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On the Sources of Consumer Boycotts Ineffectiveness

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This article investigates weaknesses of consumer boycotts. First, usual shortcomings of collective action, such as coordination failure and free riding, reduce considerably the success likelihood. Second, consumers with the highest ability to hurt the targeted firm's profit also have the highest opportunity cost of boycotting. Thus, they are less likely to participate in the boycott. Conversely, the most involved consumers have high environmental preferences and small amounts of consumption, which prevent them from hurting the firm's profit enough.

Keywords: *consumer boycott; war of attrition; environment; technology choice*

Consumer boycott (Friedman, 1991, 1999), that is, the individual or collective choice of not buying some product, is a frequently used tool by nongovernmental organizations (NGOs), lobby groups, or individual citizens to protest against perceived unfair marketing and social or environmental practices: Cosmetic firms are boycotted for their use of animal testing (Davidson, 1995); major oil companies have been targeted for their environmental damages and their supposed lobbying efforts to deter climate change policies (Skjærseth & Skodvin, 2001); some large fast-food companies have been boycotted because of their supposed environmental unfriendly way to produce meat (Garret, 1987); NGOs support the boycott of noncertified tropical timber, to protest against unsustainable harvest practices and corruption (Klooster, 2005).

The consumer boycotts literature mainly focuses on field studies (Garrett, 1987; Koku, Akighbe, & Springer, 1997; Pruitt & Friedman, 1986; Teoh, Welch, & Wazzan, 1999) or history of consumer boycotts (Friedman, 1985, 1995; Smith, 1990).

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Tyran and Engelmann (2005) provided an experimental analysis of consumer boycotts.

Theoretical investigations of consumer boycotts remain rare. First, Innes (2006) considered a duopoly setting where firms choose between a clean and a dirty technology, while environmental organizations (EO) may invest in consumer boycotts to deter the choice of the dirty technology. The boycott effectiveness is mainly determined by the EO's investment. Second, Baron (2002) considered that the action of boycotting by some consumers provides information to the other citizens about the seriousness of a situation. Boycotting allows consumers to signal their private information. More serious issues thus enhance stronger and longer boycotts. Finally, Diermeier and Van Mieghem (2005) described coordination between boycotting consumers as a stochastic process with threshold effects.

Analyzing under which conditions a consumer boycott is effective, this article points out main sources of consumer boycotts' ineffectiveness. We consider a boycott effective if it induces a change in the targeted firm's behavior consistent with the boycotting group's objective. Therefore, we focus on market-oriented boycotts and do not discuss media-oriented boycotts, of which the aim is only to signal disapproval and to increase public awareness. As a matter of illustration, we focus on environmental motivations, but consumer boycotts on social and health considerations follow the same analysis.

Two main conclusions can be given. First, as for any other type of collective action, free riding and coordination failures are major problems of consumer boycotts. Second, even if these problems may be avoided, a simple trade off between the opportunity cost of boycotting and the boycott potential to hurt the firm's profit reduces considerably the boycott potential for success. Thus, consumers who are able to hurt the targeted firm's profit are unlikely to participate, whereas some consumers with low cost of boycotting do participate but have a fairly small potential to make it succeed.

Section 2 underlines the fact that free riding and coordination issues are major problems of consumer boycotts. Section 3 presents consumer boycotts as a complete information war of attrition model. Finally, the analysis is applied to real-life boycotts in Section 4. Section 5 concludes.

Boycotts and Collective Action Shortcomings

The potential for consumer boycotts success is crucially limited by usual issues of collective action. Indeed the choice of boycotting is an individual and costly decision, whereas the boycott success is determined by collective action. This dichotomy naturally implies temptation for free riding and risk of coordination failure. We are here in the framework of critical mass models (see Granovetter, 1978).

Consider a firm producing a good with a polluting technology, while a clean technology is available. An environmental NGO announces a consumer boycott, requiring for any consumer not satisfied with the use of the dirty technology to stop consuming the good. The existence of an imperfect substitute is assumed. Thus, only one firm is boycotted (eventually a set of homogenous firms), and market competition is implicitly considered trough the quality of the available substitute.

There are N environmentalists who would prefer the firm to switch for the clean technology. Environmentalist consumers are heterogeneous in their boycotting costs and gains from a boycott success.[1] Boycotting consists of paying a cost (C_i) for sure (i.e., not consuming the good) to receive a potential gain G_i (i.e., the technology switch in case of success). Any individual environmentalist participates if the expected payoff of participating exceeds the expected payoff of not participating.

Consumer i's individual choice is boycotting ($B_i = 1$) or not boycotting ($B_i = 0$). The number of boycotting consumers is therefore

$$n = \sum_{i=1}^{N} B_i. \tag{1}$$

The firm will switch technology if the boycott is sufficiently important, that is, if the boycotting population is greater than or equal to n^s. This threshold at which the boycott is successful is unknown to the environmentalists. However, the boycott probability of success depends on the size of the boycotting population: $p[n \geq n^s]$. The success probability is zero if nobody boycotts: $p[0 \geq n^s] = 0$. The boycott would be successful for sure if every environmentalist was boycotting $p[N \geq n^s] = 1$.[2] Moreover, the current number of boycotting consumers n is public knowledge. Thus, the boycott is potentially successful.

However, as we will see in the next two sections, free riding and the lack of coordination may jeopardize the boycott success potential.

Boycott and Free Riding

In a similar manner to the voter's paradox mechanism, free riding is a major cause of boycott failures. Any individual consumer considers two potential choices and four related outcomes. First, the consumer can ignore the boycott and continue to consume the good. Second, he can decide to boycott. In each case, the boycott could succeed or fail. Boycotting is costly in terms of utility, as the consumer has to switch his consumption for an imperfect substitute, providing less utility. Moreover, the boycott success is highly uncertain, and individual participation of any consumer only has a marginal impact on the probability of success. In other words, any individual has an incentive to free ride, that is, not to participate in the boycott while hoping for it to succeed.

Indeed, any environmentalist i boycotts ($B_i = 1$) if

$$p\left[\sum_{i\neq -i} B_{-i} + 1 \geq n^s\right] G_i - C_i \geq p\left[\sum_{i\neq -i} B_{-i} \geq n^s\right] G_i. \quad (2)$$

The participation threshold $\overline{p}_i = \frac{C_i}{G_i}$ at which consumer i decides to boycott is

$$p\left[\sum_{i\neq -i} B_{-i} + 1 \geq n^s\right] - p\left[\sum_{i\neq -i} B_{-i} \geq n^s\right] \geq \overline{p}_i. \quad (3)$$

The choice of any individual consumer only increases marginally the probability of a boycott success. Thus, the left-hand side of Equation 3 is close to zero, and only consumers with very small or negative threshold $\overline{p}_i$ participate in the boycott. As a consequence, only consumers with very strong environmental preferences are expected to boycott, and the boycott success is highly improbable.

Solving free-riding issues is a crucial and complex concern in this case. Indeed, consumption behaviors are not observable, and social control is thus impossible. NGO communication may help reducing this concern, if trying to emphasize individual responsibility in the boycott. However, even if free riding is avoided, consumers still need to coordinate.

Coordination Failure

A second crucial issue concerning boycott successes is the lack of coordination. Indeed, individual consumers being disseminated, direct coordination is not possible. In contrast with the previous section, individual consumers only consider the gain from a boycott success if they participate. Thus, we avoid the voter's paradox and free riding that have been considered before.

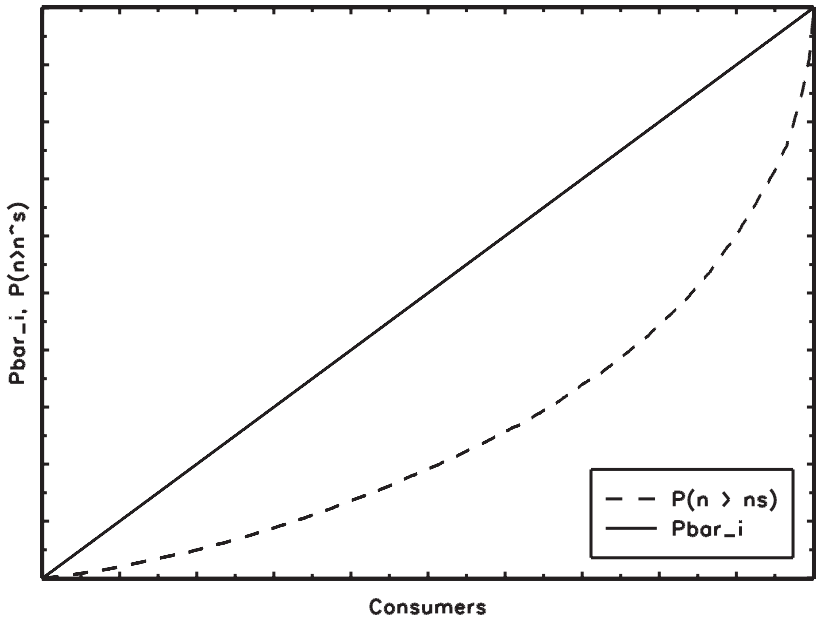
Consumer i decides to boycott at time t ($B_i(t) = 1$) if his potential gain from a boycott success exceeds his cost of boycotting. The number of boycotting consumers at time t is as follows: $n(t) = \sum_{i=1}^{N} B_i(t)$. The individual choice of boycotting still depends on the probability of the boycott success. The participation threshold $\overline{p}_i = \frac{C_i}{G_i}$ at which consumer i decides to boycott is here:

$$\begin{cases} B_i(t) = 1 \text{ if } p[n(t) \geq n^s] \geq \overline{p}_i \\ B_i(t) = 0 \text{ if } p[n(t) \geq n^s] < \overline{p}_i \end{cases}. \quad (4)$$

Consumers will thus enter sequentially in the boycott. Strong environmentalists, who have low costs of boycotting and small participation thresholds, will participate first. As the boycott importance and the probability of success grow, consumers with higher thresholds decide to participate. Therefore, the last consumer $\overline{n}$ deciding to boycott is defined as follows.

$$\overline{n}: \; p[\overline{n} \geq n^s] = \overline{p}_n. \quad (5)$$

Figure 1
Equilibrium Boycott Population



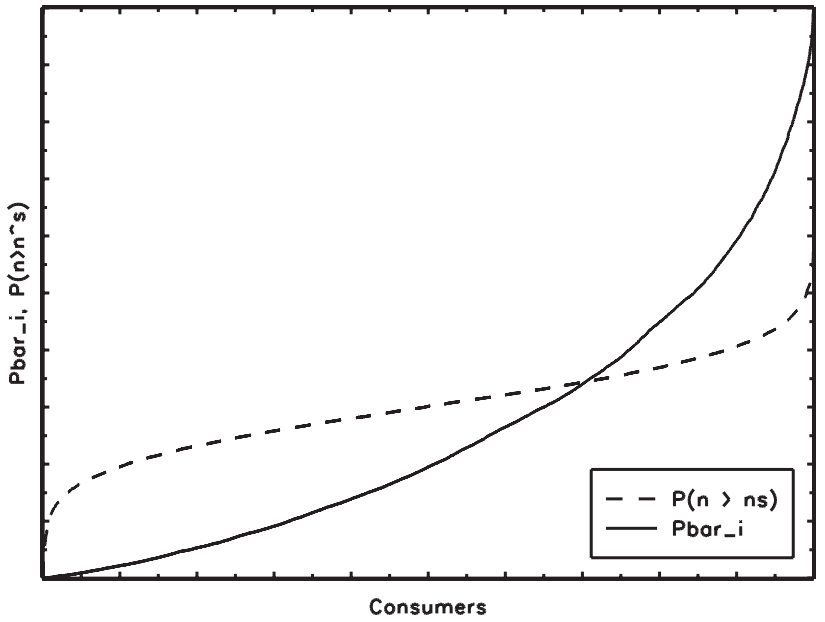
Parameters: $\overline{p}$: χ^2 distribution; $p\,[n(t) \geq n^s]$: normal distribution; $N = 10,000$, $\overline{n} = 7,296$.

$\overline{n}$ also defines the equilibrium boycott participation, which is the population with participation threshold larger than the expected probability of success. Figure 1 gives a representation of the equilibrium boycott population, which is the intersection between $p[n(t) \geq n^s]$ and $\overline{p}_i$. The boycott is successful if $\overline{n} \geq n^s$. Overall, this equilibrium boycott participation and thus the potential for success depend on the distribution of boycotting costs and the beliefs structure. Optimistic beliefs about the firm's withdrawal threshold n^s may compensate for the lack of coordination. Moreover, the consumers distribution needs to have fat tails, that is, a large number of strong environmentalists, with low participation thresholds.

Figure 2 gives an example of coordination failure leading to unsuccessful boycott. The boycott would be successful if every environmentalist would participate. However, the consumers distribution (uniform in the case of Figure 1) and the beliefs structure (normal distribution) is such that nobody decides to boycott in equilibrium (because $p\,[n(t) \geq n^s] < \overline{p}_i$, $\forall i \in [0, N]$).

Overall, one can easily see that a potentially successful boycott may be ineffective due to the lack of coordination, even if a boycott success could be an

Figure 2
Unsuccessful Boycott Due to Coordination Failure



Parameters: $\overline{p}$: uniform distribution; $p\,[n(t) \geq n^s]$: normal distribution; $N = 10,000, \overline{n} = 0$.

equilibrium. Coordination failures are also difficult to compensate for. Large communication trying to enhance optimistic beliefs and information raising environmental preferences may help to solve those issues. However, even if free-riding problems and coordination failures are solved, boycott successes are not likely.

Boycott as a War of Attrition With Perfect Information

We focus now on a best-case scenario, with no free riding nor lack of coordination. Moreover, information is now assumed to be perfect. Thus, gains and costs of both players are common knowledge. In this context, consumer boycotts can be considered as a war of attrition between a group of consumers and the targeted firm.[3]However, this model differs from usual war of attrition models, in the sense that we consider asymmetric motivations and payoffs (Burton, 2004).

A war of attrition is a model of aggression between two players. The game takes the form of a succession of identical periods. The model is stationary: Each period

represents the same type of problem for both players, with neither information gain nor change in costs or benefits. Both players make conjecture about its opponent's strategy.

Technology Choice and Consumers Behavior

Firm's technology choice. Technology 1 (T1) is cheap but polluting, whereas Technology 2 (T2) is clean but more expensive. The considered firm chooses Technology 1, if it generates larger profit than Technology 2, that is, $\pi_1 > \pi_2$. The profit schedules, π_1 and π_2, differ simply because the production costs, the price of the good, and the demand structure are not the same whether the good is produced with the dirty or the clean technology.[4]

Consumption patterns. The consumers population is of size 1, with two homogeneous groups. The environmentalists represent an exogenous share α of the population. The environmentalists' utility is increasing in consumption and decreasing in pollution. Moreover, they would prefer the firm to produce with Technology 2: $U_1 < u_2$. U_1 is the utility derived by an environmentalist if the good is produced with T1, and U_2 is the utility for a good produced with T2.

A share $(1 - \alpha)$ of consumers only considers individual consumption in its utility function. Therefore, these consumers prefer the firm to use T1 because they do not care about pollution and T1 is cheaper. Thus, they would never participate in an eventual boycott. Appendix A presents basic consumer theory illustrating links between environmental preferences and consumption.

Boycott as a war of attrition. An EO announces a consumer boycott, requiring for any consumer unsatisfied with the use of Technology 1 to stop consuming the good. Boycotting consumers switch their consumption of the good for the consumption of an imperfect substitute produced with a clean technology but providing lower utility. The utility of a boycotting consumer is U_b. The cost of boycotting is thus the difference between the utility derived by the consumption of the good and the utility of boycotting: $\Delta U = U_1 - U_b$.

This specification of an exogenous substitute allows to consider a wide variety of market structures. As an extreme case, the targeted firm is in a monopoly position, and there is no substitute available on the market, which is related to a high boycotting cost. As another extreme, if the market is very competitive and differentiated, there is room for ecological certification: A firm may provide the good considered with a clean production, which involves no boycotting cost. More generally, a better substitute provides higher utility of boycotting.

Moreover, the action of boycotting may have an utility by itself, consisting of social or psychological satisfactions generated by political activity. Transaction costs may also increase the cost of boycotting. For example, multiple certification

is likely to decrease the utility of boycotting, as it may be time consuming for the consumer to find which is the best substitute on the market.

$\lambda\gamma\pi_1$ is the residual profit of the firm under boycott. γ is the residual profit share when every environmentalist boycott ($\gamma \leq 1$) and λ is an exogenous efficiency parameter measuring the EO's capacity to coordinate consumers: $1 \leq \lambda \leq \frac{1}{\gamma}$. The EO is totally efficient in coordinating consumers if $\lambda = 1$, whereas there is full coordination failure if $\lambda = \frac{1}{\gamma}$. The direct cost of being boycotted is therefore the difference between the profit when producing with T1 and the profit when being boycotted: $\Delta\pi_1 = (1 - \lambda\gamma)\pi_1$.

A crucial element to determine one player's conjecture is the other player's maximum conflict durations, which is the point in time after which this player would never plan to stay in the game. Indeed, net cumulative payoffs being decreasing with time, there is a point in time at which these payoffs become negative. T^f is the firm's maximum conflict duration, and T^c is the consumers maximum boycott duration.

Maximum Conflict Durations

The firm's net cumulative payoff of winning the conflict after T periods, $B^f(T)$, consists of the smaller profit received during the boycott for T periods and the larger profit of keeping T1 forever, minus the payoff of the alternative strategy, which is the cumulative discounted profit of switching immediately to T2. ρ is the discounting factor.

$$B^f(T) = \sum_{t=0}^{T-1} \rho^t \lambda\gamma\pi_1 + \sum_{t=T}^{\infty} \rho^t \pi_1 - \sum_{t=0}^{\infty} \rho^t \pi_2. \tag{6}$$

The maximum conflict duration of the firm is the point in time at which its cumulative net payoff becomes negative:

$$T^f = \frac{1}{\ln \rho} \ln\left(\frac{\pi_2 - \lambda\gamma\pi_1}{(1 - \lambda\gamma)\pi_1}\right). \tag{7}$$

The environmentalists' net payoff of winning the game after T periods consists of the discounted utility of boycotting for T periods, plus the cumulative utility of having the good produced with T2 forever, net of the alternative strategy's payoff, which is the discounted cumulative utility of never boycotting:

$$B^c(T) = \sum_{t=0}^{T-1} \rho^t U_b + \sum_{t=T}^{\infty} \rho^t U_2 - \sum_{t=0}^{\infty} \rho^t U_1. \tag{8}$$

This maximum boycott duration is thus

$$T^c = \frac{1}{\ln \rho} \ln\left(\frac{U_1 - U_b}{U_2 - U_b}\right). \tag{9}$$

Game Equilibrium

We first determine responses to each player's conjectures and then which strategy both players actually choose.

Response to conjectures. Consider that the firm believes that the consumers have chosen as strategy to boycott for a strictly positive duration $\hat{D}^c$ and then to withdraw. The firm has to decide to remain in the conflict for $\hat{D}^c + 1$ periods or to withdraw immediately. Indeed, withdrawing immediately is preferable to remaining less than $\hat{D}^c$ periods. If the maximum duration of the firm is less than or equal to the conjecture on the consumer boycott length, $T^f < \hat{D}^c$, the best strategy for the firm is to withdraw immediately.

Similarly, consumers may conjecture that the firm has chosen to remain in the conflict for $\hat{D}^f$ periods and then withdraw. If the maximum boycott duration is smaller than this conjecture $T^c < \hat{D}^f$, the best strategy for the consumers is not to boycott at all.

Strategy choice. To succeed, both players have to choose a longer duration than its conjecture: $D^f > \hat{D}^c$, $D^c \geq \hat{D}^f$. This is known to both players, who also know the maximum durations T^f and T^c.

"*A rational player will use those strategies that are best responses to some beliefs he might have about the strategies of his opponents*" (Fudenberg & Tirole, 1991). Therefore, it is not rationalizable to both player to conjecture a duration that is shorter than the shortest maximum duration, $min(T^c, T^f)$.

Thus, if the firm has the shortest maximum duration $T^f < T^c$, both players can conclude that consumers will choose a larger duration: $\hat{D}^c > T^f$. In this case, the firm would be better off withdrawing immediately, resulting in a boycott success.

If the maximum boycott duration of the consumers is shorter than the maximum conflict duration of the firm $T^c < T^f$, the boycott cannot be successful because the best response for an environmentalist is to never boycott, whereas the firm's best response is to always keep T1. Conversely, for a maximum boycott duration longer than the firm's maximum duration, the best response for the consumers is always to boycott, whereas the firm's best response is to switch immediately for T2. The boycott is therefore successful if $T^f \leq T^c$. To avoid mixed strategies and to focus on pure strategies, we assume that the firm has an implicit preference for compromise: For $T^c = T^f$, the firm would be the one to withdraw.

The outcome of the game is therefore determined at the first period, which is somehow disappointing to describe real-life boycotts. Nevertheless, this setup describes the necessary conditions of the demand patterns for a successful boycott.

Outcome of the Game

Depending on utilities and profits, several outcomes may be considered (see Table 1). First, if $\pi_2 > \pi_1$, Technology 2 is more profitable than Technology 1, and

Table 1
Consumers Utility and the Firm's Profit Determine the Game Outcome

Utility	$\Rightarrow T^c$	Profit	$\Rightarrow T^f$	Outcome
		$\pi_2 > \pi_1$	$\Rightarrow T^f < 0$	Technology 2 chosen by the firm
$U_1 > U_2$	$\Rightarrow T^c < 0$			T1 preferred by the consumers
$U_1 > U_b$	$\Rightarrow T^c > 0$	$\pi_2 \leq \lambda\gamma\pi_1$	$\Rightarrow T^f \to \infty$	T1 always kept, no boycott
$U_1 < U_b$	$\Rightarrow T^c \to \infty$	$\pi_2 \leq \lambda\gamma\pi_1$	$\Rightarrow T^f \to \infty$	T1 always kept, always boycott
$U_1 < U_b$	$\Rightarrow T^c \to \infty$	$\pi_2 > \lambda\gamma\pi_1$	$\Rightarrow T^f > 0$	Boycott successful
$U_1 > U_b$	$\Rightarrow T^c > 0$	$\pi_2 > \lambda\gamma\pi_1$	$\Rightarrow T^f > 0$	Boycott successful if $T^c \geq T^f$ Boycott ineffective if $T^c < T^f$

the boycott is a nonsense (row 1). Second, if $U_1 > U_2$, T1 is preferred by the consumers. Therefore, there is no boycott and the firm keeps using T1 (row 2).

Third, for $\pi_2 \leq \lambda\gamma\pi_1$, the boycott is not costly enough (or coordination is too weak) for the firm to induce the technology change. Indeed, if the decrease in the firm's profit is too small, the firm always chooses to keep the polluting technology whatever the behavior of the environmentalists (rows 3 and 4). Fourth, if $U_b > U_1$, the environmentalists always boycott, whatever the firm's strategy. In that case, the boycotting cost is negative, meaning that consumers derive positive net utility from boycotting (rows 4 and 5).

For otherwise (row 6), that is, for $U_1 > U_b$ and $\lambda\gamma\pi_1 < \pi_2$, the outcome of the game is determined by factors influencing the two maximum lengths T^f (see Appendix B) and T^c (Appendix C). When considering the firms maximum duration, a more profitable clean technology decreases T^f: $\frac{\partial T^f}{\partial \pi_2 < 0}$. Conversely, a more profitable dirty technology increases T^f: $\frac{\partial T^f}{\partial \pi_1 > 0}$. Finally, T^f is larger if the residual profit under boycott is large and the EO inefficient to coordinate consumers: $\frac{\partial T^f}{\partial \gamma} > 0$, $\frac{\partial T^f}{\partial \lambda} > 0$. When focusing on the consumers' maximum boycott duration, a larger utility derived from the clean technology increases T^c: $\frac{\partial T^c}{\partial U_2} > 0$. Moreover, a smaller T1 utility also increases T^c: $\frac{\partial T^c}{\partial U_1} < 0$. Finally, a higher utility of boycotting increases T^c, by decreasing the boycott opportunity cost: $\frac{\partial T^c}{\partial U_b} > 0$.

What Makes a Boycott Successful?

This section analyzes which factors influence major determinants of the maximum durations T^c and T^f. Factors increasing T^c raise the boycott likelihood of success, whereas factors increasing T^f decrease this likelihood.

Quality of the substitute. The quality of the substitute directly decreases the cost of boycotting (increases T^c). Thus, it unambiguously increases the potential for success. Our specification does not consider the market structure explicitly. However, considering an imperfect substitute allows for flexibility in the analysis. As an extreme case, if the firm is in a monopoly position, there is no substitute and $U_b = 0$ (assuming boycotting provides no utility by itself). As another extreme, if the firm plays in a very differentiated market, there is room for ecological certification or labeling, and another firm may enter and provide the good with a clean production. The exploitation of this niche would imply $U_b \geq U_2 > U_1$. Then the environmentalists would always choose to boycott because the boycott would be costless. Therefore, boycotts are more likely to succeed if the targeted firm plays in a very differentiated and competitive market than if the firm is a monopoly.

Self-image. Boycotting may have an utility per se. Indeed, collective action participation to improve the quality of the environment is likely to improve the environmentalists' self-image, which is positively correlated with U_b.

Transaction costs. Potentially important transaction costs may reduce the utility of boycotting. The substitute, even if of good quality, may be quite difficult to find on the market. Moreover, if several different substitutes are available on the market, in the case of multiple certification, it may be time consuming to find the best substitute available.

Share of environmentalists in the population. A large number of environmentalists (α) unambiguously raises the boycott potential for success. Indeed a large boycotting population unambiguously decreases the residual profit (increases γ). Therefore, it decreases the maximum duration of the firm (T^f).

Environmental preferences and levels of consumption. Environmental preferences have an ambiguous effect on the boycott success potential. As mentioned in Appendix A, stronger environmental preferences imply lower level of polluting consumption. It follows naturally that the environmentalists have lower costs of boycotting (larger T^c) if they have stronger environmental preferences simply because they have smaller amounts of consumption to renounce but enjoy more the involved pollution reduction. Thus, consumers with strong environmental preferences are more likely to boycott than others.

However, because they have lower levels of consumption, their action of boycotting have a smaller impact on the firm's profit (larger γ). Thus, stronger environmental preferences tend to increase the firm's maximum duration (T^f): The targeted firm does not care about being boycotted by consumers with small amounts of consumption.

Overall, consumers with stronger environmental preferences tend to participate more easily in consumer boycotts, but their impact on the firm's profit is smaller. In the light of this proposition, it is easier to understand the existence of infinite consumer boycotts that never succeed. Take the example of the boycott of major oil companies because of their lobbying effort to deter climate change policies. Consumers most likely to boycott these companies are those who feel the highest negative utility from pollution. Even if no boycott is announced, these consumers are likely to prefer using their bicycles or public transports to the frequent use of their car, and their capacity to hurt the companies' profit is small. Conversely, consumers with the highest ability to hurt the firms' profit consume a lot of oil, and thus have high opportunity cost, which make their participation to the boycott unlikely.

Case Studies

In the light of the previous insights, it is possible to have a look at past boycott experiences.

Shell and the Brent Spar Case

In 1995, Shell Oil was planning to sink a 14,500 ton oil platform in the North Atlantic sea. The EO Greanpeace initiated a vast protestation movement to oppose this practice. Activists occupied the Brent Spar platform, 200 Shell service stations were threatened in Germany, and a widespread boycott of Shell took place. After a few months, Shell canceled its plan for deep-sea disposal and decided to recycle the entire structure (Zyglidopoulos, 2002).

Several insights given in this article can help to explain this boycott success. First, oil is quite an homogeneous good, and oil stations are easy to find almost anywhere. Therefore, one can consider that the nonpolluting substitute (i.e., oil companies not sinking the platform) is perfect, and the only transaction cost is going from any Shell station to the next oil station. Overall, boycotting Shell was costless ($U_b \geq U_1$).

Moreover, sinking costs (π_1) were estimated at 18 million pounds, whereas the alternative method costs (π_2) were estimated at 69 million pounds (Zyglidopoulos, 2002). Considering the fact that Shell is a worldwide multinational, maybe this difference in costs was quite small compared to the size and importance of the boycotting population (small γ).

In other words, Shell was almost costless to boycott and easy to hurt, which can explain why the Brent Spar case is often considered as an example of successful boycott.

Cosmetic Firms and Animal Testing

Animal testing is a commonly used practice in several industries, like cosmetics and pharmaceutical companies (Davidson, 1995).

Following this article analysis, this type of consumer boycott has very few chances to succeed. Indeed, boycotting firms using animal testing is almost equivalent to boycott the entire cosmetic sector. Good substitutes (cosmetic firms not using animal testing) are therefore difficult to find, and transaction costs are likely to be high. For example, Ahimsa, a French organization lobbying for animal protection, lists more than 200 firms testing their products on animals (cosmetic firms and others). Note first that it is difficult to perfectly memorize a 200 firms list. There is therefore a problem of clarity of the boycott, which creates important transaction costs, as it seems difficult to go shopping using a 200 boycotted firms list (decreasing T^c). Moreover, alternative strategies to animal testing, although an important research topic (see Johns Hopkins Center for Alternatives to Animal Testing) may still be very costly (increasing T^f).

Overall, boycotting firms using animal testing should not be very effective, especially because of high transaction costs, due to a lack of clarity in the boycott and difficulties to purchase good substitutes. It is thus likely that only strong environmentalists participate in this type of boycott and that their hurting capacity is quite small.

Boycott of Noncertified Timber

Several NGOs militate for a boycott of noncertified tropical timber (Klooster, 2005). Indeed, illegal logging in developing countries plagues local development and degrades forest resources. This type of boycott first appears to be a perfect case for a success. Indeed, timber is quite an homogeneous good. Moreover, ecological timber certification offers good substitutes. Overall, the cost of boycotting noncertified tropical timber seems to be quite low (related to large T^c).

However, a second look mitigates this first impression. First, quite a few ecological labels exist (SmartWood, Scientific Certification Systems, Certified Wood Products Council, Good Wood, Forest Stewardship Council), which may create confusion and decrease the clarity of the boycott. Consumers might be lost in determining which label is the most environmental friendly, which creates an indirect cost of information searching (decreasing T^c).

Moreover, boycotting consumers stand mainly in developed countries, whereas the most important part of tropical timber is consumed in the country of production (low α, increasing T^f). The World Resource Institute estimates that only 20% of the wood produced is exported (Rezende de Azevedo, Giacini de Freitas, & Donovan, 2001). Potential impact of the boycotting population is thus fairly small

because tropical timber offers multiple markets options, which reduces the boycott influence.

Overall, the boycott of noncertified timber, although presenting small opportunity cost, does not offer much potential for success, mainly because of a too small concerned population.

Conclusion

This article explores the causes of consumer boycotts' ineffectiveness. First, consumer boycotts are concerned by usual problems of collective action. Indeed, the individual choice of boycotting has a marginal impact on the chance of success, creating a voter's paradox mechanism enhancing free-riding behaviors. Moreover, the lack of coordination may be a major source of ineffectiveness.

Second, market structure is a crucial determinant of the boycott success. Competition increases the chances for the clean technology to be present on the market. Indeed, if there is free entry, there is room for ecological certification and green labeling: A firm may choose to enter the market and to produce the good with the clean technology, if it is profitable. In that case, there is a perfect substitute on the market. In a monopoly case, consumer boycotts are less likely to succeed because there is no good substitute for which the environmentalists could switch their consumption.

On the demand side, consumer boycotts unsurprisingly require large concerned population to be effective. More provocative, environmental preferences have an ambiguous effect on the potential for success. Indeed, although strong environmental preferences imply smaller cost of boycotting, they also involve a weaker hurting capacity of boycotting consumers. This might explain why one can witness so few successful boycotts in real life: Boycotting groups are usually composed of consumers with small boycotting costs, whose boycott does not hurt the targeted firm's profit enough to make it change its behavior.

A potentially effective policy for NGOs would thus be to work on the share of the population sensitive to the quality of the environment. Indeed, the game presented here is static, but informing and educating consumers may increase their awareness of environmental degradation, especially the degradation they are responsible of. The objective of this policy would have two main consequences in the long run. First, it would induce a decrease in overall consumption, which would reduce environmental degradation. Second, this would increase the population likely to participate in environmental boycotts. In the long run, the combination of education and boycott would increase the potential for environmental friendly technology adoption.

Appendix A
Basics of Consumer Theory

Utility of the dirty technology. Consider that consumers both care about their levels of consumption x and the pollution involved by consumption ex: $U_1 = U(x, ex)$, with standard assumptions $U_x > 0$, $U_{xx} < 0$, $U_e < 0$ and $U_{ee} < 0$ (subscripts refer to derivatives).

Environmental preferences and levels of consumption. Considering two consumers s and w with different environmental preferences, such that $-U_e^s > -U_e^w$, $\forall e > 0$. s thus has stronger environmental preferences (larger desutility from pollution) than w. When choosing their optimal levels of consumption, and following basic consumer theory, first-order conditions of the utility function thus bring $U_x^s + U_e^s e = U_x^w + U_e^w e$. It is straightforward that $U_x^s > U_x^w$. Provided the concavity of the utility function with respect to consumption, consumers with stronger environmental preferences have lower levels of polluting consumption than others: $x^s < x^w$.

Firm's profit when boycotted. When the firm is boycotted, its profit becomes lower: $\pi_1 > \lambda\gamma\pi_1$. γ unambiguously depends on the quantities previously consumed by boycotting consumers. Considering the previous proposition, consumer boycotts are less costly to the targeted firm when boycotting consumers have strong environmental preferences.

Appendix B
Factors Influencing T^f

Note that ρ is likely to be smaller than 1, thus $\frac{1}{\ln \rho} < 0$.

$$\frac{\partial T^f}{\partial \pi_2} = \frac{1}{(\pi_2 - \lambda\gamma\pi_1)\ln \rho} < 0. \tag{1}$$

$$\frac{\partial T^f}{\partial \pi_1} = \frac{-1}{(1 - \lambda\gamma)\pi_1 \ln \rho} > 0. \tag{2}$$

$$\frac{\partial T^f}{\partial \gamma} = \frac{\lambda(\pi_2 - \pi_1)}{(\pi_2 - \lambda\gamma\pi_1)(1 - \lambda\gamma)\ln \rho} > 0. \tag{3}$$

$$\frac{\partial T^f}{\partial \lambda} = \frac{\gamma(\pi_2 - \pi_1)}{(\pi_2 - \lambda\gamma\pi_1)(1 - \lambda\gamma)\ln \rho} > 0. \tag{4}$$

Appendix C
Factors Influencing T^c

$$\frac{\partial T^c}{\partial U1} = \frac{1}{(U_1 - U_b)\ln \rho} < 0. \quad (1)$$

$$\frac{\partial T^c}{\partial U2} = \frac{-1}{(U_2 - U_b)\ln \rho} > 0. \quad (2)$$

$$\frac{\partial T^c}{\partial U_b} = \frac{U_1 - U_2}{(U_1 - U_b)(U_2 - U_b)\ln \rho} > 0. \quad (3)$$

Notes

1. Consumers are classified according to their environmental preferences: Consumer 1 has the highest environmental preferences and individual *N* has the lowest environmental preferences.
2. The beliefs formation is not considered here. This belief structure can be due to the firm's reputation or past boycott experiences.
3. War of attrition models are well documented in the economics literature. See Fudenberg and Tirole (1991).
4. We assume that the firm can only use one technology. Thus, it cannot diversify its production process, producing the good with both technologies at the same time.

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