, p. 125) write: "*CSR attributes are like any other attributes a firm offers. The firms chooses the level of the attribute that maximizes firm performance, given the demand for the attribute and the cost of providing the attribute...*". Likewise, it is also argued that CSR activities should be considered as *strategic* investments of a firm potentially influencing all stakeholders, among them competitors, customers, employees, and government agencies. The profitability of such investments clearly depend on a firm's environment. For example, with regard to environmental product differentiation Reinhardt (1998) writes, "*The success of a strategy of differentiating products along environmental lines will depend on the characteristics of industry structure, business-government relations, and organizational capability that determine corporate success more generally.*" (p. 46). To support this view, the term "strategic CSR" has been introduced (see Baron 2001, Husted and De Jesus Salazar 2006, Piga 2001), to contrast such a type of activity from altruistic or coerced CSR.[1]

The trend to a more systematic analysis of the drivers of benefits and costs of CSR is also reflected by the fact that management and strategy researchers are increasingly relying on formal models to obtain normative guidelines and positive descriptions of actual firm behavior, with the goal to derive testable results; see e.g. McWilliams and Siegel (2001), Mackey et al. (2007), Fishman et al. (2005, 2006), Baron (2001). It is somehow surprising that despite this interest in strategic CSR, a question which is barely touched upon in the literature is, "Does CSR provide an advantage to the first-moving firm and under which conditions can such an advantage be sustained?" This lack of interest is in stark contrast to the strategy and economics literature, where the issue of a first-mover or a second-mover advantage has been hotly debated for centuries with a variety of insightful and testable results (see e.g. Kopel and Löffler 2008 for references). In contrast, in the CSR literature, only very few authors devote space to this issue despite the obvious importance for firms engaged in CSR activities (see e.g. Reinhardt 1998). In a recently published (but conceptual) paper by Tetrault Sirsly and Lamertz (2008) a first attempt is made to approach this question by deriving conditions under which a CSR leader can sustain a first-mover advantage. With reference to the resource-based approach of strategic management in the context of CSR (e.g. Branco and Rodrigues 2006), the authors argue that a CSR leader can maintain a first-mover advantage if it develops "... *a strategic CSR initiative that is central to the firm mission, visible to stakeholders and with firm-specific benefits beyond those of public goods.*" (p. 360). The present paper tries to advance this line of research by introducing a formal model of CSR leadership. Our research questions are as follows:

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[1] A common definition of CSR activities is, "...*actions that appear to further some social good, beyond the interests of the firm and that which is required by law.*" McWilliams and Siegel (2001, p. 117). Siegel and Vitaliano (2007) provide a first empirical test for the strategic use of CSR.

1. **First-mover advantage:** Does the CSR leader, i.e. the firm which invests in CSR before other firms do, always have a first-mover advantage, i.e. achives higher profits? Under which circumstances does a CSR follower obtain higher profits?

2. **Incentives to invest in CSR**: Who has higher incentives to engage in CSR activities, the CSR leader or the CSR follower? Who has a higher absolute level of CSR activities?

3. **Influence of "CSR spillovers"**: How do these results change if "CSR spillovers" exist, i.e. if a firm's activity in CSR also benefit other firms who are active in the same market or industry. How does this depend on the degree of the CSR spillovers?

4. **Influence of competition**: How do the results depend on the degree of competition? Is a higher degree of competition in an industry beneficial for investments in CSR activities?

To our knowledge, this is the first paper which tries to answer these research question systematically by using an analytic framework. The main goal is to derive potentially testable results on the influence of the degree of competition (measured by the degree of differentiation between the products of the CSR leader and the CSR follower) and the level of CSR spillovers. In order to derive clear-cut results, we abstract from informational uncertainty and the associated responses of firms (e.g. via signaling), from technical uncertainty (e.g. from environmental R&D) and from market uncertainty (e.g. changes in consumer preferences). Instead, we focus on the *strategic* uncertainty which arises if firms compete in imperfect markets. Here the question arises if it pays off to engage early in CSR activities and under which circumstances it is better to be a late mover. Also the influence of competition and CSR spillovers on the firms' incentives to engage in CSR are of interest in this context. Our main results are as follows.

- If CSR activities are specific to the CSR leader, then a first mover advantage exists. Depending on the degree of competition, the incentives to invest in CSR are asymmetric for the CSR leader and the CSR follower, however. As a result, with increasing degrees of competition, the CSR leader first decreases CSR efforts, but then increases CSR efforts again. This contrasts with the CSR efforts of the CSR follower, which decrease throughout.

- This picture changes if CSR spillovers exist: for a sufficiently large level of spillovers, CSR follower and CSR leader switch roles, that is, there is a second mover advantage. The CSR follower's level of CSR is higher than the CSR leader's level and the follower obtains higher profits. Moreover, the CSR efforts of the CSR follower now first decrease for increasing competition, but then start increasing again.

The result that the CSR leader achieves higher profits than the CSR follower in the case of perfectly appropriable CSR investments is intuitive. What is surprising, and this is revealed by our analysis, is that the level of spillovers for which a First-Mover Advantage can be sustained is very low. This demonstrates how difficult it is to keep CSR activities specific to a firm's strategy (see Reinhardt 1998, Tetrault Sirsly and Lamertz 2008). Second, it seems rather surprising that there may be an asymmetry in incentives to engage in CSR for the leader and the follower, which depends on the degree of competition. Our analysis shows that the interaction between CSR spillovers, CSR activities and the level of competition is rather complex. As a consequence, we may conclude that it might be difficult to show empirically who has a higher incentive to engage in CSR, since the answer depends on factors which are quite hard to measure accurately.

2   A brief review of the (related) literature

In this section we briefly summarize analytical papers in the CSR literature and point out which of these contributions are closely related to our work, but also try to clarify the differences with respect to the present paper.

McWilliams and Siegel (2001) and Husted and De Jesus Salazar (2006) use simple microeconomics-based supply and demand arguments, and Mackey et al. (2007) additionally consider the impact on the firm value to develop a theory of "costly philanthropy". Fishman et al. (2005, 2006) focus on the fact that business decisions are made by managers who have preferences for socially responsible actions, where it is the level of CSR activities which differentiates the firm's offering from the competitors', thus influencing the firm's value. All these papers do not consider the impact of strategic interaction on the CSR activities of firms. Baron (2001) initiates a theory of private politics, in which an activist's goal is the change of a firm's (production) practices e.g. by the threat of boycotting the firms' offerings. On the one hand, if successful, a boycott affects a firm's demand. On the other hand, responding to the activist through a nonmarket strategy increases the costs of production. Consequently, private politics will affect a firm's profit and hence the competitive position in the market. The market and the nonmarket strategy of a firm have to be chosen in an integrated manner.[2] The focus in Baron's paper is on private politics, whereas we focus the sustainability of a first mover advantage. In a development of Baron's work, Innes (2006) shows that boycotts of "brown" firms can even occur in equilibrium in a situation of symmetric information. Finally, Baron (2008) employs an agency framework where the firm owners choose an incentive contract to induce a manager to serve their interest, in this case to allocate resources, including social expenditures.

The stream of literature which considers CSR as a strategic tool to differentiate a firm's product in markets with imperfect competition is most closely

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[2]For further contributions along this line of research, see the special issues of the Journal of Economics and Management Strategy edited by Baron and Diermeier (2007) and Lyon (2009).

related to the present work. A firm achieves a competitive advantage through CSR by targeting customers with a higher willingness to pay. To achieve a certain level of CSR, firms embody their offerings with CSR attributes (e.g. organic produce, animal test-free cosmetics) or use CSR-related signals (e.g. fair trade label).[3] To consumers these activities convey the message that firms actively support CSR and are more reliable, trustworthy, and their products are of higher quality. As a consequence, consumers are willing to pay a higher price for the product with the CSR attribute (McWilliams and Siegel 2001). Research has mainly focused on the topic of (pure) vertical differentiation, see for example Bagnoli and Watts (2003), Kanniainen and Pietarila (2006), Toolsema (2009), Garcia-Gallego and Georgantzis (2009), and Chen (2001). Bagnoli and Watts (2003) find that in their vertical differentiation framework there is an inverse relationship between the intensity of competition and provision of CSR, whereas we find that the relation between competition and the level of CSR activity is ambiguous and asymmetric for the competing firms. Some authors argue that competition including CSR activities is better captured by horizontal differentiation; see Becchetti et al. (2005a, 2005b) and Conrad (2005). Becchetti and Solferino (2003) and Becchetti et al. (2007) consider such a horizontal differentiation model, where in one scenario a profit-maximizing firm and a fair trader choose sequentially their location along an ethical dimension. Although related, they consider only horizontal differentiation, do not consider spillovers, and pursue different research questions. Only few papers, like ours, include both dimensions of differentiation. For example, Alves and Santos-Pinto (2008) consider a similar (inverse) demand system as we do in a two-stage quantity-setting setup, but in their model CSR activities change the slope and the intercept of the demand functions. In contrast to their work, here we are interested in first-mover advantages in a sequential price-setting environment. Similarly, Manasakis et al. (2006) study strategic delegation in a quantity-choice game where firms move simultaneously in all stages. Following Garella and Petrakis (2008) who study minimum quality standards, Mitrokostas and Petrakis (2008) analyze the impact of certification provided either by a profit-maximizing certifier of by a regulator on the CSR engagements of firms.

Our work is also related to research on cost-reducing R&D decisions in the context of spillovers. The main economic difference is that CSR activities change the willingness to pay of the consumers (and hence, enter the utility function), whereas R&D investments change the unit production costs of firms. Despite this difference, there are some similarities between being active in CSR and being active in R&D. First, both are costly investment options to improve a firm's competitive position. Second, like CSR activities, R&D has the potential of a public good and R&D expenditures made by a firm often "spill over" to rival firms (although the mechanism of spillovers may be quite different). Spillovers

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[3]It should be noted that there is a close connection between CSR and research and development, since "*R&D investment may result in both CSR-related process and product innovations, which are valued by consumers.*" (McWilliams and Siegel 2001, p. 119; see also Scott 2005). Note also that a pioneer can influence customer preferences and thereby sustain a competitive advantage; see Carpenter and Nakamoto (1989).

can be asymmetric and in the extreme case spillovers can even be one-way only occurring from one firm to the other but not vice versa (depending on the firms' absorptive capacities). Finally, like CSR research this stream of literature also studies the relation between firm asymmetry and the incentives to invest and resulting profits. De Bondt and Henriques (1995) were among the first to consider this problem in a Cournot quantity setting model with R&D. They study the role of asymmetric spillovers in a model with endogenous leader/follower choice at the R&D stage and show that sequential play is an equilibrium if the asymmetry of spillovers is sufficiently large. An extension to several leaders and followers with Stackelberg quantity competition can be found in Vandekerckhove and De Bondt (2008). Amir et al. (2000) consider a Cournot quantity-setting framework with R&D decisions and endogenous leader-follower choice. They demonstrate that the emergence of an equilibrium with sequential play at the R&D stage depends on the relation between the degree of substitutability between the products and the level of spillovers. Amir and Wooders (2000) consider one-way spillovers flowing from the firm with higher R&D activity to the other firm, but not vice versa. They show that even if firms are symmetric ex ante, in equilibrium there will be an R&D intensive firm and the other firm imitates. In a recent paper, Tesoriere (2008) studies Cournot quantity competition with one-way spillovers and endogenous leader-follower choice. R&D spillovers only flow from leader to follower, but not vice versa. All the papers cited above share the focus on quantity competition. It is important to point out that in a quantity-setting (Cournot) framework, investment in quality can be interpreted as reduction of costs. However, such a straightforward reinterpretation is not possible in a price competition model, which we consider in this paper (see Vives 2008). Consequently, although we obviously use some of the ideas introduced in the R&D literature, formally the models are quite different. It might also be interesting to note that – in contrast to R&D (see again Vives 2008) – activities in CSR have strong commitment value since such activities are observable by stakeholders and under very close scrutiny by interest groups.

3   The Model

Our model has several features which are in line with the literature on corporate social responsibility. First, we consider a firm's CSR activity as a form of investment in order to differentiate its products or services from the offering of its competitors (McWilliams and Siegel 2001, Reinhardt 1998). Second, in order to have any strategic effect, a firms' CSR activities must be "visible" to its stakeholders (Burke and Logsdon 1996). Third, visibility enables competitors to free ride on the influences of these activities if CSR activities are not specific to the firm (Reinhardt 1998). Put differently, CSR reputational spillovers might result in benefits (or costs) to competitors in the industry without having to bear the full costs of these activities (Mayer 2006).

In order to illustrate these features of our model, as an example think of an automobile manufacturer who plans to introduce a new car with recyclable

and reusable parts like dashboards, fenders, doors, etc., so-called "green" parts. The manufacturer redesigns the production process, uses new materials for the auto parts, in short, uses resources to embody the cars with CSR attributes like "green" and "recyclable". These investments are made in order to differentiate the new automobiles from the cars of the other automobile manufacturers. The required changes in the product and its production process are costly, however, and have to be traded off with some benefit for the manufacturer. This benefit comes from a price premium the firm can now demand, since the manufacturer's reputation as a producer of environmentally friendly cars is increased and, hence, the manufacturer's "green" cars are now perceived to be of higher quality by the customer. As a consequence, there is an increase the customer's willingness-to-pay for such products (Shapiro 1983). The manufacturer also informs potential customers about these new cars and its benefits (e.g. by launching an advertising campaign), since it wants to make its CSR efforts visible, where "[v]isibility denotes both the observability of a business activity and the firm's ability to gain recognition from internal and external stakeholders." (Burke and Logsdon 1996, p. 499). Visibility is a requirement so that CSR activities can be used strategically to influence and shape the beliefs of firms, customers, and other stakeholders. Now the question arises if the manufacturer can obtain a competitive advantage based on these CSR activities. The answer strongly depends on the appropriability of the outcomes of the CSR initiative. "*Specificity refers to the firm's ability to capture or internalize the benefits of a CSR programme, rather than simply creating collective goods which can be shared by others in the industry, community or society at large.*" (Burke and Logsdon 1996, p. 497).[4] Consequently, if CSR activities are highly firm-specific and can be protected by legal means, then the focal firm can reap the full benefits. However, more often than not, the benefits of CSR activities are only imperfectly appropriable, which means that they cannot be fully captured by the focal firm. In this case, the benefits of the focal firm's CSR activities cannot be defended against imitation by competitors (Reinhardt 1998). In order to capture the extent by which a firm's CSR activity also results in a comparative differentiation advantage, we introduce "CSR spillovers". In terms of our automobile manufacturer, the "green car" initiative is successful in terms of differentiation if other car manufacturers do not introduce closely related products in terms of perceived quality. In this case the manufacturer can defend its innovation against imitation by competitors based on either patent protection or specific know-how, and CSR spillovers are negligible. On the other hand, if such barriers do not exist and other car manufacturers can introduce related products, the differentiation initiative failed.[5] As these arguments illustrate, it is sensible to assume that

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[4]As an example for benefits which are highly specific, think of a firm which – instead of air conditioning – uses water from a nearby lake to keep its offices cool and comfortable. This not only serves the environment, but also the firm which can strategically communicate these activities to stakeholders; see Tetrault Sirsly and Lamertz (2008).

[5]Reinhardt (1998) presents several case studies to illustrate these concepts. For example, Patagonia, a producer of sportswear and outdoor clothing is quite successful in differentiating its products and defending its advantage in a premium-segment of the market. On the other

CSR spillovers occur from early-movers to late-movers only.

To be more concrete, consider a duopoly where firm 1 is the CSR leader – the firm which selects its level of CSR activity prior to its competitor – and firm 2 is the CSR follower. For our analysis we focus on the following (inverse) demand system[6]

$$p_1 = \alpha + s_1 - x_1 - \gamma x_2 \tag{1}$$
$$p_2 = \alpha + (s_2 + \theta s_1) - x_2 - \gamma x_1.$$

The prices of the products of the CSR leader and the CSR follower are $p_i, i = 1, 2$. The parameter α denotes the reservation price. The variables $x_i, i = 1, 2$ denote the quantity of firm i's product bought by the representative customer. The variables $s_i, i = 1, 2$ represent the CSR activities by the firms which determine the qualities of the products (*vertical differentiation*) through their vertical intercept (Häckner 2000, Symeonidis 2003).[7] CSR activities are costly and we assume that for both firms these costs are of the form s_i^2 (see Garella and Petrakis 2008). In the model, CSR spillovers are captured by the parameter $\theta \in [0, 1]$ and posses the following properties. First, CSR spillovers only occur from CSR leader to CSR follower, but not vice versa. Obviously, the leader's CSR activities s_1 only lead to a quality advantage if θ is sufficiently small. Second, spillovers only refer to results (i.e. relative quality positions), not to money spent on CSR. Third, spillovers have a positive effect on the perceived quality of the follower's product, although in principle the effect of spillovers can also be negative (e.g. Bertels and Peloza 2008, Yu and Lester 2008). The parameter γ in our model is a measure of the degree of substitutability (or *horizontal differentiation*) between the two products. Note that for $\gamma = 0$ the two products are independent, whereas for $\gamma = 1$ they are perfect substitutes. Hence, in our analysis we will use the differentiation parameter $\gamma \in [0, 1)$ as a measure of the degree of competition in the market, where a higher degree of differentiation (low value of γ) means a low degree of competition and vice versa.

Inverting the demand system yields the demand functions

$$x_1(p_1, p_2, s_1, s_2) = \frac{\alpha(1 - \gamma) + (1 - \gamma\theta)s_1 - \gamma s_2}{1 - \gamma^2} - \frac{1}{1 - \gamma^2}p_1 + \frac{\gamma}{1 - \gamma^2}p_2 \tag{2}$$
$$x_2(p_1, p_2, s_1, s_2) = \frac{\alpha(1 - \gamma) + s_2 - (\gamma - \theta)s_1}{1 - \gamma^2} - \frac{1}{1 - \gamma^2}p_2 + \frac{\gamma}{1 - \gamma^2}p_1,$$

which show that the demanded quantities depend on both prices and the CSR activities of both firms. Own CSR activities (c.p.) influence market demand

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hand, when StarKist Seafood Company announed a switch to a dolphin-safe procurement policy, its main competitors imitated this policy almost immediately.

[6]Such type of demand system can be derived from a quality-enhanced quadratic utility function. See e.g. Dixit (1979), Symeonidis (2003), Garella and Petrakis (2008).

[7]As an alternative, one could imagine that investments in quality alter the slope of the demands as in Sutton (1996) and Symeonidis (1999, 2000, 2003). The advantage of the present model is that it allows closed-form solutions for a leader-follower timing, whereas this is not the case for the Sutton-Symeonidis model.

positively. The activities s_2 of the CSR follower reduce the market demand for the leader's product, whereas the effect of the activities of the CSR leader on the follower's demand depends on the relation between spillovers and level of competition.

The timing of our CSR game, which has three stages, is as follows. In the first stage, the CSR leader selects the CSR activity level s_1. This level is observed by the CSR follower, who – in stage 2 – selects its CSR level s_2. In the final stage, the price competition stage, both firm are assumed to choose their products' prices simultaneously, when unit production costs are constant for both firms and are given by c. The game is solved by backwards induction and, hence, we are looking for subgame-perfect equilibria of this CSR game.

4 CSR activity levels, prices, and profits

We now characterize the equilibrium of our game. Note that our demand system exhibits a discontinuity at $\gamma = 1$ (products are perfect substitutes) which is not eliminated by the introduction of vertical differentiation. In what follows, we will assume that the degree of substitutability between products is sufficiently low. More precisely, we will assume that $\gamma < \gamma_{\max} = 0.810736$, which guarantees that the equilibrium of the game is in the interior and all second order conditions are satisfied (see similarly, Garella and Petrakis 2008). Employing backwards induction, we first solve the price competition stage, where the CSR leader and the CSR follower choose prices simultaneously. In this section we will mainly rely on intuitive arguments which will be made more precise in the next section. The corresponding profits of the firms are given by

$$\pi_1 = (p_1 - c)x_1(p_1, p_2, s_1, s_2) - s_1^2$$
$$\pi_2 = (p_2 - c)x_2(p_1, p_2, s_1, s_2) - s_2^2,$$

and solving the first order conditions yields the prices of the CSR leader (firm 1) and the CSR follower (firm 2) as functions of the CSR activity levels:

$$p_1^*(s_1, s_2) = \frac{\alpha(2 + \gamma)(1 - \gamma) + (2 + \gamma)c + (2 - \gamma^2 - \gamma\theta)s_1 - \gamma s_2}{4 - \gamma^2} \tag{3}$$

$$p_2^*(s_1, s_2) = \frac{\alpha(2 + \gamma)(1 - \gamma) + (2 + \gamma)c + (2 - \gamma^2)s_2 + ((2 - \gamma^2)\theta - \gamma)s_1}{4 - \gamma^2}.$$

Note that a firm's CSR activity increases its own price, but the marginal effect is smaller for the CSR leader (if spillovers are positive). Moreover, the effect of a firm's CSR activity on the competitor might be different for the CSR leader and CSR follower. For a given degree of substitutability of the two products, if spillovers are sufficiently large, the CSR activity of the CSR leader might even lead to an increase in the price of the CSR follower![8] Taken together, it seems

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[8]More precisely, this happens if $\theta > \gamma/(2 - \gamma^2)$.

that CSR spillovers have the effect of reducing the incentives for the CSR leader to engage in CSR. Note furthermore, that in the case where both firms select an identical CSR activity level ($s_1 = s_2 > 0$), the CSR follower selects a higher price than the CSR leader if spillovers are positive.

We are now turning to the CSR follower's selection of the level of CSR activities s_2 at stage 2. The CSR follower observes the CSR activity level of the leader and subsequently chooses its profit-maximizing level of CSR activities anticipating the prices set at the market stage. Inserting (3) into firm 2's profit function, the first order condition of the CSR follower yields

$$s_2^* = \frac{(2 - \gamma^2)((\alpha - c)(2 + \gamma)(1 - \gamma) + s_1((2 - \gamma^2)\theta - \gamma))}{12 - 20\gamma^2 + 8\gamma^4 - \gamma^6}. \tag{4}$$

Note that as long as $\theta < \gamma/(2 - \gamma^2)$, an increase in the CSR activities of the leader leads to a decrease in the follower's CSR engagement. The follower's incentive to invest in CSR decreases, since the follower can free ride on the CSR activity of the leader. If spillovers are high however, $\theta > \gamma/(2 - \gamma^2)$, then the leader's incentive to invest in CSR decreases and, therefore, the follower has to increase its own CSR activities to counterbalance this effect.

In stage 1, the CSR leader chooses its CSR activity level, anticipating the response of the CSR follower at the subsequent stage and the prices to be chosen in the market stage. Solving the CSR leader's optimization problem subject to the CSR follower's reaction function (4) results in the following level of CSR activity for the leader[9]

$$s_1^e = \frac{(\alpha - c)(1 - \gamma^2)[6 - \gamma(4 + \gamma(5 - \gamma - \gamma^2))][6 - \gamma(4\theta + \gamma(5 - \gamma\theta - \gamma^2))]}{(12 - 20\gamma^2 + 8\gamma^4 - \gamma^6)^2 - (1 - \gamma^2)(6 - \gamma(4\theta + \gamma(5 - \gamma\theta - \gamma^2)))^2}, \tag{5}$$

where the superscript 'e' denotes equilibrium outcomes. Using this optimal level we can now solve for the CSR level of the follower,

$$s_2^e = \frac{(\alpha - c)(1 - \gamma)(2 - \gamma^2)N}{(12 - 20\gamma^2 + 8\gamma^4 - \gamma^6)^2 - (1 - \gamma^2)(6 - \gamma(4\theta + \gamma(5 - \gamma\theta - \gamma^2)))^2}, \tag{6}$$

where the expression in the numerator is $N = 6(3 + \theta) + 2\gamma(3 + 5\theta - 2\theta^2) - \gamma^2(35 + \theta + 4\theta^2) - \gamma^3(15 + 6\theta - \theta^2) + \gamma^4(15 + \theta^2) + \gamma^5(7 + \theta) - 2\gamma^6 - \gamma^7$. Using these equilibrium levels of the CSR activities of the firms, the (absolute) mark ups – i.e. the difference between equilibrium prices and unit production costs –

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[9] The denominator of this expression for the leader's optimal level of CSR involves the second order condition and it is easy to see that this condition is fulfilled if $\gamma < \gamma_{max}$ for all degrees of spillovers. Furthermore, the equilibrium CSR level is also positive.

and the profits in equilibrium can be expressed as

$$p_1^e - c = \frac{(\alpha - c)(1 - \gamma^2)(12 - 20\gamma^2 + 8\gamma^4 - \gamma^6)(6 - \gamma(4 + \gamma(5 - \gamma - \gamma^2)))}{(12 - 20\gamma^2 + 8\gamma^4 - \gamma^6)^2 - (1 - \gamma^2)(6 - \gamma(4\theta + \gamma(5 - \gamma\theta - \gamma^2)))^2} =$$

(7)

$$= \frac{12 - 20\gamma^2 + 8\gamma^4 - \gamma^6}{6 - \gamma(4\theta + \gamma(5 - \gamma\theta - \gamma^2))} s_1^e$$

$$p_2^e - c = \frac{(\alpha - c)(4 - \gamma^2)(1 - \gamma^2)(1 - \gamma)N}{(12 - 20\gamma^2 + 8\gamma^4 - \gamma^6)^2 - (1 - \gamma^2)(6 - \gamma(4\theta + \gamma(5 - \gamma\theta - \gamma^2)))^2} =$$

$$= \frac{(4 - \gamma^2)(1 - \gamma^2)}{(2 - \gamma^2)} s_2^e$$

$$\pi_1^e = \frac{(\alpha - c)^2(1 - \gamma^2)(6 - \gamma(4 + \gamma(5 - \gamma - \gamma^2)))^2}{(12 - 20\gamma^2 + 8\gamma^4 - \gamma^6)^2 - (1 - \gamma^2)(6 - \gamma(4\theta + \gamma(5 - \gamma\theta - \gamma^2)))^2} =$$

$$= \frac{(\alpha - c)(6 - \gamma(4 + \gamma(5 - \gamma - \gamma^2)))}{6 - \gamma(4\theta + \gamma(5 - \gamma\theta - \gamma^2))} s_1^e$$

$$\pi_2^e = \frac{(\alpha - c)^2(1 - \gamma)^2(12 - 20\gamma^2 + 8\gamma^4 - \gamma^6)N^2}{((12 - 20\gamma^2 + 8\gamma^4 - \gamma^6)^2 - (1 - \gamma^2)(6 - \gamma(4\theta + \gamma(5 - \gamma\theta - \gamma^2)))^2)^2} =$$

$$= \frac{12 - 20\gamma^2 + 8\gamma^4 - \gamma^6}{(2 - \gamma^2)^2} (s_2^e)^2.$$

In the following section of the paper we are using these expressions to answer our four research questions presented in the introduction.

5 First-mover advantage and the influence of competition and spillover levels

In this section we are answering our four research question by considering the comparative statics of the equilibrium, where we take the degree of substitutability γ as a measure of the degree of competition between the firms.[10] For $\gamma = 0$ the two products are independent, whereas for $\gamma = 1$ they are perfect substitutes. Hence, a higher value of γ indicates a higher degree of competition. On the other hand, the level of CSR spillovers can be seen as a measure of the appropriability of the outcomes of the CSR efforts. A higher level of CSR spillovers indicates that CSR is not specific to the CSR leader and the activities are to a large degree also increasing the sales of the CSR follower. Note that whereas our measure of the degree of competition, γ, deals with the external environment of the firm, the CSR spillovers are a measure for how successful a firm is in keeping other firms from benefitting from its own CSR activities. Viewed in this way, by

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[10]This is a commonly used measure for competition between firms. Alternatively, the number of firms or the market size could be used. Here we do not explore the impact of such alternative measures in detail. In the literature on R&D, there is an ongoing and recently intensified discussion about the influence of competition on R&D incentives, e.g. Vives (2008), Schmutzler (2007, 2008), Weiss (2004), Tishler and Milstein (2009).

focusing on the influences of these two parameters on the incentives to engage in CSR and the equilibrium outcomes, we are essentially combining elements of a market-based study with elements of the resource-based approach.

We recall that our research questions address the conditions under which the CSR leader achieves a first-mover advantage and the influence of CSR spillovers and the degree of competition on the level of CSR activities and the incentives to invest in CSR. It seems intuitive that for a low level of CSR spillovers (i.e. quality increases are highly firm-specific and are hard to imitate) the CSR leader has a higher incentive to invest and, consequently, the CSR leader will select a higher level of CSR and obtain higher profits. The reason is that the leader can use its CSR activities as a sort of commitment device and manipulate the demand for its product to obtain a strategic advantage. As the situation without spillovers is a natural starting point, we first consider the case $\theta = 0$ as a benchmark case. Subsequently, we will discuss the influence of CSR spillovers.

The benchmark case: no CSR spillovers ($\theta = 0$)

Using the expressions for s_1^e and s_2^e given in (5) and (6) respectively, it is easy to see that for $\theta = 0$ we have $s_1^e = s_2^e$ for $\gamma = 0$ and $s_1^e > s_2^e$ for $0 < \gamma \leq \gamma_{\max}$. That is, if there are no spillovers and the markets are separated, then both firms obviously select the same level of CSR, whereas the CSR leader selects a higher level of CSR to increase the differentiation advantage if products are ex ante (imperfect) substitutes. Furthermore, in this benchmark case, we have $\partial s_1^e / \partial \gamma < 0$ for $\gamma < 0.532$ and $\partial s_1^e / \partial \gamma > 0$ otherwise. In contrast to this, for the follower we obtain $\partial s_2^e / \partial \gamma < 0$ for all degrees of competition. In Figure 1 we depict the equilibrium levels of CSR activities of the leader and the follower in the situation without CSR spillovers ($\theta = 0$).[11]

– Insert Figure 1 here –

Figure 1 shows that there is a remarkable difference in the CSR activities of the CSR leader and the CSR follower for increasing degrees of competition. Whereas the follower's level of CSR activity decreases with increasing degree of substitutability of the firms' products, the leader's CSR level first decreases, but then starts to increase for a sufficiently high level of competition ($\gamma > 0.532$).[12] In particular, the maximum equilibrium CSR activity level is reached for $\gamma = \gamma_{\max}$. This latter observation contrasts with the results obtained for a situation where firms choose their CSR levels simultaneously, that is without knowing the level of CSR activity chosen by the other firm; see Garella and Petrakis

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[11] In all the figures in this section we set the constant $\alpha - c = 1$. Notice that this has no effect on the comparison, as $\alpha - c$ or $(\alpha - c)^2$ appears as a common factor in the equilibrium outcomes.

[12] A similar observation – although in the context of cost-reducing process R&D with simultaneous moves at the investment stage – has been reported in Schmutzler (2007, 2008) and in Tishler and Milstein (2009) and confirmed in a laboratory experiment by Sacco and Schmutzler (2008).

(2008)[13]. The economic reasoning for this outcome can be given as follows. Note that the incentives to engage in CSR activities are determined by two effects. First, for both firms increasing the degree of competition has a *negative* effect on the markups (prices minus marginal costs) in the product market equilibrium and, consequently, a *negative* effect on the incentives to engage in CSR. On the other hand, CSR has a positive effect on demand ($\partial x_i / \partial s_i > 0$) and without CSR spillovers, we have $\partial (\partial x_i / \partial s_i) / \partial \gamma > 0$. That is, a higher degree of competition *increases* the positive demand effect of CSR activity and this results in a positive effect of competition on the incentives to engage in CSR. These two opposite effects contribute to both firms' incentive to engage in CSR. Looking at the combined impact of these two effects on the CSR leader, we can see that $\partial \pi_1 / \partial s_1 > 0$. For small degrees of competition we then have $\partial (\pi_1 / \partial s_1) / \partial \gamma < 0$ (the negative markup effect dominates), whereas for higher competition levels we $\partial (\pi_1 / \partial s_1) / \partial \gamma > 0$ (the positive demand effect dominates).[14] This already indicates that there is a U-shaped relation between the CSR engagement and the degree of competition for the leader. On the other hand, for the CSR follower it can be shown that $\partial (\pi_2 / \partial s_2) / \partial \gamma < 0$.[15] If the firms would select their levels of CSR simultaneously, these two effects would determine the overall outcome. However, in our setup the CSR leader can commit to a high level of CSR and – by acting tough in the sense of the Fudenberg-Tirole taxonomy of business strategies – induce a lower CSR engagement of the follower.[16] Hence, the CSR leader's incentive is determined by the direct effect *and* the strategic effect,

$$\frac{\partial \pi_1}{\partial s_1} + \underbrace{\frac{\partial \pi_1}{\partial s_2}}_{<0} \underbrace{\frac{\partial s_2^*}{\partial s_1}}_{<0}.$$

Since the strategic effect is positive, there is an incentive of the CSR leader to "overinvest" in CSR activities, which leads to $s_1 > s_2$. Additionally, a higher degree of competition makes the strategic effect even more pronounced, leading to an increase in the difference between the CSR engagements for increasing degrees of competition. Overall, the interplay between the markup effect, the demand effect, and the strategic effect determine the incentives of the CSR leader and CSR follower to engage in CSR and, consequently, the observed pattern of CSR activities.

It is not surprising that as a result of the higher CSR engagement, the leader's profit is higher than the follower's profit. To put it differently, the CSR leader has a *first mover advantage*. What is interesting, however, is that the first

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[13]If firms simultaneously select their levels of CSR (i.e. without knowing the other firm's selection) and at the market stage choose their production quantities (Cournot quantity competition instead of Bertrand price competition), the influence of the level of competition on CSR activities can also lead to a U-shaped pattern.

[14]The sign is determined by a polynomial of the form $a_0(\gamma, a - c) + a_1(\gamma)s_1 + a_2(\gamma)s_2$, where $a_0 < 0, a_1 > 0$, and $a_2 < 0$. The relative magnitude of the coefficients and the fact that $s_1 > s_2$ then give the observed result.

[15]The sign is determined by a polynomial of the form $a_0(\gamma, a - c) + a_2(\gamma)s_1 + a_1(\gamma)s_2$, with the same coefficients as for the CSR leader.

[16]Note that $ds_2^*/ds_1 < 0$ as long as $\theta < \gamma/(2 - \gamma^2)$.

mover advantage gets more pronounced for increasing degrees of competition. In other words, as the products become increasingly homogeneous, the CSR leader increases its engagement in CSR activities and, as a consequence, the leader's profit advantage can not only be sustained, but made even larger. We can now summarize the results obtained so far as follows.

Result 1 In an industry where CSR spillovers are negligible, i.e. the outcomes of the CSR efforts are highly specific to the leader, a CSR leader invests more than a CSR follower. Furthermore, the CSR leader has a first mover advantage, that is the leader obtains a higher profit than the CSR follower.

The case with positive CSR spillovers ($\theta > 0$)

Now we are turning to the question, "How does the investment pattern of the two firms change if the leader's CSR activities can not be protected and also benefit the CSR follower?" On an intuitive level we might expect that CSR spillovers dampen the incentives of the leader to engage in CSR. Furthermore, as a consequence, the CSR leader might even lose its first mover advantage. In fact, if we consider the influence of increasing spillover levels on the incentives to engage in CSR, we notice an asymmetry between the leader and the follower, which is obviously due to the (assumed, but plausible) asymmetric directions of spillovers. We have $\partial(\pi_1/\partial s_1)/\partial\theta < 0$ for the leader, but $\partial(\pi_2/\partial s_2)/\partial\theta > 0$ for the follower. Accordingly, as expected increasing levels of CSR spillovers dampen the leaders' incentives to engage in CSR, but enhance the incentives of the CSR follower. Figure 2 provides a more detailed picture of the situation with CSR spillovers. For a given degree of substitutability between the products, if the degree of CSR spillovers θ is below the bold line depicted in Figure 2, then the CSR leader achieves higher profits ($\pi_1^e > \pi_2^e$). Hence, in this region a first mover advantage for the leader emerges. It is interesting to notice that such a first mover advantage only occurs if the level of appropriability is very low. Otherwise the second mover achieves higher profits. In Figure 2 we also depict the combinations of degree of competition (γ) and CSR spillovers (θ) which lead to higher levels of CSR activities for the leader ($s_1^e > s_2^e$), which is indicated by the dashed line. Again, it can be noted that this region is rather small, meaning that the existence of CSR spillovers drastically reduce the incentives for the CSR leader to engage in CSR activities. This gives rise to our second result on the sustainability of a First-Mover Advantage (FMA) and the influence of CSR spillovers.

Result 2 A CSR leader achieves a FMA only if the outcomes of the CSR efforts are highly specific to the leader, that is the level of CSR spillovers is quite small. Otherwise, the CSR follower has a Second-Mover Advantage. Moreover, the CSR leader selects a higher activity level of CSR than the CSR follower if the outcomes of the CSR efforts are highly specific to the firm, i.e. if CSR spillovers are quite small (independent of the degree of

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competition). Otherwise, the CSR follower has higher a higher level of CSR activity.

– Insert Figure 2 here –

Finally, let us consider how the qualitative investment patterns change if CSR spillovers exist. As argued above, the higher the level of CSR spillovers, the lower the incentives of the CSR leader to engage in CSR. The result is that the increasing part of the graph of the leader's CSR activity level shown in Figure 2 is getting smaller until eventually the leader's level of CSR activities is decreasing everywhere for $\theta > 0.229$. Recall that CSR spillovers have quite the opposite effect on the follower's incentive to engage in CSR. What we see for our CSR game is that if the spillover level is sufficiently large ($\theta > 0.202$), then starting from a monopoly situation ($\gamma = 0$) the activity level of the CSR follower first decreases for increasing levels of competition, but then starts to increase for sufficiently high competition levels. Again, this observation illustrates that the incentives to engage in CSR is asymmetric between CSR leader and CSR follower and strongly depend on the appropriability of CSR. As our analysis demonstrates, if the degree of appropriability is sufficiently high, the CSR leader and the CSR follower switch roles in the sense that the follower has a higher activity level of CSR and obtains a higher profit than the leader who selects the level of CSR first. It is interesting to notice that there are intermediate levels of competition where a similar investment patterns holds for both, CSR leader and CSR follower; see Figure 3, where the degree of spillovers $\theta = 0.21$. Summarizing, we can state the following result on the investment patters of the CSR leader and the CSR follower.

Result 3 For low and high levels of appropriability of CSR the investment patterns of the CSR leader and CSR follower differ for increasing levels of competition. For low levels of spillovers, the CSR follower's level of activity decrease for increasing levels of competition, whereas the CSR leaders' level of activity is non-monotonic: it first decreases, but then increases again. If spillovers are large, then the investment patterns of the CSR leader and the CSR follower are quite the opposite.

– Insert Figure 3 here –

To end this section, we finally turn to a description of the markups in equilibrium and mention that similar results are obtained. For a given value of substitutability between the products, the markup for the CSR leader is higher than the markup of the CSR follower if the level of spillovers is sufficiently small. In other words, in these situations the CSR follower is able to charge a

higher price for its product. Again, however, this region is rather small. As with profits and CSR activity levels, we again observe that the markup of the CSR follower decreases for increasing degrees of substitutability, whereas the CSR leader's markup first decreases, but then increases with increasing competition (if spillover levels are sufficiently small).

6   Discussion and Conclusions

Our study provides support for the claims in conceptual papers like Tetrault Sirsly and Lamertz (2008), Burke and Logsdon (1996) and Reinhardt (1998). It shows that the CSR leader can achieve and sustain a competitive advantage only if it can also capture the value that it is creating with its activities in CSR. As far as the absolute level of profits are concerned, for increasing degrees of competition γ the CSR followers' absolute profits decrease, independent of the levels of spillover θ. This is what we would expect. What is surprising, however, is that this is not true for the CSR leader. If spillovers are sufficiently small ($0 \leq \theta < 0.06$), for increasing degrees of competition the leaders' profits first decrease, but if competition is sufficiently strong the leaders' profits increase again! This is certainly due to the increased incentives to invest in CSR which leads to a strong vertical differentiation between the products of the competitors. What can be learned from our derivations for future empirical work? Our observations demonstrate that the relationship between the degree of competition and the level of CSR activities and the resulting profits might be ambiguous for the firms. Since the particular pattern of activity levels and profits is highly dependent on industry characteristics (here the degree of substitutability between products) and firm characteristics (being a leader or a follower and the specificity of the outcomes of the CSR efforts), all we can hope for is a match between particular constellations of industry/firm properties and levels of CSR. However, to look for a robust relationship between industry and firm characteristics and CSR activity levels and profits might be a hopeless endeavour (see similarly in an R&D context, Schmutzler (2007, 2008)).

In this paper, we have tried to contribute to the growing literature on analytical frameworks which have been employed to get a deeper understanding of the issues related to corporate social responsibility. We have introduced such an analytical framework and have used it to discuss the issue of CSR leadership. We have tried to use this model to provide support for claims made in other, more conceptual contributions on CSR. We have derived results which can be empirically validated with appropriate data. Finally, we have investigated if – at a more general level – a robust relationship between the drivers of the costs and benefits of CSR and CSR activity levels and profit patterns exist. It has turned out that the prospects for the sustainability of a CSR leadership advantage look rather bleak. Only if the outcomes of CSR initiatives are highly specific to a firm (i.e. CSR spillovers are quite low), a first mover advantage exists. Interesting insights are that (i) the incentives to engage in CSR and the activity levels are asymmetric between CSR leader and CSR follower, and

(ii) the outcomes and qualitative patterns depend in a rather intricate way on the degree of competition and the level of CSR spillovers. This renders the derivation of generally valid results and empirical support difficult.

We hope that this paper encourages other researchers in the field of corporate social responsibility to address the question of CSR leadership from both, analytical and empirical directions. Several extensions of the model are possible. First, a quite straightforward extension would be to consider multiple leaders and multiple followers in an industry. Here the question might be how CSR spillovers occur (between leaders, or between leaders and followers only?) and how this affects CSR investment behavior. Second, in our analysis we assume that firms are entrepreneurial. That is, the firm owners select the CSR levels in order to maximize profits. However, what happens if entrepreneurial firms are replaced by managerial firms, where the decision maker has a preference for socially responsible actions? This would be an extension along the lines suggested by Baron (2001), Fishman et al. (2005, 2006), and Baron (2008). Third, what happens in a mixed oligopoly, where only some firms invest in CSR, but others do not? Some considerations along these lines can be found in Becchetti and Solferino (2003) and Becchetti et al. (2007). Fourth, and finally, how do these results change if CSR efforts change the slope of the demand curve and not only the intercept? We hope to address these research question in the near future.

7   References

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Figure 1: Influence of the level of competition (degree of substitutability) on the level of CSR activities in the benchmark case without CSR spillovers ($\theta=0$). For increasing competition levels, the CSR leader's level of CSR activities first decreases, but then increases (bold curve). In contrast, the CSR follower's level of CSR activities decrease throughout (dashed curve). Note that the difference between CSR engagements increases for increasing levels of competition.
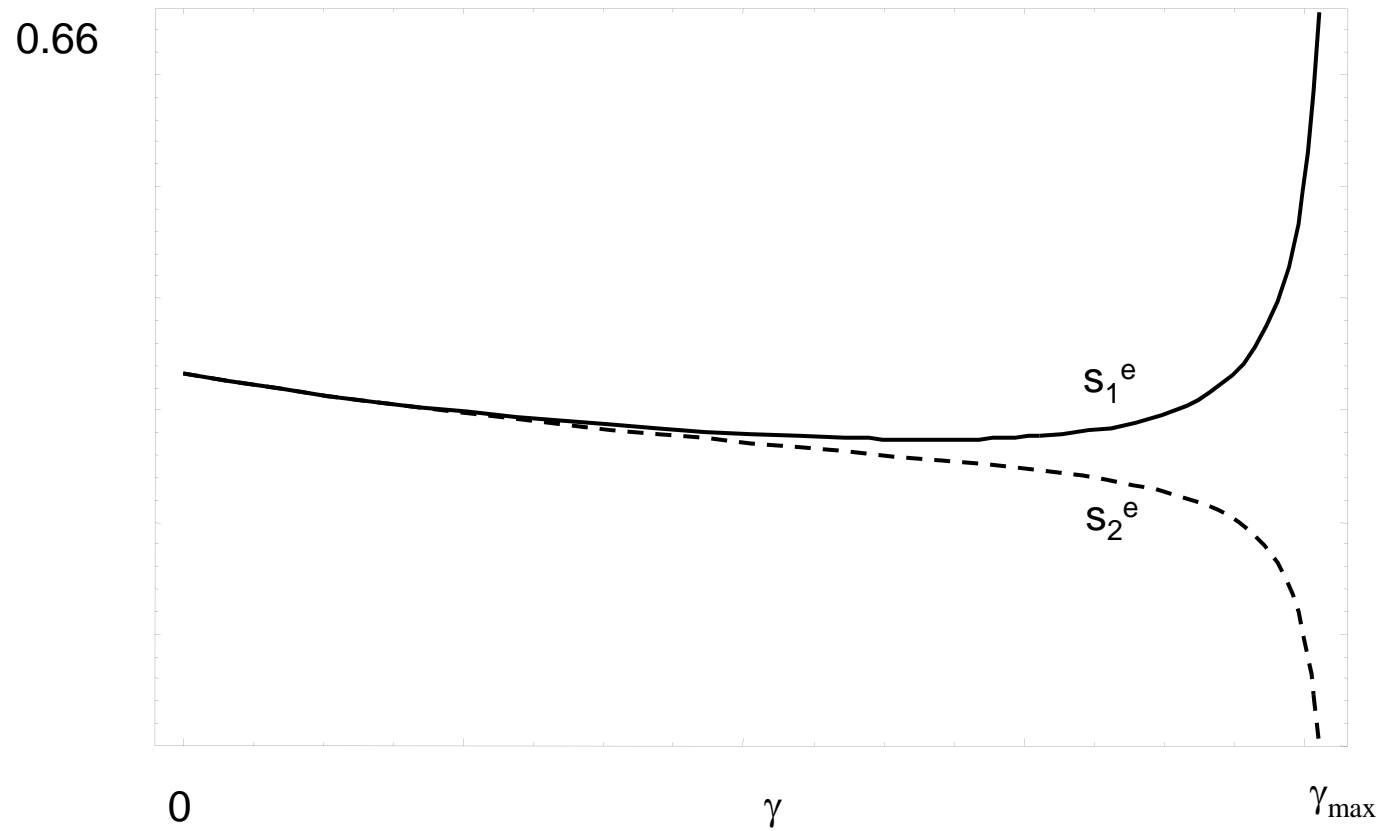
Figure 2: Influence of the level of competition γ (substitutability of the products) and CSR spillovers θ on the first mover advantage and CSR activity levels. For combinations of (γ, θ) below the bold curve the CSR leader achieves higher profits in equilibrium. For combinations of (γ, θ) below the dashed curve the CSR leader selects a higher level of CSR activities in equilibrium.
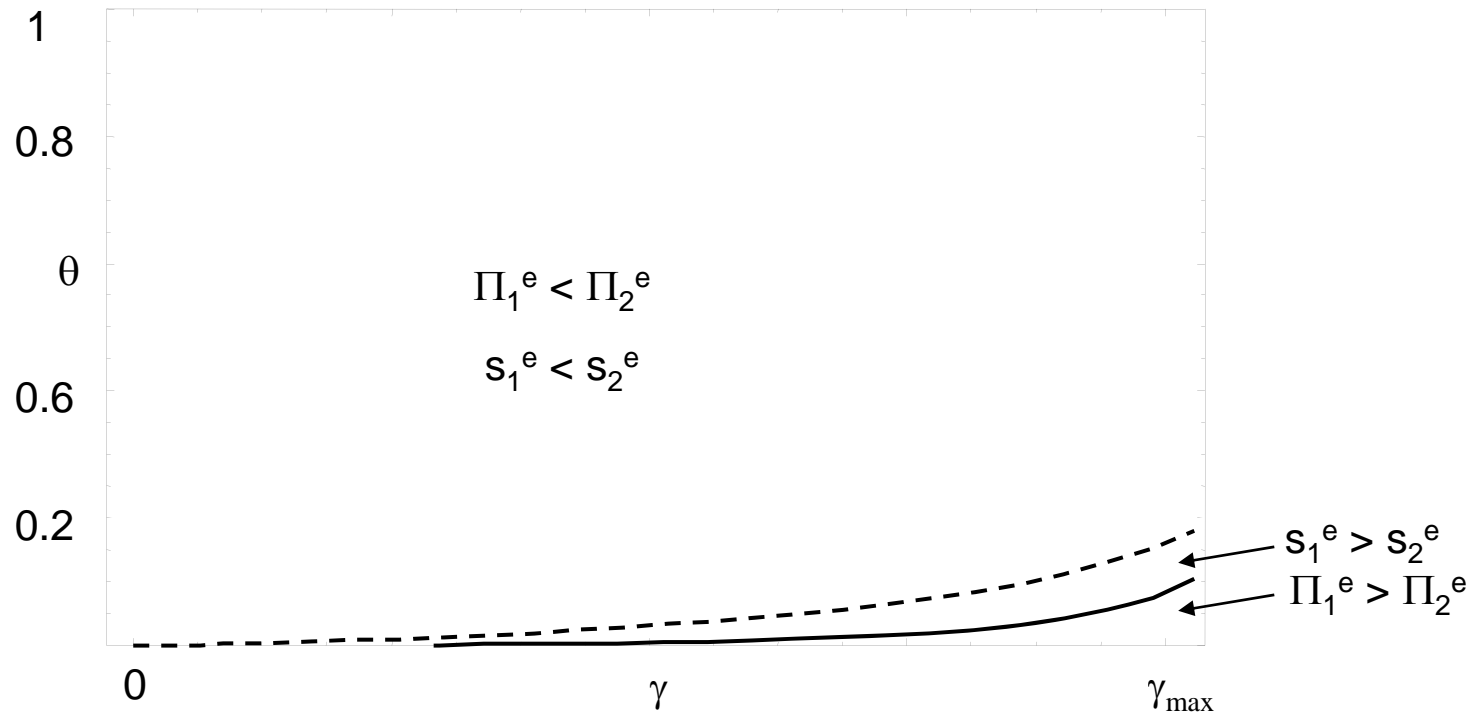
Figure 3: Influence of competition (degree of substitutablity) on the CSR activity levels for a degree of CSR spillovers of $\theta = 0.21$. For increasing competition, the levels of CSR activity for both firms first decrease, but then increase. Note that the follower's engagement in CSR (dashed curve) is higher than the CSR leader's engagement (bold curve).