Consumer Boycotts

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Abstract

I present a model for consumer boycotts. The more a firm decides to comply with consumers' wishes, the higher are its marginal cost, but the lower is the probability of facing a consumer boycott. I show that the threat of a consumer boycott increases the expected profits of firms. Firms lose out when they do face a boycott, but gain even more when their competitor does, giving them more market power. The stronger a boycott will be, the more a firm will cater to the consumer's wishes. Yet, the effect of a change in the level of competition is ambiguous.

JEL Classification Codes: ...

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- - - PRELIMINARY, SLOPPY, AND INCOMPLETE - - -

1 Introduction

Firms are under increasing pressure to behave as responsible corporate citizens. The influence of non-governmental groups (NGOs) is increasing, and consumers are increasingly concerned about e.g. environmental, labor, political, ethical, and even corporate governance standards that a firm uses. When such standards do not comply with what consumers find desirable, a consumer boycott may ensue, often orchestrated by one or several

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NGOs. Examples abound. Shell has been a target for many years, initially for its role in South-Africa, nowadays for its role in Nigeria. Nike has long been under pressure for its alleged use of sweat-shops in developing countries, where labor standards are reported to be dismal. In the Netherlands, a consumer boycott hit retailer Ahold, after the generous pay package for its new CEO, Anders Moberg, became known. After this boycott had generated a decrease in sales of x%, the company's board gave in, and the pay package was scaled down. Such consumer boycotts are never entirely succesful, in the sense that they are able to completely wipe out the sales of a company. Still, firms have to be concerned with the possibility of consumer boycotts, which may still have a non-negligible impact on the demand for their product. In this paper, I model such consumer boycotts.

I assume price competition between two firms, that are located on the extremes of a Hotelling line. Firms can choose the extent to which they comply with production methods that consumers find desirable. However, there is a trade-off. By choosing methods that are less desirable, marginal costs will be lower. Crucially, we assume that such production methods are perfectly legal. The point is, however, that consumer prefer that such methods are not being used. Therefore, the probability of a consumer boycott will be higher.

Consider for example a firm that has to decide on how much to pay its workers in some developing country. It can choose a wage rate that is so low that any consumer in its home country would find it completely unethical, although it is perfectly legal to set such a wage. The lower the wage rate this firm sets, the lower its marginal cost, but the higher the probability that some NGO will find out about its practices and convinced an outraged public to start a consumer boycott.

I model such a boycott as a discrete decrease in the willingness-to-pay of all consumers for the product of this firm. This seems an adequate simplification of reality. With a consumer boycott, consumers will be less inclined to buy the product of the boycotted firm. Yet, may of them will still do so. In my model, firms first set marginal costs. Then, consumers may decide to to boycott a firm. Once that is known, firms set prices, and consumers decide whether or not to buy.

Although this paper is presented in terms of consumer boycotts, it also applies to other cases where a firm has a choice to vary the quality of its production process in ways that are not readily observable to consumers. Consider, for example, the safety of a product. A firm can save on marginal cost by compromising the safety of its product. The more it does so, the higher the probability that things will go wrong. If it does, consumers will be less inclined to buy the product, the producer has to recall its product, and/or it may face costly lawsuits. Witness, for example, the huge recall of Firestone tyres on Ford SUVs in the US in 2000. Although, strictly speaking, such a case does not qualify as a consumer boycott, it does perfectly fit my model: by choosing a lower value of its marginal cost, a firms stands an increased probability that demand of its product will drop.

The main results are the following. In the equilibrium of my model, I find that the possibility of a consumer boycott *increases* the expected profits of a firm. The intuition is as follows. When a firm does face a boycott, it is obviously hurt. But when its competitor is hit by a boycott, it benefits, since its market power now increases. In fact, we have that a firm gains more when there is a boycott against its competitor, than it loses when it faces a boycott itself. In equilibrium, both firms are equally likely to face a boycott. But that implies that expected profits go up when there is the possibility of a boycott.

This does not imply, however, that boycotts are not effective. Firms do choose higher marginal costs (and hence more desirable production methods), when they face the possibility of a boycott. Also, the marginal costs are increasing in the severity of a possible boycott. The more consumers' willingness-to-pay for a firm's product decreases when there is a consumer boycott, the higher the marginal costs that the firm will choose.

It is often argued that more competition will induce firms to lower their standards of production, compromising on safety, labor standards, environmental standards, etc. In my model, this is indeed the case. More intense competition, modelled as a decrease in transportation costs, implies less desirable production methods. Yet, compared to the case of a monopoly, the comparison is less straightforward. For some intensities of the boycott, the monopoly chooses production methods that are more desirable than a duopoly. Yet, for other intensities, the opposite may be true.

The remainder of this paper is structured as follows. I present the model in section 2.

The last stage of the model is solved in section 3, while section 4 derives some results for the general model. In section 5, I derive some further results by choosing a specific boycott probability function. Section 7 concludes.

2 The model

Two firms, A and B, are located on a line of unit length. Firm A is located at 0, firm B is located at 1. Consumers are uniformly distributed on the line. The firms produce goods that are only differentiated by their location. Each consumer either buys one unit of the good or none at all. Yet, we will assume that in equilibrium the market is covered, in the sense that every consumer chooses to buy the product. Consumers are willing to pay at most v for the product. Transportation costs are t per unit of distance. Hence, a consumer located at x is willing to pay at most $v - tx$ for the good that firm A produces, and at most $v - t(1 - x)$ for the good that firm B produces.

Initially, marginal costs for both firms are given by some $\bar{c}$. However, firms can lower their marginal costs by choosing production methods that consumers do not consider as being desirable, as I argued in the introduction. When a firm chooses such methods, it stands an increased chance of facing a consumer boycott. I thus assume that a firm can freely choose its marginal cost c_i. Yet, the lower c_i, the higher the probability that this firm faces a consumer boycott. This is due to two forces. First, the lower c_i, the more likely it is that some group or organization will find out about these practices. Second, the more blatantly a firm violates the consumer's preferred production methods, the more likely that the group that finds out about this, is able to orchestrate a consumer boycott. For simplicity, we assume that the lowest level of marginal costs that a firm can choose is zero. Hence, we have $c_i \in [0, \bar{c}]$.

Firm i thus faces a consumer boycott with probability $\gamma(c_i)$, with $\gamma' < 0$ and $\gamma(\bar{c}) = 0$: when a firm fully complies to all standards that consumers desire, it will never face a consumer boycott. Hence, I assume that consumers do not mistakes when initiating a boycott. When a firm faces a boycott, consumers are willing to pay only $(1 - \delta)v$ for the product of this particular firm, $\delta \in [0,1]$. Hence, the parameter δ reflects the extent to which the boycott is successful. When δ is very low, consumers are not bothered very much by the firm's behavior. The higher δ, the more the firm is hurt by the boycott. One could interpret δv as the consumer's willingness to pay for sound business practices.

The timing of the game is as follows. In stage 1, firms simultaneously and noncooperatively choose their marginal costs. In stage 2, boycotts are determined. In stage 3, firms compete by setting prices. Note therefore that I allow firms to set prices after they have learned whether they face a boycott. This seems natural. Price is a variable that can be changed overnight, so once a firm learns that it faces a boycott, it can still change its price. Also, when we assume that firms have to set their price before a possible boycott is in effect, then consumers may induce the level of marginal cost of this firm by observing its price.

The model is solved using backward induction. In the next section, I solve stage 3 of the model, which is the competition stage.

3 The competition stage

Consider a Hotelling model with firm A located at 0, and firm B located at 0. We first solve for the general model, in which consumers have a willingness to pay v_A for the product of firm A, and a willingness to pay v_B for the product of firm B. Marginal costs of these firms are c_A and c_B, respectively. Firms set prices p_A and p_B. The location of the indifferent consumer is denoted by z. This location is given by

$$v_A - p_A - tz = v_B - p_B - t(1-z),$$

which implies

$$z = \frac{1}{2} + \frac{(v_A - p_A) - (v_B - p_B)}{2t}, \tag{1}$$

provided of course that $z \in [0,1]$. Profits of firm A are given by

$$\pi_A = (p_A - c_A)\, z.$$

Using (1) and maximizing with respect to p_A yields the reaction function

$$p_A = \frac{1}{2}\left(t + c_A + p_B + v_A - v_B\right).$$

Similarly, profits of firm B are given by

$$\pi_B = \left(p_B - c_B\right)\left(1 - z\right),$$

which are maximized by setting

$$p_B = \frac{1}{2}\left(t + c_B + p_A + v_B - v_A\right).$$

The Nash equilibrium of this subgame thus has

$$\begin{aligned} p_A^* &= t + \frac{1}{3}\left(v_A - v_B\right) + \frac{1}{3}\left(2c_A + c_B\right), \\ p_B^* &= t + \frac{1}{3}\left(v_B - v_A\right) + \frac{1}{3}\left(2c_A + c_B\right) \end{aligned} \tag{2}$$

For the indifferent consumer we then have

$$z^* = \frac{1}{2} + \frac{1}{6t}\left(v_A - c_A\right) - \frac{1}{6t}\left(v_B - c_B\right)$$

Equilibrium profits are now given by

$$\begin{aligned} \pi_A &= \frac{1}{18t}\left(3t + \left(v_A - c_A\right) - \left(v_B - c_B\right)\right)^2, \\ \pi_B &= \frac{1}{18t}\left(3t + \left(v_B - c_B\right) - \left(v_A - c_A\right)\right)^2. \end{aligned} \tag{3}$$

As noted, this analysis does require that $z^* \in [0, 1]$, hence that

$$v_A - c_A \in \left[v_B - c_B - 3t, v_B - c_B + 3t\right], \tag{4}$$

in other words, that the quality-cost differentials $v_i - c_i$ are sufficiently close to each other. We also assume that the market is always covered, a condition to which we will return later. In what follows, for ease of exposition, I will drop the term $\frac{1}{18}t$ from all profit functions. This is immaterial when we compare profits under different scenarios.

Depending on the outcome of the boycott stage, we may have three possible scenarios: neither firm faces a boycott, both firms face a boycott, or only one of them does. Suppose that neither firm faces a boycott. Using (3), profits of each firm then equal

$$\pi_i^{NN}(c_i, c_j) = (3t - (c_i - c_j))^2, \tag{5}$$

with $i, j \in \{A, B\}$ and $i \neq j$. I will always use the first superscript to denote whether this firm faces a boycott, and the second superscript to denote whether its competitor does. Here, the superscript NN thus denotes that this firm does not face a boycott, and the other firms does not either. Now suppose that both firms do face a boycott. We then have, again using (3), profits of each firm equal

$$\pi_i^{BB}(c_i, c_j) = (3t - (c_i - c_j))^2, \tag{6}$$

with $i, j \in \{A, B\}$ and $i \neq j$. The superscript BB denotes that this firm faces a boycott, and the other firm also does, Note that these profits are equal to π_i^{NN}: when both firms face the same boycott, and the entire market is still covered, then this does not affect competition on the market: prices are not affected and neither are firm profits.

In the third scenario, one firm faces a boycott, but the other does not. Profits of the boycotted firm can then be written

$$\pi_i^{BN}(c_i, c_j) = (3t - \delta v - (c_i - c_j))^2.$$

Profits of the firm that does not face a boycott are

$$\pi_i^{NB}(c_i, c_j) = (3t + \delta v - (c_i - c_j))^2.$$

We require that, in equilibrium, both firms still have positive sales. As argued in the introduction, we thus assume that a boycott is never so successful that it can wipe an entire firm from the market. Also, we assume that the market is always covered, so in equilibrium each consumer always buys one unit of the good. In fact, these assumptions were already implicitly made in deriving the equilibria above.

In particular, we assume that a monopolist, located in one of the extremes of the market will always choose to serve the entire market. If that is the case, then the potential market of both firms in a monopoly equals the entire line, which implies that their profit functions are well-behaved. If this condition is violated, we may have cases in which there is only a mixed strategy equilibrium in prices. In section **??**, we show that this requires $v_i > 2t + c_i$. For this to be satisfied for all $v_i \in \{(1-\delta)\,v, v\}$ and all $c_i \in [0, \bar{c}]$, we thus require $(1-\delta)\,v > 2t + \bar{c}$, or $\delta v < v - 2t - \bar{c}$. For both firms to have positive market share in equilibrium, we need $z \in (0,1)$. From (4), this requires that $v_A - c_A > v_B - c_B - 3t$ for all $v_A, v_B \in \{(1-\delta)\,v, v\}$ and for all $c_A, c_B \in [0, \bar{c}]$. We thus require that $(1-\delta)\,v - \bar{c} > v - 3t$, or $\delta v < 3t - \bar{c}$. Note that this condition immediately implies that we also have that $v_A - c_A < v_B - c_B + 3t$ for all $v_A, v_B \in \{(1-\delta)\,v, v\}$ and for all $c_A, c_B \in [0, \bar{c}]$, which is also required for (4) to hold.

We thus require the following parameter restriction

Assumption 1 $\delta v < \min\{3t - \bar{c},\ v - 2t - \bar{c}\}$.

Note that, for this to be satisfied, we also need

Corollary 1 $\bar{c} < 3t$.

4 The choice of marginal costs

We now consider the first stage of the game, in which firms choose their level of marginal costs. Note that we can write

$$\begin{aligned}
\pi_i^{BB}(c_i, c_j) &= \pi_i^{NN}(c_i, c_j) \\
\pi_i^{BN}(c_i, c_j) &= \pi_i^{NN}(c_i, c_j) - 2\delta v\,(3t - (c_i - c_j)) + \delta^2 v^2 \\
\pi_i^{NB}(c_i, c_j) &= \pi_i^{NN}(c_i, c_j) + 2\delta v\,(3t - (c_i - c_j)) + \delta^2 v^2 \qquad (7)
\end{aligned}$$

After marginal costs are set, firm A faces a boycott with probability $\gamma(c_A)$, while firm B faces one with probability $\gamma(c_B)$. Firm i will thus choose c_i to maximize

$$\Pi_i = \gamma(c_i)\,(1-\gamma\,(c_j))\,\pi_i^{BN}(c_i, c_j) + (1-\gamma\,(c_i))\,\gamma(c_j)\pi_i^{NB}(c_i, c_j) + \qquad (8)$$

$$+\left(1-\gamma\left(c_i\right)\right)\left(1-\gamma\left(c_j\right)\right)\pi_i^{NN}(c_i,c_j)+\gamma\left(c_i\right)\gamma\left(c_j\right)\pi_i^{BB}(c_i,c_j).$$

The first term reflects the case that firm i will face a boycott, and firm j will not. The probability of this occurring is $\gamma(c_i)\left(1-\gamma\left(c_j\right)\right)$. If it occurs, the profits of firm i equal $\pi_i^{BN}(c_i,c_j)$. Similarly, the second term reflects the case that firm i will not face a boycott but firm j will. The third term reflects the case that neither firm will face a boycott, and the fourth term the case that both will.

Suppose that an internal Nash equilibrium exists, in which both firms choose a level of marginal cost that lies strictly between 0 and $\bar{c}$. Using symmetry, we necessarily have $c_A^* = c_B^*$. Denote this level of marginal cost as c^*. This implies that the equilibrium probability of a consumer boycott is equal for both firms. Denote this probability as γ^*. Hence $\gamma^* = P(c^*)$. In this case, (8) simplifies to

$$\Pi_i = \gamma^*\left(1-\gamma^*\right)\left(\pi_i^{BN}(c^*,c^*)+\pi_i^{NB}(c^*,c^*)\right)+\left(1-\gamma^*\right)^2\pi_i^{NN}(c^*,c^*)+\left(\gamma^*\right)^2\pi_i^{BB}(c^*,c^*).$$

Using (7), this implies

$$\begin{aligned}\Pi_i &= 2\gamma\left(1-\gamma\right)\left(\pi+\delta^2v^2\right)+\left(1-\gamma\right)^2\pi+\gamma^2\pi\\ &= \pi_i^{NN}\left(c^*,c^*\right)+2\gamma^*\left(1-\gamma^*\right)\delta^2v^2\\ &= 9t^2+2\gamma^*\left(1-\gamma^*\right)\delta^2v^2.\end{aligned}$$

Note from (5) that, without the possibility of boycotts, any game in which firms c simultaneously, and that yields a symmetric equilibrium $c_1^* = c_2^* \equiv \tilde{c}$, yields equilibrium profits $\pi_i^{NN}(\tilde{c},\tilde{c}) = 9t^2$. Hence, we have established the following result

Theorem 1 *When in equilibrium both firms face a consumer boycott with positive probability, then the possibility of a consumer boycott increases the expected profits of both firms.*

This is a counterintuitive result. It can be understood as follows. In such an equilibrium, both firms choose the same level of marginal cost. Hence, the probability that a given firm is hit by a consumer boycott is equal to the probability that its competitor is. When the competitor is hit, then this firm benefits: the consumers' willingness to pay for the competitor's product decreases, giving this firm more market power. Of course, a firm suffers when it faces a consumer boycott itself. However, the additional profit when ones competitor faces a boycott, more than outweighs the loss in profit when it faces a consumer boycott itself. Intuitively, the expected profits of being equally like to be a monopoly or a duopoly, are higher than the expected profit of being a duopoly for sure. In the appendix, I derive conditions where this holds in a more general framework.

Note, however, that this does not imply that boycotts are not effective. Indeed, without the possibility of a consumer boycott, firms would simply have chosen the lowest possible level of marginal cost. As long as the equilibrium of the game described above has $c^* > 0$, we still have that the threat of consumer boycotts are effective, in the sense that they do induce firms to choose production methods that are more desirable for consumers than they would have chosen absent such a threat.

In order to be able to find an explicit solution, and to be able to perform some comparative statics, we need to choose an explicit specification for the boycott probability function γ. I will do so in the next section.

5 Imposing a boycott probability function

Consider the expected profits of firm i in stage 1, given by (8). For ease of exposition, we drop the arguments of the profit functions and use $\gamma_i \equiv \gamma(c_i)$. Using (7), profits can then be written

$$\Pi_i = \pi_i^{NN} + (\gamma_i + \gamma_j - 2\gamma_i\gamma_j)\, \delta^2 v^2 + 2\,(\gamma_j - \gamma_i)\, \delta v\, (3t - (c_i - c_j))\,.$$

$$(1 - 2\gamma_j$$

Using (5), the FOC is

$$-2\,(1 + \delta v \gamma_i')\,(3t - (c_i - c_j)) - 2\delta v\,(\gamma_j - \gamma_i) + \delta^2 v^2\,(1 - 2\gamma_j)\,\gamma_i' = 0, \tag{9}$$

where γ_i' denotes the first derivative of γ with respect to c_i. To get some further insights, we choose a specific functional form for the boycott probability function γ. For simplicity, we assume that when a firm chooses the lowest possible marginal costs, it faces a boycott with certainty, so $\gamma(0) = 1$. When we assume that γ is linear, the function is pinned down entirely, and we have

$$\gamma(c) = \frac{\bar{c} - c}{\bar{c}}.$$

This implies that $\gamma' = -1/\bar{c}$. For what follows, it is convenient to write $a \equiv 1/\bar{c}$. We will first solve firm is unconstrained maximization problem, thus without taking into account the condition that $c_i \in [0, \bar{c}]$. The FOC now is

$$-2\left(1 - \delta va\right)\left(3t - \left(c_i - c_j\right)\right) - 2\delta v\left(c_i - c_j\right)a - \delta^2 v^2 a^2\left(2c_j - \bar{c}\right) = 0, \tag{10}$$

Note that

$$\gamma_j - \gamma_i = \frac{\bar{c} - c_j}{\bar{c}} - \frac{\bar{c} - c_i}{\bar{c}} = \frac{c_i - c_j}{\bar{c}} = a\left(c_i - c_j\right)$$

and

$$1 - 2\gamma_j = 1 - 2\frac{\bar{c} - c_j}{\bar{c}} = \frac{\bar{c} - 2\bar{c} + 2c_j}{\bar{c}} = 2ac_j - 1,$$

so the FOC reduces to

$$-6t\left(1 - \delta va\right) + \left(4\delta va - 2\right)\left(c_j - c_i\right) - 2\delta^2 v^2 a^2 c_j + \delta^2 v^2 a = 0,$$

hence

$$\left(4\delta va - 2\right)\left(c_i - c_j\right) = -6t\left(1 - \delta Va\right) - 2\delta^2 v^2 a^2 c_j + \delta^2 v^2 a.$$

This yields the following reaction function for firm i

$$c_i = \tilde{R}_i\left(c_j\right) \equiv c_j + \frac{\delta^2 v^2 a\left(1 - 2ac_j\right) - 6t\left(1 - \delta Va\right)}{4\delta va - 2}, \tag{11}$$

where the tilde reflects that we look at the unconstrained maximization problem. Consider the second-order condition. From (10), we have

$$\frac{\partial^2 \Pi_i}{\partial c_i^2} = 2 - 4\delta va.$$

For profits to be maximized, we thus need

$$2 - 4\delta va < 0. \tag{12}$$

For the time being, we assume that this condition is satisfied. Note that it immediately implies that the denominator in (11) is positive. Also note that, when the condition fails to be satisfied, we have $2 - 4\delta va > 0$. Hence, the profit function is strictly convex. As a result, the firm's profit maximization problem must have a corner solution: the firm will either set $c_i = 0$ or $c_i = \bar{c}$.

Consider the derivative of (11) with respect to c_j. This yields

$$\frac{\partial \tilde{c}_i}{\partial c_j} = 1 - \frac{2\delta^2 v^2 a^2}{4\delta va - 2}.$$

The denominator is strictly positive. The fraction is strictly smaller than 1 iff

$$\delta^2 v^2 a^2 < 2\delta va - 1,$$

or

$$\delta va\,(2 - \delta va) > 1.$$

Consider the left-hand side as a function of δva. This function has its maximum at $\delta va = 1$, where it equals 1. Hence, the inequality is never satisfied. This establishes

Theorem 2 *Reaction curves in the unconstrained problem are linear and downward sloping. Hence, we have strategic substitutes.*

When (12) is satisfied, firm is profits are strictly concave. This implies that when the unconstrained maximization problem yields some $c_i > \bar{c}$, then firm is best reaction in the constrained problem must be to set $c_i = \bar{c}$. Similarly, the unconstrained problem yields some $c_i < 0$, then firm is best reaction in the constrained problem must be to set $c_i = 0$. The reaction function in the constrained problem are thus given by

$$c_i = R_i(c_j) \equiv \min\left\{\max\{0, \tilde{R}_i(c_j)\}, \bar{c}\right\}. \tag{13}$$

To solve for the Nash equilibrium in the unconstrained problem, imposing symmetry to (11) yields

$$\delta^2 v^2 a\,(1 - 2ac^*) = 6t\,(1 - \delta Va)\,.$$

Using the definition for a, this yields

$$\tilde{c}^* = \frac{1}{2}\bar{c} + \frac{3t\bar{c}\,(\delta v - \bar{c})}{\delta^2 v^2}. \tag{14}$$

Now consider the solution in the constrained problem. Suppose that $\tilde{c}^* > \bar{c}$. In the constrained problem, it is then an equilibrium for both firms to set $c_i = \bar{c}$. This can be seen as follows. For firm i, the best reply to $\bar{c}$ in the unconstrained problem is then to set $\tilde{R}_i(\bar{c})$. But, since $\tilde{R}_i$ is downward sloping, we have $\tilde{R}_i(\bar{c}) > \tilde{R}_i(\tilde{c}^*) = \tilde{c}^* > \bar{c}$. Hence, from (13), $R_i(\bar{c}) = \bar{c}$. so $(c_A, c_B) = (\bar{c}, \bar{c})$ is a Nash equilibrium. With $\tilde{R}_i$ linear and downward sloping, this equilibrium is unique. Now consider the case where $\tilde{c}^* < 0$. In the constrained problem, it is then an equilibrium for both firms to set $c_i = 0$. This can be seen as follows. For firm i, the best reply to 0 in the unconstrained problem is then to set $\tilde{R}_i(0)$. But, since $\tilde{R}_i$ is downward sloping, we have $\tilde{R}_i(0) < \tilde{R}_i(\tilde{c}^*) = \tilde{c}^* < 0$. Hence, from (13), $R_i(\bar{c}) = 0$, so $(c_A, c_B) = (0, 0)$ is a Nash equilibrium. With $\tilde{R}_i$ linear and downward sloping, this equilibrium is unique.

We have thus established

$$c^* = \min\left\{\max\left\{0, \frac{1}{2}\bar{c} + \frac{3t\bar{c}\,(\delta v - \bar{c})}{\delta^2 v^2}\right\}, \bar{c}\right\}, \tag{15}$$

where we still assume that the other conditions are satisfied.

We now consider c^* as a function of δ or, equivalently, as a function of δv. Plugging $\delta v = \frac{1}{2}\bar{c}$ into (14) yields $\tilde{c}^* = -6t$, so $c^* = 0$. Hence

Lemma 1 *For δv slightly above $\frac{1}{2}\bar{c}$, we still have $c^* = 0$.*

We can also establish the following result.

Lemma 2 *c^* is nondecreasing in δv.*

Proof. First note that

$$\frac{\partial \tilde{c}^*}{\partial \delta v} = -3tc\frac{\delta v - 2c}{(\delta v)^3}.$$

This is decreasing for δv when $\delta v > 2\bar{c}$. Plugging $\delta v = 2\bar{c}$ into (14) yields

$$\frac{1}{2}\bar{c} + \frac{3}{4}t.$$

This is smaller than $\bar{c}$ when $3t < 2\bar{c}$ or $\bar{c} > \frac{3}{2}t$. We also need $\delta v < 3t - \bar{c}$, so $2\bar{c} < 3t - \bar{c}$, or $\bar{c} < t$. But this contradicts $\bar{c} > \frac{3}{2}t$. Hence $\tilde{c}^*$ only decreases at some $\tilde{c}^* > \bar{c}$. Yet that may still imply that $\tilde{c}^*$ is decreasing below $\bar{c}$ within the feasible area. From (14), we have that $\tilde{c}^* = \bar{c}$ if

$$6t\left(\delta v - \bar{c}\right) - \delta^2 v^2 = 0$$

This is the case if both $\delta v = 3t - \sqrt{3t\left(3t - 2\bar{c}\right)}$ or $\delta v = 3t + \sqrt{3t\left(3t - 2\bar{c}\right)}$. We have that c^* an still be increasing if δv is larger than the second root. But that can never be satisfied, since we require $\delta v < 3t - \bar{c}$. Hence, within the feasible area, c^* is never decreasing. End of proof.

From (14), we have that $\tilde{c}^* > 0$ if

$$6t\left(\delta v - \bar{c}\right) + \delta^2 v^2 > 0.$$

This is the case if either

$$\delta v > -3t + \sqrt{3t\left(3t + 2\bar{c}\right)}, \tag{16}$$

or if $\delta v < -3t - \sqrt{3t\left(3t + 2\bar{c}\right)}$. Note however that the latter condition is never satisfied. Note that a boycott will never be effective if the rhs of (16) falls outside the feasible interval. This is the case if

$$-3t + \sqrt{3t\left(3t + 2\bar{c}\right)} > 3t - \bar{c}$$

or, noting that $6t > \bar{c}$, if

$$3t\left(3t + 2\bar{c}\right) > \left(6t - \bar{c}\right)^2.$$

This is the case if

$$\left(1 - \frac{1}{3}\sqrt{6}\right)\bar{c} < 3t < \left(1 + \frac{1}{3}\sqrt{6}\right)\bar{c}.$$

Note that the first inequality is always satisfied, since $3t > \bar{c}$.

The rhs of (16) also falls outside the feasible interval if

$$-3t + \sqrt{3t\left(3t + 2c\right)} > v - 2t - \bar{c}$$

or

$$3t\,(3t+2c) > (v+t-\bar{c})^2\,,$$

which is satisfied if

$$-t+\bar{c}-\sqrt{3t\,(3t+2\bar{c})} < v < -t+\bar{c}+\sqrt{3t\,(3t+2\bar{c})}.$$

We have thus established

Lemma 3 *There is never an effective boycott if either one of the following conditions is satisfied*

$$\begin{aligned} 3t &< \left(1+\frac{1}{3}\sqrt{6}\right)\bar{c} \\ \bar{c}-t-\sqrt{3t\,(3t+2\bar{c})} &< v < \bar{c}-t+\sqrt{3t\,(3t+2\bar{c})}. \end{aligned}$$

If they are not, there is a feasible value of δv for which the boycott is effective.

From (14), we have that $\tilde{c}^* > \bar{c}$ if

$$6t\,(\delta v-\bar{c})-\delta^2 v^2 > 0$$

This is the case if both $\delta v < 3t+\sqrt{3t\,(3t-2\bar{c})}$ and $\delta v > 3t-\sqrt{3t\,(3t-2\bar{c})}$. It is never satisfied if $3t < 2\bar{c}$. Note that the first condition can never be satisfied, since we require $\delta v < 3t-\bar{c}$. We thus have

Lemma 4 *The level $c^* = \bar{c}$ is reached only if $\delta v > 3t-\sqrt{3t\,(3t-2\bar{c})}$.*

We now have

Theorem 3 *Assume*

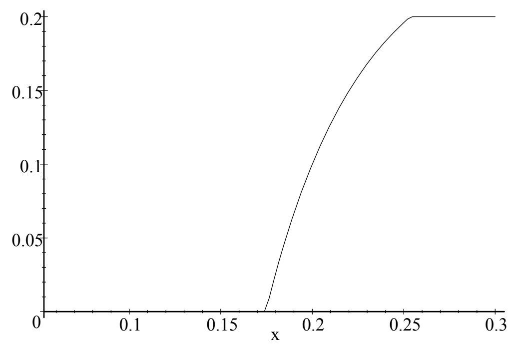
$$\begin{aligned} 3t &> \left(1+\frac{1}{3}\sqrt{6}\right)\bar{c} \\ v &> \bar{c}-t+\sqrt{3t\,(3t+2\bar{c})}. \end{aligned}$$

Then the marginal costs c^* that firms choose in equilibrium is a continuous function that equals 0 for δ smaller than some δ^*, and is strictly increasing in an interval $\left(\delta^*, \left(3t-\sqrt{3t\,(3t-2\bar{c})}\right)/v\right)$, and equals $\bar{v}$ for $\delta > \left(3t-\sqrt{3t\,(3t-2\bar{c})}\right)/v$, provided this is feasible.

As a numerical example, choose $v = 1$ and $\bar{c} = t = \frac{1}{5}$. All conditions are then satisfied and

$$c^* = \min\left\{\max\left\{\frac{1}{10} + \frac{\frac{3}{25}\left(x - \frac{1}{5}\right)}{x^2}, 0\right\}, \frac{1}{5}\right\},$$

which is depicted in figure 1.



Back to the general case, consider the increasing part of the marginal cost function, i.e. the part where $c^* = \frac{1}{2}\bar{c} + \frac{3t\bar{c}(\delta v - \bar{c})}{\delta^2 v^2}$. Note that

$$\frac{\partial c^*}{\partial t} = \frac{3\bar{c}\left(\delta v - \bar{c}\right)}{\delta^2 v^2},$$

This is positive if

$$\delta v - \bar{c} > 0.$$

Note that an increase in competition implies a decrease in t. We have thus established

Theorem 4 *On the increasing part of the marginal cost function, we have the following. For δ relatively small, marginal costs are increasing in the level of competition. For δ relatively high, marginal costs are decreasing in the level of competition.*

Hence, the common belief that an increase in competition will lead firms to compromise more on e.g. safety and production standards, is not always true in this model. When the punishment when being found out is relatively low, then more competition actually induces firms to behave in a more desirable manner. When that punishment is relatively high, more competition does induce firms to behave less well.

The intuition is as follows. The equilibrium choice of marginal costs depends on two opposing forces. On the one hand, ceteris paribus, lower marginal costs imply higher profits. But on the other hand, it implies that the probability of a boycott is higher, which decreases expected profits. We can have two situations: either firms compete on an equal footing, or they are asymmetric, in that one firm faces a boycott while the other does not. Equilibrium profits in the first case are more strongly influenced by the level of competition, than profits in the latter case.When a boycott is severe, the effect of profits per se thus dominate, and stronger competition causes firms to lower their marginal costs. But when a boycott is less severe, the effect on the probability of a boycott dominates, and stronger competition causes firms to increase their marginal costs.

Of course, it is important to see to what extent the results derived above hinge on the boycott probability function that I chose. I also analyzed a more general model, in which the probability of a boycott is given by

$$\gamma = \gamma_0 \left(\frac{\bar{c} - c}{\bar{c}} \right).$$

Note that this is the same specification as above, when $\gamma_0 = 1$. The parameter γ_0 reflects the probability of a boycott when a firm chooses the lowest possible level of marginal costs. Qualitatively, however, this specification yields the same results as presented above. Details are available from the author upon request.

6 The Case of a Monopoly

Now consider a monopoly located at, say, 0. Given the assumptions we made, the monopolist will always set a price such that everyone is still willing to buy the product. This can be seen as follows. Suppose the monopolist sets some p_i. Then demand d is given by $p_i + td_i = v_i$, or $d_i = (v_i - p_i)/t$. Profits then equal

$$\pi_i = (p_i - c_i) d_i = (p_i - c_i)(v_i - p_i)/t,$$

which is maximized by setting $p_i = \frac{1}{2}(v_i + c_i)$. Profits would then equal $\pi_i = \frac{1}{4}(v_i - c_i)^2$. This implies for total demand $d_i = (v_i - c_i)/2t$. However, this is strictly larger than 1 if

$v_i > c_i + 2t$, as we assumed previously.

The monopolist will simply set the highest price that assures that everyone buys. This implies

$$p_i = v_i - t.$$

Note that, when there is no boycott, we are always in this case, since we assumed $v > 3t+\bar{c}$, so we definitely have $v > 3t + c_i$ for any c_i. The profits of a monopolist when there is no boycott thus equal

$$\pi_m^N(c_i) = v - t - c_i.$$

The profits with a boycott equal

$$\pi_m^N(c_i) = (1-\delta)\, v - t - c_i.$$

Denoting the probability of a boycott as $\gamma(c_i)$, expected profits thus equal

$$\begin{aligned} \Pi_m(c_i) &= \gamma(c_i)\left((1-\delta)\, v - t - c_i\right) + (1-\gamma(c_i))\,(v - t - c_i) \\ &= (1-\gamma(c_i)\delta)\, v - t - c_i. \end{aligned}$$

Note therefore that monopoly profits always decrease with the possibility of a boycott. Taking the derivative with respect to c_i yields

$$\frac{\partial \Pi_m}{\partial c_i} = -\gamma' \delta v - 1$$

Using the same specification as in the duopoly case, we have $\gamma' = -1/\bar{c}$, hence

$$\frac{\partial \Pi_m}{\partial c_i} = \frac{\delta v}{\bar{c}} - 1.$$

Hence, the monopolist will always choose a corner solution. It will set $c = 0$ if $\delta v < \bar{c}$, and $c = \bar{c}$ if $\delta v > \bar{c}$. Note that, when $\delta v = \bar{c}$, the duopoly will set $c^* = \frac{1}{2}\bar{c}$. Hence, for small δ, we may have that a boycott against a monopoly is more effective than that against a duopoly. For large δ, we may have that a boycott against a duopoly is more effective than that against a monopoly. Note that this is in line with the result in theorem 4.

7 Conclusion

In this paper, I presented a model for consumer boycotts. Firms can choose to which extent they want to comply with consumers' wishes with respect to their production process. The trade-off involved is that the more a firm decides to comply with consumers' wishes, the higher are its marginal cost, but the lower is the probability of facing a consumer boycott. Such a boycott was modelled as a discrete decrease in consumers' willingness to pay for the firm's product. In my model, consumer boycotts does hurt a firm's sales, but never reduces them to zero.

I showed that, in equilibrium, the threat of a consumer boycott increases the expected profits of firms. Firms lose out when they do face a boycott, but they gain even more when their competitor does, since this gives them more market power. I also showed that the stronger a boycott will be, the more a firm will cater to the consumer's wishes. Yet, the effect of a change in the level of competition is ambiguous. Different from what is often argued, an increase in competition may also induce firms to behave in a more responsible manner.

8 Appendix

In this appendix, I sketch the model for a more general mode of competition. For simplicity, however, I do assume that a firm has a monopoly when there is a boycott against its competitor. Expected equilibrium profits then are

$$\Pi_i = \gamma\left(1-\gamma\right)\left(\pi^m(c^*)\right) + \left(1-\gamma\right)^2 \pi_N^D(c^*) + \gamma^2 \pi_B^D(c^*),$$

with π^m monopoly profits, π_N^D duopoly profits when there is no boycott, and π_B^D duopoly profits when both firms face a boycott. Without the threat of a boycott, both firms earn $\pi_N^D(\tilde{c})$, which reflects that they will then choose a different equilibrium level for marginal costs. The threat of a boycott increases expected profits if

$$\gamma\left(1-\gamma\right)\left(\pi^m(c^*)\right) + \left(1-\gamma\right)^2 \pi_N^D(c^*) + \gamma^2 \pi_B^D(c^*) > \pi_N^D(\tilde{c}),$$

which implies

$$\frac{1}{1-\gamma}\left(\pi_N^D(\tilde{c})-\pi_N^D(c^*)\right)+\frac{\gamma}{1-\gamma}\left(\pi_N^D(c^*)-\pi_B^D(c^*)\right)<\pi^m(c^*)-2\pi_N^D(c^*).$$

Note that we always have $\pi^m(c^*) > 2\pi^D(c^*)$. Sufficient for this to hold is, for example, that $\pi_B^D(c^*) = \pi_N^D(c^*)$ and $\pi_N^D(\tilde{c}) = \pi_N^D(c^*)$, as we have in the main text. In general we need that the decrease in duopoly profits due to the possibility of a consumer boycott, and the decrease in profits when both firms actually face a boycott, both are not too large.