

# Social Media and Buyers' Power: The Cottage Cheese Boycott\*

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## Abstract

In the summer of 2011 a consumer boycott on cottage cheese was organized in Israel via Facebook. The boycott was prompted by the steep increase in prices since price controls were lifted in 2006. We document the evolution of cottage cheese prices and quantities before and after the boycott. The boycott was successful as prices declined immediately and stayed low until the end of the sample period (April 2012) and beyond. We find that price elasticities, in particular cross price elasticities, substantially increased following the boycott. Larger increases in elasticity and larger declines in sales happened in areas with higher computer utilization and more education, suggesting the importance of social media in facilitating consumer mobilization. Increased price elasticities, however, cannot fully explain the observed price changes. We conjecture that firms lowered their prices to avoid further damage to their image, from fear the boycott will spread to other products, from concerns about re-regulation of prices and, possibly, from class action lawsuits.

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# 1 Introduction

The role of social media in facilitating political mobilization has attracted considerable attention in the popular press and in academic research, especially following the crucial role that Facebook and Twitter played during the 2009-2010 Iranian election protests and the 2011 uprisings in Egypt and Tunisia. These events are often referred to as “the Facebook revolution” or “the Twitter revolution” (see e.g., Andersen, 2011).<sup>1</sup> Recently, some commentators have argued that social media can also become a powerful tool that will enable consumers to force companies to set lower prices or act in a more socially responsible manner (Taylor, 2011, and Mainwaring, 2011). This possibility, of course, has far reaching implications for business strategy and for regulation. For instance, if consumers can indeed discipline firms, then antitrust authorities should be less concerned with the adverse effects of market power when they review horizontal mergers or examine vertical restraints.

We study the cottage cheese consumer boycott that took place in Israel during the summer of 2011. The boycott was a precursor for the “tents protest” which started a month later and swept Israel with thousands protesting against the rising cost of living, and more generally, demanding social justice. Cottage cheese is a staple food in Israel and one of the best-selling food products. Until July 2006, the price of cottage cheese was under government control. Since deregulation until May 2011, it increased by 43% (The Knesset Research and Information Center, 2011). Following this steep increase, and the ensuing news coverage, a Facebook event calling for a boycott of cottage cheese was created on June 14, 2011 demanding substantial price concessions.<sup>2</sup> Specifically, the boycott organizers demanded that the price of cottage cheese drop from about 7 NIS to 5 NIS per 250 grams container. The Facebook event was an immediate success: a day after it started nearly 30,000 Facebook users joined it, by June 30, the number surpassed 105,000.

The boycott had an immediate impact on prices: the average price of cottage dropped from about 7 NIS per 250 grams container just before the boycott to about 5.5 NIS within a week. Two years later, the boycott seems to have a long-lasting effect not only on prices, which remained well below pre-boycott levels, but also on business strategy.<sup>3</sup> We believe that the cottage

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<sup>1</sup>In 2013, social media like Facebook and Twitter played an important role in facilitating protests in Bulgaria, Turkey, Brazil, and Bosnia (see e.g., Faiola and Moura, 2013). For recent papers which study the effect of social networks on political participation in various countries, see Iskander (2011), Breuer (2012), Enjolras, Steen-Johnsen, and Wollebaek (2012), Tufekci and Wilson (2012), Valenzuela, Arriagada, and Scherman (2012), and Gonzalez-Bailon and Wang (2013).

<sup>2</sup>See <https://www.facebook.com/events/203744079670103/>

<sup>3</sup>For example, on January 2013, the Chief Marketing Officer of Tnuva (the market leader) said in the annual meeting of the Israel Marketing Association that “The cottage cheese crisis taught us a lesson of modesty and humility” (<http://www.ishivuk.co.il/kenes/88>). And on July 2013, Tnuva’s CEO said that “The cottage protests caused Tnuva to emphasize the opinion of the consumer and his needs. Part of this policy is putting cottage under self-regulation” (<http://www.nrg.co.il/online/1/ART2/486/100.html> and <http://www.jpost.com/National-News/Cottage-cheese-prices-fall-42-percent-318467>). Indeed, on August 25, 2013, the ministry of Agriculture and

boycott is worth studying because it was started by consumers with the specific intention of putting pressure on manufacturers and retailers to lower the price of a specific product. We are not aware of other successful, large scale, consumer boycotts that were organized in order to create similar countervailing buyer power.<sup>4</sup>

We document the evolution of prices and quantities around the boycott, examine the possible role of social media, and examine the possible reason for the swift price concessions. We do so using daily, store-level data, on prices and quantities sold of the three leading brands of cottage and white cheese (the closest substitute) between January 2010 and April 2012. The data cover all supermarket chains and most minimarkets and grocery stores in Israel and allows for a before-after boycott comparison of quantities and prices, as well as comparisons across demographically different locations.

We find that the mean price of cottage cheese dropped by over 20% once the boycott started. Low-price stores, such as the main supermarket chains, and especially hard-discount stores lowered prices significantly, practically overnight. In contrast, stores that initially had higher prices – groceries, convenience stores, and minimarkets – decreased prices only after several days or even weeks from the start of the boycott. We also find that quantity sold declined somewhat on the first week of the boycott, but due to the sharp price decrease, sales increased in later weeks, despite the continuation of the boycott. The decrease in quantity on the first week of the boycott was mainly observed in the smaller store formats (groceries, convenience stores, and minimarkets), where sales dropped by about 20%. The first week decline in sales was more pronounced in the city of Tel Aviv-Jaffa than in the rest of the country.

Consumer boycotts can have different effects on demand. First, there is the immediate, possibly temporary, decline in demand as consumers join the boycott. Second, buyers may permanently substitute to other products (e.g., to white cheese) or brands if the firm’s image is damaged by the boycott. Third, boycotts may raise consumers’ awareness about pricing, which translates into more elastic demand functions. These three mechanisms provide alternative, not necessarily exclusive, explanations for the observed price decline following the boycott: firms may have lowered prices to counter the immediate drop in demand, or to prevent further damage to their image, or because they faced a more elastic post-boycott demand. Indeed, we observe a temporary decline

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Rural Development announced its intention to re-regulate the price of “white cheese” (a soft fresh cheese, with a smooth and creamy texture, which is a close substitute for cottage cheese, and was deregulated around the same time as cottage cheese), due to “exceptional profitability.” The ministry found no need to re-regulate the price of cottage cheese for the time being because it did not find “unreasonable profitability as in the past.” The ministry stated however that it will continue to monitor the profitability of cottage cheese and it does not rule out re-regulation should its profitability become “unreasonable” (<http://www.moag.gov.il/NR/exeres/E911B43C-9BAD-488D-8493-A27069275754,frameless.htm?NRMODE=Published>).

<sup>4</sup>The cottage boycott is an example for private politics (e.g., Baron and Diermeier, 2007) where dairy manufacturers and retailers seem to be self regulating due to consumers’ activism.

in demand. To study the permanent effects of the boycott, we estimate a simple demand model and compare price elasticities before and after the boycott. We find that one of the long-lasting consequences of the boycott was much higher own and cross price elasticities, possibly reflecting increased price awareness and more willingness to substitute across brands. While the increased price sensitivity of consumers may explain part of the price decline, we find that the price concessions were too abrupt and too substantial to be explained by firms' optimal reaction to the increased demand elasticities. We posit that fear of the boycott spreading over time and to other products as well as the fear of further price controls are also part of the explanation for the observed price changes.

A necessary condition for the success of a consumer boycott is that activists or organizers garner the support of a group of followers who feel strongly enough about the issue.<sup>5</sup> Unlike many other consumer boycotts, which are organized by interest groups (like Greenpeace), the cottage boycott did not have organized backing. Social media was essential for coordinating action, and getting the message across. Moreover, boycotts are susceptible to a common problem: consumers realize that unless others join the cause, their unilateral sacrifice is futile. Social media like Facebook and Twitter can credibly convey the number of followers rallying behind the cause and hence encourage others to join. To study the role that social networks played in the cottage boycott, we correlate the decline in sales at the peak the boycott with several demographics, which proxy for the use of social media. We find that stores located in areas with higher exposure to social networks experienced larger declines in demand. Moreover, we find that the increase in demand elasticities is more pronounced in locations with higher social media exposure.

To quantify the overall extent of the boycott, we compute an index of boycott intensity. The index is defined as observed sales divided by predicted sales at observed prices. The idea is to capture the change in sales, after taking into account the increase in sales due to the substantial price drops following the boycott. We find that, despite the fact that the boycotters' demands were never met in full, most of the boycott impetus fizzled within a couple of weeks. It appears that the initial concessions were sufficient to take the wind out of the boycotters. Justifiably, firms did not offer any further price concessions.

Most of the empirical literature on boycotts has examined the stock price reaction to consumer boycotts (Friedman (1985), Pruitt and Friedman (1986), Pruitt et al. (1988), and Davidson et al. (1995), Koku et al. (1997), Teoh et al. (1999), Epstein and Schnietz (2002)), finding mixed evidence for boycott effects. We are aware of only two papers that study the effects of consumer boycotts on actual sales.<sup>6</sup> Unlike our paper, where the boycott was intended to pressure the tar-

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<sup>5</sup>Public outrage is one of the four factors Diermeier (2012) mentions as necessary for a boycott's success: (i) customers must care passionately about the issue, (ii) the cost of participation must be low (relatively small sacrifice by consumers), (iii) the issues must be easy to understand, and (iv) the boycott should be widely covered on the mass media.

<sup>6</sup>Fershtman and Gandal (1998) use product-level data to study the effect of the Arab boycott on Israel on consumer

geted firms (to lower prices), both of these papers study “proxy boycotts,” in which firms were punished as a proxy for their country of origin. Bentzen and Smith (2002) study how aggregate monthly imports of French wine in Denmark were affected by a call for a boycott of French products in response to the French nuclear testing in the South Pacific in 1995–1996. They report a temporary decline in sales and possibly minor permanent negative effects on French red wine. Chavis and Leslie (2009) examine whether French wine in the U.S. was boycotted, following the French opposition to the Iraq war in early 2003. Like us they use disaggregated product-level data. Specifically, they use scanner data on weekly prices and quantities in mass-merchandise stores in Boston, Houston, Los Angeles, and San Diego. They find that the boycott exhibited a two month ramping-up period, followed by gradual decay over 6 months. During that period, the boycott resulted in 26% lower weekly sales at its peak (9 weeks after the first news reports of the boycott), and 13% lower sales. They do not find political preferences nor media attention to be important determinants of participation in the boycott.

Our paper also relates to the recent literature that studies the effect of the Internet on political outcomes. Miner (2012), Czernich (2012), Falck, Gold, and Heblich (2013) and Campante, Durante, and Sobbrío (2013) study the link between the internet and voters turnout in elections in different European countries. In the economics literature, the use of the Internet is usually viewed as a way of providing timely and cheap information on prices thereby enhancing competition and lowering prices. Many studies have analyzed the effect of Internet usage on prices (e.g., Brown and Goolsbee, 2002). In our paper, the Internet and related social media play an additional role, namely, that of organizing atomistic consumers into an effective force that can credibly threaten, and implement, a consumer boycott.

The paper is organized as follows. In Section 2 we describe the background leading to the cottage boycott and how the latter started and evolved during the summer of 2011. Section 3 introduces the store-level data, while Section 4 uses these data to describe the evolution of prices and quantities sold over the long run as well as around the boycott period, and to examine the impact of the boycott on consumer demand. In Section 5 we estimate log-linear demand functions for cottage cheese and test whether price elasticities changed after the boycott. In Section 6 we look at the role played by social networks in the boycott, and in Section 7 we examine whether the cottage boycott spread to other product categories. Conclusions appear in Section 8.

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and producer welfare in the Israeli automobile market. This boycott however was imposed by Arab countries on Japanese car manufacturers rather than by consumers.

## 2 Background

Cottage cheese is a staple food and one of the best-selling food products in Israel.<sup>7</sup> It is sold in various fat contents and flavours, though by far, the most popular variety is the plain 5%, which accounts for about 80% of sales. The closest substitute for cottage cheese is white cheese. In 2010, 31,027 tons of cottage cheese and 45,960 tons of white cheese (0.5% – 9% milkfat) were sold in Israel (Israeli Dairy Board, annual reports for 2011).

Cottage cheese is produced in Israel by three large dairies (there are no imports due to high tariffs)<sup>8</sup>: Tnuva, which is the largest food supplier in Israel, the Strauss Group, the second largest food supplier, and Tara, a subsidiary of the CBC Group, the fourth largest food supplier and the largest beverage supplier in the country.<sup>9</sup> By the end of 2003, Tnuva's market share was 71.9%, Tara's 14.5%, and Strauss', which entered the market in 2003, 12.9%.<sup>10</sup>

Until July 2006, the prices of 20 dairy products (cottage cheese both 5% and 9%, fresh milk, cream, sour cream, semi-hard cheese, and dairy desserts) were set by the government.<sup>11</sup> From July 2006 to June 2009, the government gradually deregulated the prices of 10 of those products, including cottage and white cheese. Following deregulation, the prices of the de-regulated products increased sharply, relative to the CPI.

Figure 1 shows the evolution of the monthly average price of a standard container of 250 gram of 5% cottage cheese from January 1999 to May 2011 (just before the start of the cottage boycott).<sup>12</sup> Figure 1 also shows the prices – relative to January 1999 – of raw milk and wages in

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<sup>7</sup>See <http://www.globes.co.il/news/article.aspx?did=1000264488>, <http://www.ynet.co.il/articles/0,7340,L-3370903,00.html>, and <http://haforum-letiful.co.il/sites/default/files/files/Iftach-Bloch-Presetention.ppt> Indeed, as a famous Israeli chef has put it: “Cottage cheese is the symbol of the Israeli home... it is a staple of the two home-based meals of the day — breakfast and dinner ...” see <http://forward.com/articles/139163/a-soft-food-falls-on-hard-times/#ixzz2R67S9atZ>

<sup>8</sup>Until 2013, the effective tariff on fresh cheese was 126%. The government intends to lower this tariff gradually from 2013 onward. See <http://www.chamber.org.il/content.aspx?code=20456>

<sup>9</sup>As of 2011 Tnuva had a market share of almost 57% in the dairy market, the Strauss Group almost 23%, and Tara 10%, see [http://www.storenext.co.il/component/docman/doc\\_download/83-2011-.html?Itemid=](http://www.storenext.co.il/component/docman/doc_download/83-2011-.html?Itemid=) for market shares in the food market and <http://www.globes.co.il/news/article.aspx?did=1000713569> for market shares in the dairy market.

<sup>10</sup>These market shares are according to Nielsen data, computed from sales in stores that use barcodes only (mostly supermarkets and minimarkets). See <http://www.haaretz.co.il/misc/1.931954>

<sup>11</sup>The 20 regulated dairy products accounted for about 30% of the total expenditure on dairy products (State Comptroller of Israel, 2012, p. 36). These prices were set by a Government committee that consists of two representatives from the ministry of Finance and two representatives from the ministry of Agriculture. The committee sets prices such that dairy producers can cover their costs and earn a rate of return of 6% – 12% on their invested capital. Prices were updated every 12 month or earlier if input prices change by more than 3%. For more details, see State Comptroller of Israel (2012).

<sup>12</sup>The price plotted in the figure is based on monthly prices of cottage cheese collected from a cross-section of stores in Israel by the Central Bureau of Statistics for the purposes of computing the monthly CPI. The figure plots the cross-sectional mean of prices.

the food industry, two of the main cost drivers of cottage cheese (plotted on the right hand side axis).<sup>13</sup>

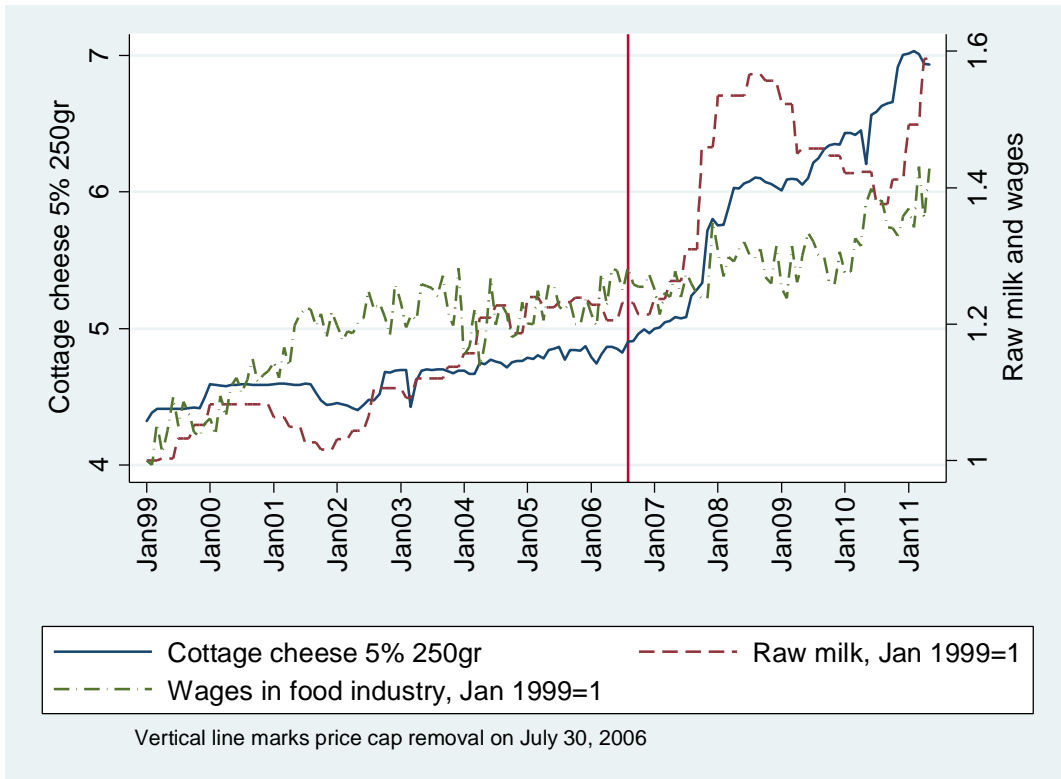


Figure 1: Cottage cheese and input prices

As the figure shows, the price of cottage cheese hovered around 4.5 – 5 NIS until its deregulation on July 30, 2006. Following deregulation, the price increased sharply, reaching 7 NIS on the eve of the boycott. This represents a 43% increase between July 2006 and May 2011. By comparison, the consumer price index increased by 12%, and the mean price of regulated dairy products increased by 10% over the same period (State Comptroller of Israel, 2012, p. 34). The price of raw milk also increased sharply in 2007, and this can account for part of the steep rise in the price of cottage cheese. However, the decline in the price of raw milk, which started at the end of 2008, was not passed-through to cottage prices. Wages exhibited less fluctuations over time, increasing by about 11% during the post deregulation period. Thus, only part of the price increase of cottage cheese after deregulation can be attributed to increases in input prices.

<sup>13</sup>The cost of raw milk accounted for 36.5% of the retail price of cottage cheese in January 2006 and 27.8% of the price of cottage cheese in June 2011 (see The Knesset Research and Information Center, 2011).

## 2.1 The Cottage protest

In general, food prices in Israel increased a lot since 2005.<sup>14</sup> Starting on May 31, 2011, a series of articles, describing this surge in food prices, as well as the general high cost of living in Israel, were published in newspapers and on TV.<sup>15</sup> The reports showed that prices of food and other consumer goods and services are higher in Israel – sometimes substantially so – than in the U.S. or in Europe. Most striking, this was also true for Israeli products exported to the U.S., such as cottage cheese, tea, honey, and chewing gum.

The news reports were followed by a sequence of events summarized in Appendix A. On June 14, 2011, a Facebook event was created calling for a boycott of cottage cheese, starting on July 1, 2011. The Facebook event was widely covered by the media. A day after it started, nearly 30,000 Facebook users joined the event, and three days later, the number grew to 70,000. By June 30, 2011, the number surpassed 105,000. Following this success, the event leaders announced on June 16, 2011 that the boycott will start immediately rather than on July 1, 2011, and recommended buying cottage and white cheese only if their prices drop under 5 NIS.

The effect of the boycott was almost immediate: several supermarket chains announced, already on June 14, that they will offer cottage cheese and other dairy products at a special sale price.<sup>16</sup> The protest leaders, however, argued that they will not stop the protest until the price of cottage falls permanently under 5 NIS.<sup>17</sup> Some politicians and Government ministers also called for various measures to control food prices.<sup>18</sup>

On June 24, Mrs. Zehavit Cohen, the CEO of Apax Partners (a private equity fund which controls Tnuva) and the chairperson of Tnuva’s board, announced in a TV interview that Tnuva will not unilaterally lower its cottage cheese prices.<sup>19</sup> Following the interview, three new groups

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<sup>14</sup>The cumulative annual growth rate of food prices in Israel was 2.1% between January 2000 and September 2005, and jumped to 5% between September 2005 and June 2011. By comparison, the cumulative annual growth rate of food prices in the OECD countries was around 3.2% throughout the 2005-2011 period (see the Kedmi Committee report, 2012, p. 8).

<sup>15</sup>The stories were first published in the evening financial newspaper Globes, see <http://www.globes.co.il/news/article.aspx?did=1000655975> though other newspapers and TV news have soon followed this lead and also started reporting extensively on this issue.

<sup>16</sup>For instance, Rami Levy, which is a hard discount chain, announced that they will offer Tnuva, Strauss, and Tara Cottage cheese for a few days at a special price of 4.90 NIS, instead of the regular price of 6.50 NIS, and Shufersal, which is the largest supermarket chain in Israel, announced a special “buy one get one free” sale for a few days on Tnuva and Tara Cottage cheese for shoppers who spend more than 75 NIS. See <http://www.calcalist.co.il/marketing/articles/0,7340,L-3520937,00.html> and <http://www.ynet.co.il/articles/0,7340,L-4082055,00.html>

<sup>17</sup>See <http://www.ynet.co.il/articles/0,7340,L-4083268,00.html>

<sup>18</sup>See <http://www.themarket.com/markets/1.656978>

<sup>19</sup>Specifically, Zehavit Cohen said that Tnuva will agree to lower its prices only if both dairy farmers, supermarkets, and the government will contribute to the price reduction. See <http://qa-galatz.scepia-sites.co.il/1404-38999-he/Galatz.aspx>





Following the resignation, Tnuva announced a price cut of up to 15% on dozens of products.<sup>24</sup>

### 3 Data, sample selection, and aggregation

We purchased data from a private company providing data services to the retail sector. The raw data record the daily transactions of the cottage and white cheese categories in 2,169 stores throughout the country, over the period January 1, 2010 - April 30, 2012. Each observation represents the total quantity and total revenue recorded by the cash register on a specific item - identified by its unique barcode - in a specific store and day. The raw dataset has over 22 million observations on 339 items over time and across stores. In Appendix B, we describe how we cleaned the data.

Items vary in terms of physical attributes (weight, flavors, fat content, packaging, kashrut standards, etc.), as well as manufacturer. We restrict attention to the most popular configurations: 250 grams containers of plain cottage and white cheese, with 3% and 5% fat content, produced by the three major manufacturers, which we label A, B and C (we use the terms “brand” and “manufacturer” interchangeably). We thus have 12 items (two types of cottage cheese and two types of white cheese for each of the three manufacturers) sold in 2,135 stores, spanning 7,291,875 store-item-day observations. This subsample of 12 items represents about 80% of cottage cheese sales in the original data, and 30% of white cheese sales.

We eliminate from the sample 1,008 stores selling the 12 items infrequently (two thirds of the deleted stores are convenience stores).<sup>25</sup> We also eliminate 298,657 observations corresponding to Saturdays since most stores are closed for religious reasons. The final sample includes 6,596,052 observations from 1,127 stores over 729 days between January 1, 2010 and April 30, 2012 (excluding Saturdays). The deleted observations represent about 5% of the total sales of the original 2,135 stores.

As Table 1 shows, the 1,127 stores in our final dataset are distributed across various business formats.

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<sup>24</sup>See <http://www.tnuva.co.il/about/PressRelease/Pages/SpecialSale.aspx>

<sup>25</sup>The 1,008 eliminated stores have less than 2,000 observations on the 12 items. The logic is as follows: if a store sells one of the 12 items at least once every weekday (virtually all shops are closed on Saturdays), we would expect 729 observations per store. And if a store sells all 12 items at least once a day, we should expect 8,748 observations per store ( $12 \times 729$ ). The deleted stores have on average 690 observations (the median is 546), indicating that they sell only a limited range of cottage and white cheeses and do so infrequently. In addition, we deleted 13 observations that were duplicated.

**Table 1: Distribution of stores**

Store Format	Frequency	Percent	Percent of Sales
Convenience Stores	54	5	0.3
Grocery Stores	84	7	0.8
Minimarkets	320	28	8.9
Main Local Supermarket Chains	290	26	28.6
Main HD Supermarket Chains	227	20	36.6
Other HD Supermarket Chains	152	13	24.9
Total	1,127	100	100

Most stores – 46% – belong to the main supermarket chains and these stores are similarly distributed between hard-discount (HD) and non-HD supermarkets. These stores account for 65.2% of the sales in our sample. Other HD supermarkets account for only 13% of the stores in the sample, but for almost 25% of the sales. The smaller store formats (convenience stores, groceries, and minimarkets), represent 40% of the stores, but only 10% of the sales.<sup>26</sup> The largest metropolitan area in Israel – the Tel Aviv region – accounts for almost a quarter of the stores. The remaining stores are equally distributed across the rest of the country.

It is convenient to view the data as a standard panel of stores over time in which, for each store-date combination, we record the transaction data of each of the 12 items. Stores not selling a particular item on a specific date have missing values. All in all we have 741,940 store-date observations, implying that each store has, on average, some transaction data on 658 days.

### 3.1 Prices and aggregation into products

The prices of the 3% and 5% varieties of the same brand are highly correlated (the correlation is above 95% for cottage cheese and around 85% for white cheese), making it impossible to separately identify their respective demands. We therefore aggregate the sales of 3% and 5% cottage cheese and 3% and 5% white cheese which belong to the same brand into a single product. This aggregation results in 6 products: one cottage cheese and one white cheese per brand. Thus, brand A cottage cheese refers to “brand A cottage cheese of 3% *and* 5% fat.”

In 55% of the observations (store and day pairs), all 6 products are sold. About 75% sell at least 5 products. Thus, in most observations, most of the products are being transacted, which is not surprising given the popularity of cottage and white cheeses.

<sup>26</sup>The vast majority of stores in our sample (91%) serve the general public, while 6% of the stores are dedicated to the orthodox Jewish population. The remaining stores are in Arab towns, though this group is underrepresented in our sample.

The price per 250 grams (the standard size of a container) of cottage cheese of brand  $b = A, B, C$ , in store  $s$  at time  $t$  is computed as follows:

$$p_{bst}^c = 250 \times \frac{r_{bst}^c}{q_{bst}^c}, \quad (1)$$

where  $r_{bst}^c$  is the total revenue from selling 3% and 5% cottage cheese of brand  $b$  in store  $s$  at time  $t$  and  $q_{bst}^c$  is the corresponding quantity in grams.<sup>27</sup> The price of white cheese,  $p_{bst}^w$ , is defined similarly. These prices can be thought of as the quantity-weighted mean price across all daily individual transactions (for a given product and store).<sup>28</sup>

## 4 Anatomy of the cottage boycott

We now examine what happened to prices and quantities sold as the boycott evolved. We start by looking at the evolution of prices since they were the first to react to the boycott threat. We then move on to quantities in order to assess the harm inflicted by consumers on manufacturers. *We estimate demand functions to assess and ask why firms did not offer later concessions as the boycott ensued. We answer these questions using demand estimates.*

### 4.1 Firms' reaction to the boycott: prices

To gain a long-term perspective on how firms reacted to the boycott, we begin by looking at the evolution of prices, by brand, over the entire sample period.

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<sup>27</sup>These prices exhibit a few extreme values due to very low recorded revenues and relatively high weights sold and vice-versa. We view these cases as keying errors (typos) and therefore deleted them from the sample. Specifically, we deleted from the sample 15,682 observations with prices per 250 grams below 3.75 NIS or above 9 NIS; these observations represent a quarter of one percent of the observations (the bottom and upper 1 percentiles are 4.60 NIS and 7.90 NIS, respectively).

<sup>28</sup>Weighting by quantity will only matter if prices differ across transactions within the same day (e.g., due to quantity discounts), but we are not aware of this happening in cottage and white cheeses. The price of an item not being sold in a store in a given day (i.e.,  $q_{ist} = 0$ ) is set to missing.

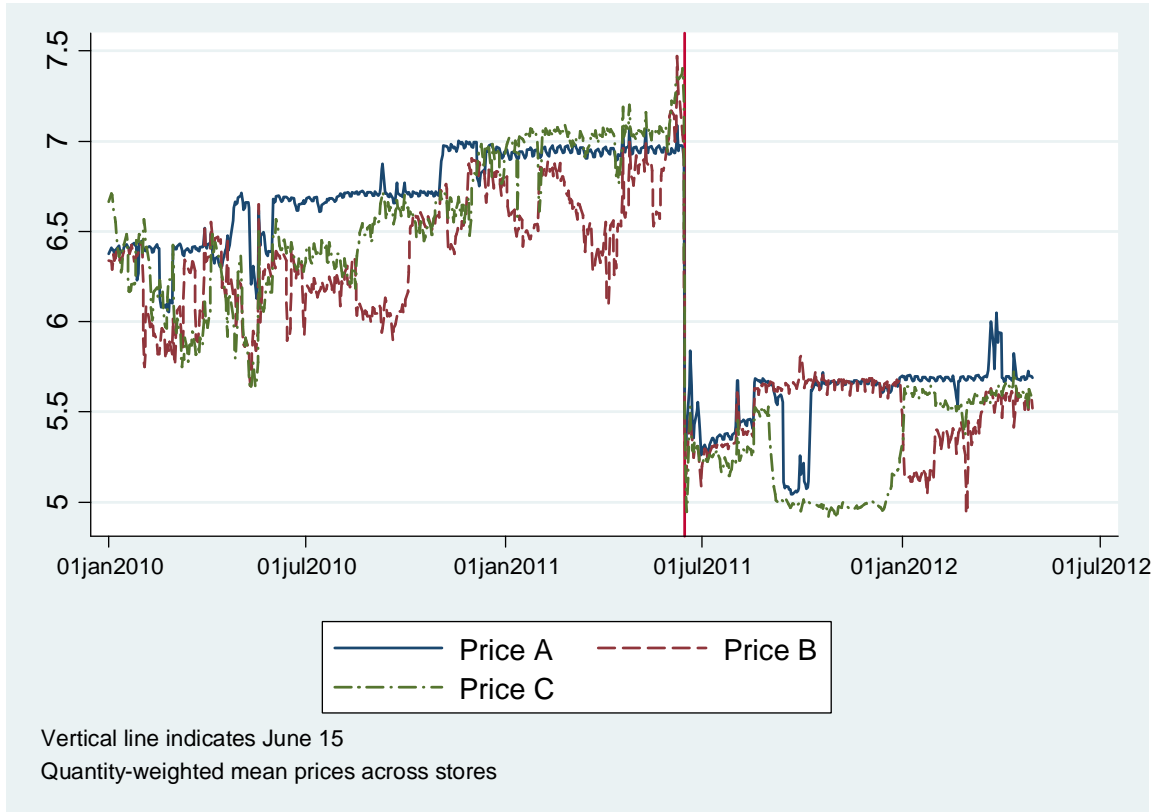


Figure 2: Daily mean price of cottage cheese by brand

Figure 2 shows the daily, quantity-weighted mean price of cottage cheese by brand.<sup>29</sup> Several points are worth mentioning. First, the prices of the three brands are fairly close to each other, with some divergence for relatively short periods of time. The price of brand A, though, seems more stable and typically higher than the prices of brands B and C.

Second, the price responses to the boycott were almost immediate: the quantity-weighted average price (across all brands) dropped by 24% between June 14 and June 16. We do not know whether the price concessions were initiated by the manufacturers or by the retailers, although we will be able to shed some light on this issue below.

Third, the mean prices of all three brands decreased after the boycott started to about 5.50 NIS, close to the boycott organizers' demand of 5 NIS, and remained at the new level until the end of the sample period.

Finally, the immediate, and steep, price decline may give the misleading impression that the dairies and retailers fully complied with the demands of the boycott organizers and that the boycott ended (almost) as soon as it started. However, as described in Section 2.1, not only did the

<sup>29</sup>Prices are computed using equation (1), for each brand  $b = A, B, C$ , and averaged across stores using quantity weights. The price lines are not smooth because the weights change on a daily basis, even though prices change less frequently. These prices are consistent with the Central Bureau of Statistics data shown earlier in Figure 1.

initial boycott remain active (since demands were not fully met) but additional boycotting groups were organized later in the summer of 2011.

We now take a closer look at the price responses. Figure 3 zooms in on the period May 15 to July 15 (i.e., from one month before to one month after the boycott started), and plots various percentiles of the daily, cross-sectional, distribution of prices by brand.

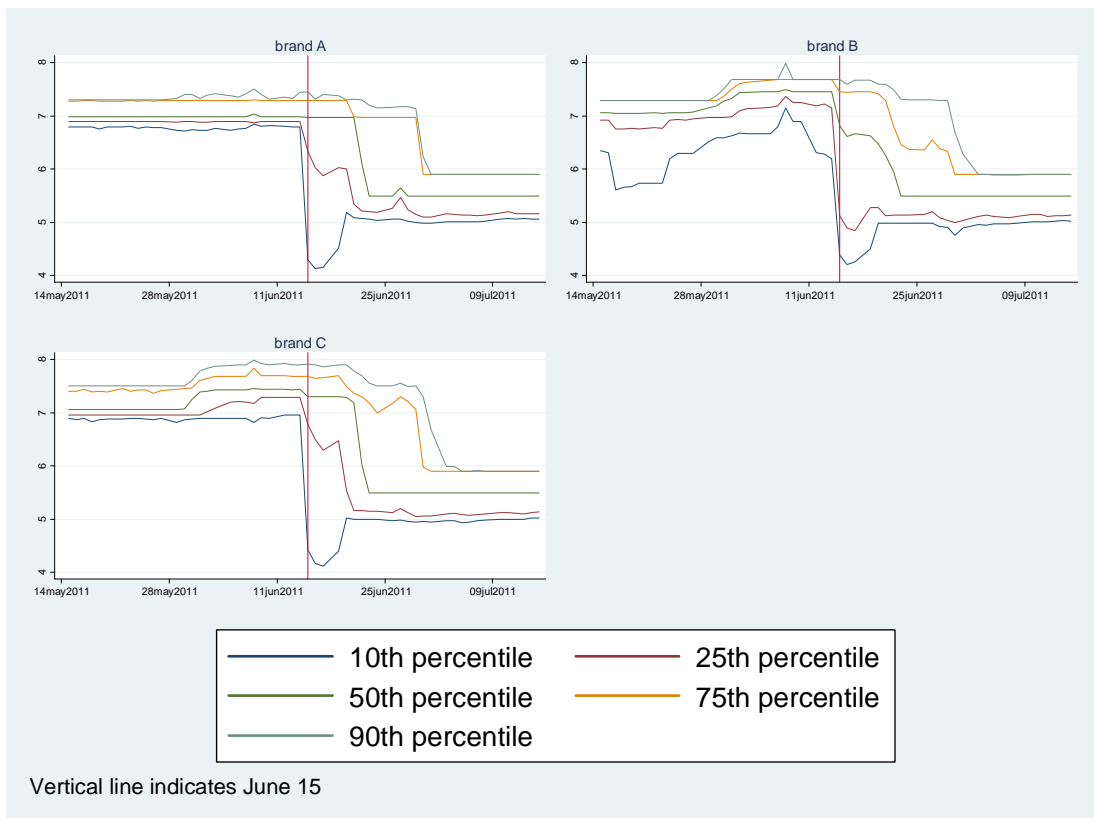


Figure 3: Distribution of cottage cheese prices by brand around the boycott period

Figure 3 shows that the steep price decrease displayed in Figure 2 was not uniform across stores. Only the low-price stores (the 10th percentile and to a lesser extent also the 25th percentile) reacted immediately to the boycott. Interestingly, the prices at the low-price stores rebounded somewhat after the steep initial decline. The high-priced stores took days, and in some cases even weeks, to cut prices. In any event, it seems that by the beginning of July, all stores converged to a new low price level.

There are interesting variations in the price response to the boycott by store format. Figure 4 plots the quantity-weighted mean price (across stores and brands) by store format around June 15. The plots suggest that the swift decline in prices occurred mainly at the supermarket chains. In particular, prices dropped from June 14 to June 16 by 33% in the hard-discount stores belonging to the main supermarket chains, 24% in the local stores belonging to the main supermarket chains, and 15% in the hard-discount stores, which do not belong to the main supermarket chains. By contrast,

the price reaction of the smaller formats (convenience stores, groceries, and minimarkets) lagged by around 10 days and was substantially smaller. Between June 14 and June 30, prices dropped by 16% in convenience stores, by 15% in groceries, and by 18% in minimarkets. Interestingly, prices in the hard-discount stores belonging to the main supermarket chains rebounded after the initial steep decline on the eve of the boycott and increased somewhat during the first week of the boycott relative to the June 16 level which marks the lowest price level over the sample period.

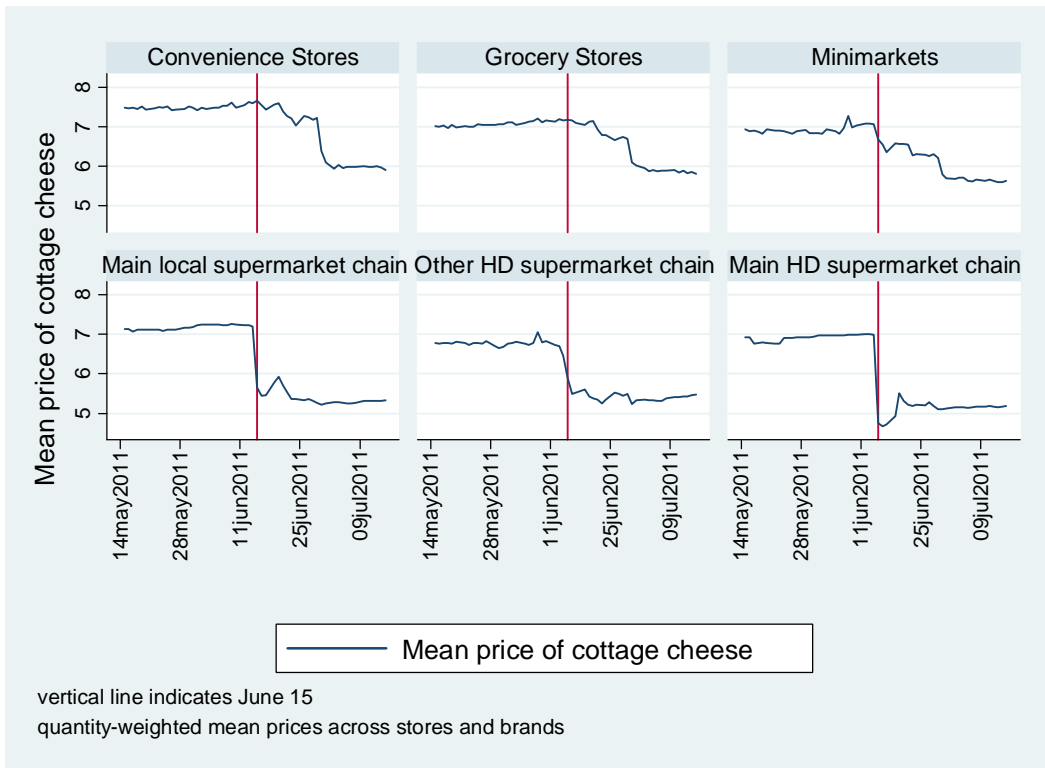


Figure 4: Mean price of cottage cheese by store format around the boycott period

Figure 5 shows the standard deviation of cottage cheese prices by store format. It is clear that the price cuts documented earlier varied a lot across stores even within the same store format. This is particularly so within the group of supermarkets, especially those that belong to the main supermarket chains.

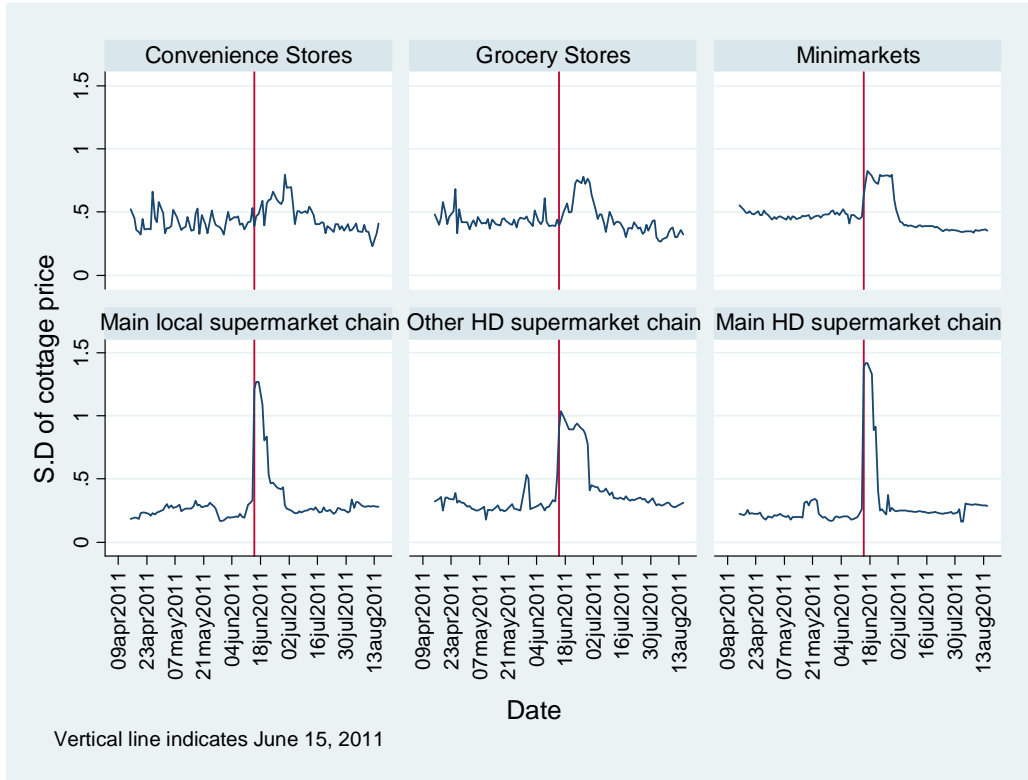


Figure 5: Standard deviations of cottage cheese price by store format around the boycott period

While we cannot tell from the data whether manufacturers or retailers took the lead in lowering prices – and keeping them low – there are indications suggesting that it was the retailers that made the initial move and that it took some time until manufacturers compromised on the wholesale price. First, as shown in Figure 5, the increase in price dispersion following the boycott is consistent with the stores, rather than the manufacturers, taking the initiative by cutting their retail prices unilaterally during the first few days of the boycott. Second, price declines were quite homogenous across brands within a store, suggesting that the decision to cut prices was made at the store (or chain) level rather than at the manufacturer level. Indeed, redoing Figures 4 and 5 by brand paints essentially the same picture. Large retailers offered temporary deals in light of the attention garnered by the product category, as a sort of loss leader. As mentioned in Section 2.1, many supermarkets announced special sales at the moment the boycott started. On the other hand, Tnuva – the largest manufacturer – announced cuts in its wholesale price only towards the end of June, after three new groups formed on Facebook calling for the boycott of all of Tnuva’s products.

## 4.2 Consumers’ reaction to the boycott: quantities

A key for the success of a boycott is the harm that boycotters can inflict on the target. In this case, there were at least three potential channels through which firms can be harmed: (i) the immediate



loss of sales, (ii) the risk that the government decides to re-regulate prices, and (iii) the risk of class action on the grounds that prices are excessive.<sup>30</sup> The latter is relevant for Tnuva, which was declared a monopoly in the “milk and milk products” market by the IAA in 1989.<sup>31</sup> The Israeli antitrust law prohibits a monopoly from abusing its dominant position, among other things, by charging “unfair prices.”<sup>32</sup>

While it is hard to quantify the risks of re-regulation and of class actions, we can use our data to examine the direct loss of sales due to the boycott. To this end, we examine the evolution of quantities sold during the May 15-July 15 period.<sup>33</sup> Since sales vary considerably within the week (high sales on Thursdays and Fridays and low sales on Sundays and Mondays), Figure 6 displays weekly total sales (Sunday to Friday); each dot in the figure represents the total weekly quantity sold in tons, with the dots being displayed on the last day of the week (Friday). The quantity for the week when boycott started – the week starting on Sunday June 12, 2011– appears just to the right of the vertical red line.

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<sup>30</sup>Indeed, the government is considering re-regulating the price of white cheese, and a class action lawsuit was filed against Tnuva.

<sup>31</sup>Among other things, the declaration can serve as prima facie evidence for the firm’s dominant position in any legal proceeding, including class action law suits.

<sup>32</sup>A class action lawsuit against Tnuva was submitted to a district court on July 2011, alleging that Tnuva has abused its monopoly position; see Mivtach-Shamir Holdings LTD, financial statements for 2011, Sec. 26.1.5 (Mivtach-Shamir Holdings controls Tnuva along with Apax). The document is available at [http://maya.tase.co.il/bursa/report.asp?report\\_cd=725120](http://maya.tase.co.il/bursa/report.asp?report_cd=725120)

<sup>33</sup>We only report the evolution of total sales because the data acquisition agreement does not allow us to disclose quantity information at the brand level.

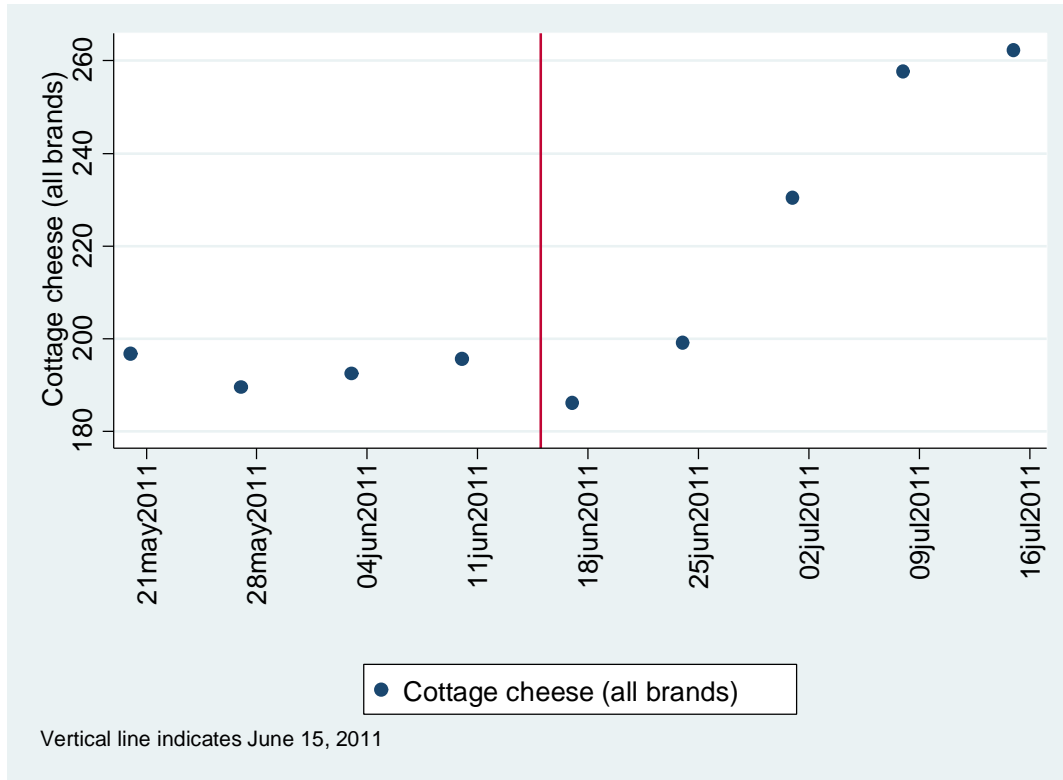


Figure 6: Weekly total quantity of cottage cheese sold (in tons)

Figure 6 shows a small decline in sales during the first week of the boycott. Although the quantity decrease is not large, the 24% price decline around June 15th gives a rough estimate of the foregone revenue during that week, which provides a sense of the inflicted harm. In later weeks, however, sales increased sharply probably in response to the substantial price reductions.

Figures 7 and 8 show different breakdowns of the quantity data. In Figure 7, we plot total weekly quantities by store format relative to the weekly quantity sold during the week starting on Sunday May 15, 2011 (a month before the boycott).

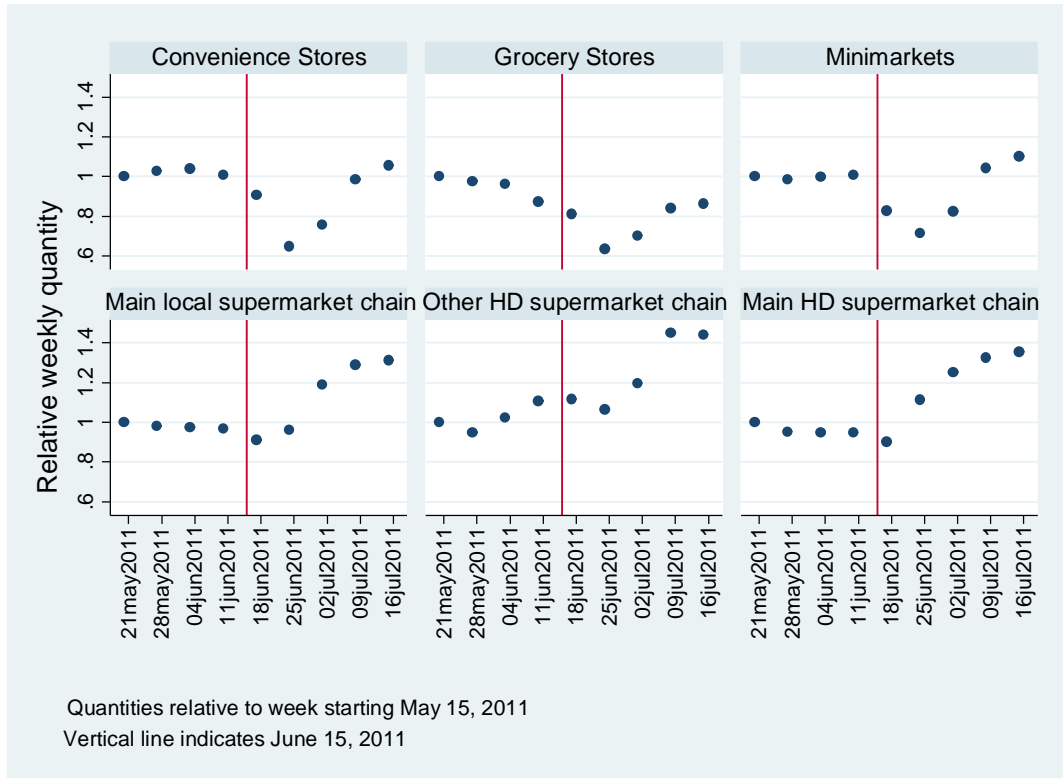


Figure 7: Relative weekly quantity of cottage cheese sold by store format (all brands)

Figure 7 confirms that the boycott initially lowered sales, but not uniformly across store formats: the decrease in quantity sold is mainly observed in the smaller store formats (convenience, grocery stores, and minimarkets), where quantities sold declined by about 20% on average during the week the boycott started. These formats account for about 40% of the observations but only 9% of quantity sold. By contrast, the boycott had only a slight negative effect on sales in larger store formats.

Figures 4 and 7 present a consistent picture: stores that did not immediately cut prices – the smaller store formats – experienced declines in sales, whereas stores that did cut prices – the larger store formats – actually gained sales.

Figure 8 indicates that the decline in quantity sold was more pronounced in the city of Tel Aviv-Jaffa – which represents about 10% of the observations and 8.7% of the quantity sold – than in the rest of the country. Quantities sold declined by 15% in Tel Aviv-Jaffa between the week ending on June 10 and the week ending on June 24. In conjunction with the decline in prices, this represented a loss of 32% in revenues during that two-week period.

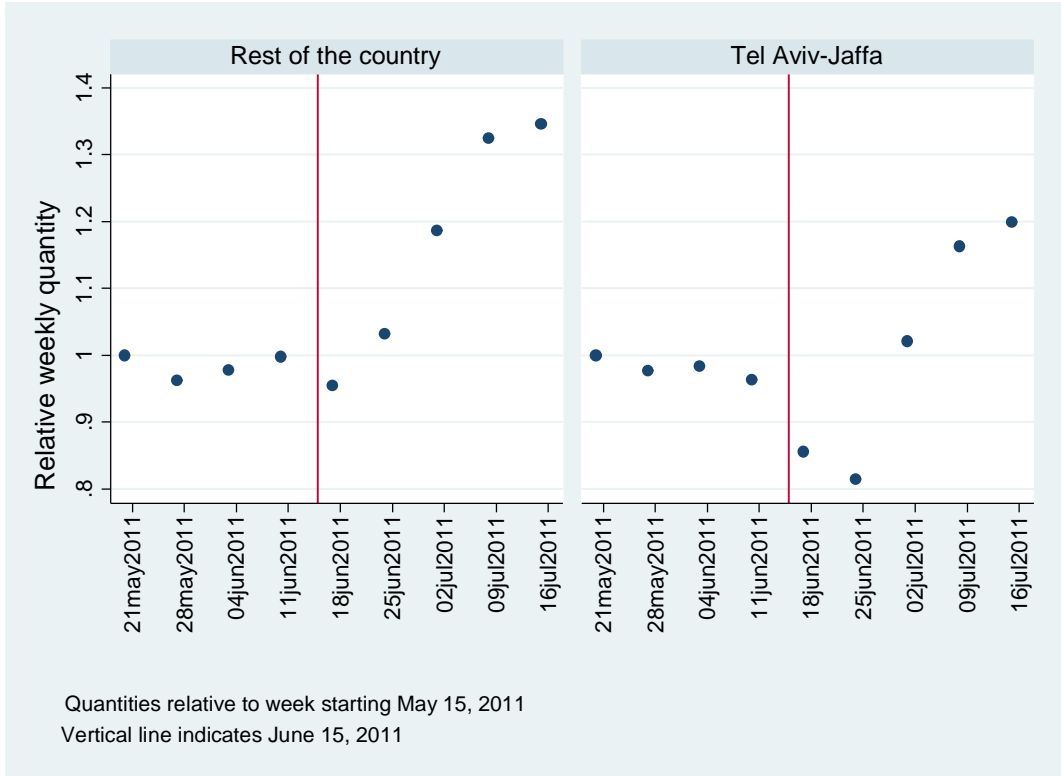


Figure 8: Relative weekly total cottage cheese quantity sold by location (all brands)

### 4.3 Demand versus quantity decline

As observed in Figures 6-8, quantities of cottage cheese initially declined but, after a week or two, they were back to the pre-boycott level and kept increasing thereafter. This change in quantities sold was likely prompted by the immediate, and steep, price concessions. The quantity data reflect shifts of the demand function, as well as movements along the demand function, as prices were drastically reduced. We therefore cannot infer from sales data alone whether the boycott induced a change in demand. In order to do this, we estimate a demand system and use it to impute the move along the demand curve, given the observed price decline, in order to infer the downward shift of the demand curve associated with the boycott. We interpret this downward shift as the “*boycott impact-on-demand*.”

While the purchase decision at the household level is a discrete choice – how many units and what brands to purchase – in the absence of consumer level data, we can only estimate an aggregate demand system. We could still use a discrete choice model of aggregate demand, but we do not think it is necessary as the choice set is limited (only six products), and the store-level, daily data provide us with a large number of observations.

Our basic specification assumes that the demand for product  $j$  at store  $s$  in day  $t$  is linear

in logs:

$$\log q_{jst} = \alpha_{sj} - \beta_j \log p_{jt} + \sum_k \gamma_{jk} \log p_{kt} + x_t \delta + \varepsilon_{jst}, \quad j = 1, 2, \dots, 6, \quad k \neq j \quad (2)$$

where  $\alpha_{sj}$  is a brand-specific intercept for each store  $s$ ,  $x_t$  are exogenous covariates that vary only over time (day-of-the-week dummies and week dummies), and  $\varepsilon_{jst}$  is an *i.i.d.* shock.

Price endogeneity is always a concern when estimating demand functions. First, there is a cross-sectional concern that stores may be of heterogeneous quality (service, location, product assortment, etc.), and quality may determine both sales and prices. Ignoring store heterogeneity may bias price elasticities. The structure of our data allows us to control for brand-store fixed effects to deal with this type of endogeneity at the store level. In addition, there is a time dimension concern if unobserved demand shocks drive both prices and quantities. We therefore use dummies for the “day of the week” to control for within-week variation, and dummies for each of the 121 weeks in the sample to control, in a very flexible way, for time trends and main holidays.

Demand estimates are described in Section 5 (Table 2). For now, we only use the estimated parameters for the pre-boycott period (January 1, 2010 – June 14, 2011) to construct a predicted quantity under the pre-boycott demand function at post-boycott prices. Formally, we define the boycott impact-on-demand index at any time  $t$  as follows:

$$BI(p_t) = 100 \times \left( \frac{q_t}{q_0^*(p_t)} - 1 \right),$$

where  $t$  is a period after the boycott started,  $q_0^*(p_t)$  is the predicted quantity under the pre-boycott demand function at observed prices  $p_t$  and  $q_t$  are observed sales at time  $t$ .

The index  $BI(p_t)$  captures the gap between observed and predicted sales, in percentage terms, at observed post-boycott prices. It measures how much lower demand in period  $t$  is, relative to what it would have been expected at prices  $p_t$  had the boycott not occurred. Negative values of the index indicate that sales were below their expected level. The more negative the index, the more intense the boycott effect is. The  $BI$  index proxies for foregone sales and will help us to evaluate the initial impact of the boycott, as well as its evolution throughout the summer of 2011, in reaction to the partial price concessions and to the creation of additional consumer groups joining the boycott.

Details of the computation of  $BI(p_t)$  are presented in Appendix B. Figure 9 shows  $BI(p_t)$  from the start of the boycott on June 14, 2011 until the end of August, 2011.

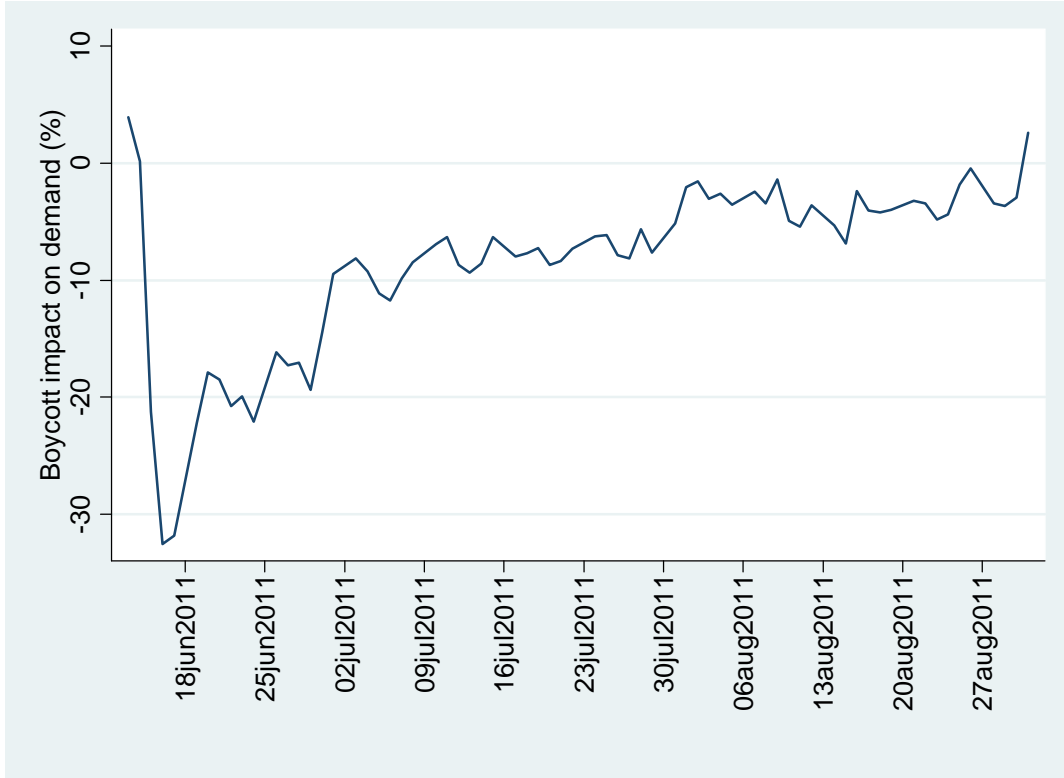


Figure 9: Boycott impact-on-demand index (all brands)

Figure 9 shows an immediate and quite strong effect: sales are much lower than anticipated given the substantial price reductions. Gradually, the boycott impact diminishes. About six weeks after its start, the boycott effect all but fizzled out: sales recovered and surpassed pre-boycott levels due to the lower prices, and matched expected demand based on pre-boycott preferences.

Underlying the evolution of the BI index is a downward shift of demand as displayed in Figure 10. The move from  $(q_0, p_0)$  to  $(q_1, p_1)$  represents about a 30% decline in the quantity that would have been sold at the new post-boycott price  $p_1$  with the pre-boycott demand function. Over time, demand shifts gradually outward and the BI index declines. Towards the end of August, 2011, demand reaches point  $(\hat{q}(p_1), p_1)$  on the old demand curve and the BI index then is zero. As we will show in 5, the post-boycott demand curve – passing through  $(\hat{q}(p_1), p_1)$  – is more elastic than the pre-boycott demand curve.

Judging by the evolution of the *BI* index, firms rightfully reacted with immediate price concessions, but then correctly perceived there was no need for further price reductions, despite the creation of additional boycott groups on Facebook. The public appear to have been satisfied with their initial accomplishments.

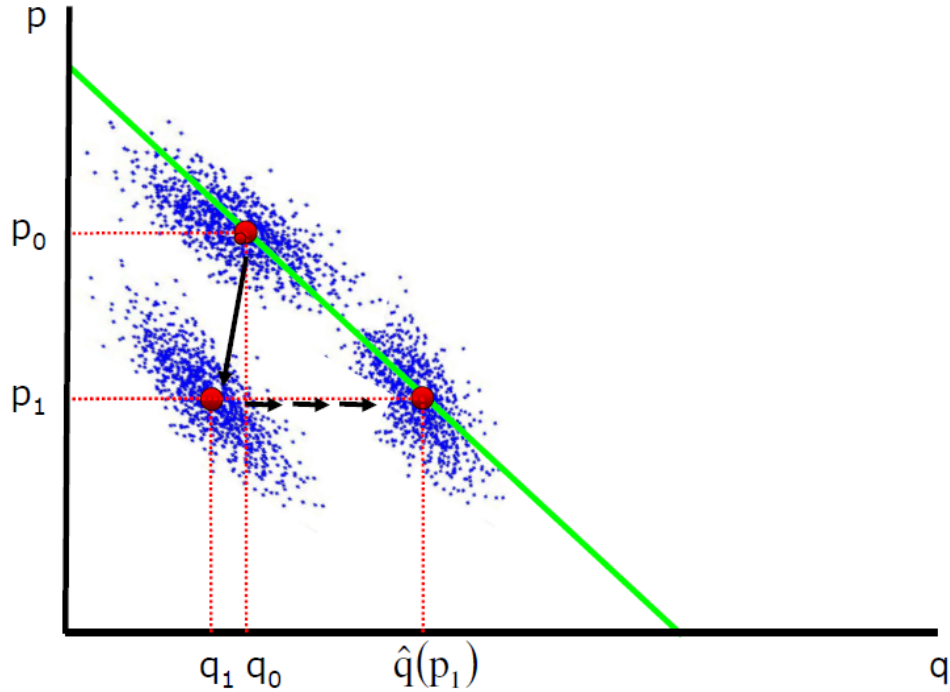


Figure 1: Figure 10: The evolution of the *BI* index

## 5 What did the boycott do?

The previous Sections shows that, by and large, the public rallied behind the boycott organizers, forcing the three dairies and retailers to cut the prices of cottage cheese. In this Section we look at the lasting impact of the boycott; we look at how demand was affected by the boycott campaign.

### 5.1 Demand: before and after

As in most boycotts, the organizers based their argument on claims of unfair business practices in order to motivate the public to join the cause. This animosity can lead to a drop in demand, a temporary or a long-lasting one, should the reputation of the target firms be tarnished. As documented in previous Sections, demand did decline but, judging by the BI index, only temporarily. In addition, by raising the public's awareness to the high prices in the product category, the boycott may change consumers' shopping habits, possibly inducing consumer to search more and compare prices across brands, products, and store formats.<sup>34</sup> One would expect increased consumers' awareness to translate into higher own and cross price elasticities.

<sup>34</sup>Indeed, a consumer survey from August 2011, reported in the press, showed that following the boycott, a third of the respondents reported that they buy fewer consumer products, including dairy products, and 60% reported that they search for cheaper products (see <http://www.globes.co.il/news/article.aspx?did=1000674348>).

To examine the lasting impact of the boycott, we use the demand system described above, to study whether demand changed, and how these changes relate to market demographics. We estimate variants of equation (2) interacting each regressor, including the store effects, with a before/after indicator. The sample period is January 1, 2010 until April 30, 2012, excluding the subperiod May 15, 2011 - October 2, 2011. This subperiod covers the cottage cheese boycott, as well as the tents protest, and is excluded because we want to use data from periods where consumer preferences are stable.<sup>35</sup> We estimate each equation separately because there are no efficiency gains to joint (SUR) estimation. Table 2 reports OLS elasticity estimates, controlling for the various fixed effects.

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<sup>35</sup>We also excluded the subperiod corresponding to a strike at one of the manufacturers (March 18, 2012-April 3, 2012)



**Table 2: Cottage cheese own and cross price elasticities**

		Dep. Var: log quantity					
		(1)	(2)	(3)	(4)	(5)	(6)
Brand		A	B	C	A	B	C
Constant							
	before	9.352***	9.578***	9.922***	10.623***	9.694***	11.761***
	after	-1.426***	-1.927***	-1.24***	-1.382***	-1.094***	-2.108***
Log Price A							
	before	-1.564***	0.505***	0.144	-1.283***	0.603***	0.274**
	after	-1.694***	2.053***	1.772***	-1.572***	2.013***	1.81***
Log Price B							
	before	0.108***	-3.632***	0.114**	0.09***	-3.446***	0.226***
	after	0.69***	-4.706***	0.596***	0.237***	-4.438***	0.515***
Log Price C							
	before	0.031	0.238***	-4.3***	0.092**	0.285***	-3.85***
	after	0.467***	0.807***	-5.071***	0.464***	0.65***	-5.78***
Log Price A white cheese							
	before	–	–	–	-0.207***	-0.084*	-0.166**
	after	–	–	–	-0.080	0.104	0.355***
Log Price B white cheese							
	before	–	–	–	0.012	0.019	0.034
	after	–	–	–	0.021	0.383***	0.015
Log Price C white cheese							
	before	–	–	–	-0.037	0.003	-0.373***
	after	–	–	–	0.037	0.195**	0.68***
	Nobs	431,954	431,954	431,954	330,907	330,907	330,907
	R squared	0.88	0.74	0.72	0.87	0.72	0.71

Daily price data are used. The sample period is from January 1, 2010 until April 30, 2012 excluding the boycott period (May 15, 2011-October 2, 2011) and the period corresponding to a strike at a major manufacturer (March 18, 2012-April 3, 2012). Before(after) indicates the coefficient value during the period before (after ) the boycott. All regressions include “day of the week” and store effects whose values are allowed to change before and after the boycott, as well as a set of week dummies to capture weekly aggregate effects over the sample period. Standard errors clustered at the store level.

p<0.05; \*\* p<0.01; \*\*\* p<0.001

In Columns 1-3, we include cottage cheese prices only – own price and the price of the other two brands. Own (brand) price elasticities are negative and of reasonable size. They increase, in

absolute value, after the boycott for all brands, but the increase is statistically significant only for brands B and C. This is consistent with consumers becoming more price sensitive after the boycott. Interestingly, brand A's own price elasticity, which did not significantly change after the boycott, is a lot smaller than that of the other two brands.<sup>36</sup> This is interesting because all three brands were similarly priced before the boycott, despite the large difference in price elasticities. We return to this point in Section 7.2.

Cross-brand price elasticities are all positive so that brands are perceived by consumers as substitutes. The cross-brand elasticities increase significantly after the boycott: consumers become more willing to substitute across brands. The increase in cross price elasticities is quite substantial: the average of the six cross-brand price elasticities, across the three equations, was 0.19 before the boycott and increased five-fold to 0.99 after the boycott. Especially large is the increase in substitutability between brands A and C.

The change in elasticities is consistent with the boycott having increased consumer awareness prompting them to engage in more active search for lower prices and in more substitution across brands.

In Columns 4-6 we add the prices of the three brands of white cheese. The number of observations is reduced by about 23% since many stores do not sell all six products on any given day. The effect of white cheese prices on the demand (own and cross-brand elasticities) for cottage is minimal and, in many instances, not significantly different from zero. In order to use a larger sample, we omit white cheese prices from the regressions that follow.

## 6 Social Networks

The consumer boycott was initiated and managed on Facebook, although it received wide media coverage. To look at the role of social networks, we study the link between demographics that proxy for social media utilization (at the local level) with: (i) the decline in sales at the peak of the boycott, and (ii) changes in demand changes from before to after the boycott.

The demographic data come from the 2008 Israel Census of Population conducted by the Central Bureau of Statistics. It corresponds, when available, to the statistical area in which the store is located. A statistical area is a relatively small, homogenous, geographical area (with population between 2,000 and 5,000) within cities, defined by the Central Bureau of Statistics (similarly to census tracts in the US). When we do not have data at the statistical area, the match is done using demographic data at the subquarter, quarter, or city level.

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<sup>36</sup>The finding that A's own price elasticity did not change is consistent with customers (including those of A) becoming more price sensitive, for example, if the least loyal customers (more price sensitive) migrated away from A.

## 6.1 Who participated in the boycott?

We correlate the decline in sales (from the pre-boycott period to the peak of the boycott) with several demographics, which proxy for the use of social media.

Let

$$\Delta q_{bs}^c = 100 \times \left( \frac{\sum_{t \in (\text{June}12-\text{June}24)} q_{bst}^c}{\sum_{t \in (\text{May}22-\text{June}3)} q_{bst}^c} - 1 \right),$$

where  $q_{bst}^c$  is the quantity in grams of 3% and 5% cottage cheese of brand  $b = A, B, C$  sold in store  $s$  at time  $t$ .

$\Delta q_{bs}^c$  measures the percentage change in the total quantity of cottage cheese of brand  $b$ , sold in store  $s$ , during the first two weeks of the boycott, relative to the quantity sold during the two weeks before the boycott.<sup>37</sup> We regress  $\Delta q_{bs}^c$  on six demographic variables associated with stores' location; we run separate OLS regression for each demographic variable (each store is an observation).<sup>38</sup> The estimated coefficients are reported in Table 3.<sup>39</sup>

**Table 3:  $\Delta q_{bs}^c$  correlation with social media proxies**

	$\Delta q_{As}^c$	$\Delta q_{Bs}^c$	$\Delta q_{Cs}^c$
Coefficient of:			
% of households using a PC	-.0031***	-.0084*	-.0293***
% of households with an Internet subscription	-.0024***	-.0036	-.0182**
% of those aged 15 and over with first academic degree	-.0048***	-.0255***	-.0637***
Average number of mobile phones per household	-.0517***	.0531	-.1436
% of Jewish men aged 15 and over who study in a "yeshiva"	.0014**	.0009	.0095*
% of those aged 65+	.0026**	-.0020	.0155
Standard errors clustered at the statistical area level			
p<0.05; ** p<0.01; *** p<0.001			

The first four demographic variable – % of households using a PC through average number of mobile phones per household – can be thought of as indirect measures of accessibility to social media, and are likely to be positively correlated with the use of social networks. All four demographics turn out to be negatively correlated with changes in quantity, especially in the case of brand A.

<sup>37</sup>We do not include the week immediately before the boycott, June 5-June 10, because of the Shavuot holiday occurring on June 8 and 9.

<sup>38</sup>Czernich (2012), Miner (2012), Falck, Gold, and Heblich (2013), and Campante, Durante, and Sobbrío (2013) employ a similar empirical strategy and regress political outcomes, such as votes for particular parties and voters' turnout in different areas, on internet penetration in these areas..

<sup>39</sup>We do not report mean changes, as the data acquisition agreements does not allow us to disclose quantity information by brand.

This suggests that stores located in areas with higher exposure to social networks experienced the largest quantity declines (or smaller increases due to price declines).<sup>40</sup>

The last two variables, religiosity and age, are likely to be negatively correlated with participation in social networks. The coefficients are mostly positive, suggesting that stores located in religious neighborhoods and in neighborhoods with older population, where exposure to social networks is likely to be low, experienced smaller quantity declines. Once again, brand A has the most significant estimates.

Table 3 presents evidence suggesting that the use of social networks and media facilitated the diffusion and impact of the cottage cheese boycott.

## 6.2 Who was influenced by the boycott?

We now examine whether demand changed differentially by demographic composition. We use the percentage of the population above 15 years old with a bachelors degree, and the percentage of households using a personal computer (PC). Appendix D shows results for the other demographics. For each demographic variable, we defined a dummy equal to one if the location is above the median value. In the median location, 17% of their 15+ population has an academic degree, and 78% of their households use a PC.

Table 4 presents demand estimates allowing elasticities to depend on demographics. We basically allow for a different constant and price elasticities across locations with below and above average values of each covariate. We also allow the estimates to vary before and after the boycott. We can thus assess the relation between demographics and price sensitivity, and more importantly, the relation between demographics and the changes in elasticities.

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<sup>40</sup>Since we are not controlling for prices, one may worry that the correlation is capturing some implicit link to price reaction. That is not the case. The price reduction over the same period is not correlated with the demographics because price changes were not location-specific.

Table 4: Cottage cheese own and cross price elasticities and demographics

Dep. Var: log quantity						
Brand	Percentage of households using a PC			Percentage with first academic degree		
	(1) A	(2) B	(3) C	(4) A	(5) B	(6) C
Constant						
before below	12.508***	12.793***	13.483***	11.443***	11.784***	12.388***
before above	-3.551***	-3.991***	-4.721***	-2.5***	-3.119***	-3.553***
after below	-1.82***	-0.084	0.175	-0.937***	-2.204***	-1.519***
after above	omitted	omitted	omitted	omitted	omitted	omitted
Log Price A						
before below	-1.855***	0.266**	-0.042	-1.928***	0.152	-0.072
before above	-1.174***	0.837***	0.415*	-1.211***	0.872***	0.358*
after below	-1.923***	2.193***	1.757***	-2.072***	2.375***	2.02***
after above	-1.376***	1.947***	1.817***	-1.266***	1.817***	1.634***
Log Price B						
before below	0.128***	-4.067***	0.07	0.105**	-4.129***	0.088
before above	0.099***	-3.145***	0.157*	0.127***	-3.112***	0.187**
after below	0.343***	-5.129***	0.612***	0.373***	-5.047***	0.6***
after above	0.18***	-4.247***	0.551***	0.147**	-4.445***	0.551***
Log Price C						
before below	0.033	0.274***	-4.886***	0.023	0.251***	-4.887***
before above	0.047	0.199**	-3.453***	0.070	0.265***	-3.503***
after below	0.43***	0.765***	-5.343***	0.431***	0.837***	-5.419***
after above	0.511***	0.891***	-4.784***	0.548***	0.89***	-4.812***
Nobs	426,881	426,881	426,881	409,972	409,972	409,972
R squared	0.88	0.74	0.72	0.88	0.74	0.72

The sample period is from January 1, 2010 until April 30, 2012 excluding the boycott period (May 15, 2011-October 2, 2011) and the period corresponding to a strike at a major manufacturer (March 18, 2012-April 3, 2012). Before(after) indicates the coefficient value during the period before (after ) the boycott. Below (above) indicates the coefficient value for locations below (above) the median value of the corresponding demographic variable. All regressions include “day of the week” and store effects whose values are allowed to change before and after the boycott, as well as a set of week dummies to capture weekly aggregate effects over the sample period. Standard errors clustered at the store level

p<0.05; \*\* p<0.01; \*\*\* p<0.001

Two results are worth mentioning. First, demand is less price sensitive in localities with higher computer usage and with more educated populations. These differences are statistically significant, and are present both before and after the boycott.<sup>41</sup> These covariates are likely to be associated with different income levels (we do not have income data) and therefore our findings suggest that richer households are less price sensitive.

Second, the own price elasticities of brands B and C increased (in absolute value) more after the boycott in areas with more computers and more education. The change in brand A's own price elasticity is minimal and not statistically different from zero. Thus, taking both demographics as proxies for social media usage, we observe that locations with higher social media exposure experienced larger changes in elasticity that occurred coincidentally with the boycott.

## 7 Firms' Incentives

### 7.1 Did firms fear a spillover?

Firms made rapid price concessions, perhaps fearing that the boycott could spill over to other product categories.<sup>42</sup> We can partially explore this possibility by examining the evolution of the sales of white cheese around the time of the boycott. If consumers were targeting other products besides cottage cheese, we may also see a decline in the sales of white cheese.

Figure 11 shows the total weekly quantity of white cheese sales.

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<sup>41</sup>This and other statements on statistical significance are based on statistical tests which are not shown for the sake of brevity. Results available upon request.

<sup>42</sup>According to the press, the overall sales of Tnuva in some retail chains have dropped by 7% – 8% after the boycott started (see <http://www.globes.co.il/news/article.aspx?did=1000682092>). Moreover, press reports in December 2011 reveal that many firms (manufacturers and retailers) have decided to keep a low profile due to the negative sentiment of the public: “We feel that the public today hates all firms”, a retail chain executive was quoted (see <http://www.themarket.com/advertising/1.1599266>).

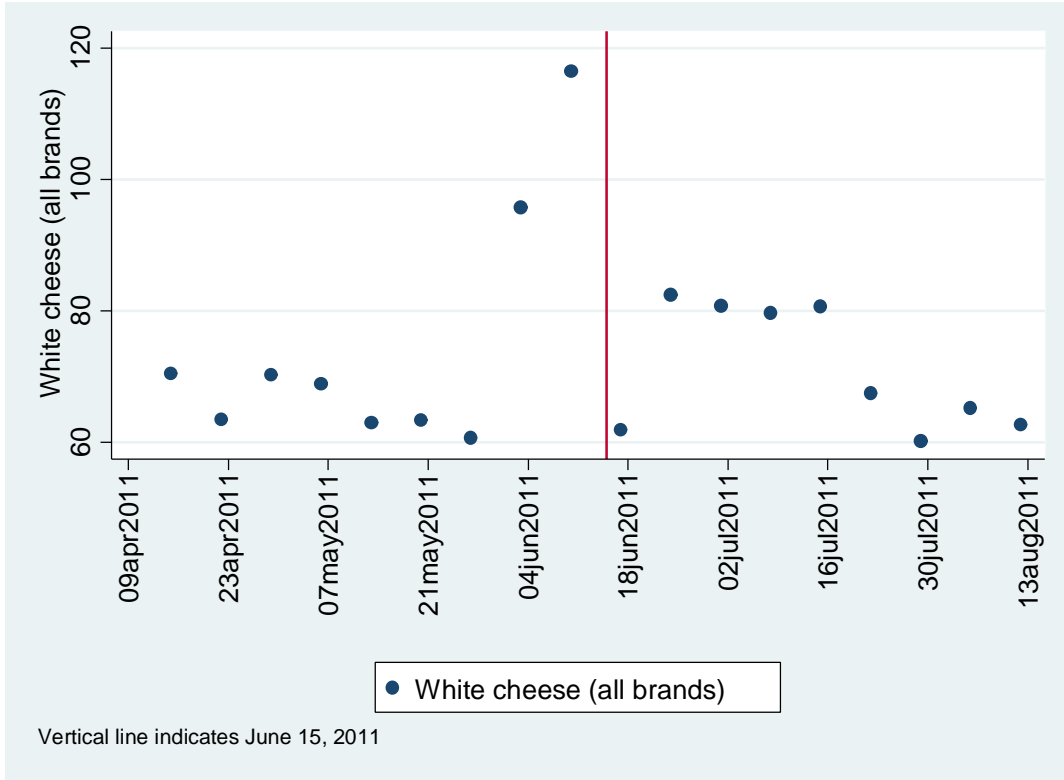


Figure 11: Weekly total quantity of white cheese sold (in tons)

The spike in demand just before the boycott is due to the Shavuot holiday which is traditionally a peak demand for dairy products, and white cheese in particular. In any event, we do not observe major unusual patterns in the quantities of white cheese sold around the start of the boycott. If anything, there is a small increase in quantity sold, just after the boycott began.

Figure 12 shows the distribution of the price of white cheese by brand,  $p_{bst}^w$ , which we compute using equation (1).

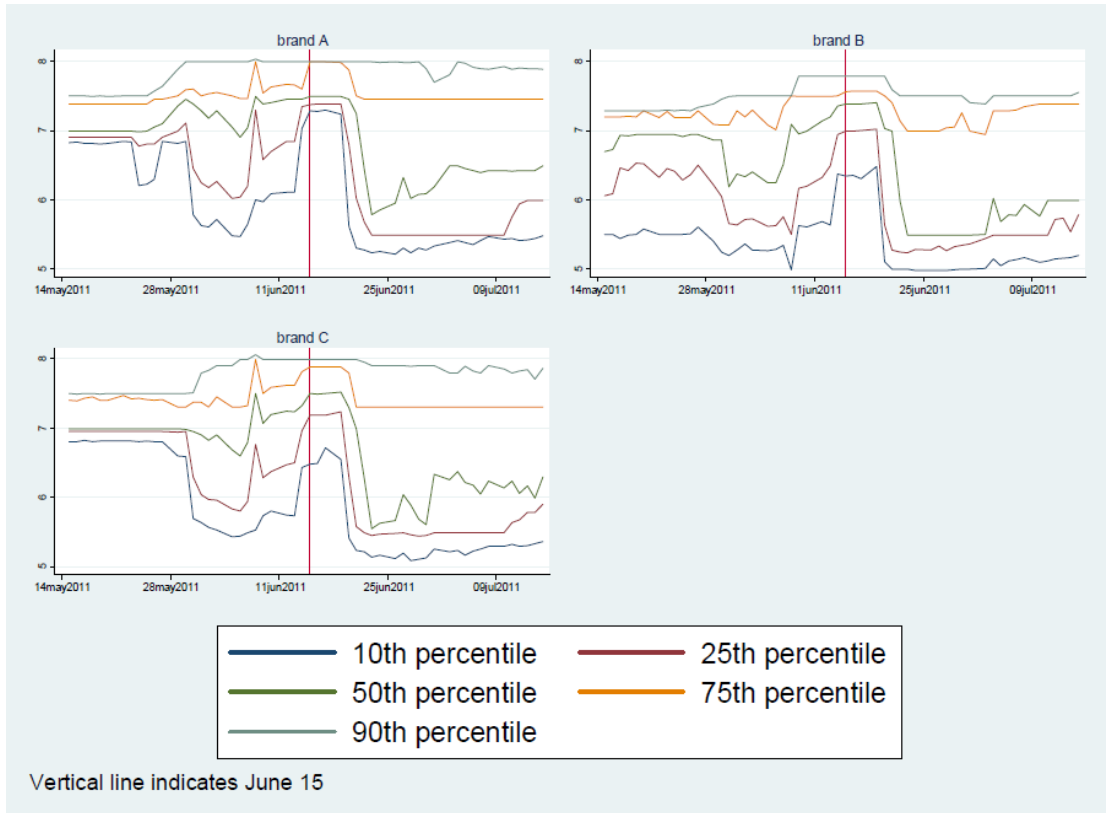


Figure 12: Distribution of white cheese prices by brand around the boycott period

White cheese prices increased for a few days after the start of the boycott, perhaps in response to substitution of consumers away from cottage cheese. The price increases are more pronounced at the lower percentiles of the price distribution. Prices then drop after new groups formed on Facebook, calling for the boycott of additional dairy products, specifically demanding that the price of white cheese drop to around 5 NIS as well. It appears that firms did not initially fear a spillover (they even raised white cheese prices, as sales increased around June 15), but once the boycotters started expanding their demands to other dairy products, we observe price declines in the white cheese category as well.

## 7.2 Decomposition of the price decline

Two competing hypotheses can explain the price decline that followed the boycott. First, higher elasticities – perhaps due to increased price awareness – should lead to lower optimal prices. Second, firms’ fear of the harm boycotters could inflict to cottage cheese, as well as to other products, as well as the concern for re-regulation of prices, and potential legal action, may have prompted price concessions. Having estimated demand elasticities before and after the boycott, we can follow the Industrial Organization tradition, and use the price elasticities, together with first order conditions at the product level, to impute markups, before and after the boycott. This exercise



would allow us to assess how much of the observed price decline is implied by the change in preferences (elasticities). The proportion of the price decline that cannot be attributed to changes in elasticities can – as a residual – be interpreted as the firms’ reactions to the boycott threats.

Rearranging the first-order conditions for profit maximization with respect to price, we get the standard markup equation  $\frac{p-c}{p} = \frac{1}{\eta}$ , or  $p = \frac{\eta c}{\eta-1}$ , where  $c$  represents marginal cost, and  $\eta$  own price elasticity. Using elasticities before and after, while assuming  $c$  remained unchanged, we can solve for the expected price increase associated with demand changes.

The exercise is trivial for firm A since we did not find a change in A’s own price elasticity. Thus, the only explanation for the price decline of brand A is that management was afraid of the losses inflicted by boycotters. Using the change in estimated elasticities for brands B and C, we can impute between 5% and 10% price decline to the change in demand, which accounts for a fraction of the observed price decline. Thus, for these firms as well, the boycott directly influenced pricing.

## 8 Summary and conclusions

We study a consumer boycott organized through Facebook aimed at forcing manufacturer and retailers to lower prices in a concentrated market. We find that demand declined about 30% during the initial week of the boycott. Firms reacted swiftly. While the boycott lasted for several months, firm did not offer further concessions. Demand changed after the boycott. Demand elasticities increased, especially cross price elasticities which, on average, increased fivefold.

Using data on demographics, we find that proxies for social media utilization are correlated with the boycott intensity (extent of quantity decline). These proxies also explain changes in demand elasticities. Areas with higher social media penetration had higher participation in the boycott, and are associated with larger increases in demand elasticities.

## A Summary of the main events

**Table 1: Summary of main events**

Date	Event
May 31, 2011	News articles describing the surge in food prices in Israel begin to be published
June 7-9, 2011	Shavuot holiday (traditionally a peak demand for dairy products)
June 14, 2011	A Facebook event is created, calling for a boycott of cottage cheese, starting on July 1, 2011
June 14, 2011	Several supermarket chains announce special sales of cottage cheese and other dairy products
June 15, 2011	The number of users who join the Facebook event approaches 30,000 <sup>43</sup>
June 16, 2001	The leaders of the Facebook event announce that the boycott will start immediately and recommend buying cottage and white cheese only if their prices drop under 5 NIS <sup>44</sup>
June 17, 2011	The number of users who join the Facebook event passes 70,000 <sup>45</sup>
June 24, 2011	Mrs. Zehavit Cohen, the chairperson of Tnuva's board, announces in a TV interview that Tnuva will not unilaterally lower the price of its cottage cheese Following the interview, three new groups who call for boycotting all of Tnuva's products were formed in Facebook Tnuva lowers the wholesale price of cottage cheese to 4.55 NIS; soon after, Strauss and Tara follow suit <sup>46</sup>
June 27, 2011	The government appoints the Kedmi committee to review competition and prices in food and consumption markets in Israel
June 30, 2011	The number of users who join the Facebook event surpasses 105,000 <sup>47</sup>
July 14, 2011	The "tents protest" starts on Rothschild Boulevard in Tel Aviv
July 17, 2011	The Kedmi committee recommends reforms in the dairy market
July 30, 2011	Mass rallies in major cities across Israel to protest the rising cost of living and demanding social justice
Sept. 3, 2011	Around 300,000 people demonstrate in Tel Aviv against the rising cost of living and demanding social justice. This demonstration marks the peak of the social protest
Early Sept., 2011	12 student's associations announce their intention to boycott Tnuva until it lowers its prices <sup>48</sup>
Sept. 25, 2011	The Israeli Antitrust Authority raids Tnuva's central office as part of an open investigation of the extent of competition in the dairy industry
Oct. 2, 2011	Mrs. Zehavit Cohen announces its resignation as the chairperson of Tnuva's board. Tnuva announces that it will cut the prices of all its products by 15%.

<sup>43</sup>See [www.ynet.co.il/articles/0,7340,L-4082323,00.html](http://www.ynet.co.il/articles/0,7340,L-4082323,00.html) and <http://www.themarket.com/markets/1.656978>

## B Data Appendix

In this Appendix we describe the process by which the initial working sample was generated. We start with 22,788,084 observations, where each observation records the daily total volume of transactions recorded by the cash register on a specific item, in a specific store, in a specific day. An item is identified by its unique barcode.

1. **Negative values.** 77 observations had negative missing values for 3 key variables (number of items sold, total weight sold, total number of containers sold). The values of these variables were set to missing.
2. **Duplicates.** 955 observations had one additional duplicate observation and 290 additional observations had three additional duplicate observations. The 1,825 additional “copies” were deleted and only one original observation was kept.
3. **Repeated observations.** Each observation should represent the total transactions in each store per day and item. That is, all the transactions for a given item are aggregated to a daily total. However, 105 (store, date, item) observations appear more than once. We keep these repeated observations (but not exact duplicates since the revenue and weight may vary) in the sample.
4. **Small revenue.** We delete 1,859 observations with total daily revenue of less than 1 NIS.
5. **Non-integer number of containers.** 76 observations have non-integer number of containers (and items) sold; they also have non-integer total weights sold. They maybe selling by weight. We keep these observations and flag them by `Noninteger(=1)`. The price per container would not make much sense for these observations.

After these changes were made to the original sample we were left with 22,784,400 observations.

## C Computation of the BI index

We compute the observed and predicted quantities for each brand separately and then add them up to get the (aggregate) BI index. We illustrate with brand *A*.

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<sup>44</sup>See <http://www.themarket.com/markets/1.656978> and <http://www.ynet.co.il/articles/0,7340,L-4083268,00.html>

<sup>45</sup>See [www.ynet.co.il/articles/0,7340,L-4082323,00.html](http://www.ynet.co.il/articles/0,7340,L-4082323,00.html) and <http://www.themarket.com/markets/1.656978>

<sup>46</sup>See <http://www.haaretz.co.il/misc/1.1178816>

<sup>47</sup>See <http://www.haaretz.co.il/misc/1.1178816>

<sup>48</sup>See <http://www.calcalist.co.il/local/articles/0,7340,L-3530639,00.html> and <http://news.walla.co.il/?w=/3/1858515>

First,  $q_t$  is the daily quantity sold of brand A cottage cheese observed in the data. Second,  $q_0^*(p_t)$  is the predicted quantity sold of brand A under the pre-boycott demand at post-boycott prices  $p_t$ . This predicted quantity is computed in two steps. Denote by  $\widehat{q}(p)$  the fitted (predicted) quantity demanded estimated using the pre-boycott estimates. The expected increase in quantity attributed to the observed price decline (a move along the demand curve) is given by  $\widehat{q}(p_t) - \widehat{q}(p_{t_0})$ , where  $p_{t_0}$  are prices at a pre-boycott time  $t_0$ . Thus, predicted sales are:

$$q_0^*(p_t) = q_{t_0} + [\widehat{q}(p_t) - \widehat{q}(p_{t_0})]$$

where  $q_{t_0}$  is the average quantity sold at the pre-boycott time  $t_0$ .

We use the demand function to estimate changes in quantity rather than its level because doing this is more reliable as it is based on observed quantities until the start of the boycott, and does not require the use of the numerous estimated fixed effects.

We use the estimated parameters of the demand function appearing in the first three columns in Table 2 to compute the expected change in demand between the initial period  $t_0$  and  $t$ ,  $\widehat{q}(p_t) - \widehat{q}(p_{t_0})$ ,

$$\widehat{\ln q_A}(p_t) - \widehat{\ln q_A}(p_{t_0}) = \widehat{\beta}_A (\log p_{At} - \log p_{At_0}) + \widehat{\gamma}_B (\log p_{Bt} - \log p_{Bt_0}) + \widehat{\gamma}_C (\log p_{Ct} - \log p_{Ct_0}),$$

where  $\widehat{\beta}_A$ ,  $\widehat{\gamma}_B$  and  $\widehat{\gamma}_C$  are, respectively, the own and cross-price elasticities from the first column in Table 2 before the boycott started, and  $\log p_{At_0}, \log p_{Bt_0}, \log p_{Ct_0}$  are prices in the pre-boycott period, being set equal to the mean price during June 9-June 13, 2011.

We then have, for brand A,

$$q_0^*(p_t) = q_{t_0} + e^{\widehat{\ln q_A}(p_t) - \widehat{\ln q_A}(p_{t_0})},$$

and similarly for the other brands.

We then add up the observed and predicted quantities over the three brands and compute the aggregate *BI* index. The daily variation in quantity sold during the week is also reflected in the *BI* index. We therefore remove “day-of-the-week” effects by using the residuals from a regression of the *BI* index on day-of-the-week fixed effects. Furthermore, for ease of exposition, in Figure 9 we show a normalized *BI* index obtained by subtracting its value on June 14, 2011.

## D Interaction with additional demographics

Table D1: Cottage cheese price elasticities (daily price data) and demographics

Brand	Dep. Var: log quantity					
	% of households with Internet subscription			Average number of mobile phones per household		
	A	B	C	A	B	C
Constant	9.60	10.158***	10.538***	12.057***	11.597***	12.821***
before above	2.901***	1.871***	2.21***	-2.682***	-2.051***	-2.943***
after below	-0.559***	-1.217***	-1.08***	-0.798***	-0.468	-0.361
after above	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Log Price A						
before below	-1.84***	0.334***	0.075	-1.587***	0.514***	0.133
before above	-1.218***	0.752***	0.274	-1.536***	0.507***	0.167
after below	-1.887***	2.129***	1.802***	-1.849***	1.83***	1.761***
after above	-1.448***	1.997***	1.701***	-1.52***	2.299***	1.795***
Log Price B						
before below	0.136***	-4.083***	0.087	0.128***	-3.641***	0.107
before above	0.091***	-3.171***	0.129*	0.091***	-3.609***	0.120
after below	0.33***	-4.976***	.604***	0.29***	-4.942***	0.597***
after above	0.186***	-4.393***	.553***	0.235***	-4.437***	0.577***
Log Price B						
before below	0.0296	0.279***	-4.825***	0.066	0.233***	-4.299***
before above	0.0415	0.188**	-3.649***	-0.002	0.245***	-4.285***
after below	0.419***	0.744***	-5.341***	0.459***	0.748***	-5.197***
after above	0.518***	0.925***	-4.791***	0.482***	0.903***	-4.928***
Nobs	426,881	426,881	426,881	426,881	426,881	426,881
R squared	0.88	0.74	0.72	0.88	0.74	0.72

Daily price data are used. The sample period is from January 1, 2010 until April 30, 2012 excluding the boycott period (May 15, 2011-October 2, 2011) and the period corresponding to a strike at a major manufacturer (March 18, 2012-April 3, 2012). Before(after) indicates the coefficient value during the period before (after ) the boycott. Below (above) indicates the coefficient value for locations below (above) the median value of the corresponding demographic variable. All regressions include "day of the week" and store effects whose values are allowed to change before and after the boycott, as well as a set of week dummies to capture weekly aggregate effects over the sample period. Standard errors clustered at the store level. \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$

Table D2: Cottage cheese price elasticities (daily price data) and demographics

Brand	Dep. Var: log quantity					
	% of Jewish men aged 15 and over who study in a "yeshiva"			% of those aged 65+		
	A	B	C	A	B	C
Constant	10.885***	10.774***	11.398***	9.44***	9.861***	9.721***
before above	-1.234***	-0.832***	-1.227***	2.731***	2.053***	3.153***
after below	-1.576***	-2.257***	-2.005***	2.062***	1.067***	-0.084
after above	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Log Price A						
before below	-1.386***	0.557***	0.101	-1.644***	0.437***	0.422**
before above	-1.831***	0.344***	0.053	-1.506***	0.579***	-0.119
after below	-1.763***	2.133***	1.884***	-1.63***	1.987***	1.983***
after above	-1.67***	2.256***	1.888***	-1.795***	2.188***	1.536***
Log Price B						
before below	0.106***	-3.401***	0.165**	0.121***	-3.86***	0.13
before above	0.113**	-3.893***	0.118*	0.097***	-3.42***	0.105*
after below	0.28***	-4.791***	0.582***	0.228***	-4.759***	0.679***
after above	0.253***	-4.79***	0.583***	0.306***	-4.673***	0.521***
Log Price B						
before below	0.053	0.182***	-4.109***	0.011	0.249***	-4.395***
before above	-0.002	0.295***	-4.469***	0.058	0.238***	-4.206***
after below	0.552***	0.913***	-4.894***	0.526***	0.737***	-5.183***
after above	0.427***	0.792***	-5.351***	0.428***	0.9***	-4.982***
Nobs	399,753	399,753	399,753	428,359	428,359	428,359
R squared	0.87	0.74	0.72	0.88	0.74	0.72

Daily price data are used. The sample period is from January 1, 2010 until April 30, 2012 excluding the boycott period (May 15, 2011–October 2, 2011) and the period corresponding to a strike at a major manufacturer (March 18, 2012–April 3, 2012). Before(after) indicates the coefficient value during the period before (after ) the boycott. Below (above) indicates the coefficient value for locations below (above) the median value of the corresponding demographic variable. All regressions include "day of the week" and store effects whose values are allowed to change before and after the boycott, as well as a set of week dummies to capture weekly aggregate effects over the sample period. Standard errors clustered at the store level. \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$

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