Scientific Annals of Economics and Business
70 (2), 2023, 163-183
DOI: 10.47743/saeb-2023-0024

Pretending to be Socially Responsible? The Role of Consumers' Rewarding Behaviour

Margarida Catalão-Lopes[*], Joaquim P. Pina[**], Ana S. Costa[***]

Abstract: Extant evidence on corporate social responsibility (CSR) shows that consumers are willing to pay a premium if they infer that the firm is truly "prosocial" (i.e if it is altruistic), but their valuation of the product will not increase as much (and may even decrease) if they believe the company has an ulterior motive for CSR (i.e. if the firm is opportunistic). We pose that the CSR level of investment can be strategically used as a signalling tool to help consumers identify the true nature of the firm and solve this incomplete information problem. Using a signalling game, where altruistic firms want to express their nature and opportunistic ones want to conceal it, we explore the relative effectiveness of consumers' premiums and penalties (expressed as demand increases or decreases, respectively) in the promotion of corporate truth-revealing behaviour. We also characterize the conditions for market equilibria in which altruistic firms are distinguished from opportunistic ones, allowing consumers to solve the information asymmetry and, with that, influence firms' profits. Contrary to what might be expected, we show that rewards for altruistic CSR and penalties for opportunistic CSR are not symmetrically effective. Our results help companies to improve their CSR decisions, by understanding how consumers solve the information asymmetry regarding the true nature of the CSR investments. Especially for altruistic firms, this may be important to guarantee that CSR effort and expenses are not just a cost but turn into higher revenues and profits.

Keywords: Corporate Social Responsibility (CSR); firm behaviour; consumers' perceptions; consumers' reactions.

JEL classification: D12; D21; M14.

[*] CEG-IST, Instituto Superior Técnico, Universidade de Lisboa, Portugal; e-mail: *mcatalao@tecnico.ulisboa.pt* (corresponding author).

[**] MARE – Marine and Environmental Sciences Centre, Associate Laboratory; ARNET – Aquatic Research Network, and Departamento de Ciências Sociais Aplicadas, Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa, Portugal; e-mail: *jagl@fct.unl.pt*.

[***] CEG-IST, Instituto Superior Técnico, Universidade de Lisboa, Portugal; e-mail: *ana.costa@novasbe.pt*.

Article history: Received 2 October 2022 | Accepted 26 May 2023 | Published online 27 June 2023

To cite this article: Catalão-Lopes, M., Pina, J., Costa, A. (2023). Pretending to be Socially Responsible? The Role of Consumers' Rewarding Behaviour. *Scientific Annals of Economics and Business*, 70(2), 163-183. https://doi.org/10.47743/saeb-2023-0024.

1. INTRODUCTION

Over the past decades, corporate social responsibility (CSR) practices have become increasingly important in firms' positioning strategies. Offering CSR attributes may improve consumers' evaluation (Alan *et al.*, 2019) and even reduce the risk of consumer boycotts (Luo & Bhattacharya, 2009). Specially under changing economic conditions that may lead firms to reorient social responsibility practices (Cassely *et al.*, 2021) or in face of humanitarian disasters, CSR may play a crucial role in shaping consumers' perceptions about companies. Although not all CSR investments respond in the same way to economic determinants (e.g., Acabado *et al.* (2020)) and/or receive the same attention in all countries (Pimentel *et al.*, 2016), during economic downturns CSR may be an important demand enhancing instrument (Catalão-Lopes *et al.*, 2016).

But are consumers' perceptions and reactions independent of the CSR motivation? Skilton and Purdy (2017, p. 117) conclude that stakeholders respond to CSR activities "dynamically by evaluating both their content and the motivations behind them". Consumers know that firms' CSR effort may not be altruistic. For instance, if greenwashing purposes exist behind CSR, this may backfire on the company and its reputation (Gatti *et al.*, 2019). CSR's influence on consumers' purchase intentions is more complex than just a simple positive influence. According to Ribeiro *et al.* (2022), consumers' reaction to CSR initiatives takes into account the proactive or reactive nature of the observed CSR, the CSR dimension (environment, employees, or social) and the price of the product.

In the literature, there is ample evidence of how consumers react to CSR. Moisescu (2017) found that the perceptions of customers about the corporate social responsibility of their service providers impacted consumers' loyalty. Hashimoto and Karasawa (2018) concluded that consumers' empowerment derived from the massification of social network drives them to show negative psychological and behavioural reactions to misbehaving firms. Brandão *et al.* (2022) found that consumers are more likely to join anti-brand communities depending on how firms behave regarding CSR. Consumers' involvement is confirmed by several experiments (Chernev & Blair, 2015; Ribeiro *et al.*, 2022). Clients are willing to pay more when part of the payment goes to a charitable cause (Elfenbein & McManus, 2010). The positive influence of CSR on the way that consumers evaluate a company's products can exist even when the acts of social goodwill are unrelated with the company's core business (Chernev & Blair, 2015). However, this positive influence may be attenuated if consumers believe that the firm is acting by self-interest rather than by altruism. (Du *et al.*, 2010) found evidence that the benefits and business returns of CSR are contingent on customers awareness of a company's CSR activities. In a literature review, Neacșu and Georgescu (2023) concluded that the transparency of the decision-making process in the field of sustainability and financial performance helps the integration of these two areas. Additionally, CSR improves the firm's image when consumers attribute sincere motives and hurts the firm's image when motives are perceived as insincere (Yoon *et al.*, 2006). As Alhouti *et al.* (2016, p. 1242) put it, "it is not enough for a firm to simply engage in CSR. A firm's CSR strategy must also consider the extent to which consumers perceive the CSR initiative to be authentic". Schlegelmilch and Pollach (2005, p. 284), reinforce this notion when considering "people's distrust of and cynicism about corporate ethics" as a challenge for companies' ethics communication.

Polls evidence supports the existence of socially responsible consumers, the existence of beliefs about the nature of CSR, and highlights the role of information. We offer an

overview of these findings in the Annex, covering polls from 2000 to 2019. In the current paper we follow these results by admitting a consumers' reward for altruistic behaviour and a lower reward (or even a penalty) for opportunistic CSR, with the aim of identifying conditions for separation of the two firm types (altruistic and opportunistic) and each type's optimal CSR investment, based on consumers' perceptions. Throughout the article we employ the terminology "altruistic" versus "opportunistic" meaning firms' other-regarding and self-regarding behaviours, respectively. Also, the words "separate" and "distinguish" are used interchangeably to denote separating equilibrium in which consumers can identify altruistic CSR behaviour, as opposed to "pooling" equilibrium, in which the two types of firms send signals to consumers that they are unable to distinguish. Consumers use a visible outcome, manipulated by the firm, to try to infer an unobservable firm's characteristic.

Signalling models have been applied to many settings in the literature, including job markets, insurance, advertising expenses, warranties, and several other adverse selection contexts. Among empirical works, applications to capital markets (e.g., Ritter & Welch, 2002) and to management practices (e.g., Haas & Hansen, 2007) are worth mentioning.

Following Zerbini (2017) that suggested the use of signalling theory to explore the problem of adverse selection when there is asymmetric information between the firm and its customers on the ethicality of the firm, we adopt the CSR level of investment as a signalling tool. The signalling approach points "to the cueing process that links the CSR initiatives to the market response" (Zerbini, 2017, p. 3), and, as such, is adequate to explore the nature of firms' CSR behaviour and the corresponding customers' perceptions and behaviour. In the spirit of Kirmani and Rao (2000), the use of CSR as a signalling instrument can be regarded as a "no pain no gain" argument. CSR initiatives can be seen as shortcuts by which customers infer the hidden ethical nature of the firm and choose their providers. The power of the 'CSR level of investment' as a signalling tool depends on the *a priori* probability attached by consumers regarding the existence of altruistic and opportunistic companies, and also on consumers' response to CSR effort. Of course, it is also subject to financial constraints, as noted by Kumar *et al.* (2019).

One of our research hypotheses is thus that, under some conditions depending on the level of consumers' reward and penalty and prior probability of the two types of firms, altruistic firms may be able to separate from opportunistic. This research hypothesis is confirmed by the model developed, and quantitatively assessed by the simulations performed. Given this, a second research hypothesis has to do with the best instrument consumers may use to lead to separation. We hypothesize, and then prove, that rewards and penalties are not symmetrically effective in helping consumers distinguish altruistic from opportunistic CSR. We furthermore derive conditions under which one instrument is more effective than the other.

In the current paper, two types of asymmetries are present: on the one hand, there is information asymmetry between firms and customers, as customers observe the strategies and actions of companies but do not observe the true motives behind these strategies. Customers try to infer those motives, and their decisions will reflect their perceptions. On the other hand, we find an asymmetry between penalties and rewards that customers use to encourage companies to separate. Contrary to what might be expected, we show that rewards for altruistic CSR and penalties for opportunistic CSR are not symmetrically effective at leading to separation. These results parallel those obtained by Mulder (2008) for punishments and rewards in fostering moral concerns in social decision making, where punishing non-cooperation fosters moral concerns regarding cooperation more strongly than rewarding

cooperation. Wagner *et al.* (2009) conclude that a proactive communication strategy generates higher levels of perceived hypocrisy than a reactive one. In an experimental design to compare proactive and reactive CSR, Ribeiro *et al.* (2022) test consumers' response to these two types of CSR, in terms of awards or penalties, and find that consumers tend to reward more proactive CSR initiatives and are willing (in a lesser extent) to reward some CSR initiatives that follow a reactive approach, also confirming the existence of asymmetries.

Although from a social point of view a separating equilibrium is not necessarily preferable to a pooling one if the latter involves a sufficiently larger amount of CSR, we focus on the likelihood of the former. CSR initiatives are valuable, and the more valuable the more information they convey. As Zerbini (2017, p. 1) notes, social and ethical initiatives may have the (additional) advantage of signalling "the ethical nature of the business to a target audience, when this is not directly observable." They are shortcuts that enclose informational value to help solving adverse selection problems and change the market outcome. We perform some numerical simulations that reveal that the likelihood of separation may be high, which means solving the uncertainty associated with CSR's nature and helping consumers in their decision-making process.

The rest of the article is organized as follows. Section 2 presents the model. Interpretations and results on the relative effectiveness of rewards and penalties are provided in Section 3. Section 4 offers some numerical simulations. Section 5 concludes and presents suggestions for future work. An Annex contains all formal proofs.

2. MODEL

This section develops a standard signalling model that incorporates consumers' reaction to CSR investment. Consumers know that there are two types of firms in the market, those with altruistic CSR behaviour and those with opportunistic CSR behaviour. Thus, they are sceptical about observed CSR. Altruistic firms (A) care about social motives besides profit. Opportunistic ones (O) only care about profit and their CSR initiatives are entirely aimed at increasing profit. Each firm knows its type, but consumers cannot perfectly distinguish between the two. Consumers attach an *a priori* probability to each type, $0<\theta<1$ and $1-\theta$ respectively. These beliefs are assumed to be common knowledge. The *a priori* probability for a firm to be altruistic (θ) can be as small as desired, provided it is positive. As seen before, the existence of (some) altruistic firms is sometimes assumed in the CSR literature. Some consumer uncertainty about the type of the firm exists, hence θ must be strictly positive.

Consumers are socially responsible (we thus focus on the subset of consumers who care about CSR) and observe (through firms' disclosure and CSR reporting) the amount of the firm's CSR. From this observation they may be able to extract information about the type of the firm and update their *a priori* probability θ. Let us admit a standard inverse market demand

$$p = 1 - q$$

where p is price and q is quantity in the absence of CSR activity. Without loss of generality, and to avoid additional parameters, we follow the common procedure of normalizing to one the maximum willingness to pay and the sensitivity of demanded quantity to price. If firms invest in CSR and consumers believe that the observed amount of CSR corresponds to altruistic conduct, this impacts positively on demand which becomes:

$$p = 1 - q + \delta$$

where $\delta>0$ means that consumers are willing to pay a reward for the products (indifference to CSR activity would imply $\delta=0$). In the words of (Smith, 2008), this corresponds to 'ethical consumerism', as opposed to 'negative ethical consumerism' which often involves a penalty.

If firms invest in CSR but consumers believe that the observed amount of CSR corresponds to opportunistic conduct, demand becomes:

$$p = 1 - q - \mu$$

where $0<\mu<1$ means that consumers are only willing to pay a lower price, penalizing companies for their perceived opportunistic behaviour (indifference to CSR activities would imply $\mu=0$). Given that we focus on the subset of consumers who care about CSR, $\delta\neq0$ and $\mu\neq0$.

If we consider $\mu<0$ we are admitting that consumers always reward CSR. If this is the case, to assure that this reward is lower than when CSR is taken for altruistic, we must still impose $|\mu|< \delta$. In this context CSR is always desirable (for instance when some company contributes to an important medical advance, consumers will probably reward it independently of the true motivation), however the true motivation may make some difference in consumers' willingness to reward the CSR effort. In other words, consumers prefer that opportunistic firms spend some money on CSR as compared with no money at all, even if their motives are not genuine.

Hence, to take both penalties and "smaller" rewards into account, we will assume the union of both intervals above, that is, $-\delta<\mu<1$. A possible interpretation for these demand shifts is that consumers regard firm types as selling a vertically differentiated product. Note that in case of penalty the value for μ can be as close to zero as desired (almost no penalty) or, on the other extreme, demand may be completely eroded ($\mu\rightarrow1$).

Firm losses are bounded (by demand declining to zero) but gains may be very high, which is consistent with a view where consumers preferably reward prosocial behaviour and are less willing to change their buying habits when it comes to punishing. Consumers' valuation of CSR behaviour is reflected on the magnitudes of δ and μ relative to demand. We are interested in how δ and μ compare with 1, the upper bound for the willingness to pay. This is what will be used in the 'what if' analysis ahead. Of course, if no CSR is observed demand does not change.

A signalling game allows modelling the conditions under which we have a separating equilibrium, that is, a solution in which the CSR amounts chosen by A and O firms are sufficiently different so that consumers perceive the true nature of firms, or a pooling equilibrium, in which the two types of firms remain mixed. The sequence of our game is standard in signalling models and is as follows. Nature chooses the firm's type (A or O). In stage 1, after observing its type, the firm chooses the amount R to invest in CSR (this decision is contingent on the type), considering the expected reaction by consumers. In stage 2, after observing R, consumers revise their expectations about the type of the firm and decide how much to buy (this decision is contingent on the firm's choice in period 1). We look for the perfect Nash equilibrium of this game. Firms want to understand how much to spend in CSR to be perceived as altruistic and benefit from it. Altruistic firms want to know the minimum amount they need to spend in CSR to be correctly perceived as altruistic. Opportunistic firms want to know the minimum amount they need to spend in CSR to be incorrectly perceived as altruistic.

For simplicity, we assume that fixed and variable production costs are zero. CSR costs are fixed and equal to *R*. This is consistent with donations but can also be related with other CSR dimensions as long as they have a fixed cost nature: investments in employee relations (healthcare benefits, training opportunities or other), community, human rights or environment. Although in these cases assessing the amount involved may be more difficult than for donations, companies' accounting and disclosure practices will try to guarantee that consumers get to know them.

To evaluate how consumers' reaction impacts on firms' decisions, we need to consider profits under different scenarios. If no investment is made in CSR, profit maximization under the demand conditions specified above simply yields the following value for profit (π):

$$\pi = \frac{1}{4}$$

On the other hand, if some investment is made and consumers perceive altruistic CSR concerns, profit becomes:

$$\pi_R(\delta) = \frac{(1+\delta)^2}{4} - R$$

If the firm invests in CSR but consumers believe that this is opportunistic, profit becomes:

$$\pi_R(\mu) = \frac{(1-\mu)^2}{4} - R$$

Note that the no CSR profit is a particular case of the last two expressions, when there is no CSR and thus demand is not impacted. It will serve as a reservation profit in the analysis that follows, that is, the value firms can guarantee themselves by not performing any CSR.

Finally if consumers cannot distinguish the two types of CSR, the expected profit $E_R(\pi)$ is a weighted average of the gross profit (before deducting R) when being perceived as altruistic and the gross profit when being perceived as opportunistic, where each term is multiplied by the corresponding probability, deducted of the amount spent in CSR:

$$E_R(\pi) = \theta\frac{(1+\delta)^2}{4} + (1-\theta)\frac{(1-\mu)^2}{4} - R$$

2.1 How consumers' reaction influences the CSR strategy sets

Altruistic firms maximize a utility function that combines social concerns (W) and private profit (in line with Beltratti (2005)) with a weighting parameter (call it γ) that captures the relative preference for social concerns (altruism parameter): $U=\gamma W+(1-\gamma)\pi$, where W is increasing in the amount of CSR (and π is non monotone). Altruistic firms may thus have different levels of altruism, captured by γ. Their choice of the amount to spend in CSR, R^A, is an increasing function of γ, the willingness to sacrifice profit for social causes, and must be bounded from above by a non-negativity expected profit condition ($E_R^A(\pi)\geq 0$), which gives rise to the following participation constraint, where $\overline{R^A}(\theta, \delta, \mu)$ is the upper limit for R^A:

$$R^A \leq \overline{R^A}(\theta, \delta, \mu) = \frac{\theta(1+\delta)^2 + (1-\theta)(1-\mu)^2}{4}$$

In turn, the participation constraint of the opportunistic firm requires that profits do not decline as compared with the no CSR case. Consequently the opportunistic firm's profits should be above the no investment threshold ($E_R{}^O(\pi) \geq 1/4$) and, hence, their choice of the amount to spend in CSR, R^O, must be bounded from above by $\overline{R^O}(\theta, \delta, \mu)$, given by the following expression:

$$R^O \leq \overline{R^O}(\theta, \delta, \mu) = \frac{\theta(1+\delta)^2 + (1-\theta)(1-\mu)^2 - 1}{4}$$

Notice that the maximum amount the altruistic company is willing to invest in CSR ($\overline{R}^A$) is positive for all admissible θ, δ and μ (*a priori* probability, reward, and punishment, respectively), thus the decision set for the *A* (altruistic) firm includes positive levels of CSR. Given the altruistic nature of the firm we exclude $R^A=0$ from the possible choices of the *A* firm. However, for the opportunistic firm to invest in CSR (i.e., for a positive $\overline{R^O}$) the *a priori* probability θ must exceed the following threshold θ*:

$$\theta > \theta^* = \frac{\mu(2-\mu)}{\delta(2+\delta)+\mu(2-\mu)}$$

We note that $0<\theta^*(\delta,\mu)<1$ for $\delta>0$ and $0<\mu<1$, but $\theta^*(\delta,\mu)<0$ for $\mu<0$. This means that when the *O* (opportunistic) company faces the possibility of a penalty for opportunistic behaviour ($0<\mu<1$), it decides to invest in CSR only if the *a priori* probability θ that consumers attach to altruism is high enough, in which case there is a large chance of being pooled with *A*. On the contrary, if *O* knows there is no penalty for opportunistic CSR (but only a smaller reward, that is, $\mu<0$ and $|\mu|<\delta$), then it always invests in CSR (θ must then be higher than a negative value, which always happens).

As expected, the opportunistic firm is more likely to invest in CSR when the reward δ is high (larger demand expansion following CSR), and when the penalty μ is low (small demand contraction when consumers perceive opportunistic CSR, or even some expansion if $\mu<0$). This can be easily seen from $\frac{\partial\theta^*(\delta,\mu)}{\partial\delta} < 0$ and $\frac{\partial\theta^*(\delta,\mu)}{\partial\mu} > 0$. If there was no reward for prosocial behaviour ($\delta=0$) but there was a penalty for pretending to be altruistic ($\mu>0$), then opportunistic firms would never invest in CSR ($\theta^*=1$), because there was no incentive to try to be perceived as altruistic. On the other hand, if there was no penalty for opportunistic behaviour ($\mu<0$) we would obtain $\theta^* \leq 0$ which means that *O* companies would always invest in CSR.

In conclusion, the amount R^{*A} that the altruistic firm invests in CSR belongs to the interval $(0, \overline{R^A}]$. In turn, the amount R^O invested by the opportunistic firm belongs to the interval $(0, \overline{R^O}]$, with $\overline{R^O} < \overline{R^A}$.

2.2 Equilibria CSR as a function of consumers' reaction

This section describes how consumers' reaction determines the equilibrium type (that is, the firms' CSR choice) – separating or pooling.

2.2.1 Low a priori probability ($\theta \leq \theta^*(\delta,\mu)>0$)

As we have seen, when the a priori probability of the firm being altruistic is low enough the participation constraint for the O firm is not satisfied, which means that it does not invest in CSR. Since the altruistic firm always invests in CSR, the equilibrium is obviously separating. The following Proposition states this result.

Proposition 1: For a positive reward δ and a positive penalty μ, when the *a priori* probability θ of the firm being altruistic is low the market equilibrium is separating, and consumers can distinguish altruistic from opportunistic CSR. (The opportunistic firm chooses $R^{*O}=0$ and the altruistic chooses $0 < R^{*A} \leq \frac{(1+\delta)^2}{4}$).

Figure no. 1 illustrates the situation.

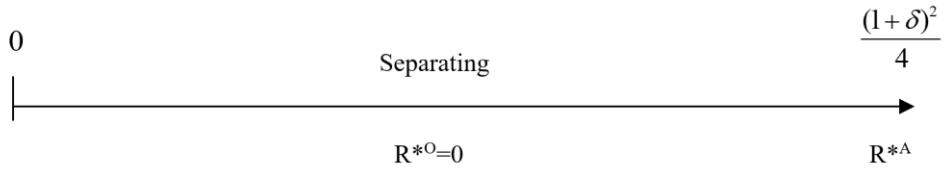

Figure no. 1 – CSR equilibria when $\theta \leq \theta^*(\delta,\mu)$

Separation occurs for all admissible values of CSR by *A* firms. This large set of equilibria contains the CSR level that maximizes U, which will be the chosen one.

2.2.2 High a priori probability ($\theta > \theta^*(\delta,\mu)>0$)

When the *a priori* probability of the firm being altruistic is sufficiently high, the participation constraint for the opportunistic firm *O* is satisfied, which means that it invests in CSR. Clearly, if altruistic firms have a relatively weak preference for social concerns, they do not invest much in CSR and the equilibrium is pooling, meaning that consumers are not able to distinguish companies. In the opposite case, *A* firms invest largely in CSR and the equilibrium becomes separating, as expected. The next Proposition states this result.

Proposition 2: Let γ* be the altruistic firm's preference for social concerns such that this firm chooses the same CSR level as the opportunistic firm (that is, $R^{*A}(\gamma^*) = \bar{R}^O$). For a sufficiently high a priori probability θ of the firm being altruistic, given a positive reward δ and a positive penalty μ, or also a reward for opportunistic behaviour but lower than the reward for altruistic behaviour (μ<0 and <|μ|<δ),

i) for $\gamma \leq \gamma^*$ the market equilibrium is pooling with $R^{*A} \leq \bar{R}^O$; consumers cannot distinguish altruistic from opportunistic CSR;

ii) for $\gamma > \gamma^*$ the market equilibrium is separating with $R^{*A} > \bar{R}^O$, $R^{*O}=0$ if μ>0, and $R^{*O} < \bar{R}^O$ if μ<0; consumers can distinguish altruistic from opportunistic CSR.

Figure no. 2 illustrates these results, which, qualitatively, are as expected in a signalling model. In quantitative terms, the results obtained define some regions that will be useful in what follows for comparative statics regarding the use of rewards and/or penalties, as well as for simulation purposes.

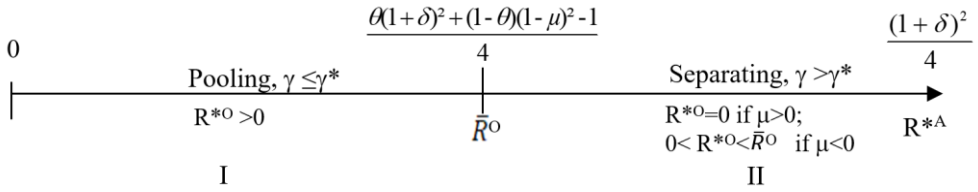

Figure no. 2 – CSR equilibria when $\theta > \theta^*(\delta,\mu)$

The large set of separating equilibria can be restricted to a single point, the one corresponding to the *A* choice by maximizing U. The same applies to the set of pooling equilibria, in which case the *O* firm also chooses this CSR level.

With Propositions 1 and 2 we confirm our first research hypothesis: that altruistic firms may be able to separate from opportunistic, under some conditions depending on the level of consumers' reward and penalty and prior probability of the two types of firms.

Note that changes in the reward and/or in the penalty level (δ, μ) can result in a switch from the case examined in Proposition 1 to the case examined in Proposition 2, or vice-versa, as they alter the value of θ^*. This is relevant for the simulations presented ahead.

3. COMPARING THE EFFECTIVENESS OF REWARDS AND PENALTIES

Although in real life distinguishing altruistic from opportunistic CSR may be difficult for consumers, the signalling model shown proves that it is possible. If the consumers' *a priori* probability associated with altruistic CSR is low enough, it does not pay opportunistic firms to try to mimic altruistic ones, consequently the equilibrium is separating for every choice of R^A. In turn, when the consumers' *a priori* probability associated with altruistic CSR is high enough two outcomes may occur: i) in markets where the investment in CSR is modest as compared with expected profits (area I in Figure no. 2, which happens when the "degree" γ of altruism is low), information is not enough for consumers to be able to discern about the two types of corporations and the equilibrium is pooling; ii) high levels of *R* (area II) signal altruism, so the information asymmetry between demand and supply is solved and the equilibrium is separating.

Note that if consumers were insensitive to CSR (δ=μ=0) there would always be separation. Opportunistic companies would choose not to invest in CSR (R^{*O}=0), because by selecting a positive amount of CSR they would decrease their profits below the reservation level ¼, without any chance of increase. Altruistic firms would choose $0<R^{*A}\leq 1/4$, increasing in γ, because they do not mind reducing their profits below the no CSR level, and they are just constrained by a nonnegative profit condition. Consumers would infer the type of the firm by simply observing whether *R* is null or positive, but they really would not care about that (because δ=μ=0). So, if consumers do not respond to CSR, only altruistic firms spend some resources in CSR, as expected.

Consider now that a reward for altruistic CSR is introduced but with no penalty for opportunistic behaviour (i.e., $\delta>0$ and $\mu\leq 0$). In this case the threshold for θ is non positive ($\theta^*\leq 0$), which implies that $\theta > \theta^*(\delta,\mu)$, therefore the equilibrium is pooling for R^{*A} below $\bar{R}^O$ and separating otherwise (with $R^{*O}=0$). On the other hand, in case of penalty but no reward ($\mu>0$ and $\delta=0$), opportunistic firms do not want to participate ($\theta^*=1$), and the equilibrium is always separating with $R^{*O}=0$ and $0<R^{*A}\leq 1/4$ increasing in γ. Not surprisingly, but formally proven, it is the existence of a reward by consumers that may turn the investment in CSR attractive for opportunistic firms, thus generating the untangling problem.

The possibility of pooling is indeed introduced by the existence of a reward ($\delta>0$). Actually, rewards and penalties have asymmetric impacts on firms' CSR decisions as is clear from the quadratic profit expressions $\pi_R(\delta)$ and $\pi_R(\mu)$ presented before. $\pi_R(\delta)$ grows with δ and $\pi_R(\mu)$ declines with μ, as expected, but the impact of an increase in δ is stronger than the impact of a reduction in μ, in absolute value.

Some comparative statics tell us how changes in the parameters of the model (one at a time) affect the relative magnitude of the pooling and separating areas when both types invest in CSR ($\theta > \theta^*(\delta,\mu)>0$), that is, the likelihood of the two equilibria (Proposition 3). After that we compare the effectiveness of the different consumer "instruments" (Propositions 4 and 5).

Let us define the relative magnitude of the separation area II in Figure no. 2 as

$$S = \frac{\frac{(1+\delta)^2}{4} - \frac{\theta(1+\delta)^2+(1-\theta)(1-\mu)^2-1}{4}}{\frac{(1+\delta)^2}{4}} = \frac{(1-\theta)\left[(1+\delta)^2-(1-\mu)^2\right]+1}{(1+\delta)^2}$$

Proposition 3: For a high a priori probability θ that consumers attribute to the firm being altruistic, ceteris paribus

i) If reward δ rises (falls), the relative magnitude of the separation area is reduced (enlarged).

ii) If penalty μ falls (rises), the relative magnitude of the separation area is reduced (enlarged).

iii) If the prior θ rises (falls), the relative magnitude of the separation area is reduced (enlarged).

Proposition 3 confirms that lower consumer rewards for altruistic CSR make the separating equilibrium more likely (and the consumers' effort in distinguishing altruistic from opportunistic companies is eased). Higher penalties do the same. Very high penalties may even push the threshold θ^* above θ, which means that consumers no longer expect *O* firms to invest in CSR and the equilibrium is always separating. If consumers become more sceptical about firms being altruistic (lower θ), the separating equilibrium becomes more likely too. For too low prior the expected profit just depends on the reward δ again because *O* firms are not expected to invest in CSR.

We conclude that while rewarding is effective at stimulating CSR, it may also have the perverse effect of pooling different types and creating untangling problems for consumers. Firms know their type and anticipate consumers' reaction to CSR investment, then decide the amount to invest in order to be taken as an altruistic company. Altruistic firms invest according to their

social preference and constrained by positive profit. If *O* firms know the market is willing to pay low rewards for CSR efforts or assign high penalties for opportunistic CSR investment, incentives to invest and mimic *A* firms are reduced, up to a point where those firms decide not to invest. If they decide that it pays to invest in CSR, their investment will depend on the *a priori* beliefs (θ) and other market parameters that can be observed (reward δ and penalty μ).

It is important to note that although the separation area increases as the penalty μ rises, this occurs at a rate that is diminishing with θ, the consumers' *a priori* probability of altruistic CSR (in other words, the second cross derivative is negative). Additionally, the separation area increases at a growing rate with θ as the reward δ declines. In other words, a large *a priori* probability of altruistic CSR reduces the effectiveness of a penalty increase as compared with a reward reduction. This happens because consumers are more prone to believe the firm is altruistic, and hence to reward its CSR effort, rather than punish it. The inverse happens when θ is low.

We now ask: which consumers' instrument is more effective at increasing the likelihood of being able to distinguish, a reward reduction or a penalty increase? As pointed out before, rewards and penalties have asymmetric impacts on firms' CSR decisions, so this comparison is relevant. The answer depends on the different parameter configurations that may take place, as Propositions 4 and 5, with complementary parameter sets, detail (see proof in the Annex for the complete explanation of all the thresholds). We admit $\delta<1$, that is, rewards are not as high as to duplicate the willingness to pay. We also admit positive penalties ($\mu>0$).

Proposition 4: When altruistic and opportunistic firms invest in CSR, a penalty increase is more effective at making consumers distinguish altruistic from opportunistic firms than a reward reduction when:

i) the penalty is low ($0<\mu<0.382$) and

   a. the prior is low ($0<\theta<\frac{\mu^2-3\mu+1}{\mu^2-3\mu+2}$), independently of the reward level (δ);

   b. the prior is high ($\theta>\frac{\mu^2-3\mu+1}{\mu^2-3\mu+2}$) and the reward is high ($0<\frac{2\theta-1+\mu(1-\theta)(3-\mu)}{(1-\theta)(1-\mu)}<\delta$);

ii) the penalty is intermediate ($0.382<\mu<0.586$) and the reward is high ($\delta>\frac{2\theta-1+\mu(1-\theta)(3-\mu)}{(1-\theta)(1-\mu)}$), independently of the level of the a priori probability θ.

Proposition 5: When altruistic and opportunistic firms invest in CSR, a reward reduction is more effective at making consumers distinguish altruistic from opportunistic firms than a penalty increase when:

i) the penalty is low ($0<\mu<0.382$), the prior is high ($\theta>\frac{\mu^2-3\mu+1}{\mu^2-3\mu+2}$) and the reward is low ($\delta<\frac{2\theta-1+\mu(1-\theta)(3-\mu)}{(1-\theta)(1-\mu)}$);

ii) the penalty is intermediate ($0.382<\mu<0.586$) and the reward is low ($\delta<\frac{2\theta-1+\mu(1-\theta)(3-\mu)}{(1-\theta)(1-\mu)}$), independently of the level of the a priori probability θ;

iii) the penalty is high ($\mu>0.586$), independently of the levels of the reward δ and the a priori probability θ.

Table no. 1 summarizes the results of Propositions 4 and 5. Low penalty means $0<\mu<0.382$, intermediate penalty means $0.382<\mu<0.586$ and high penalty means $0.586<\mu<1$; low prior means $0<\theta<\frac{\mu^2-3\mu+1}{\mu^2-3\mu+2}$ and high prior means $0<\frac{\mu^2-3\mu+1}{\mu^2-3\mu+2}<\theta$; low reward means $0<\delta<\frac{2\theta-1+\mu(1-\theta)(3-\mu)}{(1-\theta)(1-\mu)}<1$ and high reward means $0<\frac{2\theta-1+\mu(1-\theta)(3-\mu)}{(1-\theta)(1-\mu)}<\delta$. In the Table, P4 refers to results from Proposition 4 and P5 refers to results from Proposition 5.

Table no. 1 – Data of the study Comparison of penalty (μ) increase versus reward (δ) reduction effectiveness, for given a priori probability (θ) of altruistic behaviour

		μ low		**μ intermediate**		**μ high**	
		δ		**δ**		**δ**	
		High	**Low**	**High**	**Low**	**High**	**Low**
θ	High	P4 ib)	P5 i)	P4 ii)	P5 ii)	P5 iii)	P5 iii)
	Low	P4 ia)	P4 ia)	P4 ii)	P5 ii)	P5 iii)	P5 iii)

With Propositions 3, 4 and 5 we confirm our second research hypothesis: that rewards and penalties are not symmetrically effective in helping consumers distinguish altruistic from opportunistic CSR.

Notice that, as mentioned before, a higher reward (δ) and/or a higher penalty (μ) raise θ^*, the threshold for the *a priori* probability that consumers attach to altruism above which opportunistic firms invest in CSR. If the conditions of Proposition 1 are met, they will continue so, and the probability of separation remains one. Instead, if the conditions of Proposition 2 are met, either they will continue so but with a higher likelihood of separation, or we switch to the conditions of Proposition 1, with the probability of separation becoming 1. In either case, the separating equilibrium becomes more likely.

Propositions 4 and 5 tell us that when the penalty chosen by consumers is high, a lower reward is always preferable to an even higher penalty. For intermediate penalties the current level of the reward also matters for the relative effectiveness of the two instruments, and for low penalties the *a priori* probability attached by consumers to altruistic CSR becomes relevant too. When the penalty is at an intermediate level, it may still be more effective to reduce the reward if it is low, but not if it is considered high. Finally, when the penalty is low the balance depends on the *a priori* probability θ: i) if θ is low too, it is better to use a penalty increase because, as explained earlier, low θ decreases the relative effectiveness of a reward reduction (consumers are less prone to believe the firm is altruistic and hence to reward its CSR effort rather than punish it, which is consistent with the signs of the second cross derivatives mentioned before); ii) if θ is high it is more effective to increase the penalty when the reward is high, and to reduce the reward even more when this is already low.

We conclude that the type of consumers' response is not irrelevant to solve the uncertainty problem associated with the nature of CSR activity. Contrary to what might be expected, the two instruments - rewards and penalties - are not interchangeable. Their impact is asymmetric. The reason for this has to do with the quadratic profit expressions $\pi_R(\delta)$ and $\pi_R(\mu)$, as mentioned before, and with the fact that the maximum profit any firm can attain, and which shapes the separation area, is defined by the reward δ, but not by the penalty μ. Sometimes it is more effective that consumers reduce their premiums for altruistic behaviour

rather than increase penalties for opportunistic CSR. Under other circumstances the reverse happens. These findings stress the importance of consumers' responses in shaping firms' social attitudes. Although the levels of the reward and the penalty are not under the control of the firms, altruistic firms benefit from their knowledge, as they determine the CSR investment level that must be made in order to be separated from opportunistic rivals. Similarly, it is valuable for opportunistic firms to know the minimum amount they must invest if they want to be mixed with altruistic rivals.

As we have seen, Propositions 4 and 5 present several possible cases. They also set an upper bound on the effectiveness of increasing penalties, such that it is not worth to increase the penalty μ above 58.6% of the maximum willingness to pay that the market bears to ease detection of opportunistic CSR. In other words, it is not worth to set a penalty that decreases demand by more than 41.4%, rather it is better to reduce the reward for altruistic CSR. If firms know that consumers are better off acting this way, they can adjust their CSR efforts to either reach separation or pooling.

It is important to analyse the robustness of our main findings to the assumptions made. Most of the intuitions presented are robust to different specifications and results apply with some qualifications. For example, if we relaxed our simplifying assumption of zero marginal production costs (which is a realistic hypothesis in some sectors like telecommunications, transports, and others), the computations performed would include another variable (the marginal cost). The results obtained would again depend on the level of the parameters, with several possibilities, but now would also depend on this. Setting the maximum willingness to pay and/or the sensitivity of demanded quantity to price different from 1 would also introduce more parameters in the analysis, would change the expression for the separation likelihood, but with no relevant new qualitative insights. The asymmetry result concerning rewards and penalties subsists in both cases, although with the cut-off levels of δ, μ and θ having more complex expressions that now also depend on the additional parameters.

A more interesting extension could consider multiplicative rewards and penalties, instead of additive. This means that demand would change to $(1-q)\delta$ with $\delta > 1$ if consumers believe the observed CSR is altruistic, and to $(1-q)\mu$ with $0<\mu<\delta$ if consumers believe that the observed CSR is opportunistic. For μ to represent a penalty we must impose $\mu < 1$ (the lower μ, the stronger the penalty), otherwise we admit that consumers always reward CSR, but less when they think it is opportunistic than when they think it is altruistic. This multiplicative approach changes both the maximum price and the elasticity: in case of a reward, demand expands and becomes less elastic (which both work in favour of the firm); in case of a penalty, demand shrinks and becomes more elastic (which both work against the firm). Profits in this case are linear functions of δ and of μ. A lower reward and a higher penalty both increase the likelihood of separation, but we can prove that the prevalence of the reward reduction is reinforced, as it now becomes more effective than the penalty increase for all possible parameter configurations. A reward reduction shrinks the set of possible values for the CSR investment (the upper limit in Figure no. 2, which is now $\delta/4$ instead of $(1+\delta)^2/4$), thus contributing, *ceteris paribus*, to enlarge the relative weight of the separation area. This effect is already present in the additive approach but becomes stronger in the multiplicative one, hence generating the dominance of the reward reduction strategy by consumers instead of the penalty increase, with the resulting implications for firms' choices. The asymmetry between the two instruments is thus reinforced.

4. NUMERICAL SIMULATIONS

When $\theta > \theta^*(\delta,\mu)$ the minimum likelihood of a separating equilibrium is 25%, reached for $\theta=\delta=1$. This means that, under the specified conditions, it is possible to distinguish altruistic from opportunistic CSR at least in 25% of the cases.

Tables no. 2 and no. 3 present a "what-if" analysis that allows assessing the likelihood of separation for different parameter combinations under the hypothesis of our model. The model seems to adhere well to parameter values which are acceptable in a real-world context. Again, we admit $\delta<1$, that is, rewards are not as high as to duplicate willingness to pay.

Table no. 2 – Likelihood of separating equilibrium as δ and θ change, $\theta > \theta^*(\delta,\mu)$

$\delta, \mu, \theta^* = \frac{\mu(2-\mu)}{\delta(2+\delta)+\mu(2-\mu)}$	Separation area for θ=0.1	Separation area for θ=0.2
δ=0.04, μ=0.01, $\theta^* = 0.196$	____	99.96%
δ=0.05, μ=0.01, $\theta^* = 0.16$	____	99.6%
δ=0.1, μ=0.01, $\theta^* = 0.09$	99.7%	97.8%
δ=0.2, μ=0.01, $\theta^* = 0.04$	98.2%	95.0%

Table no. 3 – Likelihood of separating equilibrium as μ and θ change, $\theta > \theta^*(\delta,\mu)$

$\delta, \mu, \theta^* = \frac{\mu(2-\mu)}{\delta(2+\delta)+\mu(2-\mu)}$	Separation area for θ=0.1	Separation area for θ=0.2
δ=0.05, μ=0.005, $\theta^* = 0.09$	99.9%	98.9%
δ=0.05, μ=0.01, $\theta^* = 0.16$	____	99.6%
δ=0.05, μ=-0.005, $\theta^* = -0.10841$	98.3%	97.4%

As is apparent from the tables, the separation area can be considerably large. For instance, for a prior probability corresponding to the existence of 10% altruistic firms (θ=0.1), a reward by consumers corresponding to a 20% increase in the willingness to pay (δ=0.2) and a penalty corresponding to a 1% reduction in the willingness to pay (μ=0.01), the likelihood of a separating equilibrium is equal to 98.2% (Table no. 2). If the reward decreases to 10%, keeping the other parameters constant, the separation area enlarges to 99.7%. A reward of 10% or more is in line with the evidence from polls. If the prior consumers' belief rises to 20%, the separation area shrinks to 97.8% when δ=0.1 and to 95.0% when δ=0.2, but if the reward decreases for instance to 5% the separation area covers 99.6% of the total (Table no. 3). *Ceteris paribus*, cutting the penalty to a half (Table no. 3) only decreases the likelihood of separation to 98.9%.

So, results point to a large possibility that altruistic firms achieve separation. Changing the hypotheses of the model, namely the functional form of demand, would change these figures, but the qualitative results obtained before would remain valid, as already explained. With these simulations we illustrate how our first research hypothesis is confirmed.

It is interesting to observe that our model helps explain some famous real-life cases. Let us consider the classical TOMS and Bobs shoes' example (e.g., Torelli *et al.* (2012)). Before Bobs shoes entered the market, consumers were rewarding TOMS for altruistic philanthropy ($\delta>0$). The prior probability θ was high and hence CSR was paying for *O* (opportunistic) firms. At first the newcomer benefitted from the reward too. However, consumers became

suspicious and finally punished the new operator, which means that μ became positive. In the terminology of Figure no. 2, this corresponded to the frontier between pooling and separating equilibria, which stood at $R=\theta\delta(2+\delta)/4$, moving to the left towards $R = \frac{\theta(1+\delta)^2+(1-\theta)(1-\mu)^2-1}{4}$. If firms were spending in between these two points, the equilibrium would change from pooling to separation, which happened.

Consider now the also well-known Nike's case (e.g., Torres *et al.* (2012)). At first consumers were sympathetic to Nike's campaigns, thus $\delta\geq 0$ and $\mu=0$. In these circumstances, the equilibrium could either be pooling or separating. As consumers started seeing Nike's policies as hypocritical, the situation eventually changed to $\delta=0$ and $\mu>0$, in which separation is the only equilibrium. It is no longer worth for opportunistic firms to spend resources trying to mimic altruistic concerns. The same happens when the amount invested in proactive disclosure is too large as compared with the social contribution itself.

5. CONCLUDING REMARKS

The current article analyses the impact of asymmetric information between consumers and firms on the nature of CSR activity (opportunistic or altruistic), and how consumers' perception of CSR true motivation and response influence the firms' decisions as to the level of CSR investment.

Using a two-period incomplete information game, we characterize the conditions for market equilibria in which altruistic firms separate from opportunistic ones, showing that it may be possible for consumers to identify the two types, with the corresponding consequences on firms' profits, thus confirming our first research hypothesis. We then explore the sensitiveness of the likelihood of separation to the model's parameters. Not surprisingly, separation becomes easier when the consumers' prior belief about altruistic CSR is sufficiently low, because then opportunistic firms do not have much to gain from pretending to be altruistic. For the same reason, separation also becomes easier when the reward for altruistic CSR is low and when the penalty for opportunistic CSR is high. Interestingly, we show that while rewarding CSR is effective at stimulating separation, it may also have the perverse effect of pooling different types of CSR.

In addition, we derive conditions under which a reward reduction is more effective at leading to separation than a penalty increase. Contrary to what might be expected, the two instruments are not symmetrically effective, which confirms our second research hypothesis. When the penalty is high (as compared with demand magnitude), a reward reduction is more effective than increasing the penalty even further, so, to assure that CSR conveys more information about the firm's nature, consumers are advised to reduce the benefits they give to altruistic CSR. On the one hand, this consumers' response harms the altruistic companies' profits by contracting the demand they face; on the other hand, however, by increasing the likelihood that the altruistic companies are correctly perceived, their profits may eventually end up increasing. For intermediate levels of the penalty the answer as to the most effective instrument is not as straightforward since it also depends on the current level of the reward. For low penalty levels the answer additionally depends on the *a priori* probability attached by consumers to altruistic CSR, in a way explained in detail in Propositions 4 and 5. To the best of our knowledge this is the first time that this asymmetry is shown to exist.

Our results help companies to improve their CSR decisions, by understanding how consumers solve the information asymmetry regarding the true nature of these investments and open the door to future experimental testing. It would be interesting, for instance, to test whether consumers opt for a penalty increase or a reward reduction as uncertainty about the nature of the observed CSR activity varies (the *a priori* belief). Namely, if that choice is dependent on the penalty or reward levels currently employed, and if consumers choose these instruments interchangeably, admitting different approaches to rewards and penalties (additive, multiplicative, other). This would be an interesting complement to the current article.

Schlegelmilch and Pollach (2005) research suggested that corporate ethics, corporate communication, and corporate image should be aligned, and that companies should adjust their messages as they change their business conduct, so that public perceptions fairly reflect corporate behaviour. Our whole analysis is based on consumers being able to observe firms' CSR effort, that is, full disclosure. However, too much proactive disclosure may refrain consumers from believing that firms are acting in an altruistic way or induce suspicions of opportunistic disclosure while misreporting on issues such as child labour (e.g., Arena *et al.* (2018)). Hence, altruistic firms must balance the benefits from disclosing and increasing the likelihood of separation with the risks of being taken for opportunistic. Further research may enlighten this trade-off.

Finally, the model developed in the current article applies to socially responsible consumers who react to CSR initiatives. But not all consumers are socially responsible. At least some may simply pretend to be. Another interesting extension would hence admit two types of consumers - socially and not socially responsible - besides the two types of firms.

Acknowledgements

Margarida Catalão-Lopes gratefully acknowledges financial support from Fundação para a Ciência e a Tecnologia˜ (FCT) under the project 2022.08870.PTDC and through UIDB/00097/2020. Joaquim P. Pina gratefully acknowledges financial support from FCT under the project LA/P/0069/2020 granted to the Associate Laboratory ARNET, and the strategic project UIDB/04292/2020 granted to MARE – Marine and Environmental Sciences Centre. Ana S. Costa gratefully acknowledges financial support from Fundação para a Ciência e a Tecnologia˜ (FCT) through UIDB/00097/2020..

ORCID

Margarida Catalão-Lopes http://orcid.org/0000-0003-0849-6568
Joaquim P. Pina https://orcid.org/0000-0001-7234-3799
Ana S. Costa https://orcid.org/0000-0002-7618-8578

References

Acabado, D., Branca, A. S., Catalão-Lopes, M., & Pina, J. P. (2020). Do distinct CSR categories have distinct determinants? The roles of market structure and firm size. *European Management Review, 17*(1), 5-17. http://dx.doi.org/10.1111/emre.12341

Alan, Y., Kurtulus, M., & Wang, C. (2019). The role of store brand spillover in a retailer's category management strategy. *Manufacturing & Service Operations Management, 21*(3), 620-635. http://dx.doi.org/10.1287/msom.2018.0714

Alhouti, S., Johnson, C. M., & Holloway, B. B. (2016). Corporate social responsibility authenticity: Investigating its antecedents and outcomes. *Journal of Business Research, 69*(3), 1242-1249. http://dx.doi.org/10.1016/j.jbusres.2015.09.007

Arena, C., Liong, R., & Vourvachis, P. (2018). Carrot or stick: CSR disclosures by Southeast Asian companies. Sustainability Accounting. *Sustainability Accounting, Management and Policy Journal, 9*(4), 422-454. http://dx.doi.org/10.1108/SAMPJ-06-2016-0037

Beltratti, A. (2005). The complementarity between corporate governance and corporate social responsibility. *The Geneva Papers on Risk and Insurance. Issues and Practice, 30*(3), 373-386. http://dx.doi.org/10.1057/palgrave.gpp.2510035

Brandão, A., Popoli, P., & Passos Tomás, I. (2022). Joining the anti-brand communities on the Internet: Who and why. *Scientific Annals of Economics and Business, 69*(1), 1-27. http://dx.doi.org/10.47743/saeb-2022-0003

Cassely, L., Larbi, S. B., Revelli, C., & Lacroux, A. (2021). Corporate social performance (CSP) in time of economic crisis. Sustainability Accounting. *Sustainability Accounting, Management and Policy Journal, 12*(5), 913-942. http://dx.doi.org/10.1108/SAMPJ-07-2020-026

Catalão-Lopes, M., Pina, J. P., & Branca, A. S. (2016). Social responsibility, corporate giving and the tide. *Management Decision, 54*(9), 2294-2309. http://dx.doi.org/10.1108/MD-12-2015-0553

Chernev, A., & Blair, S. (2015). Doing well by doing good: The benevolent halo of Corporate Social Responsibility. *The Journal of Consumer Research, 41*(6), 1412-1425. http://dx.doi.org/10.1086/680089

Du, S., Bhattacharya, C. B., & Sen, S. (2010). Maximizing business returns to corporate social responsibility (CSR). The role of CSR communication. *International Journal of Management Reviews, 12*(1), 8-19. http://dx.doi.org/10.1111/j.1468-2370.2009.00276.x

Elfenbein, D., & McManus, B. (2010). A greater price for a greater good? Evidence that consumers pay more for charity-linked products. *American Economic Journal. Economic Policy, 2*(2), 28-60. http://dx.doi.org/10.1257/pol.2.2.28

Gatti, L., Seele, P., & Rademacher, L. (2019). Grey zone in–greenwash out. A review of greenwashing research and implications for the voluntary-mandatory transition of CSR. *International Journal of Corporate Social Responsibility, 4*(6), 1-15. http://dx.doi.org/10.1186/s40991-019-0044-9

Haas, M. R., & Hansen, M. T. (2007). Different knowledge, different benefits: Toward a productivity perspective on knowledge sharing in organizations. *Strategic Management Journal, 28*(11), 1133-1153. http://dx.doi.org/10.1002/smj.631

Hashimoto, T., & Karasawa, K. (2018). Impact of consumer power on consumers' reactions to corporate transgression. *PLoS One, 13*(5), e0196819. http://dx.doi.org/10.1371/journal.pone.0196819

Kirmani, A., & Rao, A. R. (2000). No pain, no gain: A critical review of the literature on signaling unobservable product quality. *Journal of Marketing, 64*(2), 66-79. http://dx.doi.org/10.1509/jmkg.64.2.66.18000

Kumar, D., Goyal, P., & Kumar, V. (2019). Prioritizing CSR barriers in the Indian service industry: A Fuzzy AHP Approach. *Scientific Annals of Economics and Business, 66*(2), 213-233. http://dx.doi.org/10.47743/saeb-2019-0009

Luo, X., & Bhattacharya, C. B. (2009). The debate over doing good: Corporate Social Performance, Strategic marketing levers, and Firm-idiosyncratic risk. *Journal of Marketing, 73*(6), 198–213. http://dx.doi.org/10.1509/jmkg.73.6.198

Moisescu, O. I. (2017). From CSR to customer loyalty: An empirical investigation in the retail banking industry of a developing country. *Scientific Annals of Economics and Business, 64*(3), 307-323. http://dx.doi.org/10.1515/saeb-2017-0020

Mulder, L. (2008). The difference between punishments and rewards in fostering moral concerns in Social Decision Making. *Journal of Experimental Social Psychology, 44*(6), 1436-1443. http://dx.doi.org/10.1016/j.jesp.2008.06.004

Neacșu, M., & Georgescu, I. E. (2023). Financial Performance - Organizational Sustainability Relationship. Literature Review. *Scientific Annals of Economics and Business, 70*(SI), 99-120. http://dx.doi.org/10.47743/saeb-2023-0016

Pimentel, L., Branca, A., & Catalão-Lopes, M. (2016). International comparisons of corporate social responsibility. *International Journal of Economics & Management Sciences, 5*(2), 1-5. http://dx.doi.org/10.4172/2162-6359.1000327

Ribeiro, A. C., Catalão-Lopes, M., & Costa, A. S. (2022). Corporate Social Responsibility and consumers' reaction: An experiment. *Journal of Sustainable Business and Economics, 5*(3), 1-11. http://dx.doi.org/10.30564/jsbe.v5i3.13

Ritter, J. R., & Welch, I. (2002). A review of IPO activity, pricing, and allocations. *The Journal of Finance, 57*(4), 1795-1828. http://dx.doi.org/10.1111/1540-6261.00478

Schlegelmilch, B., & Pollach, I. (2005). The perils and opportunities of communicating Corporate Ethics. *Journal of Marketing Management, 21*(3-4), 267-290. http://dx.doi.org/10.1362/0267257053779154

Skilton, P. F., & Purdy, J. M. (2017). Authenticity, power, and pluralism: A framework for understanding stakeholder evaluations of Corporate Social Responsibility activities. *Business Ethics Quarterly, 27*(1), 99-123. http://dx.doi.org/10.1017/beq.2016.60

Smith, N. C. (2008). Consumers as drivers of corporate responsibility. In D. Siegel, J. Moon, D. Matten, A. McWilliams, & A. Crane (Eds.), *Oxford Handbook of Corporate Social Responsibility* (pp. 281-302): Oxford University Press.

Torelli, C. J., Monga, A. B., & Kaikati, A. M. (2012). Doing poorly by doing good: Corporate Social Responsibility and brand concepts. *The Journal of Consumer Research, 38*(5), 948-963. http://dx.doi.org/10.1086/660851

Torres, A., Bijmolt, T., Tribó, J., & Verhoef, P. (2012). Generating global brand equity through Corporate Social Responsibility to key stakeholders. *International Journal of Research in Marketing, 29*(1), 13-24. http://dx.doi.org/10.1016/j.ijresmar.2011.10.002

Wagner, T., Lutz, R., & Weitz, B. (2009). Corporate hypocrisy: Overcoming the threat of inconsistent Corporate Social Responsibility perceptions. *Journal of Marketing, 73*(6), 77-91. http://dx.doi.org/10.1509/jmkg.73.6.77

Yoon, Y., Gürhan-Canli, Z., & Schwarz, N. (2006). The effect of Corporate Social Responsibility (CSR) activities on companies with bad reputations. *Journal of Consumer Psychology, 16*(4), 377-390. http://dx.doi.org/10.1207/s15327663jcp1604_9

Zerbini, F. (2017). CSR initiatives as market signals: A review and research agenda. *Journal of Business Ethics, 146*(1), 1-23. http://dx.doi.org/10.1007/s10551-015-2922-8

ANNEX

Evidence from polls

Poll	Sample	Prosocial behaviour
Ipsos MORI, 2000, "Ethical Consumerism Research" (http://www.ipsos-mori.com/researchpublications/researcharchive/1496/Ethical-Consumerism-Research.aspx)	1970 interviews in 151 sampling points, between 18 and 22 May 200, to British public aged 15 and over.	- recommend a company, choose product, 51%; - avoid products, 44%; - buy product, 29%; - actively seek information, 24%; - felt guilty, 17%; - actively campaigned, 15%.
Ipsos MORI, 2003, "Ethical Companies" (http://www.ipsos-mori.com/researchpublications/rese	2026 interviews in 161 sampling points, between 7 July and 11 August 2003, to British public aged 16 and over.	- availability of more information influences consumer behaviour, 74%; - buy product (because charity link), 29%;

Poll	Sample	Prosocial behaviour
archarchive/849/Ethical-Companies.aspx)		- boycott products, 17%; - choose product, 14%; - seek information, 5%; - invest, 4%.
Ipsos MORI, 2008, "Climate Change — The Expected Role for Business" (http://www.ipsos-mori.com/researchpublications/researcharchive/2343/Climate-Change-The-Expected-Role-for-Business.aspx)	975 interviews, June 2006, all British public.	- foreseen (for companies' behaviour): - concern with environment, 44%; - conserving energy, 29%.
Ipsos MORI, 2009, "Ethical purchasing squeezed by recession, but companies will continue to invest in company responsibility (CR)" (http://www.ipsos-mori.com/researchpublications/researcharchive/2505/Ethical-purchasing-squeezed-by-recession-but-companies-will-continue-to-invest-in-company-responsibility-CR.aspx)	1011 interviews in 157 sampling points, between 4 and 10 September 2009, to British public aged 16 and over.	- buying, 70% or more over last decade; - continue to invest in CSR despite the crisis: - reputation council (within companies), 85%; - corporate responsibility experts, 70%; - Non-Governmental Organizations, 64%; - captains of industry, 57%.
Ipsos MORI, 2014, "Public views on ethical retail" (https://www.ipsos-mori.com/researchpublications/researcharchive/3408/Public-views-on-ethical-retail.aspx)	2,257 public aged over 16, UK, online survey, 13-17 June 2014	- ethical standards matter (83%, of which 49% "a great deal" or "a fair amount") - being ethical requires proof besides telling, 63% - lack of information reliability and intensive advertisement are barriers to buy ethically (24% and 30%, respectively)
Ipsos MORI, 2017, "Over a third of consumers believe social purpose should come before profit" (https://www.ipsos.com/ipsos-mori/en-uk/over-third-consumers-believe-social-purpose-should-come-profit)	1001 adults above 18, UK, 26 May - 9 June	- 48% of consumers prefer businesses that behave ethically - 37% consider that businesses should put social drive before profits
Ipsos Global Trends Survey, 2017, "Just how much do sustainability and brand purpose matter?" (https://www.ipsosglobaltrends.com/just-how-much-do-sustainability-and-brand-purpose-matter/)	18180 adults from 23 countries, online, 12 September – 11 October 2016	- 67% of people agree on the higher importance that chosen brands make positive contributions to society - social media amplifies reputation problems from unethical practice or accidents, wherever they take place
Ipsos Global Advisor Poll, November 2019, "A Throwaway	19515 online adults across 28 countries, 26 July 26 – 9 August 2019	- 77% UK citizens and 75% global respondents say they would feel better about a brand

Poll	Sample	Prosocial behaviour
World: the challenge of plastic packaging and waste" (https://www.ipsos.com/ipsos-mori/en-uk/throwaway-world-challenge-plastic-packaging-and-waste)		that makes changes to achieve better environmental outcomes - 80% global respondents consider that manufacturers should be obliged to help with the recycling and reuse of packaging that they produce

Proof of Proposition 1: Given that the participation constraint for the *O* firm is not satisfied, $R^{*O}=0$ and so if consumers observe $R>0$ they infer that the company is *A* (θ is updated to 1) and expand demand to $p=1-q+\delta$. Altruistic firms choose R^{*A} in the interval $(0,(1+\delta)^2/4]$ to maximize U (so taking into account the magnitude of γ), where $(1+\delta)^2/4= E(\pi)$ since θ has been updated to 1. ■

Proof of Proposition 2: Let us start with case ii). Given that the participation constraint for the *O* type is satisfied, consumers try to distinguish altruistic from opportunistic CSR expenditure. We know that $\bar{R}^{O} < \bar{R}^{A}$. Therefore, if the firm chooses $R \geq \bar{R}^{O}$ consumers infer that it is *A*, because the *O* firm would never make such a choice. In this case, the equilibrium is separating. The altruistic firm's profits are equal to $\frac{(1+\delta)^2}{4} - R^{*A}>0$, with R^{*A} increasing in γ. The opportunistic type then chooses the least-cost strategy $R^{*O}=0$ for $\mu>0$ and $0<R^{*O}< \bar{R}^{O}$ for $\mu<0$. This proves ii).

In turn, if the firm chooses $0<R^{*}< \bar{R}^{O}$ consumers cannot tell whether it is *A* or *O*. The equilibrium is pooling. The *a priori* probability θ remains unaltered, so the firm earns $\frac{\theta(1+\delta)^2+(1-\theta)(1-\mu)^2}{4} - R^{*}$, with $R^{*}=R^{*A}=R^{*O}$. Note that choosing $R^{*}=0$ is a dominated strategy for the *O* company, because it will be perceived as such and earn $¼< E_R(\pi)-R^{*O}$, since the *A* company always performs a positive level of CSR. Both types choose positive levels of CSR. This proves i). ■

Proof of Proposition 3: Immediate, by considering the appropriate derivatives and considering the effect on θ:

i) The variation is monotone, as a change in δ implies an opposite sign change in θ^{*}. Hence, even if δ falls, the relative size of the separation area enlarges and may eventually become 1 (a shift from the results of Proposition 2 to the results of Proposition 1).

ii) The variation is monotone, as a change in μ implies a change in θ^{*} with the same sign. Hence, even if μ rises, the relative size of the separation area enlarges, and may eventually become 1 (a shift from the results of Proposition 2 to the results of Proposition 1).

iii) The variation is monotone. Even in case θ rises, the relative size of the separation area enlarges, and may eventually become 1 (a shift from the results of Proposition 2 to the results of Proposition 1). ■

Proof of Propositions 4 and 5: Let us compare the effects of a reward reduction and a penalty increase (so for the cases where $\mu>0$) on the relative magnitude of area II in Figure no. 2, which is defined by $S=\frac{\frac{(1+\delta)^2}{4}-\frac{\theta(1+\delta)^2+(1-\theta)(1-\mu)^2-1}{4}}{\frac{(1+\delta)^2}{4}}$. It is easy to see that $\frac{\partial S}{\partial \delta}=\frac{-2[\theta(1-\mu)^2+\mu(2-\mu)]}{(1+\delta)^3}<0$, $\frac{\partial S}{\partial \mu}=\frac{2[(1-\mu)(1-\theta)]}{(1+\delta)^2}>0$ and $\left|\frac{\partial S}{\partial \delta}\right|-\frac{\partial S}{\partial \mu}=\frac{(1-\theta)(3\mu-\delta+\mu\delta-\mu^2)+2\theta-1}{(1+\delta)^3}$. The sign of $\left|\frac{\partial S}{\partial \delta}\right|-\frac{\partial S}{\partial \mu}$ depends on δ, μ and θ as the following expression shows: $\left|\frac{\partial S}{\partial \delta}\right|-\frac{\partial S}{\partial \mu}>0 \Leftrightarrow (1-\theta)(3\mu-\delta+\mu\delta-\mu^2)+2\theta-1>0$.

This expression is linearly decreasing in δ, being positive if and only if $\delta<\delta_1=\frac{2\theta-1+\mu(1-\theta)(3-\mu)}{(1-\theta)(1-\mu)}$. However, it is easy to see that $\delta_1>1$ for $\theta>\theta_1=\frac{\mu^2-4\mu+2}{\mu^2-4\mu+3}$, and that $\theta_1<0$ if and only if $\mu>\mu_2=0.586$.

We proceed the proof starting with high penalties ($\mu>\mu_2$), then intermediate ($\mu_1<\mu<\mu_2$), and finally low ($\mu<\mu_1$).

From the above, we conclude that for $\mu_2<\mu<1$ we have $\delta_1>1$ for all θ, which implies that $\left|\frac{\partial S}{\partial \delta}\right|-\frac{\partial S}{\partial \mu}>0$. This proves Proposition 5 iii).

Notice that the denominator of δ_1 is positive for all $0<\theta, \mu<1$, and that the numerator is positive for $\theta>\theta_2=\frac{\mu^2-3\mu+1}{\mu^2-3\mu+2}$. It is easy to see that $\mu^2-3\mu+2>0$ for all $0<\mu<1$, because it is convex in μ and its roots are 1 and 2. It is also easy to see that $\mu^2-3\mu+1>0$ if and only if $0<\mu<\mu_1=0.382$. Hence, for $\mu_1<\mu<\mu_2$ we have $\theta_2<0$, so $\delta_1>0$. This implies Proposition 4 ii) and Proposition 5 ii).

Finally, for $0<\mu<\mu_1$ we have $\theta_2>0$. Therefore, $\delta_1>0$ if and only if $\theta>\theta_2$. Hence, $\theta<\theta_2$ implies that increasing the penalty is always more effective than reducing the reward, which proves Proposition 4 i) a). In turn, $\theta>\theta_2$ implies that the two situations may occur: increasing the penalty is always more effective than reducing the reward if and only if δ is high ($\delta>\delta_1$). This proves Proposition 4 i) b) and Proposition 5 i). ■