The Effects of Mandatory Disclosure of Supermarket Prices

PRELIMINARY AND INCOMPLETE

Itai Ater and Oren Rigbi*

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Abstract

We study how a regulation that required Israeli supermarket chains to post all their prices online affected prices and price dispersion in brick-and-mortar stores. Using data collected before and after the regulation, a differences-in-differences research design and various control groups, we show that supermarket chains significantly reduced the number of distinct prices that each item is sold for resulting in considerably smaller price dispersion. We also find that prices have fallen by 4% to 5% relative to the control groups, and that the decline in prices is concentrated among supermarkets that faced weaker local competition and among chains that initially set relatively high prices. We discuss alternative channels through which transparency affected prices and highlight the potential role of the media in disciplining retailers' prices.

keywords: Price Transparency; Information; Mandatory Disclosure; Retail Food

*Itai Ater is a senior lecturer in business economics and strategy at the Coller School of Management, Tel Aviv University. Oren Rigbi is a senior lecturer at the economics department at Ben Gurion University. We are grateful to suggestions and comments by Liran Einav and Hilary Hoynes as well as to participants at seminars at the Coller School of Management, the applied-micro conference at Tel Aviv University, and the 6th Israeli IO day. We benefited greatly from the excellent help of several research assistants, including: Amos Nitka, Jacques Cohen, Itamar Popliker, Dana Chap and Niv Malach. Rony Rojkin from the Israeli Consume Council kindly shared with us the ICC data, Financial support by the Eli Hurvitz Institute of Strategic Management and the Coller Foundtion is greaetly acknowledged. Remaining errors are our own. Commemts are welcome at ater@post.tau.ac.il, origbi@bgu.ac.il

1 Introduction

Does more price information promote or hinder competition? A common view in economics is that more information is likely to foster competition because firms are incentivized to set lower prices when consumers can observe price reductions. An alternative view maintains that more price information can actually be detrimental to competition as firms can use this information to coordinate prices. Which of these effects dominate? How does it depend on the nature of competition among firms? Arguably, if the pro-competitive impact of price information is stronger then policy makers may want to advance policies that mandate price disclosure. Furthermore, the implementation of such policies is probably easier these days given the low cost and the wide reach of information disseminated through the web. On the other hand, if such initiatives actually help firms to tacitly collude then surely, from the social perspective, such policies should be abandoned.

We study how price transparency affects retail food prices. Food prices are important not only because consumers spend about one sixth of their disposable income on food but also because the steep rise in food prices between 2005 and 2011 was associated with social unrest and often violence in both western and developed countries (Bellemare (2015)).[1] Though price increases are partially explained by increased demand from emerging economies, drought conditions and changes in commodity markets, policy makers are looking for ways to improve the functioning of food markets. The OECD, for instance, published a lengthy report describing the various policies taken by OECD counties to improve the operations of food markets.

Our setting offers a unique opportunity to examine the effectiveness of one such policy, a policy that made retail food prices transparent. In particular, since June 2015, Israeli food retailers are required to post online the prices of each and every item sold in their stores. Following the regulation, starting in August 2015, independent websites have began providing price comparison services. We take advantage of this change in transparency to evaluate its impact on prices, and also examine how these changes depend on the pre-existing market structure conditions. A main challenge in identifying the impact of transparency on prices is taking into account the various factors (e.g., local competition, costs, seasonality and consumers' tastes) that might also affect pricing decisions. Because these factors may change over time it is inherently difficult to attribute changes in prices to changes in transparency over a given time period. To illustrate these concerns, Figure 1 presents a time series of the basket prices for each of the supermarket chains in our data. According to the figure, both prices and price dispersion have fallen over the last two years. Price dispersion declined soon after the retailers began posting prices, and the decline in prices seem to occur afterwards. Thus, while the pattern in the figure suggests that prices have fallen after

[1] For instance, Spain, Greece and have witnessed social unrest that is often linked to the rise in food prices. While commodity prices have fallen between 2011 and 2015, since the beginning of 2016 food prices have increased by roughly 21 index points.

prices became transparent, many factors (other than transparency) might have contributed to this decline.

Our research design allows us to address such concerns. First, we use price data on more than 100 food items sold in nearly 100 stores throughout Israel. The price data were collected multiple times both in the year that preceded the transparency requirement as well as in the following year. Such a large set of items and stores mitigate concerns that observed price changes are driven by unobserved local trends or changes which are relevant to specific food items. Second, and more importantly, we identify a group of "treatment" items that became transparent after the regulation, and compare the price changes in this group against price changes in three distinct control groups. Notably, the three control groups that we use offer a different reference group relative to the treatment group. The first control group consists of prices of the same items as in the treatment group but that are sold online, through the online channel of the same supermarket chain. These prices constitute a useful control group because prices of items which are sold online remained transparent before and after the transparency regulation became effective. Second, we use prices of items that were collected since March 2013 on a bi-monthly basis by the Israeli Consumer Council (ICC). The products collected by the ICC form a representative basket of items which were often cited in the media and frequently mentioned in chains' ad campaigns as a reliable source of price data. Accordingly, we treat these items as another set of items whose price was transparent before and after the transparency regulation came into effect. Third, we use prices of items sold in stores of SuperPharm, the largest drugstore chain in Israel, as another control group. Since drugstores were exempted from the Food Act we can use their prices as a comparison group to prices in supermarkets that were subject to the Act.

In the empirical specifications, we also include various fixed effects, such as store, item and date. Accordingly, when using the online channel as a control group, our identification of the effect of transparency comes from comparing the change in prices of the same item, sold by the same chain in the same time periods but through a different channel. When using the ICC basket as control, our identification comes from comparing the change prices of different items sold in the same physical store and in the same time period. Finally, when using the drugstore prices as control, our identification comes from comparing the change in prices of the same items before and after the regulation, sold in the same week but in chains that were either subject or not subject to the regulation. Although each of the control groups might be subject to a critique, the fact that we use three control groups and obtain similar results, alleviate such concerns and gives us confidence that we actually identify the impact of transparency on prices.

Our first finding shows that shortly after prices became transparent, the average number of distinct prices that a given item was sold for significantly fell. Before prices became transparent,

on average, in our sample there were 16 distinct prices for a given item sold in brick-and-mortar stores. After prices became transparent, the average number of distinct prices fell to about 5, resulting in a much more uniform distribution of prices for each item. Figure 2 illustrates the fall in the number of distinct prices by presenting a time series of the average number of distinct prices for the items in the treatment group and in both the ICC control group and for items in that were sold through chains' online channel. As can also been seen in the Figure 2, the average number of distinct prices in the two control groups was smaller already before prices in the treatment group became transparent. This finding is consistent with our view that the prices of products in these two control groups were transparent already before the transaprency regualtion. After prices became transparent, the difference between the treatment and the control groups diminished. Notably, similar patterns are observed when we separatly examine the number of unique distinct prices in different supermarket chains. The reduction in the number of distinct prices implies that price dispersion has fallen after price became transparent. Indeed, we find that price dispersion has substantially declined also when we use conventional measures of price dispersion, such as the coefficient of variation or the percentage price range. Because the change in the number of distinct prices is observed already in August 2015, the first month that prices became transparent, we believe that it is driven by supermarket chains restructuring the pricing policy in anticipation of the future impact of transparency rather than being driven by the actual response to consumers' use of the price information.

After demonstrating the change in price dispersion, we turn to analyzing the impact on price levels. Our estimation results indicate that prices of items in the treatment group have fallen by 4 to 5 percents compared to the items in the control group. Importantly, the estimates are quite similar across the three control groups and do not significantly change in different specifications (e.g., when using price promotions). We further examine how the effect on prices varies across different chains and how it depends on the level of local competition. With regards to chains, we find that prices have primarily dropped among the chains that are generally considered more expensive. In contrast, the impact of the regulation on heavy-discount chains is largely insignificant. In the specification that focuses on the role of local competition, we find that prices have declined more in supermarkets that faced weaker competition in the pre-transparency period. Arguably, these supermarkets had higher markups and therefore transparency resulted in lower prices and lower margins at these stores.

An attractive feature of using the prices of products collected by the ICC is that identification comes from comparing change in prices of items sold in the same store and over the same time period. At the same time, a potential concern with using the ICC items as a control group is that, unlike the case for the two other control groups, the items in the ICC group are different than

the items in the treatment group. Accordingly, if consumers' search patterns for those items are different compared to the items in the treatment group then the comparison between the changes in the prices in the ICC relative to the changes in the prices in the treatment group is potentially contaminated. To address this concern, we construct a subset of 10 pairs of items that we deem comparable (10 items from the treatment and 10 items from the ICC control group). For instance, one pair of items includes 200 gram Tasters' Choice Coffee which is included in the ICC control group and a comparable items from the treatment group: a 200 gram Jacobs coffee. When we repeat the analysis for this subset of items we obtain qualitatively similar results.

After establishing the decline in both price dispersion and in price levels, we turn to examining the relationship between the change in price dispersion and the change in price levels. We first demonstrate that the change in price dispersion preceded the change in price levels. In particular, our analysis indicates that the change in price levels took place only several months after prices became transparent. We then we take advantage of this gradual impact on price levels and examine how the change in price dispersion for a given product is related to the subsequent change in the price of that product. Our analysis suggests that price dispersion and price levels are positively related. That is, products that experienced a larger reduction in price dispersion also experienced a larger reduction in prices. One possible interpretation of these findings is that in the pre-transparency period, retailers could have more easily used pricing strategies which resulted in relatively high prices. After prices became transparent and more uniform, these obfuscation pricing strategies were less effective and as a result prices have declined.

What drives the findings that we document? We highlight two main channels that we think are important. First, we show that the reduction in prices is negatively associated with the usage of websites that offer price comparison services. In particular, we use monthly data on the number of pages viewed in the main three such services, and find a negative relationship between usage and prices. Second, we highlight the potential role of the media in disciplining retailers' pricing decisions. In particular, we argue that the media uses the available price information and act as an intermediary in disseminating that information to the market. we further claim that another channel that may be at play with regards to the media emphasizes the value that supermarkets chains and chains' managers obtain from getting positive media exposure. Thus, we suggest that, at least some, retailers are interested in getting positive media coverage regarding the prices that they charge. This prefernce by chains' mamagers is irrespective of whether consumers are actually looking for the cheapest available option.

The magnitude of our estimates is not trivial for both consumers and firms. Using the 5% price reduction estimate, we can compute consumers' saving and firms' revenue losses from the increased transparency. In particular, we find that consumer saved about \$27 per month and firms'

lost revenues are about 375 million dollars each month. We also note that the actual reduction in food prices has been smaller, given that our estimates are relative to the control groups that we use.

The remainder of the paper is organized as follows. In the next section we review the relevant literature. In Section 3 we provide the necessary background on the regulation and the Israeli retail food sector. In section 4 we describe the research design and the data and in Section 5 the estimation results. Finally, we discuss our findings in Section 6 and conclude in Section 7.

2 Related Literature

Economic theory provides conflicting predictions regarding the consequences of mandatory disclosure of prices. On the one hand, as search costs decline and consumers become more informed about prices, both price levels and price dispersion are expected to decrease (e.g., Salop and Stiglitz (1977); Stahl (1989); Stigler (1961)). Indeed, if consumers were to know every firm's prices, everyone (assuming an absence of transportation costs) would buy from the firm offering the lowest price; thus, all firms would offer the same price. On the other hand, classic theoretical models in industrial organization (e.g., Green and Porter (1984), Rotemberg and Saloner (1986)) have shown that better access to price information can help retailers monitor their rivals' prices and adjust their own accordingly thereby possibly facilitating tacit collusion. In this case, we might expect prices to increase and price dispersion to fall.

Somewhat surprisingly, while the impact of mandatory disclosure of price information is at the core of IO, to our knowledge, only few studies have examined this issue empirically. These studies have focused on markets in which firms sell one or two products and have not examined how the effect varies with pre-regulation competition conditions. In particular, Albek et al. (1997) showed that the price of ready-mixed concrete in Denmark significantly increased after firms were required to disclose prices; Likewise, Luco (2016) found that the margins of gasoline stations in Chile increased after the implementation of a mandatory disclosure policy. In contrast, Rossi and Chintagunta (2016) who studied gasoline prices in Italy found evidence that prices have fallen by 1 euro cent after stations were required to post their prices on highways' signs. The latter two studies have not found a change in price dispersion following the change in price transparency.

In contrast to the dearth of evidence on the impact of mandatory disclosure, several strands of the literature study the role of voluntary price disclosure. Most common are studies that examine how online markets are formed and how prices in these markets evolve. Ellison and Fisher (2009) is one prime example and Orlov (2011) is another example. These studies are concerned with industries in which actual transactions are conducted online, and had to assume

away selection issues with regards to the types of retailers who begin or expand their online operations. Another related study is Brown and Goolsbee (2002) which shows how firms' decisions to post their prices online affect prices in traditional markets. They find that prices have fallen and that price dispersion has initially increased and then dropped. Brown and Goolsbee have not examined how local market conditions affect firms' pricing decisions, and have examined which firms choose to go online. Studies that look at the effects of price advertising offer another channel through which firms choose to disclose their prices. For instance, Milyo and Waldfoegel (1999) investigate how removing the ban on advertising prices of alcohol items affected firms' decisions which alcohol products to advertise and how these decisions affected prices. Finally, few studies examined how the introduction of communication technologies, typically in developing countries, affected price levels or price dispersion (e.g.Jensen (2007); Svensson and Yanagizawa (2009)).

In addition to the studies on price disclosure, there are many papers that study the supermarket industry (e.g., (Masta, 2011a,b), Dubois and Perrone (2015)). In particular, there are few studies that look at the Israeli supermarket industry. Hendel et al. (2016) focus on the events that led to Israeli consumers' boycott of the cottage cheese in the summer of 2011. Eizenberg et al. (2016) study the period 2005 to 2007 in the Israel supermarket industry and Heffetz, Jia Barwick and Kott (2016) also study the transparency regulation.

3 Institutional Background

The average expenditure on food items in Israel accounts for 16% of disposable income. The Israeli retail food market is considered quite concentrated and was ranked 7th among OECD countries according to the CR3 criterion, and 5th according to the CR2 criterion (OECD 2013). Shufersal is the largest supermarket chain, with 283 stores at the end of 2014, and Mega is the second largest chain with 197 stores at the end of 2014. These two large chains operate in many localities throughout Israel and use more than format. Other chains in our data operated with fewer stores at the end of 2014 (Rami Levy, a heavy discount chain operated 27 stores, Victory 28 stores and Yeinot Bitan 67 stores). Online grocery sales in Israel are growing but still account for only few percents from total food sales. Likewise, private label is growing but still account for a relatively small fraction of total grocery sales in the Israeli food market. The supermarket stores in our sample are affiliated with five large grocery chains: Shufersal; Mega; Rami Levy; Yenot Bitan and Victory. We focus on these chains given their significant market shares, 73% in 2014, and because they also operate in the online grocery segment (prices in the online segment are one of the control groups we use).

Rising food prices were at the center of social protests that took place in Israel in the summer

of 2011. The cumulative annual growth rate of food prices in Israel between September 2005 and June 2011 was 5%, compared with 2.1% for the period January 2000 to September 2005, and compared with 3.2% in the OECD countries for the 2005-2011 period.[2] The conventional view is that following the social protests, Israeli consumers became more price-conscious and more likely to search for low-priced items. Hendel et. al (2016) document a prime example of consumers' reaction to the rise of one typical food item in Israel, the cottage cheese. While Israeli consumers became more price sensitive, supermarket chains found it more difficult to keep high prices. To set a sense of the impact of change in the competitive landscape, before and after the social protests, we examine the gross profits of the two largest supermarket chains, Shufersal and Mega. In the second quarter of 2011, before the summer protests, the gross profit percentage of Shufersal and Mega 26.6 and 27.5 percents, respectively. In the second quarter of 2014, the gross profit percentage of Shufersal and Mega fell to 23 and 24.9 percent respectively. In light of the change in the competitive landscape and other managerial issues, Mega faced increasingly large financial difficulties and went bankrupt. In June 2016, the antitrust authority allowed Yenot Bitan, another large chain to purchase Mega. Somewhat in contrast to the large supermarket chains, over the same time period, heavy discount chains, were able to increase their market share, although they also had to reduced the operational margins.

Another direct implication of the social protests in the summer of 2011, was the formation of a special committee on food prices (the Kedmi Committee). Following the recommendations of the committee a long legislation process, in March 2014 the Israeli parliament passed the"Food Act". A primary component of the new legislation is the transparency chapter requiring retailers to display up-to-date prices on their websites for all the products sold at each and every store they operate. Both chains' managers, politicians and academics have raised concerns regarding the effectiveness of the new regulation. The head of the economic committee in the Israeli parliament, Professor Avishay Bravermann remarked "I am not convinced that transparency will result in good news. I hope that prices will go down in the process, though I doubt it and hope to be wrong."[3] Eyal Ravid, CEO of Victory, a large food retailer, argued that "what is transparency in the Internet? It is price coordination under the law." Likewise, Itzik Aberkohen, the CEO of Shufersal noted that "there is a concern that transparent prices will be used as a platform to coordinate prices under the law". Finally, Prof. Yossi Spiegel in an op-ed called the government "to reconsider the mass experiment that consumers are subject to". [4] Other parts of the Food Act came into effect immediately in January 2015 and hence allow us to examine the impact of the regulation irrespective of the impact of these parts of the Act.

[2]See the Kedmi Committee report, 2012, p. 8 - http://economy.gov.il/publications/publications/documents/kedmireport2012.pdf

[3]See http://www.globes.co.il/news/article.aspx?did=1000921890

[4]See http://www.themarker.com/opinion/1.2506245

Food retailers were initially required to start uploading prices in January 2015 but due to technological difficulties, an extension was granted until May 20, 2015. During May 2015 retailers began uploading price data to dedicated websites. Given that the raw price data uploaded by each chain was not easy to use, independent websites began making the data more accessible to consumers. During August and September 2015, websites began providing "beta" versions for price comparison services for food items sold in brick-and-mortar retail food stores across Israel. Information from personal communications indicates that food retailers and suppliers also obtained data from these websites. As of 2016, three websites offer food price comparison services: MySuperMarket.co.il, Pricez.co.il and Zapmarket.co.il. We obtain the price data in the transparency period from one of these websites.

4 Methodology and Data

Identifying causal effects of transparency on prices is a challenging task for several reasons. First, such an endeavor requires an exogenous shock to the level of available information. Absent of variation in the level of transparency it will be difficult to attribute any observed price differences to transparency. Furthermore, if price transparency is endogenously determined by the firms then selection is a valid concern. That is, the firms that will choose to advertise their products or the advertised products will not be representative of all firms or all products. Accordingly, the analysis of the effect of such a change in transparency will likely lead to biased estimates. Second, pricing decisions taking into account various factors, such as cost, local competition and seasonality. These factors may very well change alongside the change in transparency. Thus, to identify the impact of transparency on prices one needs to account for these additional determinants of pricing decisions and for potential changes in these sources. Finally, studying pricing decisions of supermarkets poses another challenge as thousands of items are sold in supermarkets. Accordingly, to obtain a reasonable estimate of the impact of transparency on prices, one should investigate a large sample of items. Our differences-in-differences research design offers a unique opportunity to address these issues. Below we describe our data and the research design that allows us to address these empirical challenges. Generally, we compare price changes in items that belong to a treatment group against price changes in three distinct control groups: one control group includes items that were not transparent before as well as after the regulation, and the two other control groups consist of items that were transparent both before and after the regulation.

4.1 Data and Descriptive Statistics

Our price data come from several sources. For the pre-transparency period, we collected the prices of 81 products sold in 61 supermarket stores via a market survey firm. For the time period after prices became transparent we obtained the prices of these items from MySupermarket, one of the platforms that offers a price comparison service for food items sold in supermarkets in Israel. The selected products, which belong to several product categories (e.g., fruit and vegetables, dairy products, drinks, ready meals, household cleaning, health and beauty) and different price ranges, comprise the treatment group in our analysis. The market survey firm collected prices in the pre-treatment period in the last week of the following 8 months: July, August, September and October and December 2014, and February, March and April 2015. Figure 1 presents a time series of the treatment basket price, divided into the five chains. As can be observed in the Figure, overall there is a declining trend in prices. In addition, there is convergence across chains' prices, particularly shortly after prices became transparent. Yet, these patterns might be driven by various factors besides price transparency. The figure is also useful in ranking the five chains by the basket price. According to the figure, the price of the basket at the large chains: Mega and Shufersal is higher than in the other chains, such as and Rami Levy, the heavy discount chain which sets the lowest prices.

To take into account alternative factors that potentially affect pricing, we collected prices that belong to three distinct control groups. First, since July 2014 we have been collecting on a weekly basis the prices of all the items included in the treatment group but sold online through the websites of each of the five grocery chains. These prices are a useful comparison group because online prices were transparent both before and after the transparency regulation that we study. Unlike prices at traditional stores which are often determined locally and vary across stores, prices of items sold online by a given chain are similar regardless of the location of the store or the delivery address of an online customer. For the second control group we obtained monthly reports of product prices collected by the Israeli Consumer Council (ICC), the largest consumer organization in Israel. These monthly reports, starting in March 2013, include price data of 39 items sold in hundreds of stores throughout Israel. The prices of these products, which are different from the items in the treatment group, were frequently cited in the media when reporting where consumers could find low-priced food items. For instance, a weekly update was dedicated to the ICC pricing initiative at "Saving Plan", one of the top-rating TV programs broadcasted in Israel. In addition to the media reports, supermarket chains also often mentioned the ICC reports in ad campaigns as a credible reference for cheap prices. Mega, the second largest supermarket chain has dedicated about 40% of its advertising budget in 2014 to ads mentioning the ICC pricing initiative. Because chains and consumers are well aware of the items collected by the ICC, we consider the items

collected by the ICC as transparent also before the regulation and use them as a second control group. Finally, the third control group is based on prices of 44 items sold at 30 stores affiliated with Super-Pharm, the largest drugstore chain in Israel. These prices provide a useful control group since drugstore chain were exempted from the food law.[5] The prices at Super-Pharm stores were collected before and after the transparency regulation law came into effect: in October 2014, April and October 2015 and April 2016. Given that drugstores do not sell the full array of products sold in supermarkets, we do not have a full overlap between items in the treatment group and the items in the Super-Pharm control group. In light of the regulation, the price collection effort is less cumbersome for the post-regulation period. Accordingly, for the post-transparency regulation period, we obtain weekly reports on the prices of 300 items sold in 800 stores including the online stores of the five chains. The 300 items include the items in our treatment group; items collected by the ICC as well as other items. In addition to an item's price at each store, the weekly reports also include information on price promotions associated with each item in each store. We will use these data in the robustness tests.

Table 1 present summary statistics for the stores that we collect data from separated by the different channel and relevant time period.

Figures 3 and 4 present a time series of the total price of a basket of items sold in the sampled stores starting in July 2014 and ending in July 2016. In both figures, we distinguish between the treatment and the control groups. In Figure 3 the control and the treatment group baskets consist of the same set of items, sold either through the online channel of through the traditional channel, whereas in Figure 4 the control group basket consists of items collected by the ICC. Since the items in the ICC control group differs from the items in the treatment group, we normalize the basket price of the control and the treatment baskets to 100 in April 2015 (the month before the regulation became effective). In figure 5 we focus only on a subset of comparable items from the treatment and the ICC control group. That is, instead of using the entire ICC basket we restrict attention to items that appear in our treatment group and in the ICC control group and that are also considered substitutes. For instance, one of the items in the ICC group is 200 gram Nescafe Tasters' choice. Accordingly, in this exercise we include in the treatment group the price of another quality brand of coffee: 200 gram Jacobs Kronung Coffee. Likewise, we take from the ICC control group the prices of a 700 ml Hawaii shampoo bottle and from the treatment group of items we use the prices of a 700ml Crema Nourishing cream wash bottle. Overall, in this exercise we have 20 items, 10 items from the treatment group and 10 items from the ICC control group. As can be seen in these figures, the aggregate price of the treatment basket significantly fell compared to that of the control group basket. Figure 3 reveals that prices of items that are sold online were throughout

[5]Starting on January 2017, drugstore chains will also be subject to the transparency regulation. We intend to also examine the impact of this change.

cheaper than the prices of the same items sold in brick-and-mortar stores. One potential reason for this difference is that online prices were transparent in the pre-regulation period and this transparency led to fiercer competition among retailers who sell online. More importantly, we also see that the gap between online and traditional stores has declined after prices in traditional stores became transparent. This suggests that price transparency in traditional stores led to more intense competition and eventually to lower prices. A similar decreasing difference pattern is observed in Figures 4 and 5. In particular, when using the comparable basket of items, the patterns in the pre-transparency period of products in the ICC and in the treatment look quite similar. After prices became transparent, we observe that prices of items in the treatment decline relative to the items in the ICC group. While the graphical illustration is encouraging, the figures do not account for time and item specific changes that may have occurred over the relevant time period. In the regression analysis we intend to account for these factors. Finally, in addition to the price data that we use we also construct measures of local competition. These measures are based on the number of supermarkets operated by rival chains within a certain distance from a given store.

4.2 Identification and Research Design

To identify the impact of the transparency regulation, we compare price changes of items that belong to the treatment group with price changes of items that belong to the control groups. If the transparency resulted in increased competition among food retailers then we would expect that the prices of items in the treatment group would fall relative to items that belong to the control group. If, however, transparency helped food retailers to tacitly collude then we would expect that the prices in the treatment group would rise relative to the prices of items that belong to each of the three control groups.

Importantly, using each of the control groups help mitigate concerns about the validity of the causal interpretation of the estimated parameters. For instance, using online prices as a control group is important because it helps addressing concerns that the estimated effect in the ICC specification is driven by changes in the marginal costs of items in the treatment group, rather than by changes in transparency. In other words, as long as chains purchase the food items sold in traditional stores and in the online segment for the same price then changes in the marginal costs cannot constitute an alternative explanation for the estimates we provide. Likewise, using the items collected by the ICC as a control group is important because it mitigates concerns that the estimates when the online prices is used as a control group are driven by changes in the online segment that also could have led to higher prices in the online segment compared to the traditional segment. Furthermore, obtaining similar estimates for the impact of transparency when using three different control groups gives us more confidence that our estimates are indeed driven by the

transparency regulation rather than by other changes in the market.

To control for other factors that potentially affect prices, in the empirical specification, we also include week, store and item fixed effects. The week fixed effects capture the impact of seasonality on pricing and other regulatory changes that might have affected chains' costs and pricing decisions. For instance, the minimum wage in Israel was increased in April 2016 and this should affect retail chains' pricing decisions. Yet, such an effect should be captured by the week fixed effects. The store fixed effects capture time-invariant local competition conditions and the socio-demographic characteristics of local customers. Finally, the item fixed effects capture time-invariant characteristics of each item, such as its mean cost of production. We also acknowledge the possibility of pricing trends that may vary across items by incorporating linear item-specific time trends. Finally, we cluster the standard errors at the store level.

Our first specification focuses on the relationship between transparency and price dispersion. In the regression analysis, we use three measures of price dispersion: the number of distinct prices that a given item is sold for in a given period, the coefficient of variation of a given item in a given time period and the percentage price range of an item in a given week. Since the dispersion of prices depends on the number of prices observed per item-date, we also control for it in the price dispersion specification.

Intuitively, identifying change in dispersion is similar to identifying changes in the price level, using similar control groups and the temporal variation in the implementation of the law. Yet, to capture changes in price dispersion we aggregate the price data to the item-date level. Formally, we estimate the following equation:

$$y_{ict} = \mu_i + \gamma_t + \alpha \times Num\_obs_{it} + \beta \times After_t \times Treatment_{is} + \epsilon_{ict} \tag{1}$$

where the dependent variable is one of three measures of price dispersion. The $After$ indicator equals one for items whose prices were collected after the transparency regulation came into effect in May 2015, and zero otherwise. The $Treatment$ indicator gets the value 1 for products in the treatment group of items. Num_obs is the number of observation the price dispersion measure is based on. The equation also includes fixed effects for the item and the time period in which the prices were collected. Standard errors are clustered at the item level. The coefficient of interest, β captures the change in price dispersion in the treatment group of items after prices became transparent relative to the change in dispersion in the control group.

To identify the impact of transparency on price levels we use the following difference-in-differences specification:

$$log(p_{isct}) = \mu_i + \eta_s + \gamma_t + \beta \times After_t \times Treatment_{is} + \epsilon_{isct} \tag{2}$$

In this specification an observation is an item and the dependent variable is the log(price) of item i sold in store s affiliated with chain c in week t. In addition, μ_i, η_s and γ_t are vectors of item, store and week fixed effects, respectively. The main parameter of interest is β which is the coefficient on the interaction between the $After$ and the $Treatment$ indicators. Like in the price dispersion equation, the $After$ indicator equals one for items whose prices were collected after the transparency regulation came into effect in May 2015, and zero otherwise. The $Treatment$ indicator gets the value 1 for products that belong to the treatment group of items and that were collected by the market survey firm. The identifying assumption is that the only systematic difference between the control group products and the treatment group products is the amount of price-related information available to consumers before the law took effect. Per our discussion above regarding the use of the three control groups, and given that the treatment and control groups contain a substantial number of products in several categories, with overlapping manufacturers, we believe that this is a reasonable assumption.

We also examine how local market conditions affect retailers' response to transparency. To do so, we interact the the $After * Treatment$ variable in Equation 2 with a measure of local competition that we constructed based on the number of other retailers that operate in the local market. We construct two such measures. One is a continuous measure and the other measure is a binary variable for high and low competitive environments. Notably, in this analysis we are exploring whether stores affiliated with the same supermarket chain but face different local competitive conditions respond differently to the transparency regulation. Notably, because we are comparing pricing decisions by same-chain stores, we can only use the ICC prices as a control group.

5 Results

The regression results of Equation 1 are shown in Table 2. The table includes the estimates for three measures of dispersion for the price charged for a product in a given week: the number of unique prices, the coefficient of variation and the percentage price range. Each column corresponds for a different price dispersion measure and includes not only the parameter of interest point estimate, but also the average value of the dependent variable. Comparing the point estimate of the main parameter of interest is informative for the magnitude of the transparency effect. Although the magnitude of the transparency effect varies across dispersion measures and control groups, the table demonstrates an economically and statistically significant decrease in price dispersion. For instance, in columns 1-3 we show that after prices became transparent the number of distinct prices charged for a product in a given week has fallen by 5 to 10 distinct prices, depending on the

control group we use. This decrease is fairly large given that the average number of distinct prices charged for a product in a week prior to the mandatory transparency was 16 to 20.[6]

To explore the effect of mandatory disclosure of prices on the price level, we present in Table 3 the regression results of Equation 2. The point estimates of the main parameter of interest for the various control groups are roughly similar and indicate that after prices became transparent, the prices in traditional stores fell by 4 to 5 percents relative to the prices of items in the control groups. We also estimate the same equation using a limited set of products that enhances the comparability of the treatment and the ICC control groups. We obtain similar qualitative results.

Table 4 presents the point estimates from a version of Equation 2 that simultaneously estimates the transparency effect for each of the retailers. The regression results illustrate that the reduction in prices attributed to the transparency change is mostly among the more expensive chains: Mega, Shufersal and also Victory. For the chains that set relatively cheaper prices: Yeinot Bitan and Rami Levi we do not find evidence that prices have fallen.

A different heterogeneous effect analysis in presented in Table 5. The corresponding analysis accounts for the possibility that the effect of transparency on prices is heterogeneous in the degree to which a store faces local competition. For this we estimate two specifications. The one presented in column 1 allows the effect to differ between stores that operate in markets that are more (less) concentrated than the median degree of concentration. The second specification, whose results are presented in column 2, imposes a linear effect of competition on the effect of transparency on prices. The regression results suggest that the change in prices is greater in stores that faced weaker competition. Overall, these findings are consistent with the competitive impact of transparency and that prices have declined more when they set at a relatively high level before the transparency regulation.

5.1 Additional results

Given the effects on price dispersion and on the price level presented in Tables 2 and 3, it is natural to examine the pace at which these effects took place and their relative order. To examine this, we conducted an analysis estimating monthly effect of price transparency for each month included in our sample. This type of analysis is also useful for examining the degree to which the outcome variables responded *prior* to the date in which price transparency became mandatory. Identifying an early response would suggest that the estimated treatment effects discussed above are a lower bound of the true effect of the regulation. We estimate the monthly-specific effects using flexible versions of Equations 1 and 2 and present the monthly effects on the (log) price levels

[6] In Table 1 of the Appendix we present the estimation results from a specification that simultaneously estimates the effect for each of the retailers on the number of unique prices, which is the main price dispersion measure. The tables reveals significant effect for each of the chains, suggesting that no single chain is responsible for the results shown in Table 2.

and on the number of distinct prices (as a measure for price dispersion) in Figure 6. The figure demonstrates the while the effect on price dispersion was quite immediate, the effect on prices was essentially indistinguishable from zero for the first eight months following the regulation, and only then the effect became negative and statistically significant. This suggests that supermarket chains responded to the mandatory disclosure of prices in two phases: First, they reduced the number of distinct prices for each item while maintaining the average price unaffected, and only later they decreased the level of prices that they charge.

Once we established that the fall in price dispersion preceded the change price levels, we can also investigate the empirical relationship between the change in price dispersion of a given product and the corresponding change in the price of that product. Theoretically, the link between price dispersion and price levels is ambiguous. On the one hand, fewer distinct prices per product means less obfuscation and can help consumers to compare prices. We can therefore expect that products that experienced a greater reduction in the number of distinct prices will also experience a greater reduction in prices. On the other hand, a reduction in the number of unique prices could also help retailers coordinate prices and result in higher prices. In figure 7 we display for each of the control groups the relationship between the change in price dispersion and the change in price for the treated products. In particular, the measure for price dispersion on the horizontal axis, is the estimated change in the per-product number of distinct prices. For instance, the value -5 for a product implies that after the transparency regulation, five fewer prices were charged for that product. For the change in prices - on the vertical axis - we use the product specific estimates from a version of Equation 2 that allows the coefficient of the $After \times Treatment$ to be product-dependent. In addition, each graph contains the t-statistic from the corresponding regression. As can be seen in the figure, we find some evidence favoring a positive relationship between the change in the number of distinct prices and the change in prices. That is, products that experienced a greater reduction in their price dispersion later also experienced a greater reduction in prices.

5.2 Research Design Validation

5.2.1 Parallel Time Trends

The key requirement for the differences-in-differences research design to be valid is that both control and treatment groups share the same time trend. Given the multiplicity of control groups used here, we find it useful to demonstrate that each of the control groups share a similar time trend with the treatment group. For this, we estimated specifications using log(price) and the number of distinct prices as the dependent variables that incorporates group (treatment/control) by month specific effects and graph these effects in Figure 8. The figure demonstrates that for each of control group and outcome variable, the treatment group time trend is nearly parallel to the corresponding

control group time trend. This observation validates the ability of the research design to identify the regulation treatment effect.

5.2.2 Placebo Tests

A potential threat to identification when using a differences-in-differences research design is that the estimated effects are not driven by the treatment, but by other unobserved factor. For this, we conducted a placebo test by considering a sample that started on July 2014 and ends of July 2015, just before the full implementation of the regulation. We then re-estimated the price regression (Equation 2), defining a fictitious date for the implementation of the reform. Since the treatment group was sampled eight times in the pre-regulation period, and given that we want the placebo pre-regulation period and the placebo post-regulation period to incorporate at least two data pulls each, we are left with at most five possible points in time to set the fictitious regulation dates. We conducted the test for both the online and the ICC control groups. The results, which show no significance effect of the fictitious regulation, are presented in Table 2 of the Appendix. These results validate our empirical approach as they reveal that no other event that occurred prior to the regulation implementation can explain the empirical findings.

6 Potential channels

6.1 Usage of comparison websites

The natural channel through which increased transparency led to smaller price dispersion and lower prices is consumers' access and use of the available price information. To examine this channel, we obtained information on the total number of pages viewed at each of the three websites that offer price comparison services (MySupermarket.co.il, Pricez.co.il and ZapMarket.co.il). These data, at the monthly level, cover the time period from June 2014 to November 2016. Overall, the number of visitors in these websites increased over the relevant time period. For instance, at Pricez.co.il, the only website that relies on price comparison services in the traditional stores as its core business, we find that that the total monthly number of pages viewed increased from about 100k before the regulation to above 300k in September and October 2016. Also, the average number of pages viewed per visitor increased from about 2 pages per visit before the regulation[7] to 8 pages per visit towards the end of the period. We then use the total number of pages viewed in each month to estimate a version of Equation 2, replacing the transparency indicator in the original specification with the number of total-pages-viewed. We perform the analysis using the three control groups and either use the total number of pages viewed in three websites combined or focus only on

[7]Before the transparency regulation, Pricez offered price comparison services based on consumers' reports

information on Pricez.co.il[8]. The regression results, presented in Table 6 support our conjecture that increased access to price information lead to lower prices in traditional stores. This regression estimates are qualitatively similar for the three control groups and for the two intensity measures. Focusing on the results using only the visits at Pricez.co.il, the estimates suggest that a monthly increase of 100k pages viewed is likely to result in a price decrease of 2.9% in traditional stores compared to online prices.

While the latter analysis is consistent with our previous results, implying that increased consumer access to price information leads to more intense price competition, we are quite hesitant to rely on this as the primary channel through which the transparency regulation affected prices. In particular, the overall number of visitors at the three websites is not large. Furthermore, from conversations with these websites the number of users who actively use the mobile applications of these websites is also not large. For that reason, we are concerned that relying on the direct number of customers who access the price information as the main mechanism is not sufficient to explain the reduction in prices. Instead, we believe that a related channel can, at least partially, explain the reduction in prices. We refer to this channel in the next subsection.

6.2 The Media

The Israeli media, especially since the massive social protests in the summer of 2011, has been actively involved in supporting pro-market agendas, criticizing attempts to gain market power and reporting on price changes. Both traditional newspapers and online sources have almost regularly report on consumers' issues, often highlighting retailers who sell at low prices. While before the transparency regulation, reporters had to visit themselves the stores and wander across the aisles to find the prices of each product. After the regulation the costs of collecting and comparing prices significantly fell. For instance, on April 7th 2016, Ynet, the most popular Israeli website, reported on a comprehensive price comparison across dozens of retailers across Israel. The comparison, based on information from Pricez, included information from 18 geographic regions, where the names and addresses of the three stores that offered the cheapest basket in each region were reported. The number of items included in the basket compared varied across regions, where the minimum of items was 130 in one region and 210 items in another.[9]. On January 12, 2016, channel 2 news, the most popular news program, had a 4.5 minutes item on a new price competition among supermarkets chain in the city of Modi'in.[10] To compare prices across supermarket chains, the reporter used the online application of Pricez. In December 2015, the Israeli Internet association, together with

[8]The main business of MySupermarket,co.il is facilitating online *shopping* and we are unable to disentangle between customers who visit that website to shop online (e.g., at Shufersal Online) from visitors who want to obtain price information in traditional stores. ZapMarket, the third website began offering service only in November 2015.

[9]http://www.yediot.co.il/articles/0,7340,L-4788678,00.html.

[10]www.mako.co.il/news-channel2/Channel-2-Newscast-q1_2016/Article-996f23598873251004.htm.

Google and the Israeli Fair Trade Authority, launched a competition for the development of the best food price comparison application. This competition received coverage by national coverage.[11]

The national media also compared the user interface of food price comparison websites, their accuracy and graphical design. In other cases, the media reported on price differences across stores or regions.[12] Another example of the role of the Media in using the price comparison services and in disciplining retailers' pricing decisions is the merger between two large supermarket chains: Mega and Yeinot Bitan in June 2016. In this case, TheMarker, a leading business national newspaper, compared the price changes at the merged firm before and after the merger relative to price changes at another supermarket chain that did not take part in the merger. For this comparison, TheMarker used price data from one of the price comparison platforms and repeated this exercise a few weeks after the merger as well as a few months after the merger.[13] We also found reports at the local level on the new price comparison platforms. For instance, the local newspaper of Petach Tikva, the fifth largest city in Israel, used the price comparison platform to report on the supermarkets with the cheapest prices.[14]

We believe that the extensive coverage of consumers' issues by the media has two potential effects on supermarket prices. First, thanks to the media, the number of consumers who are exposed to price comparison services is significantly higher than the actual number of consumers who visit the price comparison website. Second, and at least as important, many food retailers find it worthwhile getting positive press coverage. Thus, for instance, in 2012, Rami Levy, who owns and manages the heavy discount chain Rami Levy, was chosen by TheMarker as the most influential figure in Israel in that year!. On Israel's independence day in 2015, Rami Levy received from the state of Israel, the most prestigious award for Israelis who made a difference for society. No doubt, that the media's praise and support were helpful in the widespread recognition of Rami Levy's achievements. This latter channel implies that regardless of whether consumers actually respond to lower prices set by retailers or not, retailers have an incentive to set low prices and to be regarded as offering consumers good value for the money.

Another supporting evidence for the impact of the media is the change in price dispersion shortly after the transparency regulation became effective. Before the transparency regulation, supermarket chains were exposed to a critique not only regarding the level of prices that they set but also on price differences across different stores affiliated with same chain. The media often provided anecdotal evidence on stores that were located in affluent areas and set prices lower than

[11] See http://www.globes.co.il/news/article.aspx?did=1001056276 and http://www.globes.co.il/news/article.aspx?did=1001074618.

[12] See http://www.themarker.com/consumer/1.2824847 for food price applications comparison. For reports on price differences see http://www.globes.co.il/news/article.aspx?did=1001108062 and http://www.yediot.co.il/articles/0,7340,L-4858377,00.html.

[13] See http://www.themarker.com/advertising/1.3006498 and http://www.themarker.com/advertising/1.3116830

[14] See https://goo.gl/YsVT9a

stores affiliated with the same chain but located in rural and relatively low-income areas. In March 2015, an attempt to pass a law that would force chains to set the same price in all the stores of the chain has failed. Yet, supermarket chains were concerned that after prices will become transparent, more evidence on these differences will become available in the media and more bad publicity will arise. This concern could explain why chains, in anticipation of the transparency, chose to change their pricing strategy and reduce the number of unique prices set in their stores.

7 Concluding remarks

Economists often stress that available price information is crucial for the efficient functioning of markets. Yet, other have also stressed that more information can also be used by firms to better coordinate the actions in a manner that will reduce consumer surplus. Quite surprisingly, the empirical evidence on this issue is very limited. In this paper, we investigate the effects of the transparency regulation in the supermarket industry in Israel. Following this regulation, Israeli food retailers have began uploading food prices to the Internet and independent websites have developed price comparison services. We use this regulation to investigate how price transparency affected pricing decisions. First, we show that supermarket chains, shortly after the regulation became effective, reduced the number of distinct prices that they set for each item that they sell. This finding suggest that supermarket chains, anticipating that prices become transparent, changed their pricing strategy. Second, we show that prices have fallen and that the decline in prices is greater in stores that initially set high prices: either stores that are affiliated with more pricey chains or stores that face weaker competition in their local markets. These latter set of findings suggest that as price information became available to consumers, the media and food retailers, the competitive role of information prevailed and prices have declined.

The impact of transparency potentially affects other decisions made by the firms. For instance, how product availability is affected once consumers can observe it before reaching to the store? How often prices change in such an environment and whether firms adopt a different price promotion strategy? Another potential issue is how transparency affect firms' advertising decisions. While without transparency, loss-leader campaigns may be useful to attract consumers who do not have access to prices of other items in the store, this may not longer be the case when all prices become transparent. We leave these issues for future research.

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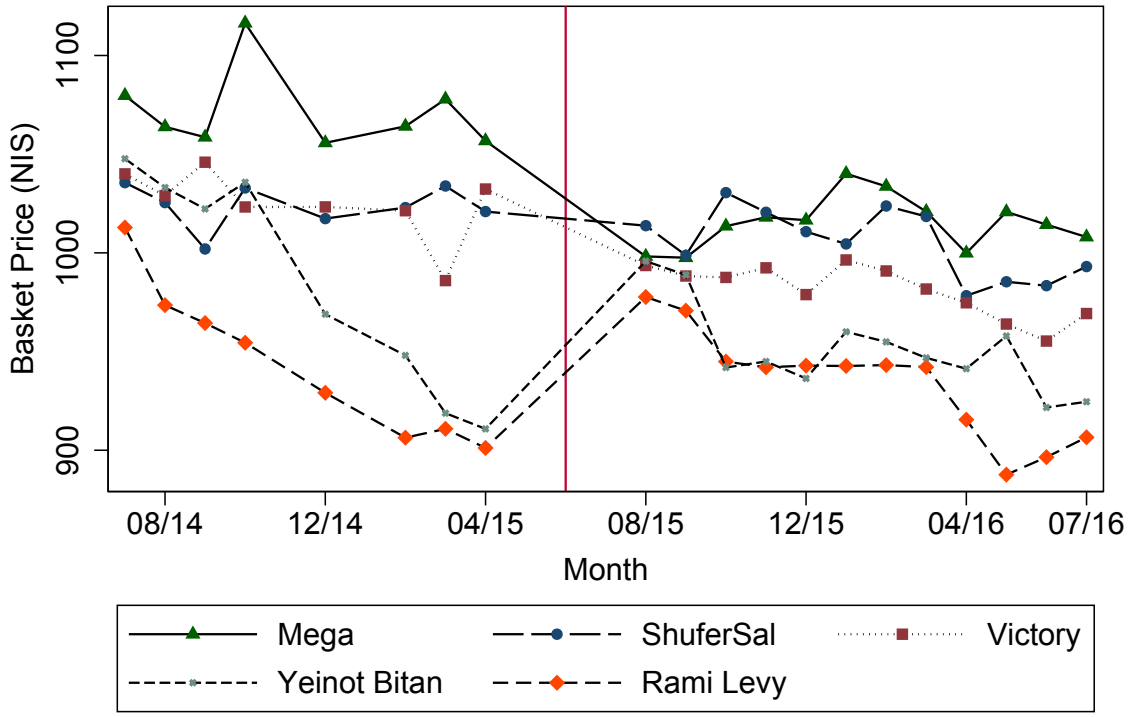
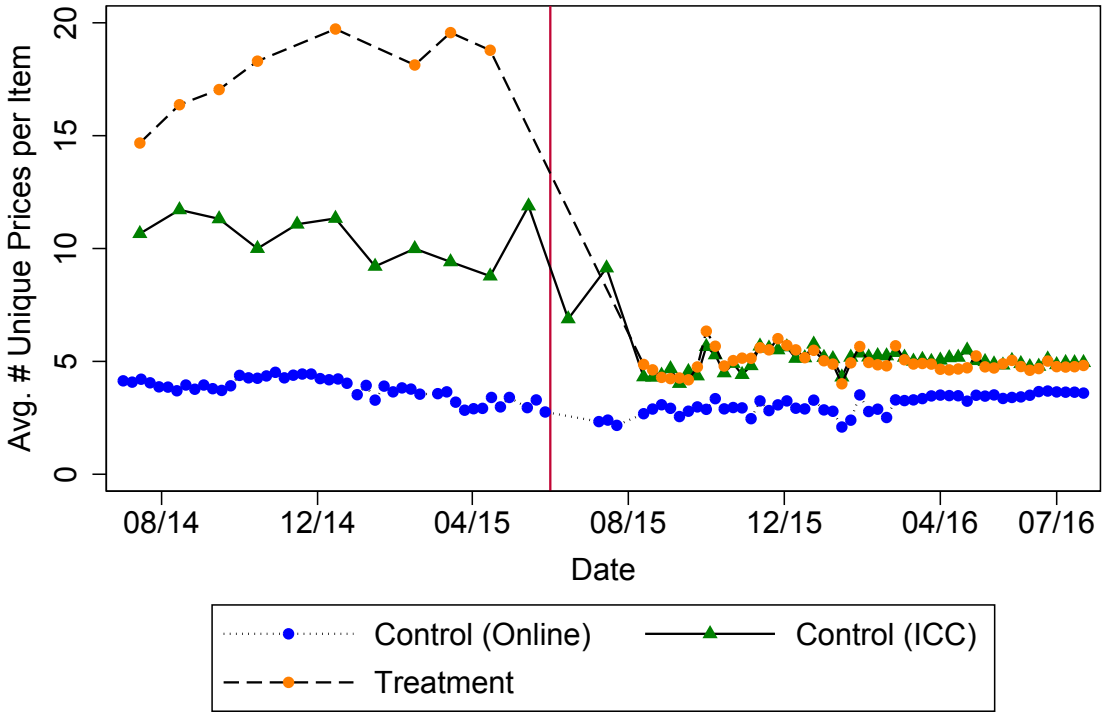
Figure 1: Retailer-Specific Basket Price



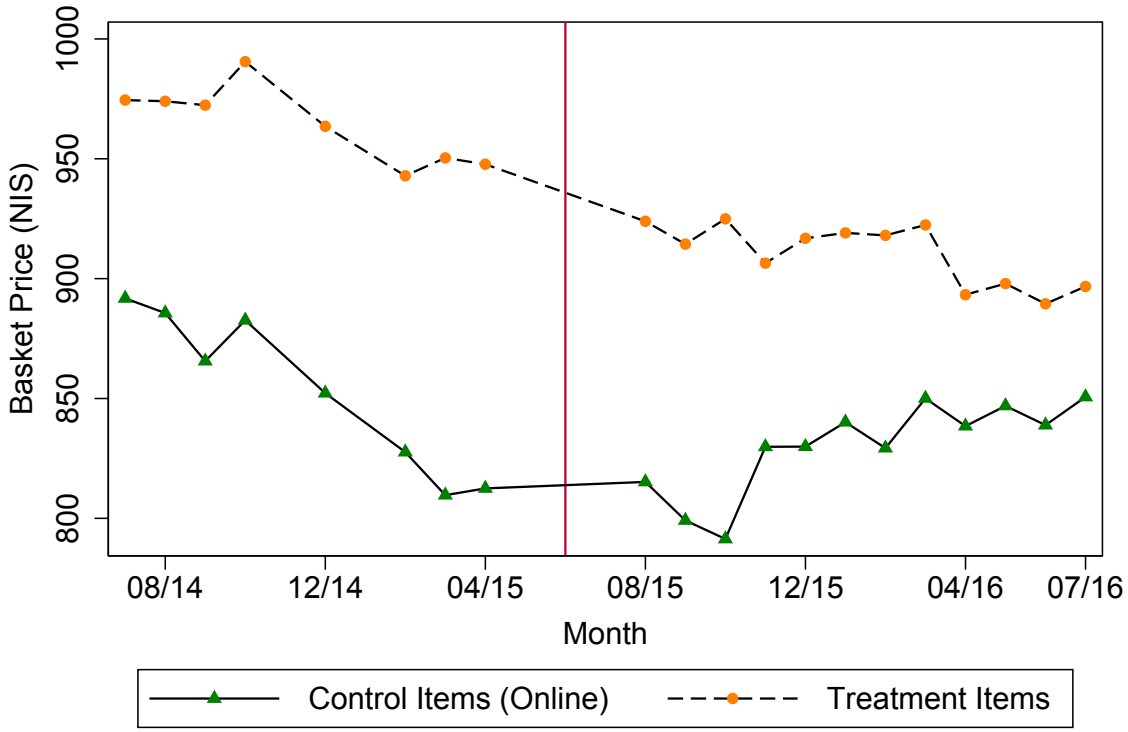
The figure shows a time series of the total basket price for each of the retailers. A basket consists of 58 items. Monthly basket price is the sum of items average price, where the average is taken over the retailers' stores. Missing price are imputed.

Figure 2: Number of Distinct Prices



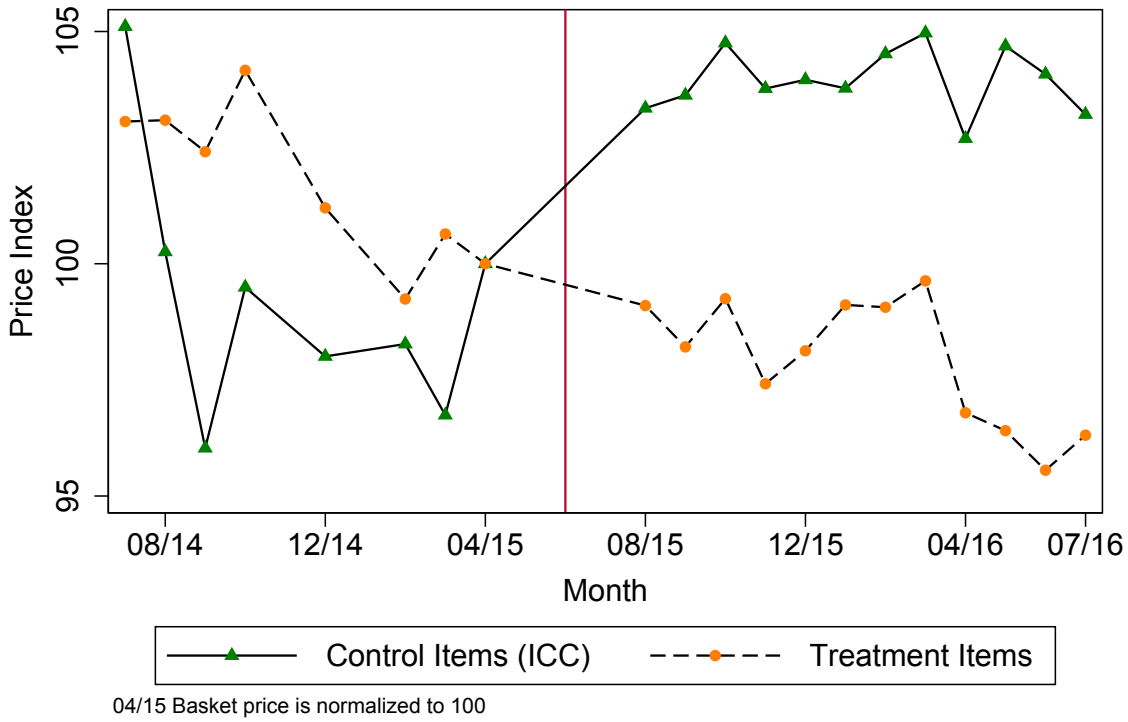
The figure shows a time series of the average number of distinct prices for the treatment group of items, the ICC control group and the online control group.

Figure 3: Basket Price in the Online Control and the Treatment Groups



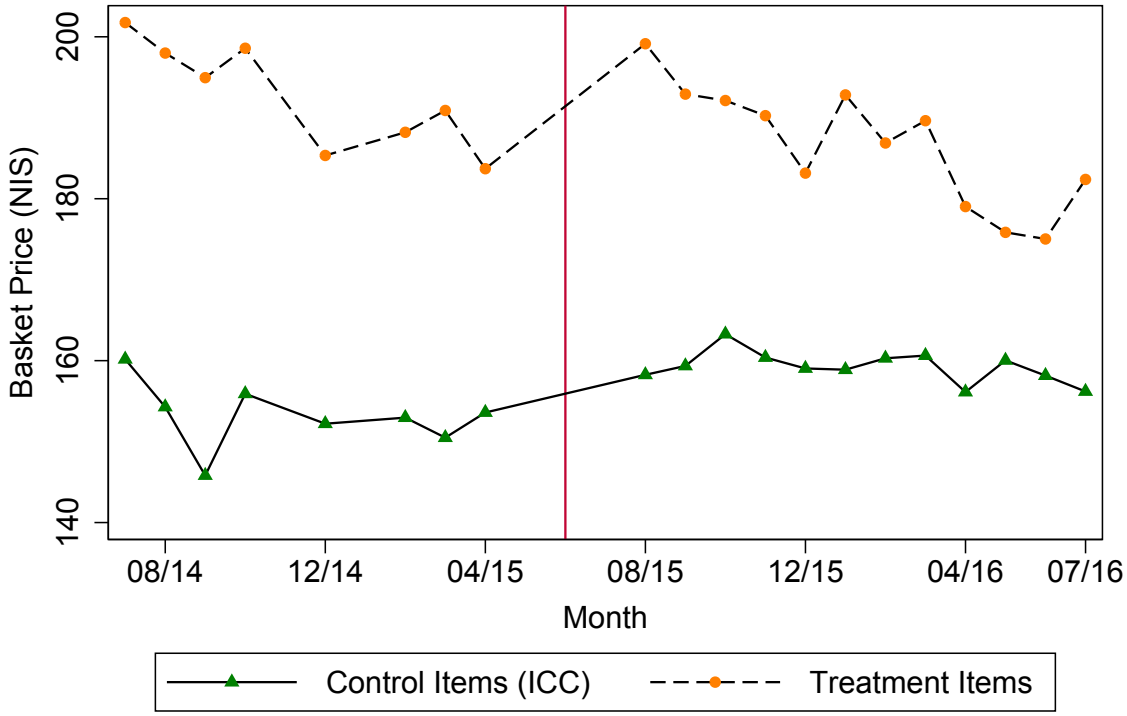
The figure shows a time series of the total basket price, divided into the online (control group) channel or traditional (treatment group) channel. In each channel, prices are averaged across stores and chains and missing prices are imputed. The figure shows that throughout the period the online basket is cheaper than the same basket purchased in the traditional channel. Yet, the difference between the two channels falls after the prices in traditional stores became transparent.

Figure 4: Basket Price Index in the ICC Control and the Treatment Groups



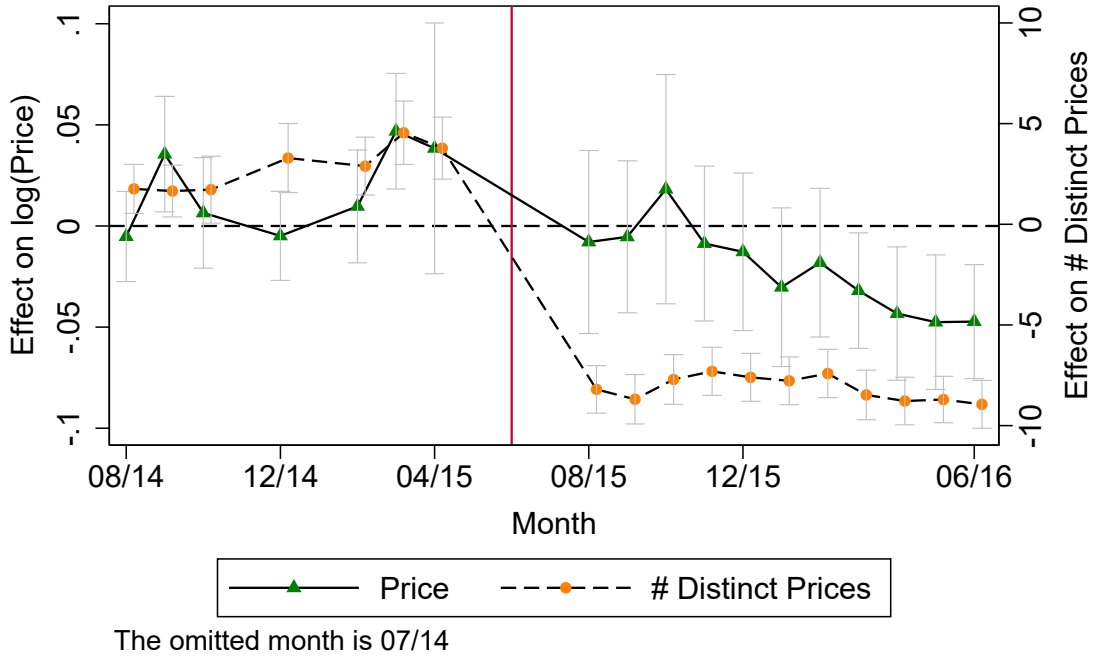
The figure shows a time series of the total basket price, divided into the ICC control basket and the treatment basket. In each group, prices are averaged across stores and chains and missing prices are imputed. Since the two baskets contains different items, we normalize each basket price to 100 on April 2015, the last data point before price transparency became mandatory.

Figure 5: Comparable Basket Price



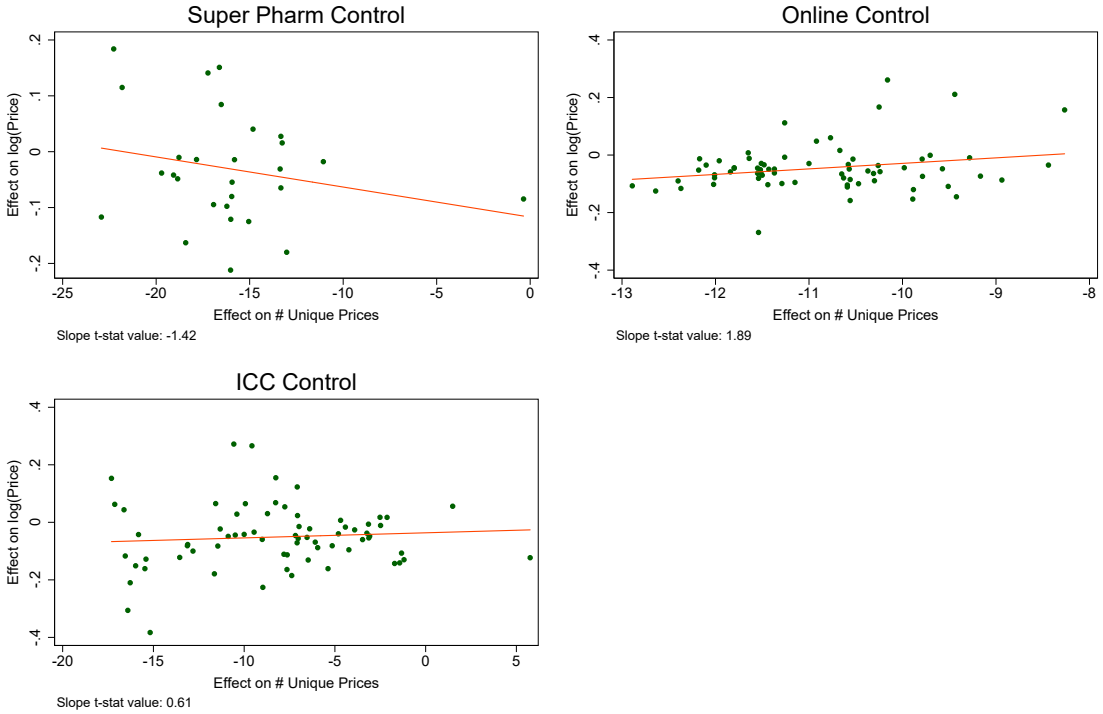
The figure shows a time series of the total basket price for two baskets. One basket consists from 10 ICC cotrol items (control group) and the other consists from 10 comparable items from the treatment group. The figure demonstrates that the two baskets exhibit similar patterns before prices in the treatment group became transparent.

Figure 6: Monthly Effect on Price Level and Price Dispersion



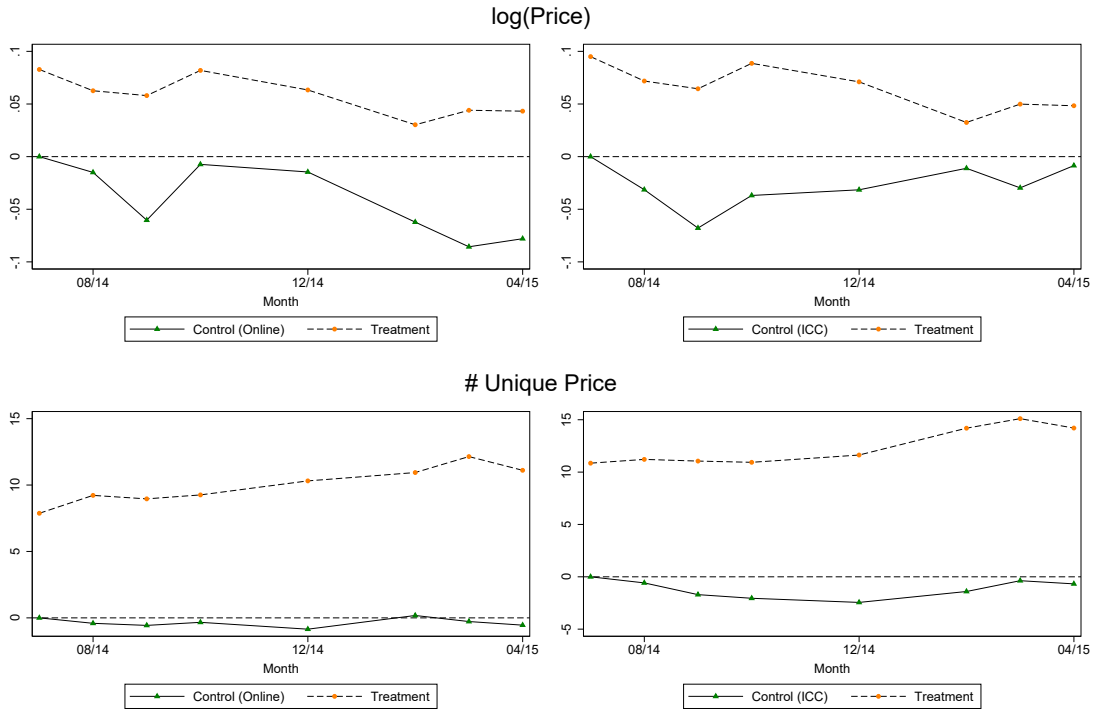
The figure shows the monthly F.E. from two variants of Equations 1 - 2 in which the effect is estimated for each and every month before and after the regulation. For each monthly estimate the 95% confidence interval is presented.

Figure 7: Monthly Effect on Price Level and Price Dispersion



Each figure is a scatter plot of items' change in price dispersion, measured by the number of distinct prices, on the horizontal axis and items' change in price level on the vertical axis. The item-specific changes were obtained from variants of Equations 1 and 2 that incorporate item specific effects. Each scatter plot corresponds to a different control group. In addition, the bottom of each scatter plot features the value of the t-statistic obtained from a test for the significance of the slope of the corresponding univariate linear regression.

Figure 8: Validating the Parallel Time Trend Assumption - Monthly Effect on log(Price) by Groups Association



Each figure presents the pre-regulation period group specific monthly effects estimated in regressions using log(price) and number of distinct prices as the dependent variable. Figures are distinguished by the control group used in each of them.

Table 1: Descriptive Statistics

Data Source		Pre-Transparency Period				Post-Transparency Period			
Supermarkets		# Stores	# Items	# Data Pulls	*N*	# Stores	# Items	# Data Pulls	*N*
	Treatment group	61	81	8	23,501	61	69	50	138,978
	Online stores	5	78	49	17,837	5	69	50	13,415
	ICC	59	39	13	18,707	61	44	50	97,064
Drugstore		30	24	2	1,271	31	26	2	1,518

Table 2: Mandatory Disclosure Effect on Price Dispersion

	# Unique Prices			Standard Deviation/Avg.			Percentage Range ($100 * \frac{P_{max}-P_{min}}{P_{max}}$)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
After*Treatment	-15.920**	-10.881**	-8.103**	-0.083**	-0.101**	-0.053**	-32.962**	-27.396**	-12.481**
	(1.700)	(0.549)	(0.812)	(0.024)	(0.011)	(0.012)	(6.300)	(1.679)	(2.436)
Week F.E.	✓	✓	✓	✓	✓	✓	✓	✓	✓
Item F.E.	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lin. Item Time Trend	✓	✓	✓	✓	✓	✓	✓	✓	✓
Control Group	Super Pharm	Online	ICC	Super Pharm	Online	ICC	Super Pharm	Online	ICC
Dep. Var. Average Value	19.097	16.265	17.317	0.209	55.006	0.211	57.742	55.006	55.642
R^2	0.833	0.785	0.804	0.471	0.392	0.627	0.635	0.488	0.736
N	1525	9636	6176	1510	9345	6120	1525	9636	6176

The unit of observation in columns 1, 2, 4, 5, 7 & 8 is item i in date t in treatment/control group

The unit of observation in columns 3, 6 & 9 is item i in date t

Time period covered 7/2014 - 6/2016

Errors are clustered by items

* $p < 0.05$, ** $p < 0.01$

Table 3: Mandatory Disclosure Effect on Price

	(1) log(Price)	(2) log(Price)	(3) log(Price)
After*Treatment	-0.040**	-0.051**	-0.052**
	(0.014)	(0.008)	(0.005)
Store F.E.	✓	✓	✓
Date F.E.	✓	✓	✓
Item F.E.	✓	✓	✓
Linear Item Specific Time Trend	✓	✓	✓
Control Group	Super Pharm stores	Online stores	Moatza Items
R^2	0.909	0.937	0.961
N	58358	186810	278228

The unit of observation is item i in store j in date t

Time period covered 7/2014 - 6/2016

Errors are clustered by stores

* $p < 0.05$, ** $p < 0.01$

Table 4: Mandatory Disclosure Retailer-Specific Effect on Price

	(1) log(Price)	(2) log(Price)	(3) log(Price)
Mega: After*Treatment	-0.060**	-0.084**	-0.047**
	(0.014)	(0.008)	(0.005)
Shufersal: After*Treatment	-0.035*	-0.048**	-0.053**
	(0.015)	(0.008)	(0.006)
Victory: After*Treatment	-0.052	-0.062**	-0.044**
	(0.026)	(0.020)	(0.007)
Yeinot Bitan: After*Treatment	-0.006	-0.025	-0.048**
	(0.016)	(0.014)	(0.006)
Rami Levi: After*Treatment	0.021	-0.009	-0.002
	(0.015)	(0.008)	(0.006)
Store F.E.	✓	✓	✓
Date F.E.	✓	✓	✓
Item F.E.	✓	✓	✓
Linear Item Specific Time Trend	✓	✓	✓
Control Group	Super Pharm	Online stores	Moatza Items
R^2	0.911	0.937	0.962
N	57734	186810	274669

The unit of observation is item i in store j in date t

Time period covered 7/2014 - 6/2016

Errors are clustered by stores

* $p < 0.05$, ** $p < 0.01$

Table 5: Mandatory Disclosure Effect on Price by Degree of Competition

	(1) log(Price)	(2) log(Price)
After*Treatment - Low Comp.	-0.057**	
	(0.006)	
After*Treatment - High Comp.:	-0.043**	
	(0.006)	
After*Treatment		-0.037**
		(0.008)
After*Treatment*Concentration		-0.043**
		(0.015)
Store F.E.	✓	✓
Date F.E.	✓	✓
Item F.E.	✓	✓
Linear Item Specific Time Trend	✓	✓
Control Group	ICC Items	ICC Items
R^2	0.962	0.962
N	238957	238957

Concentration ranges form 0 to 1, with 0 being perfect competiton and 1 being monopoly
The $10^{th}, 50^{th}$ and 90^{th} percentiles of concentration are 0.13, 0.32 and 0.45, respectively
The unit of observation is item i in store j in date t
Time period covered 7/2014 - 6/2016
Errors are clustered by stores
* $p < 0.05$, ** $p < 0.01$

Table 6: Mandatory Disclosure Effect on log(Price) using Web Site Page Views as Intensity Measure

	(1) log(Price)	(2) log(Price)	(3) log(Price)	(4) log(Price)	(5) log(Price)	(6) log(Price)
After*Treatment Inten.	-0.058***	-0.005***	-0.029***	-0.002**	-0.004*	-0.001**
	(0.013)	(0.002)	(0.006)	(0.001)	(0.002)	(0.000)
Store F.E.	✓	✓	✓	✓	✓	✓
Week F.E.	✓	✓	✓	✓	✓	✓
Item F.E.	✓	✓	✓	✓	✓	✓
Lin. Item Time Trend	✓	✓	✓	✓	✓	✓
Traffic Source	Pricez	All	Pricez	All	Pricez	All
Control Group	Super Pharm	Super Pharm	Online	Online	ICC	ICC
R^2	0.909	0.909	0.937	0.936	0.961	0.961
N	58358	58358	186810	186810	278228	278228

The unit of observation is item i in store j in date t

Time period covered 7/2014 - 6/2016

Treatment intensity is based on 100,000 page views and is measured monthly

Errors are clustered by stores

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix to "The Effects of Mandatory Disclosure of Supermarket Prices"

Itai Ater
Tel-Aviv University

Oren Rigbi
Ben-Gurion University

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In this appendix we present the results that are referred to from the paper.

1. Table 1 - chain-specific effect on the number of unique prices
2. Table 2 - placebo test

Table 1: Mandatory Disclosure Retailer-Specific Effect on # Unique Prices

	(1) # Unique Prices	(2) # Unique Prices	(3) # Unique Prices
Mega: After*Treatment	-5.672**	-3.429**	-1.667**
	(1.182)	(0.107)	(0.182)
Shufersal: After*Treatment	-7.935**	-3.856**	-1.975**
	(1.232)	(0.147)	(0.188)
Victory: After*Treatment	-2.806*	-2.623**	-1.132**
	(1.249)	(0.095)	(0.197)
Yeinot Bitan: After*Treatment	-3.113*	-3.010**	-1.307**
	(1.250)	(0.086)	(0.188)
Rami Levi: After*Treatment	-4.229**	-3.313**	-1.885**
	(1.265)	(0.094)	(0.197)
Week F.E.			
Item F.E.			
Lin. Item Time Trend			
Control Group	Super Pharm	Online	ICC
R^2	0.792	0.680	0.596
N	6120	37685	25978

The unit of observation in columns 1 and 2 is item i in date t in chain c in treatment/control group

The unit of observation in column 3 is item i in date t in chain c

Time period covered 7/2014 - 6/2016

Errors are clustered by items

* $p < 0.05$, ** $p < 0.01$

Table 2: Placebo Test for Mandatory Disclosure Effect on Price

	(1) log(Price)	(2) log(Price)	(3) log(Price)	(4) log(Price)	(5) log(Price)	(6) log(Price)	(7) log(Price)	(8) log(Price)	(9) log(Price)	(10) log(Price)
After*Treatment	0.024	0.003	0.010	0.021	0.028	0.000	0.001	-0.005	-0.008	0.011
	(0.013)	(0.018)	(0.021)	(0.023)	(0.035)	(0.008)	(0.007)	(0.008)	(0.016)	(0.007)
Placebo Date	15/9/14	15/10/14	15/12/14	15/2/15	15/3/15	15/9/14	15/10/14	15/12/14	15/2/15	15/3/15
Store F.E.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Date F.E.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Item F.E.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Linear Item Spec. Trend	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Control Group	Online	Online	Online	Online	Online	Moatza	Moatza	Moatza	Moatza	Moatza
R^2	0.873	0.873	0.873	0.873	0.873	0.925	0.925	0.925	0.925	0.925
N	34417	34417	34417	34417	34417	42186	42186	42186	42186	42186

The unit of observation is item i in store j in date t

Time period covered 7/2014 - 7/2015

Five differetn placebo dates are used

Errors are clustered by stores

* $p < 0.05$, ** $p < 0.01$