Universität St.Gallen

To Buy or Not to Buy?
An Experimental Study of Consumer Boycotts in Retail Markets

Jean-Robert Tyran and Dirk Engelmann

May 2002 Discussion paper no. 2002-13

Department of Economics University of St. Gallen

Editor: Prof. Jörg Baumberger
University of St. Gallen
Department of Economics
Bodanstr. 1
CH-9000 St. Gallen
Phone ++41 71 224 22 41
Fax ++41 71 224 28 85
Email joerg.baumberger@unisg.ch

Publisher: Forschungsgemeinschaft für Nationalökonomie
an der Universität St. Gallen
Dufourstrasse 48
CH-9000 St. Gallen
Phone ++41 71 224 23 00
Fax ++41 71 224 26 46

Electronic Publication: www.fgn.unisg.ch/public/public.htm

To Buy or Not to Buy?
An Experimental Study of Consumer Boycotts in Retail Markets[1]

Jean-Robert Tyran and Dirk Engelmann

Author's address:

Dr. Jean-Robert Tyran
University of St. Gallen
Department of Economics
Bodanstrasse 1
CH-9010 St. Gallen
Tel. +41 71 224 2315
Fax +41 71 224 2885
Email jean-robert.tyran@unisg.ch
Website www.unisg.ch
Dr. Dirk Engelmann
Humboldt University Berlin
School of Business and Economics
Spandauer Str. 1
DE-10178 Berlin
Email engelmann@wiwi.hu-berlin.de

[1] We thank Simon Gächter, Tobias Lindqvist, and participants at seminars in Lyon, Tucson (ESA), San Diego (Public Choice Society) for helpful comments. We are grateful for financial support by the GFF-foundation for basic research under project no. G02110108 as well as by the Deutsche Forschungsgemeinschaft (DFG). This research was conducted while Dirk Engelmann was a visitor at the institute of Empirical Research in Economics of the University of Zurich. The hospitality is gratefully acknowledged.

Abstract

We experimentally investigate how firms and consumers react to a sudden cost increase in a competitive retail market. We compare two conditions which exclusively differ with respect to how difficult it is to organize and enforce boycotts. We find that cost increases translate into sudden price increases, and that these frequently trigger consumer boycotts. However, consumer boycotts are unsuccessful in holding down market prices even if collective action problems are completely eliminated. While consumer boycotts do not increase consumer rent, they reduce firm profits and market efficiency. Consumer boycotts apparently serve to punish firms for seemingly unfair price increases.

Keywords

Posted-offer markets, consumer boycotts, collective action.

JEL Classification

C9, D74, L19.

1. Introduction

What triggers consumer boycotts? How successful are consumer boycotts? Answers to these questions are much sought after in an era of increased willingness of consumers to boycott particular firms and entire industries. For example, *The Economist* (1990: 69) writes: "Consumer boycotts are becoming an epidemic for one simple reason: they work", and a recently conducted survey reports that 50 percent of Americans claim to have taken part in a product boycott (Dolliver 2000). While consumer boycotts may target any type of egregious behavior, boycotts in response to unfair marketing practices, and in particular to unfair price increases are called economic consumer boycotts (see Friedman 1999). Economic consumer boycotts are the prototypical or "classic" type of boycott. In fact, the expression "boycott" was termed after Charles C. Boycott, an English land agent living in Ireland who was ostracized in 1880 for refusing to reduce rents.

Researchers have investigated the causes and consequences of consumer boycotts with a variety of methods. For example, some have studied historical consumer boycotts (Friedman 1985, 1995, Smith 1990), others have conducted field studies (Miller and Sturdivant 1977, Pruitt and Friedman 1986, Garrett 1987), and still others have used survey methods and hypothetical consumer response experiments (Klein, John and Smith 2001, Sen, Gürhan-Canli and Morwitz 2001). While all of these methods have their merits, we propose an experimental economics approach to investigate consumer boycotts.

A key advantage of experimental economics techniques is the ability to observe *market* outcomes under *controlled* conditions (for an introduction see Roth 1995). In particular, we induce supply and demand conditions in a retail (posted-offer) market and compare observed market outcomes with theoretically predicted outcomes. We implement a sudden cost increase and observe whether firms increase prices as predicted by economic theory, and whether consumers respond with boycotts. This procedure allows us to throw new light on the issues of what triggers consumer boycotts, and when they are successful. In particular, we are able to identify whether the price increases trigger boycotts, and whether boycotts succeed in holding down prices. Experimental methods allow us to measure the consequences of consumer boycotts on consumer rent, firm profits, and market efficiency. Hence, we are in the position to resolve some difficult questions of cause and effect, which are almost impossible to

disentangle in the field (see Kardes 1996 for a discussion of the usefulness of experimental methods in consumer research).

Our approach differs from recent marketing studies investigating boycotts (Klein et al. 2001, Sen et al. 2001). These studies take a consumer perspective and use survey techniques to explore what determines consumers' intentions and motivations to participate in a boycott. In contrast, our approach takes a market perspective. This approach takes into account that the causes and consequences of consumer boycotts may depend on market interaction. For example, consumers may make their boycott decision dependent on boycott success, i.e., on how much market prices fall in response to boycotts. At the same time, however, boycott success may depend on how many consumers participate in boycotts.

Since consumer boycotts prevail if consumers refuse to buy from certain firms or industries in a more or less concerted manner, it has been argued that boycott success depends on the pervasiveness of collective action problems, in particular small-agent and free-rider problems (John and Klein 2001, Sen et al. 2001). These authors suggest that the more consumers lack the means to effectively organize and enforce boycotts, the less successful boycotts will be. To analyze the behavioral importance of these collective action problems in a market setting, we compare market outcomes in two experimental treatments. In one treatment, consumers lack any means of effectively organizing and enforcing the boycott. In this treatment, therefore, small-agent and free-rider problems loom large. In the other treatment, consumers are provided with a very effective means of organizing and enforcing a boycott. In this treatment condition, small-agent and free-rider problems are completely eliminated.

The results of this study show that the sudden cost increases translate into sudden price increases, and that consumers frequently refuse to buy after these price increases. This holds irrespective of whether collective action problems prevail or whether they are eliminated. In both cases, consumer protests fail to hold down prices and are not profitable for consumers. Hence, consumer boycotts are not successful even if they are easy to organize and enforce. However, consumer protests are found to reduce firm profits and market efficiency. Our interpretation of the data is that boycotts are mainly called and executed for expressive reasons. That is, consumer boycotts serve to punish sellers for apparently "unfair" price increases.

We proceed as follows. Section 2 explains the advantages of an experimental economics approach to consumer boycotts, and relates this study to the literature. Section 3 explains the experimental design, section 4 presents the experimental results, and section 5 concludes.

2. An experimental approach to consumer boycotts

This section argues that an experimental economics approach to consumer boycotts has important advantages in comparison to other modes of investigation. Before turning to measurement and methodological issues, we first provide a definition. According to the Merriam-Webster dictionary, "to boycott" means "to engage in a concerted refusal to have dealings with a person, store or organization, usually to express disapproval or force acceptance of certain conditions." Three aspects of this definition are noteworthy, and serve to organize the discussion below.

First, the definition is too broad for our purposes. In this paper we are exclusively concerned with *economic* consumer boycotts, i.e., boycotts by consumers who target the behavior of particular firms or entire industries in the marketplace. We henceforth refer to "economic consumer boycotts" as "consumer boycotts" or "boycotts" for short.

Second, the definition states that a boycott is a "*concerted* refusal" to buy. In our experimental analysis, we implement two polar cases in which consumers either completely lack the means to coordinate their refusal to buy, or in which they can perfectly coordinate their actions. Section 2.2 explains that this treatment variation is useful in assessing whether collective action problems can be held responsible for the apparent ineffectiveness of boycotts. We henceforth distinguish two forms of consumer protests. We use the expression *demand withholding* to indicate an individual refusal to buy. In contrast, a *boycott* is a collective refusal to buy.

Third, the above definition informs us that a boycott may serve "to express disapproval or force acceptance of certain conditions". In section 2.3, we discuss in what respect experiments may also serve to explore consumer motivations to call boycotts.

2.1. Identifying the causes and consequences of boycotts

It is difficult to identify the causes and consequences of boycotts from the analysis of field observations. The basic problem is nicely illustrated by the following quotation taken from Friedman (1991: 156):

> "In the case of consumer economic boycotts, lower prices are often the goal – frequently for products that have recently sharply risen in price. When fewer consumers buy the products after the boycott has been called, it is sometimes not clear how much of the decreased demand is due to the boycott and how much is due to the products' rapid rise in price [...]."

In other words, demand may fall as a direct and an indirect consequence of the sharp increase in prices. First, an observed reduction in sales may be the result of a normal market reaction, i.e., a movement along a stable demand curve. Second, sales may also fall as an indirect reaction to the price increase if the price increase triggers consumer protests. In this case, an observed reduction in demand is the result of a shift of the demand curve. It is basically impossible to disentangle these two effects if the shape and location of the demand function are not known over the relevant range. While this is almost never the case in the field, it is easily possible to disentangle these effects by use of experimental economics methods.

In this study, we observe the decisions of participants in an experimental retail market (a posted-offer market). In such a market, sellers and consumers are provided with induced values and earn money depending on their decisions and market outcomes (e.g., Davis and Holt 1993: Ch. 4). The techniques of experimental economics allow us to induce demand and supply functions and, by application of the theory of competitive markets, we have a prediction for market outcomes. These predictions can then be confronted with observed behavior. For example, we can easily observe traded quantities and transaction prices without measurement error in an experimental market. In the laboratory, supply and demand can easily be manipulated in a controlled manner. In particular, we induce a sharp increase in costs which is predicted to translate into sharp price increases. We then observe whether these sharp price increases actually trigger consumer protests as suggested in the quotation above. Since we know the number of units that can profitably be bought at each price, and since we observe the number of units consumers actually buy, we have an exact measure of demand withholding. An observed reduction in quantity can therefore unambiguously be identified as resulting from a normal price reaction or from consumer protests.

The success of boycotts can be measured in the laboratory along two dimensions. First, we can analyze whether consumer boycotts succeed in holding prices below the theoretical equilibrium price. In contrast, equilibrium prices are not known in the field. Second, success can be measured with respect to changes in consumer rent. While consumer rents are notoriously difficult to estimate in the field, their net changes due to boycotts can easily be measured in the laboratory. We have to consider the net change in consumer rent because it may fall as a direct consequence of the boycott (consumers forego gains from trade), but consumer rent may increase indirectly if boycotts hold prices down in the periods following the boycott. To measure boycott success, it is, therefore, important to consider an experiment extending over several market periods.

2.2. Collective action and the effectiveness of instrumental boycotts

Standard economics assumes that economic agents are rational and egoistic and that they act instrumentally. According to this view, economic agents evaluate the costs and benefits of alternative courses of action and choose the one in which private benefits exceed the costs the most. A rational and egoistic consumer will never withhold demand because of small-agent and free-rider problems (John and Klein 2001). Individual demand withholding poses a small-agent problem for a consumer because withholding demand is privately costly (in the guise of foregone consumer rent) but may bear an insignificant benefit. The benefit is insignificant because the actions of a small consumer have no effect on market outcomes in competitive markets. If the small-agent problem is only partial, free-riding incentives may arise. Free-riding incentives prevail if a rational and egoistic buyer prefers other buyers to withhold demand (thus pushing down prices for all), but does not withhold demand himself because it is privately costly.

Small-agent and free-riding problems can be mitigated or even eliminated by collective action. Clearly, the more consumers participate in a boycott, the less pervasive the small-agent problem. The free-rider problem can be eliminated if consumers succeed to effectively enforce boycott discipline. For example, if the choice is whether *all* consumers collectively refuse to buy or whether no consumer refuses to buy, a rational and egoistic consumer may indeed opt for a collective boycott. The intuition is that if all consumers boycott, the effect on the market (and hence the individual benefit from holding down prices) may be large while the individual cost may be relatively low if the boycott is cheap to organize and enforce. For example, Friedman (1995) reports that in some local protests against high meat prices,

housewives were able to effectively organize and enforce boycotts by exerting social pressure.[1] However, exerting social pressure may not be possible in anonymous markets, and collective action problems are much more prevalent in this case. Several authors have therefore hypothesized that the ability to organize and enforce boycotts is crucial to boycott success (e.g., Sen et al. 2001).

We investigate how the ability to organize and enforce a boycott determines boycott success by comparing two experimental conditions. In one treatment, consumers lack any means of effectively organizing and enforcing the boycott. In this treatment, therefore, small-agent and free-rider problems loom large, and effective boycotting is impossible. In the other treatment, consumers are provided with a very effective means of organizing and enforcing the boycott. Consumers hold a referendum on whether they all want to boycott or not. If the boycott is accepted, it is perfectly enforced at no cost. In this case, small-agent and free-rider problems are completely eliminated. Note that if the boycott option is rejected, consumers can still individually withhold demand, as in the first treatment. Hence, consumer protests in response to sudden price increases are possible in both treatments, but the option to collectively boycott is only available in the second treatment.

An important advantage of this approach is that we measure the behavioral effects of the ability to organize and enforce boycotts under controlled conditions and in a market context. The two treatments implement a *controlled* (ceteris paribus) variation of the ability to organize and enforce boycotts. In particular, small-agent and free-rider loom large in one treatment, and are completely eliminated in the other treatment while all other potentially important characteristics (like market size) are held constant. In contrast, the ability to organize and enforce boycotts is a matter of degree in the field and is notoriously difficult to measure. The referendum is not thought to reflect that consumers vote on boycotts in the field (as labor union members do when voting on a strike). Rather, the referendum is just a convenient (i.e., controlled) shortcut to implement a condition in which a boycott is easy to organize and enforce (as in the case of the meat boycott cited above).

---

[1] Friedman (1995: 60) writes about the 1902 meat boycotts in New York: "... the boycott's source of strength was its neighborhood orientation. ... the boycotters went house-to-house seeking support for their actions. ... Boycott participants picketed local butchers and refused to speak to 'scabs' who violated the boycott. The ongoing presence of boycott leaders in the neighborhood made it difficult for local residents to avoid surveillance. In short, the neighborhood provided a sense of community and solidarity for the boycott participants."

To see the importance of investigating how the ability to organize and enforce boycotts affects boycott success in a *market* context, suppose that the elimination of collective action problems indeed makes boycotts more successful. In this case, market prices must be lower and consumer rent must be higher than in the control treatment. However, while the improved ability to organize and enforce boycotts may make boycotts more successful, it may not make them more frequent. The reason is that firms may refrain from increasing prices after a cost increase if they anticipate that consumer protests are more imminent in reaction to sudden price increases (see Pruitt and Friedman 1986). Hence, the existence of an *option* to effectively boycott can change market outcomes, even if boycotts are never actually executed (see Eaton and Engers 1992 for a general discussion).

2.3. Expressive boycotts in response to "unfair" price increases

Experimental economics methods may also shed some light on consumer motivations to participate in a boycott. However, the comparative advantage of experimental economics is limited in this respect, and survey-based modes of investigation may provide more detailed evidence on motivations. We henceforth distinguish between what Friedman (1991) calls instrumental and expressive boycotts. Instrumental boycotts are executed with a marketplace end in mind, while expressive boycotts are "more concerned with venting the frustrations of the protesting group" (Friedman 1991: 153). Note that both motivations (or a combination thereof) may be involved when deciding on whether to participate in a boycott in response to a sudden price increase. Consumers may boycott a product to hold down its price (as assumed in the previous section), or consumers may boycott the product because they perceive the sudden price increase as being "unfair".

Klein, John and Smith (henceforth KJS 2001) empirically explore motivations for participation in a consumer boycott. KJS inform participants about the potentially "egregious behavior" of a food company to investigate whether this information induces a willingness to boycott the company. KJS show that about half of the participants in the sample in the study indicate that they would boycott to express anger or to punish the company. However, most participants appear to have mixed motives to participate in the boycott.

Economic consumer boycotts may be triggered by a feeling of being treated unfairly. In particular, consumers may perceive a sudden price increase as "unfair" (see also Sen et al. 2001). Kahneman, Knetsch and Thaler (henceforth KKT 1986) conducted questionnaire studies showing, among other things, that respondents may judge price increases as being

unfair in particular instances. However, do these emotions articulated in a questionnaire also translate into action? Studies in marketing research suggest that this may be the case to some extent. For example, in KJS (2001), respondents who indicated that they would be willing to boycott a particular food company also tended to refuse a candy bar produced by this company as a reward for participation in the survey. These findings are in line with and nicely complement recent results in experimental economics analyzing the economic consequences of experiencing an unfair treatment (see Fehr and Schmidt 2001 for a survey).

Suppose that consumers perceive a sudden price increase as being unfair, and suppose that this indeed induces consumers to boycott. Then, the next question is: Do firms anticipate that boycotts are triggered by sudden price increases? If so, do firms refrain from increasing prices in the first place, in an attempt to avoid boycotts? For example, KKT (1986: 212) state "Retailers will have a substantial incentive to behave fairly if a large number of customers are prepared to avoid doing business with an unfair firm." Thus, according to these authors, consumers are willing to boycott an unfair firm, and anticipating this, the firm will have an incentive to price fairly (see also Blinder et al. 1998: 307f.)

Several experimental studies have investigated the effects of cost increases on market prices under differential information conditions (Kachelmeier, Limberg and Schadewald 1991, Franciosi et al. 1995, Ruffle 2000). The general finding from these studies appears to be that sellers are better able to enforce marked price increases if consumers are informed about the cost increase. The interpretation of this finding is that consumers are more willing to tolerate price increases if they are sufficiently justified by cost increases. However, these studies tend to find only temporary and rather weak effects of informational differences on market prices and tend to conclude that fairness has no important role to play in competitive markets. For example, Franciosi et al. (1995: 462) conclude that "... market fairness may be a short-lived phenomenon."

Our study is similar to these studies in terms of methodology, but differs in terms of focus. Similarities are that we implement a competitive experimental retail market, and that we use a sales tax to induce the cost increase. An important difference, however, is that we are not concerned with the effects of providing different information or investigate different market forms. Instead, we focus on the effects of boycotts and vary consumers' opportunities for collective action. Of the above studies, Ruffle (2000) is the only one to analyze demand

withholding in some detail, and none analyzes collective boycotts. Hence, to the best of our knowledge, we provide the first experimental study of consumer boycotts.

3. Experimental Design

Section 3.1 provides a general description of the design and section 3.2 explains the procedures and parameters in detail. Section 3.3 presents the predictions and hypotheses.

3.1. General description

In all experimental conditions described below, subjects repeatedly participate in a posted-offer market as a seller or as a buyer (we refer to buyers as consumers throughout). In each period, sellers simultaneously choose a price and quantity offered. Price offers are then publicly announced ("posted"), and consumers can shop from these offers in a randomly determined order. This procedure is repeated for a total of 30 market periods. In the first phase (periods 1-15) sellers' cost are low, and this condition is henceforth called Low. In the second phase (periods 16-30), sellers' costs are high, and this condition is therefore called High. The increase in sellers' costs is known to all market participants at the beginning of the second phase. The market parameters are such that standard economic theory predicts the cost increase to be fully passed on to the consumers. That is, in equilibrium, the entire cost increase translates into a price increase.

Table 1: Overview of experimental conditions

	Sellers' costs are ...	
	Low periods 1-15	**High** periods 16-30
NoBoy	Low/NoBoy	High/NoBoy
Boy	Low/Boy	High/Boy

There are two treatments, which exclusively differ with respect to whether consumer boycotts can effectively be organized and enforced. In the treatment labeled Boy, consumers vote at the beginning of each period in a referendum on whether to boycott the market,

whereas consumers do not have this option in the control treatment NoBoy (see table 1). If a majority of consumers votes for the boycott in Boy, the boycott is perfectly enforced at no cost. That is, the market is closed for one period if the boycott is accepted. In this case, neither sellers nor consumers earn incomes in this period. If the boycott is rejected, treatment Boy proceeds exactly as treatment NoBoy. In particular, consumers can shop among posted offers or they can refuse to buy, and individually withhold demand in both treatments. As explained in section 2.2 in detail, this treatment variation serves to test the hypothesis that the ability to organize and enforce byocotts is crucial to boycott success.

While standard economic theory predicts that consumers do not boycott irrespective of whether sellers' costs are Low or High, and irrespective of how pervasive collective action problems are, consumers may nevertheless express their anger by punishing sellers for apparently unfair price increases (see section 2.3 for explanations). In particular, we investigate within each treatment whether consumer protests are triggered by the price increase, and, if so, whether these protests have any significant market-level consequences. In addition, we test across treatments whether the elimination of collective action problems makes boycotts successful in forcing subsequent market level outcomes.

3.2. Procedures and Parameters

We conduct posted-offer markets with 3 human sellers and 5 human consumers. At the beginning of each market period, all sellers simultaneously choose one price from the range $0 \leq p_i \leq 100$ and a quantity offered from the interval $0 \leq q_i \leq 10$. Then, prices are posted, i.e., all sellers and all consumers are informed about the offered prices. Consumers are arrayed in a randomly determined sequence and can choose from the offers. That is, the consumer who is first in the queue can choose among all offers, while the second and all following consumers can only choose among the remaining offers. Each consumer j can buy any number of units $0 \leq q_j \leq 5$.

Payoffs are determined as follows. Each seller i is assigned induced costs c_{ik}, and each consumer j is assigned induced values (willingness to pay) v_{jk}. Sellers earn more if they sell more units at higher prices. In particular, $\pi_i = \Sigma_k(p_{ik} - c_{ik})$. Consumers earn more if they buy more units at lower prices, $E_j = \Sigma_k(v_{jk} - p_{jk})$. Each seller is endowed with costs for 10 units, and each consumers is endowed with values for 5 units. With respect to costs (values), sellers (consumers) are identical (see table 2). All participants can earn money exclusively through

trading. That is, π_i and E_j are converted into money at the end of the experiment (see instructions in appendix A).

Table 2: Overview over parameters and predictions

	Low Periods 1-15	**High** Periods 16-30
Number of consumers / voters	5	5
Consumers' induced values *v*	98, 96, 94, 92, 30	98, 96, 94, 92, 30
Number of sellers	3	3
Sellers' induced costs *c*	10, 10, 10, 15, 25, 35, 45, 50, 50, 50	50, 50, 50, 55, 65, 75, 85, 90, 90, 90
Equilibrium quantity (q^*)	20	20
Equilibrium price (p^*)	45	85
Equilibrium earnings *E* (per period *t*) for each consumer	200	40
Equilibrium profit π (per period *t*) for each seller	165	165

The experiments were computerized, and we used the experimental software z-tree (Fischbacher 1999). We explained the exogenous cost increase after period 15 to subjects by introducing a uniform sales tax of 40 units. Using a tax to justify the cost increase is common practice in this type of experiment (e.g., Kachelmeier et al. 1991, Franciosi et al. 1995).

All information about parameters and payoffs provided to subjects is private. That is, participants know exclusively their own induced costs or values, but not the costs or values of other participants. Subjects keep their role throughout. At the end of each period, each participant is informed about market prices and about his or her own payoff. All participants are publicly informed about the cost increase at the end of period 15.

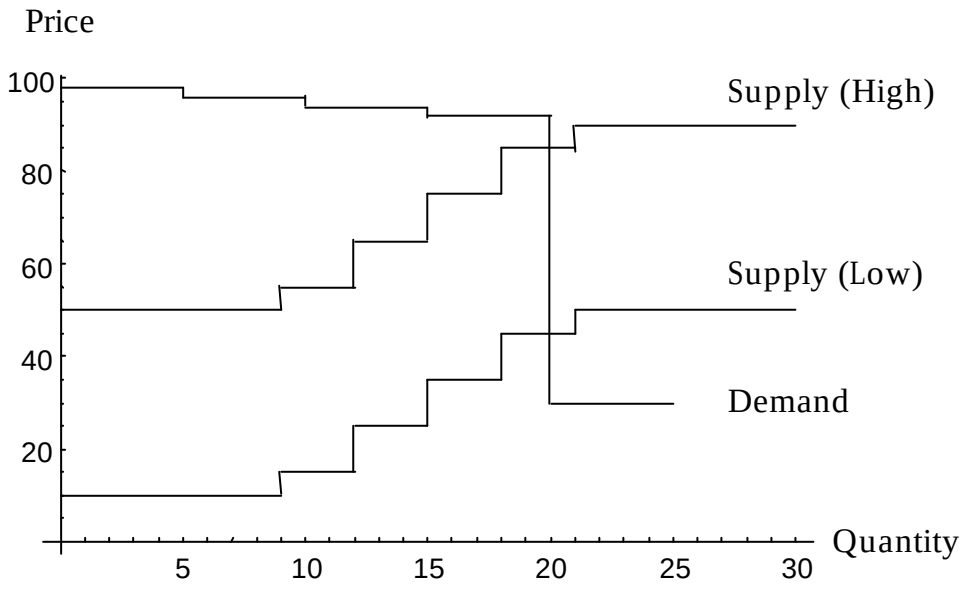
There are two treatments. In the control treatment (NoBoy), consumers can repeatedly shop among the available offers as described above. Treatment Boy is exactly the same as treatment NoBoy with the only difference that consumers can collectively boycott the market in Boy. At the beginning of each period *t* (except for the respective first periods in Low and High, i.e., periods 1 and 16), consumers participate in a referendum. That is, each consumer *j* anonymously and simultaneously votes (Yes or No) on a proposal to boycott the market in market period *t*. Voting is mandatory for consumers, abstentions are not possible. The proposal is accepted if a majority of voters approves of the proposal (i.e., if 3, 4 or 5 voters

vote Yes). If the proposal to boycott is accepted in period *t*, the market is closed in this period and all participants (sellers and consumers alike) get a payoff of zero in period *t*. If the proposal is rejected, the market remains open in this period, and participants are paid according to trading outcomes as explained above.

3.3. Predictions and hypotheses

According to standard economics, the competitive equilibrium prices and quantities are determined by the intersection of the demand and supply schedules as shown in figure 1. This figure is a graphic representation of consumers' values and sellers' costs given in table 2. Since demand is completely inelastic in the relevant range, the prediction is that the cost increase is fully shifted to consumers. Equilibrium quantity is $q^* = 20$ in Low and High, but prices are predicted to rise from p^*(Low) = 45 to p^*(High) = 85. As a consequence, consumer *j*'s earnings fall from 200 to 40 units, while seller *i*'s profits remain unaffected by the cost increase at 165 units (see table 2).

Figure 1: Supply and demand in the market



In principle, consumers can protest the price increase by individually withholding demand (in Boy and NoBoy) or by collectively executing a boycott (in Boy). However, standard economic theory predicts that consumers will not protest price increases either way. In particular, game theory predicts that consumers neither withhold demand nor execute

boycotts in any period (i.e., neither in Low nor in High) if rationality and selfishness is common knowledge.

The rational prediction can be found by backward induction and results from the fact that the game has a known end. In the last period (period 30), all players will strictly maximize this period's earnings. That is, consumers buy all the units they profitably can buy, since withholding a unit means to forego the earnings generated by this unit. Given this behavior, sellers will post profit maximizing offers (i.e., the highest possible accepted prices). Since these offers still allow for positive consumer earnings, consumers will not vote for a boycott, because a boycott means to forego equilibrium profits. In the next-to-last period (period 29), consumers know that whatever they do in this period, it will have no effect on the last period. That is, withholding a unit in this period is costly but does not have any return in the next period. Hence, consumers behave in period 29 just as they behave in period 30: they maximize this period's earnings. By backward induction, the preceding logic extends to period 1: Given that rationality and selfishness are common knowledge, consumers will never withhold demand or boycott. Note that under these assumptions behavior and market outcomes should be the same in the two treatments. The elimination of free-rider incentives in Boy is predicted to have no effect on market prices or incomes.

4. Results

We conducted 5 NoBoy markets and 9 Boy markets at the University of Zurich. In total, 112 undergraduate students from various disciplines participated in our experiment. Subjects on average earned CHF 45.10 (US$ 27, approx.), including a show-up fee of CHF 10 (US$ 6, approx.), within 120-150 minutes.

4.1. Consumer boycotts and market prices

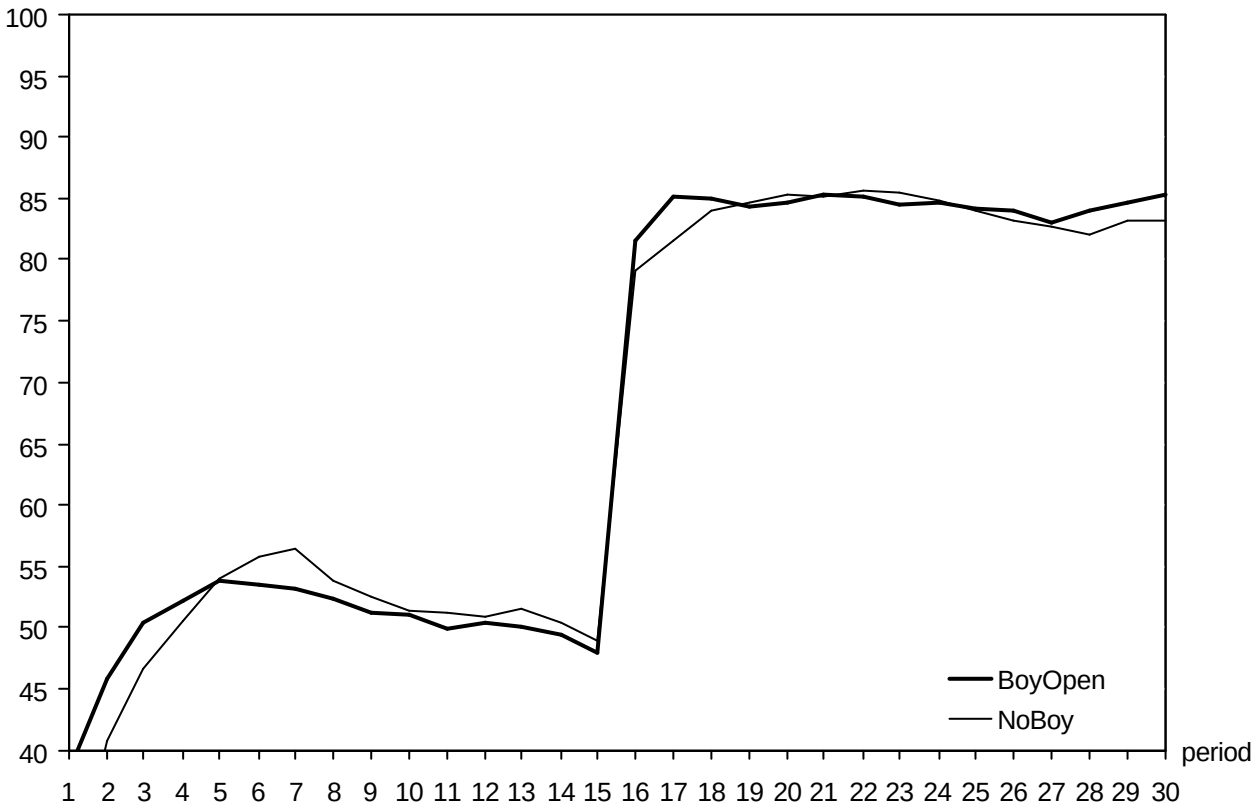
Periods 1-15 (Low) serve to equilibrate markets and to provide a benchmark against which the presumed increase in demand withholding and boycotts in response to the cost increase can be measured. How well did markets equilibrate? By the end of Low (in period 15), the average price is 47.9 units in Boy, and 48.9 units in NoBoy. Therefore, average market prices are slightly too high in both treatments (p^*(Low) = 45, see table 2). The average quantity in period 15 is very close to equilibrium in Boy (20.1 units, $q^* = 20$), and somewhat too low in NoBoy (18.6 units). This near-perfect equilibration, including the convergence of

prices to the competitive equilibrium from above is in line with a large body of experimental research on posted-offer markets (see Ruffle 2000 for a discussion).

After period 15, we induce an exogenous cost increase by levying a uniform sales tax of 40 units on sellers. According to the predictions of the model of competitive markets, prices should rise instantaneously to p^*(High) = 85 units in period 16. How did markets react to this cost increase? Result R1 summarizes the corresponding finding.

Result R1 *In both treatments, the cost increase translates into price increases as predicted. The option to collectively boycott the market had no effect on market prices.*

Figure 2: Average transaction prices



Support for result R1 comes from figure 2 and statistical tests. This figure shows transaction prices averaged over all markets in NoBoy, and all open (i.e., not boycotted) markets in Boy. These markets are henceforth called BoyOpen. As can be seen, in BoyOpen average prices jump to 81.9 units in period 16, and in NoBoy to 79.2 units. The figure also shows that average prices rapidly stabilize around the equilibrium price of p^*(High) = 85, and that average prices are very similar in the two treatments. For example, already in the third

period in High (period 18), average prices are 84.0 in NoBoy and they are 84.9 units in BoyOpen.

To provide support for the claim that prices are similar in the two treatments, we use average market prices in BoyOpen and in NoBoy to conduct Mann-Whitney tests for each period. We find that average prices were neither significantly different before nor after the cost increase across treatments. In particular, there are no significant differences in any of the periods in Low ($p > 0.05$), and in any of the periods in High ($p > 0.05$) across treatments. We conclude that the option to collectively boycott the markets had no effect on average prices (see result R1).

Why did the boycott option not have any effect on market prices? Is it because there were no boycotts (as predicted by standard economic theory) or is it that the executed boycotts were just ineffective? In any case, sellers do not seem to have been afraid of boycotts. In the first period of High (period 16), 56 percent of sellers in BoyOpen post prices above the competitive equilibrium prediction, and, as a result, the average posted price is 91.8 units, considerably above the competitive equilibrium prediction of p^*(High) = 85. Our main result with respect to the incidence of boycotts is summarized in

Result R2 *Consumer boycotts are a frequent response to a sudden price increase.*

Consumer boycotts were much more frequent after than before the price increase. We observed not a single boycott in any of the 9 Boy markets in any of the 15 periods in Low. In contrast, we observed a total of 24 boycotts in High. Therefore, markets were boycotted in 18 percent (= 24/135) of the periods in High. In High, almost all markets were boycotted repeatedly: 8 out of 9 markets were boycotted at some point in High. One market was boycotted 7 times, and the mean number of boycotts per market is 2.7 (see table B1 in appendix B for details). We conclude that boycotts are *triggered* by the price increase.

The observation that boycotts were never executed in Low/Boy, but that boycotts were called in 24 cases in High/Boy results from differences in voting decisions. An analysis of individual voting decisions reveals that consumers are twice as likely to vote for the boycott in High than in Low. Moreover, a comparison of the average number of Yes-votes over all periods in Low/Boy with High/Boy reveals that consumers vote significantly more for boycotts in High than in Low in 6 out of 9 Boy markets (Mann-Whitney test, 5%-level of significance).

Result R1 has shown that the option to boycott collectively had no impact on average prices. Did boycotts at least temporarily affect a particular market? Our analysis shows that this was not the case either. To investigate this issue, we compare the average market price in a period directly preceding and a period directly following a boycott. There are 19 cases to analyze (2 of the 24 boycotts occur in the last period and in 3 cases 2 subsequent periods were boycotted). On average, market prices decrease from the pre-boycott to the post-boycott period by only 0.7 percent. The average transaction price decreases in only 13 cases, while it even increases in 6 of the 19 cases. On an even more disaggregated level, we investigate how individual sellers responded to a boycott. In 47 percent (= 27/57) of the cases sellers reduce their posted prices after a boycott, while they leave them unchanged or even increase them in 53 percent of the cases.

4.2. Consumer boycotts and market incomes

Did consumers gain from executing boycotts? Did sellers suffer from boycotts? To isolate the causal effect of consumer boycotts, we need to compare the changes in income from Low to High in Boy with the respective changes in NoBoy. To illustrate why this comparison is necessary, suppose, for example, that consumer rent is equal to the predicted level in Low (when no boycotts are observed), but is above the predicted level in High (when boycotts are observed). We cannot conclude from this observation, however, that boycotts caused consumer rent to exceed the prediction. Suppose, for example, that incomes were above the predicted level in High/NoBoy, too. In this case, only the difference in increase in consumer rent can be causally attributed to the elimination of small-agent and free-rider problems among consumers.

Table 3 shows the deviation of average income (averaged over all markets and periods of a phase) from equilibrium income due to the cost increase after period 15 for consumers and sellers. This deviation is defined as the difference between the observed change and the predicted change. Remember from the discussion of figure 1 that seller profits are predicted not to change, while the cost increase is predicted to be fully shifted to consumers. In particular, consumers are predicted to lose 80 percent of their equilibrium income due to the cost increase (see table 2). The subtrahend (in parentheses) is the predicted change, and the first number in parentheses is the observed change in percent of potential income.

The first line of table 3 shows that consumer rent fell by 2 percentage points more than predicted in Boy, but fell by 3 percent less than predicted in NoBoy. Hence, consumer rent

changed about as predicted by the theory of competitive markets. In contrast, seller profits fell much more than predicted in both treatments. Seller profits fell by 23 percent in NoBoy, and even fell by 30 percent in Boy.

Table 3: Average deviation from equilibrium income due to cost increase (= observed change - predicted change), in percent of potential income

	Boy	NoBoy
consumer rent	-2 [= (-82) – (-80)]	+3 [= (-77) – (-80)]
seller profits	-30 [= (-30) – 0]	-23 [= (-23) – 0]

Table 3 shows that the cost increase induced considerable unpredicted income losses and that boycotts caused considerable *additional* income losses. Consumer boycotts reduced seller profits by 7 percentage points [= (-30) – (-23)], and reduced consumer rent by 5 percentage points [= (-2) – (+3)] of equilibrium incomes in Low. As a consequence, boycotts caused efficiency losses (measured by the sum of actual incomes relative to the sum of potential incomes). In particular, efficiency in High/Boy was 12 percent lower than in High/NoBoy. The main result of the preceding discussion is summarized in

Result R3 *Consumer boycotts are not profitable for consumers. Boycotts reduce seller profits and cause considerable efficiency losses.*

We have argued that boycotts hurt sellers because their incomes fell more in Boy than in NoBoy. However, we have not yet discussed why seller profits fell in NoBoy, too. In particular, table 3 shows that the cost increase unexpectedly reduced seller profits by 23 percent. We now analyze income losses in our control treatment NoBoy.

4.3. Consumer boycotts and demand withholding

Clearly, boycotts hurt sellers because by closing down the market, sellers cannot realize gains from trade. As explained in section 4.1, markets are boycotted in 18 percent of the periods in High but in 0 percent of the periods in Low. This fact leads us to expect two relations, ceteris paribus. First, seller profits should be 18 percent lower in Boy/High than in Boy/Low. Second, seller profits should be 18 percent lower in Boy/High than in NoBoy/High. However, both of these expectations turn out to be wrong. In fact, seller profits are lower than expected (-30% instead of -18%) in a comparison of Boy/High and Boy/Low, but higher than

expected (-7% instead of -18%) in a comparison Boy/High with NoBoy/High. The reason for these deviations is that the ceteris paribus-clause does not hold. In other words, the sudden price increase not only induced boycotts, but also seems to have affected other aspects of the market. We now explain that the price increase had strong effects on demand withholding.

Figure 3: Demand withholding

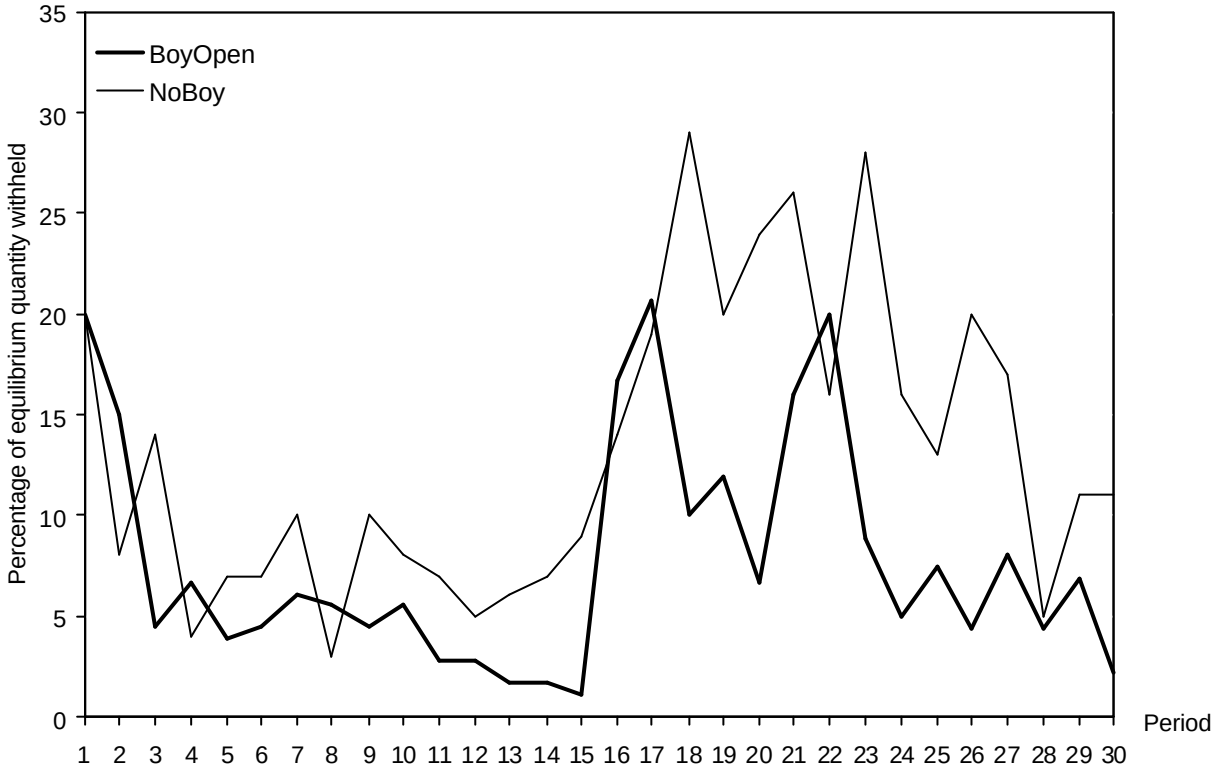


Figure 3 shows average withholding (as a percentage of equilibrium quantity) in BoyOpen and NoBoy. A consumer *j* is said to withhold a unit if *j* foregoes to buy a unit that would have yielded a net gain to *j*. To calculate withholding, we have to take into account that consumers shop in a particular (randomly determined) sequence. Consumer *j*'s demand is the maximum number of units *j* can profitably buy among available units when it is *j*'s turn to shop. Demand withholding is then simply the difference between demand and total quantity bought. Remember that standard economics predicts no withholding at any time.

Figure 3 shows that demand withholding is at relatively low levels in Low. In periods 1-15 withholding is at an average of 5.7 percent of equilibrium trading volume in BoyOpen and at 8.3 percent in NoBoy. However, in response to the price increase in period 16, demand withholding clearly increases in both treatments. In particular, demand withholding over all

periods in High about doubles to 9.9 percent in BoyOpen, and more than doubles to 17.9 percent of the equilibrium quantity in NoBoy.

Result R4 *Demand withholding is a frequent response to a sudden price increase. Boycotts and demand withholding are substitutes to protest price increases.*

Since both consumer boycotts and demand withholding increase in response to sudden price increases, they may be substitutes. Figure 3 clearly suggests that this is the case. As can be seen, there is clearly less demand withholding when boycotts are executed. Withholding is about twice as common in High/NoBoy (17.9 percent) than in High/BoyOpen (9.9 percent). Statistical analysis supports this conclusion. We calculate average withholding over all periods in High and in Low for each market, and compare the distributions across treatments. While average withholding per market before the price increase is not significantly different between NoBoy and BoyOpen, it is significantly larger in NoBoy than in BoyOpen after the price increase ($p < 0.05$, Mann-Whitney).

We think it is worthwhile to reiterate two points of the preceding discussion. First, consumer protests (demand withholding) are remarkably frequent even in the presence of collective action problems. While the intensity of demand withholding decreases somewhat over time it remains strikingly common even after consumers have experienced its ineffectiveness. Second, when consumers are provided with a means to overcome collective action problems, consumers tend to protest more (i.e., the average traded quality is lower in High/Boy than in High/NoBoy). However, the overall increase is less pronounced than expected from just looking at the incidence of consumer boycotts. The explanation for this result is that demand withholding and consumer boycotts are substitutes, i.e., consumers partly retreat from withholding when the boycott option is available (and exercised).

4.4. Why did consumers boycott?

Consumer boycotts do not seem to serve uniquely or even predominantly instrumental purposes. That is, subjects appear to have voted for boycotts in order to *punish* the sellers for "unfair" price increases, and were less motivated by trying to enforce lower prices. If instrumental motives were dominant, one would expect to observe more boycotts in early periods. However, this is not the case. We observe not a single boycott in Low/Boy but 24 boycotts in High/Boy. One may object that this claim is unwarranted because the fact that boycotts are more frequent in High than in Low could also be explained by the relative

costliness of boycotts to consumers in the two phases. Still, one would expect boycotts to be executed at the beginning of High, and not towards the end. Yet, the actual number of boycotts is higher in the second half of High (periods 24-30: 14 boycotts) than in the first half of High (periods 17-23: 10 boycotts). Hence, it seems to be the case that consumers insist on boycotting even though they experience that boycotts are costly to them, and that boycotts are ineffective in reducing prices. The most convincing evidence provided in this study that boycotts are at least in part executed to punish sellers comes from the fact that 22 percent (= 2/9) of all markets are boycotted in the very last period.

Result R5 *Consumer boycotts are mainly executed for expressive reasons. They serve to punish sellers for "unfair" price increases.*

We interpret these findings as indicating that consumers boycotted predominantly for expressive reasons, in the sense that boycotts serve to punish sellers for apparently "unfair" price increases. This interpretation is in line with results from survey studies (e.g., Klein et al. 2001) and with experimental evidence from public good games. Fehr and Gächter (2000) conducted experiments in which subjects decided on how much to contribute to a public good in the first stage of the game. In the second stage of the game, subjects could, after observing other players' contributions, mete out costly punishments. The authors found that subjects tended to punish other agents for "unfair" behavior, i.e., subjects tended to punish those players whose contribution was below the average contribution to the public good. Most importantly, the authors observed non-negligible punishment even in the last period of the game.

5. Concluding remarks

Are consumer boycotts effective in forcing firms to change their behavior, in forcing certain market conditions? Not only environmentalists and animal rights activists seem to think so, well-known economists do too. For example, Theodore Bergstrom (2001: 196) criticizes some publishers for overpricing academic journals and suggests "that economists consider at least a partial boycott against them", for example by cancellation of subscriptions or by refusing to serve as a referee for these journals.

The effects of consumer boycotts are very difficult to measure in the field because of fundamental measurement and identification problems. We conduct an experimental study to measure the behavioral effects of consumer boycotts in a retail market. The focus of our study is on actual behavior of consumers and on market-level effects of boycotts, not on stated intentions to participate in boycott. We induce a sudden price increase to investigate whether this triggers boycotts. We find that the incidence of consumer boycotts massively increases in response to the price increases, and that consumers are willing to protest price increases even in the presence of small-agent and free-rider problems. While consumer boycotts remain ineffective in holding down market prices and in increasing consumer rents even after elimination of collective action problems, boycotts become more effective in reducing firm profits.

Why are consumer boycotts ineffective in forcing particular market outcomes like lower prices and higher consumer rents in our experiment? The tentative explanation we offer is that in a competitive market *both* sides of the market are subject to small-agent and free-rider problems. Apparently, it is not sufficient to eliminate these problems on one side of the market to make consumer boycotts effective in moving markets. To illustrate this conjecture, suppose a particular firm anticipates that a sharp increase in market prices will trigger consumer boycotts. However, this firm may not find it optimal to hold down its price. The reason is that to do so is costly to the firm but may not have a sufficient effect on the market to avert boycotts (i.e., a small-agent problem prevails). In addition, even if a price cut by an individual firm had a sufficient effect to avert the boycott, the firm would still prefer other firms to hold down prices (i.e., a free-rider problem prevails). Hence, our results should not be interpreted as showing that small-agent and free-rider problems can be ignored in an analysis

of consumer boycotts. Quite to the contrary, they may be more pervasive in a competitive market than a casual observer expects.

Our results with respect to the effects of consumer boycotts are clear and their interpretation is relatively straightforward. These effects can be isolated because observed behavior can be compared to theoretical predictions, both over time and across treatments. Our interpretation of the results with respect to the causes of consumers boycotts and with respect to consumers' motivations to boycott are more speculative. While survey studies are able to draw a much more detailed picture of intentions and motivations, this study in our view nevertheless provides some interesting complementary conclusions. In particular, survey studies (cited in section 2.3) suggest that price increases which are justified by cost increases are acceptable to consumers. In contrast, we infer from observed behavior that at least some consumers are willing to punish firms for apparently unfair price increases (which are induced by cost increases in our experiment). For example, 22 percent of consumers boycott a market in the last period when no future gains of boycotts can be expected.

Taken together, our results indicate that fairness considerations may be of considerable importance even in competitive retail markets. Consumers who feel treated unfairly seem to be willing to repeatedly forego gains from trade to punish firms. This willingness to punish firms is remarkable because it is observed in a fully anonymous market without suggestive labeling or framing, and without communication opportunities among consumers. One would expect that an alternative framing may induce even more consumers to boycott (e.g., Sen et al. 2001). If the considerable and persistent losses in firm profits and market efficiency observed in this study are indicative of the effects of boycotts in naturally occurring markets, consumer boycotts should be of substantial interest to consumer activists, firms and policymakers alike.

References

Bergstrom, T.C. (2001): Free Labor for Costly Journals? *Journal of Economic Perspectives* 15(3): 183-98.

Blinder, A.S., Canetti, E.D., Lebow, D.E., Rudd, J.B. (1998): *Asking about Prices*. New York: Russell Sage Foundation.

Davis, D.D. and Holt, C.A. (1993): *Experimental Economics*. Princeton: Princeton University Press.

Dolliver, M. (2000): Boomers as Boycotters. *Adweek Eastern Edition*, April 12, 41(49): 44.

Eaton, J. and Engers, M. (1992): Sanctions. *Journal of Political Economy* 100(3): 899-928.

Economist (1990): Boycotting Corporate America. *The Economist* , May 26, 315: 69-70.

Fehr, E. and Gächter, S. (2000): Cooperation and Punishment in Public Goods Experiments. *American Economic Review* 90(4): 980-94.

Fehr, E. and Schmidt, K. (2001): Theories of Fairness and Reciprocity - Evidence and Economic Applications. Working paper no. 75, Institute for Empirical Research in Economics, University of Zurich. Forthcoming in: Advances in Economic Theory: Eighth World Congress.

Fischbacher, U. (1999): z-Tree. Experimenter's Manual. Working paper no. 21, Institute for Empirical Research in Economics, University of Zurich.

Franciosi, R., Kujal, P., Michelitsch, R., Smith, V.L., Deng, G. (1995): Fairness: Effect on Temporary and Equilibrium Prices in Posted-Offer Markets. *Economic Journal* 105(43): 938-50.

Friedman, M. (1985): Consumer Boycotts in the United States, 1970-1980. Contemporary Events in Historic Perspective. *Journal of Consumer Affairs* 19: 98-117.

Friedman, M. (1991): Consumer Boycotts. A Conceptual Framework and Research Agenda. *Journal of Social Issues* 47: 149-68.

Friedman, M. (1995): American Consumer Boycotts in Response to Rising Food Prices: Housewives' Protests at the Grassroots Level. *Journal of Consumer Policy* 18(1): 55-72.

Friedman, M. (1999): *Consumer Boycotts.* London: Routledge.

Garrett, D. (1987): The Effectiveness of Marketing Policy Boycotts: Environmental Opposition to Marketing. *Journal of Marketing* 51: 46-57.

John, A. and Klein, J.G. (2001): The Boycott Puzzle: Consumer Motivations for Sacrifice. Working paper INSEAD, March 2001.

Kachelmeier, S.J., Limberg, S.T. and Schadewald, M.S. (1991): Fairness in Markets: A Laboratory Investigation. *Journal of Economic Psychology* 12: 447-64.

Kahneman, D., Knetsch, J. and Thaler, R. (1986): Fairness as a Constraint on Profit Seeking: Entitlements in the Market. *American Economic Review* 76(4): 728-41.

Kardes, F.R. (1996): In Defense of Experimental Consumer Psychology. *Journal of Consumer Psychology* 5(3): 279-96.

Klein, J.G., John, A. and Smith, N.C. (2001): Exploring Motivations for Participation in a Consumer Boycott. Centre for Marketing Working Paper 01-701, London Business School.

Miller, K.E. and Sturdivant, F.D. (1977): Consumer Responses to Socially Questionable Corporate Behavior: An Empirical Test. *Journal of Consumer Research* 4(1): 1-7.

Pruitt, S.W. and Friedman, M. (1986): Determining the Effectiveness of Consumer Boycotts: A Stock Price Analysis of their Impact on Corporate Targets. *Journal of Consumer Policy* 9: 375-87.

Roth, A.E. (1995): Introduction to Experimental Economics. In: J.H. Kagel and A.E. Roth (eds.): *Handbook of Experimental Economics*. Princeton Univ. Press: Princeton, N.J.: Chapter 1 (3-109).

Ruffle, B.J. (2000): Some Factors Affecting Demand Withholding in Posted-Offer Markets. *Economic Theory* 16(3): 529-44.

Sen, S., Gürhan-Canli, Z. and Morwitz, V. (2001): Withholding Consumption: A Social Dilemma Perspective on Consumer Boycotts. *Journal of Consumer Research* 28(3): 399-417.

Smith, N.C. (1990): *Morality and the Market. Consumer Pressure for Corporate Accountability.* London: Routledge.

Appendix A: Instructions

(Original instructions were in German. Instructions below refer to treatment Boy. In treatment NoBoy the instructions were identical except that all references to boycotts, open markets and collective choices were missing. All subjects received the general instructions, including the part on the vote on the closure of the market, but only the detailed instructions for their own type.)

General instructions for all participants

Welcome to the experiment. The purpose of this experiment is to analyze decisions in markets. If you read these instructions carefully and follow all the rules, you can earn money in addition to the 10 Fr. you receive for showing up in time. During the experiment we do not refer to Swiss Francs but to Taler. These will be converted according to:

1 Taler = 0.01 Swiss Francs.

During the whole course of the experiment **you are not allowed to talk** to other participants. If you have a question, please ask us. We will answer your question in private. It is important to follow this rule. Otherwise the results of the experiment are useless for scientific purposes.

Here's a short outline of the experiment. You will receive a detailed description below. You will participate in a market experiment. In this market there are 5 buyers and 3 sellers who trade a hypothetical good. The **first** trading period is conducted as follows: First, each seller decides how many units he or she wishes to sell at which price. Then all the offers will be published. The computer randomly determines the order in which buyers can choose from the offers. Both buyers and sellers can only earn income by trading. Those who do not trade earn an income of 0 Taler. The income of a seller is the higher, the higher the sales price. The income of a buyer is the higher, the lower the sales price. At the end of the period all buyers and sellers will be informed about the trading prices. In addition, each participant will learn how much he or she has earned in that period.

The following periods are conducted in the same way as the first period, with one important exception: From period 2 on the **buyers** can **vote**, before trading starts, whether they want to **close** the market in the current period. If the majority of buyers votes for a closure of the market, no trade will take place in that period and the next period follows. If, in contrast, the closure of the market is rejected, trade will take place as described above. This experiment consists of 30 trading periods in total. The first 15 periods are conducted as described below. From period 16 on, there will be a change which will be explained later on.

Detailed Instructions for Buyers

If the market is not closed, the sellers make their decisions at the start of each trading period. Each seller chooses a price and the maximum quantity that he or she wishes to sell at this price. After all sellers made their decisions, the prices will be announced to all buyers and sellers. The offers are, however, anonymous. That means, it is not possible to tell which seller has asked which price.

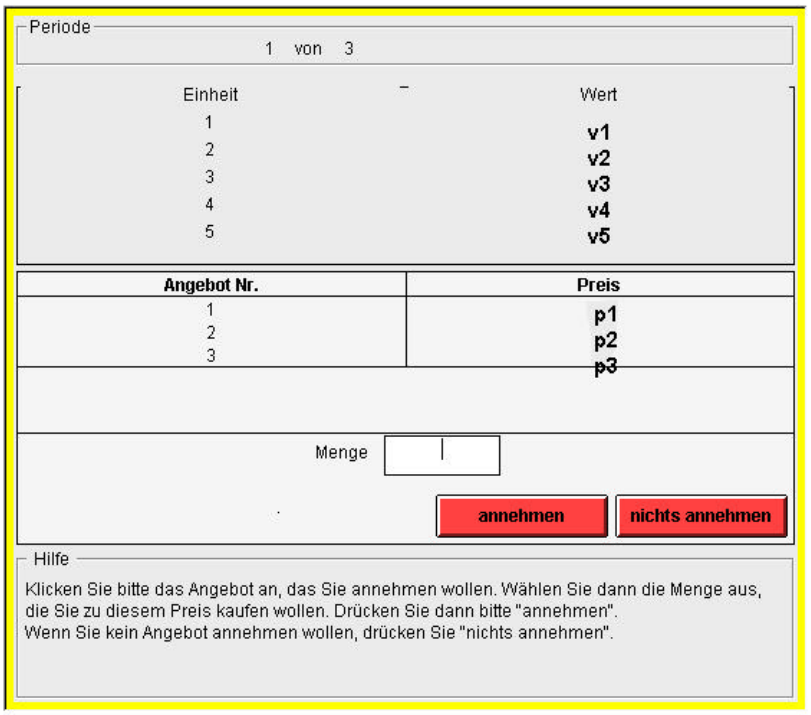
Now the buyers can buy units of the good. The sequence in which this is done is randomly selected by the computer in each round. The decisions of the buyers will be entered on the

screen shown in Figure A1. In the upper half of the screen you see the maximum number of units you can buy (in the present example 5 units). Each unit bought has a certain buyer's value (the symbols v1 etc. correspond to a certain number of Talers). A buyer's values are only known to the respective buyer, but not to the other buyers or the sellers.

When it is a buyer's turn to buy, he clicks on one of the prices offered. In addition, he has to choose the maximum quantity he wants to buy at this price. Then he clicks "accept". If the desired quantity is available from that offer, he obtains these units and it is the next buyer's turn. If the desired quantity exceeds the quantity that is still available from that offer, he obtains the remaining units. He then has the opportunity to choose again from the remaining offers. If he does not want to choose any offer, he clicks "accept none".

Note: There may be no more offers available when it is your turn to choose. In this case you cannot buy anything in this period and you get directly to the results screen.

Figure A1: Buyers' Decision Screen



A buyer's profit from the purchase of a unit equals the difference between the buyer's value and the price for that unit. Hence, a buyer earns more at a lower price. The equivalent holds for the sellers: The profit from selling a unit equals the difference between the price and the production cost. Hence, a seller earns more at a higher price. The production costs are only known to the respective seller, but not to other sellers or to the buyers.

The **total profit** in a period is the sum of the profits of all units purchased. The profit from units offered but not sold is 0. The computer makes sure that you will first buy the units with the highest buyer's value.

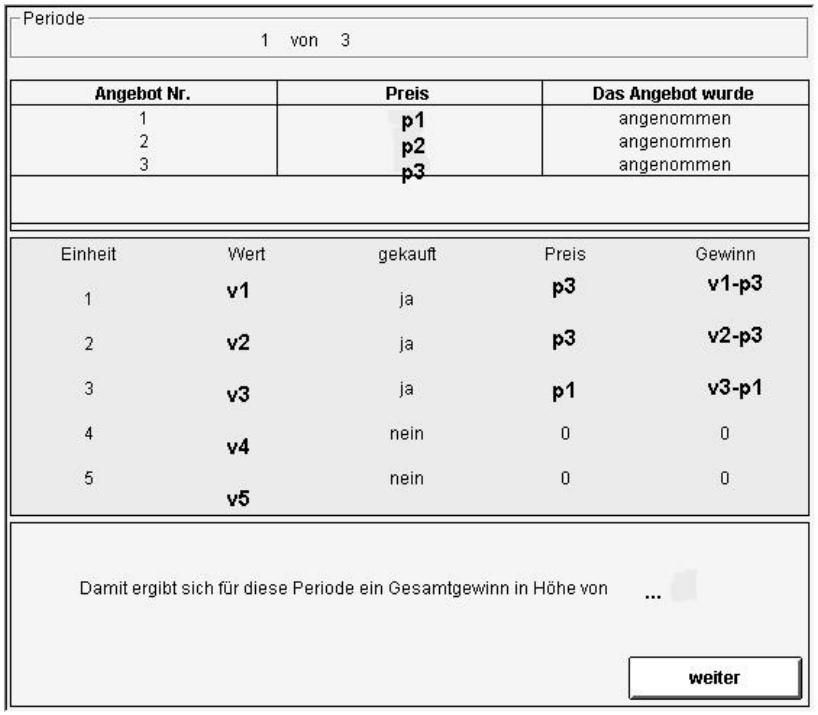
Note that **losses** are possible. Losses can occur if a unit is bought at a price that exceeds the buyer's value. You can, however, always avoid losses with certainty.

Overview of the Results at the End of a Period

At the end of each trading period all buyers and all sellers will be informed about all offers that are accepted and all offers that are rejected.

The buyers see a screen as in figure A2, showing: The buyer's value per unit, whether the unit was bought, and if so, the price at which this unit was bought, and the profit that has been made with this unit. In addition the total profit in this period is shown.

Figure A2: Buyers' Results Screen



In the example the buyer has bought two units for a price **p3** and one unit for a price **p1**. His profit for the first unit is the difference between his buyer's value and the price paid, i.e. **v1-p3** and similarly for the second and third unit. The total profit is then simply the sum of the profits for the three units purchased.

This screen is followed by a screen presenting an overview of the periods so far.

Detailed Instructions for Sellers

If the market is not closed, the sellers will decide upon their offers in the beginning of each trading period. The decisions of the seller will be entered in the screen shown in Figure A3. In the upper half of the screen you can see how many units you can sell at most (in the example 10). Each unit sold causes the seller certain production costs. The production costs are only known to the respective seller but not to the other sellers or the buyers.

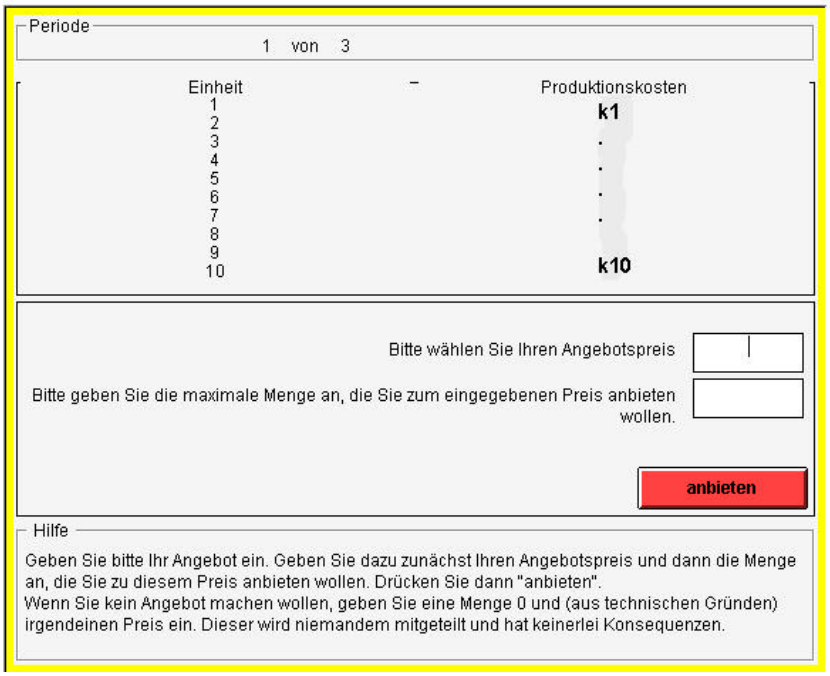
Each seller chooses **one** price and the maximal quantity he wishes to sell at this price. In order to do so, fill in the respective fields on the screen and then click "offer". If you do not want to offer anything, enter 0 for the quantity (and any price, that nobody will be informed about).

After all sellers have decided, the prices, but not the sellers' maximal sales quantities will be made public. Now all buyers and sellers know the prices asked. The offers are, however, anonymous. That means that it is not possible to tell which seller asked which price.

Now the buyers can purchase units of the good. The sequence in which they do so will be randomly determined by the computer in each period.

For the buyers units bought have a "buyer's value" determined by us. The buyers (as the sellers) can only make profits by trading. The profit from the purchase of a unit equals the difference between buyer's value and price for that unit. Hence a buyer earns the more the lower the price. The buyer's values of the units are only known by the respective buyers, but not by the other buyers or the sellers.

Figure A3: Sellers' Decision Screen



A seller's profit from the sale of a unit equals the difference between price and production costs. Hence per unit a seller earns the more the higher the price. The **total profit** in one period equals the sum of the profits of all units sold. The profit of units offered, but not sold, is 0. The computer guarantees that you first sell the units with the lowest production costs.

Note that **losses** are possible. Losses can occur if a unit is sold for a price below the production costs. You can, however, always avoid losses with certainty.

Overview of the Results at the End of a Period

At the end of each trading period all buyers and all sellers will be informed about all offers that are accepted and all offers that are rejected.

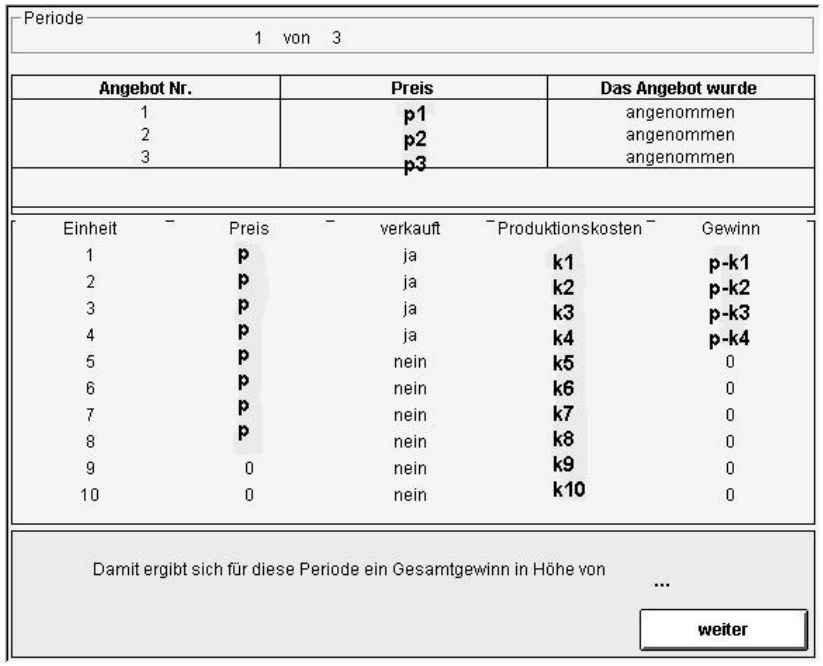
The sellers see a screen (Figure A4) that shows: The prices asked (for the units offered, 0 for the remaining units), whether a unit was sold, the actual or prospective production costs and the profit that this unit yielded. In addition the total profit in this period is shown.

In the example shown the seller has offered eight units for a price **p** and has sold four of these. The first units thus yields a profit equal to the difference between the price and the production costs **p-k1** and respectively for the second to fourth unit. No production costs are incurred for the fifth to eighth units since they have only been offered, but have not been sold. The total profit simply equals the sum of the profits for the four units sold.

At the end of each period the buyers will be informed how many units they have bought for which price and how much they have earned.

The results screen is followed by a screen presenting an overview of the periods so far.

Figure A4: Sellers' Results Screen



Referendum on Closure of the Market

From the second trading period on, **the 5 buyers** can vote by simple majority whether they want to close the market in that period. In order to do so simply click "yes" or "no".

If a majority (i.e., at least 3 buyers) votes "no", the market will not be closed in that period and trade takes place as described above.

If a majority (i.e., at least 3 buyers) votes "yes", the market will be closed in that period. This means that no trade will take place in that period and all market participants will obtain a profit of 0 Taler. You will then be shown the overview of the periods so far. That is the end of that period. The next period starts with the vote on the closure of the market in the next period.

All participants will be informed about the result of the referendum immediately after the vote. The vote itself is completely anonymous. This means that no one will get to know how a specific person has voted.

Control Questions (BUYERS)

Please answer the following questions. If you have any questions or if you have answered all the questions, please raise your hand.

1. Assume a buyer purchases two units for a price **p2** (i.e., from the second offer) and one unit for a price **p1** (i.e., from the first offer)

   His profit is independent of the buyer's value for the fourth unit

   YES NO

   His profit is independent of the buyer's value for the third unit

   YES NO

2. Assume a buyer purchases one unit for a price **p1** and one unit for a price **p3**. The buyer's value for the first unit is **v1**, that for the second is **v2**.

   What is his profit?

3. Suppose two buyers vote for a closure of the market. Will trade take place in this period?

   YES NO

4. Suppose three buyers vote for a closure of the market. Will trade take place in this period?

   YES NO

5. If the first three buyers have purchased all the units offered, the profit for the fourth and the fifth buyer will be 0 in this period.

   YES NO

Control Questions (SELLERS)

Please answer the following questions. If you have any questions or if you have answered all the questions, please raise your hand. We will then come to you.

1. Assume a seller has offered six units and has sold four of these.

   His profit is independent of the costs for the seventh unit.

   YES NO

   His profit is independent of the costs for the sixth unit.

   YES NO

2. Assume a seller has sold two units for a price **p**.

   The costs for the first unit are **k1**, those for the second unit are **k2**.

   What is his profit?

3. Suppose two buyers vote for a closure of the market. Will trade take place in this period?

   YES NO

4. Suppose three buyers vote for a closure of the market. Will trade take place in this period?

   YES NO

Appendix B

Table B1: Boycotted periods (x indicates boycott)

	Low															**High**															Total number of boycotts
period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Boy 1																					**x**			**x**			**x**				3
Boy 2																		**x**									**x**				2
Boy 3																										**x**		**x**			2
Boy 4																					**x**						**x**				2
Boy 5																		**x**				**x**		**x**							3
Boy 6																	**x**				**x**			**x**	**x**		**x**		**x**	**x**	7
Boy 7																															0
Boy 8																			**x**		**x**	**x**		**x**							4
Boy 9																														**x**	1