DISCUSSION PAPER SERIES

No. 6999

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INDUSTRIAL ORGANIZATION

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ISSN 0265-8003

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Discussion Paper No. 6999
October 2008

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CEPR Discussion Paper No. 6999

October 2008

ABSTRACT

Seasonality and the Effect of Advertising on Price*

This paper lays out an econometric strategy for estimating the effect of advertising on prices, by exploiting seasonal demand and imperfect targeting. We present two simple models of duopoly where firms choose prices and advertising. In times of high demand for the product, a larger fraction of consumers who obtain an advertisements are interested in the product, and so the effectiveness of advertising is greater, and firms advertise more. We use this to justify IV estimation of price on log advertising (and trend), in which monthly dummies are used as instruments. Using Israeli data we find a sufficiently large degree of advertising seasonality to justify estimation by the LIML or Fuller-k method. Among those industries, only a few exhibit a significant response of price to advertising.

The interpretation of these results depends on the nature of the marginal cost curve: under constant returns to scale a negative response is consistent with informative advertising, and a positive with brand enhancing advertising. Under sufficiently increasing returns to scale, informative advertising will lead to a price increase, yet for some of the products we are able choose among these two types of advertising based on knowledge of the likely cost structure of the industry. Nevertheless, in almost all cases, significant and insignificant, the magnitude of the measured response is very small.

JEL Classification: L10 and M37
Keywords: advertising, prices and seasonality

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* We wish to thank the Israeli Central Bureau of Statistics, in particular Yafit Alfandari and Doron Sayag, for their help in assembling the price data.

Submitted 28 September 2008

I. Introduction

Does advertising make markets more or less competitive? This paper lays out an econometric strategy for estimating the effect of advertising on prices, by exploiting seasonal demand and imperfect targeting of consumers. In almost all the 131 market categories that we investigate, using monthly Israeli data from 1999-2005, we find only very small effects.

To motivate our econometric strategy, we present two simple models of duopoly where firms choose prices and advertising. One model captures the essence of informative advertising, the other persuasive advertising. In both models, in times of high product demand, a larger fraction of consumers who are exposed to an advertisement for the product are potentially interested in it than would otherwise be the case, and so the effectiveness of advertising is greater, leading firms to advertise more. We use this result, along with the assumption that marginal cost does not fluctuate seasonally, to justify the use of monthly dummies as instruments in the regression of price on log advertising (and trend).

Somewhat more than a quarter of the categories evidence a sufficiently large degree of advertising seasonality to justify estimation by the LIML and Fuller-k method. Among those categories, only five exhibit a significant negative response of price to advertising, and four a positive response; the rest are insignificant and small. We also look at categories with a high degree of price seasonality, to ensure that our method of selecting industries is not biased against categories with large advertising on price effects, and estimate inverse regressions estimates, which turn out to be consistent with our direct regression results. An alternative method of selecting categories (Hahn and Hausman, 2002) yields a similar distribution of estimates, but with a somewhat different set of categories.

The interpretation of these results depends on the nature of the marginal cost curve: under constant returns to scale a negative response is consistent with informative advertising, and a positive with persuasive advertising. Under sufficiently increasing returns to scale, informative advertising will lead to a price increase as well, yet for some of the products we are able to decide between these two advertising mechanisms based on prior knowledge of the likely cost structure of the industry. In any case, given the measured effects, one is forced to conclude that, at seasonal frequencies, the effect of advertising on prices is generally small.

The role of advertising in competition has long been an issue of some contention in Industrial Organization. One view, dating back to Kaldor (1950), conceives of advertising as primarily *persuasive*, manipulating tastes and distorting choices. According to this view, the primary effect of advertising in the short term is to increase perceived product differentiation, thus decreasing competition and so increasing prices. In the long run, the enhanced product differentiation impedes entry as well, further ensuring high prices.

A second view, which dates to Telser (1964), but whose first precise formalization is by Butters (1977) sees advertising as *informative*, providing information to consumers about prices and the presence of firms. This increases competition and so lowers prices, and in the long run facilitates entry as well. This approach generally views advertising in a positive light, although as Stegeman (1991) and Grossman and Shapiro (1984) have shown, in general the market does not provide the right amount of informative advertising.

A number of studies have made an effort to determine which of these two mechanisms dominates in practice. Beginning with Benham (1972), a series of papers, including Kwoka (1984) and Cady (1976), compared prices of professional services and related goods offered in U.S. states where advertising was permitted to those where it was not. These papers typically show that where advertising is permitted prices are generally lower, although the results are likely to be far less precise than claimed, due to these papers' failure to account for geographical clustering in the data.[1]

Concern with the possible endogeneity of the laws prohibiting or restricting advertising (such as when an industry differs by state also in its ability to successfully collude), has led others to investigate situation in which the amount of advertising in a given industry changed over time for exogenous reasons. Glazer (1981) showed that supermarket food prices rose relative to those of small grocery stores during the New York City newspaper strike, which impeded advertising by supermarkets (but not small grocery stores, which do not generally advertise); furthermore, prices rose less in areas of the city that were still partially served by non-striking newspapers. Milyo and Waldfogel (1999) similarly trace the pattern of liquor prices in Rhode Island and

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[1] Thus Benham's basic regression is based on 177 individuals residing in 15 states, Kwoka's analysis is based on seven cities and Cady's data has about 1900 pharmacies in, it would appear, 48 states.

neighbouring Massachusetts around the time the U.S. Supreme Court struck down a law prohibiting liquor store advertising in Rhode Island. The authors find no overall effect of advertising de-prohibition on prices, although they do show that advertised products are priced substantially lower, although only at stores that advertise that product. In contrast to these two quasi-experimental studies, Devine and Marion (1979) undertake a true experiment by gathering prices from Ottawa area supermarkets, and publishing store-specific indices at weekly lags over a five week period; they show that, relative to general inflation, prices fall during the period of publication.

This paper differs from the aforementioned studies in a number of ways. Both the cross section and event studies compare situations in which there is advertising to those in which there is none. No study attempts a quantitative estimate of the marginal effect of advertising on prices, as we do here. Furthermore, each of the aforementioned studies focuses, by their nature, on a very narrowly defined group of goods.[2] In contrast, this study attempts to estimate the marginal effect of advertising on price for a large number of categories of goods.[3]

The cost of examining a large set of goods is having to make two strong assumptions about the nature of seasonal demand and cost shocks: that the seasonality in demand shocks swamps that of cost shocks, and that seasonal demand shifts are proportional ones. Stability of the cost function across seasons is obviously an untenable assumption for fruits and vegetables, and so we do not include any such goods. For manufactured goods, however, this assumption is reasonable, especially since these goods can be stored and seasonal demand shocks are perfectly forecastable. Furthermore, as Israel is a small open economy, a large percent of manufactured goods are imported. That its demand constitutes a very small

[2] There is also a large literature which regresses markups or profit rates on advertising, along with other variables. For the most part, this literature predates widespread concern with issues of endogeneity.

[3] Our work is also related to the set of studies that document that prices fall at demand peaks. Warsky and Barsky (1995) showed that prices of eight goods at several stores fell at weekends and during the Thanksgiving to Christmas, while Chevalier et al (2003) show that prices of seven food products at a Chicago supermarket chain fall at holiday or weather related demand peaks (although Nevo and Hatzitaskos show that much of the decrease is due to time varying quantity weights across brands). MacDonald (2000) found that 48 food products with pronounced seasonal quantity peaks exhibited decreased prices at those peaks.

percentage of overall production for these goods, and to the extent that its demand shocks are uncorrelated with aggregate world demand shocks, further justifies the constant marginal cost assumption. The proportionality assumption is obviously more problematic; we will discuss it further later on.

The power of our test depends crucially on advertising's effectiveness increasing in times of greater demand. This condition almost certainly holds for conventional advertising: since an ad on television, for example, will reach a viewer whether or not the viewer is currently 'in the market' for the good, advertising will be more effective at reaching a potential customer during periods of high demand. The increased effectiveness will be mitigated somewhat if 'regular' demanders' media choices are more concentrated than 'seasonal' demanders. [4] The condition will not hold for Internet search-based advertising, where, to a first approximation, advertising expenditure is proportional to the number of clicks and so to demand; but such advertising is still a very small fraction of overall advertising expenditure.

In the next couple of sections we lay out two simple models of duopoly interaction, in which firms compete simultaneously in prices and advertising. In the first model, which is based on Tirole's (1988, p. 292) duopoly presentation of the Grossman and Shapiro (1984) model, advertising is informative. Our contribution here is to allow for non-constant marginal cost, and to explicitly consider the effect of a proportional increase in demand. The second model strips away the informative aspect and makes preferences advertising dependent. Here too we allow for non-constant returns to scale and consider proportional increases in demand. We show in both cases, that the equilibrium outcome can be viewed as the intersection of two curves, one determining price as a function of advertising, the other advertising as a function of prices, suggesting a simultaneous equations approach to the estimation. Section IV lays out the methodology for estimating the first of those equations. Section V describes our data and Section VI our results, for which Section VII , which concludes the paper, offers interpretations.

II. Model of Informative Advertising

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[4] Note, however, that if regular wine drinkers also tend to read wine magazines, targeting will not necessarily improve with proportional increases in demand. As will be clear, this will simply reduce the extent of shocks to the effective cost of advertising, and so the power of the test, and not bias the estimates.

Two firms are located on the unit line, one at each end. S consumers are uniformly distributed on the line. A consumer is interested in purchasing at most one unit of the good, in which case he enjoys utility $v_i - td(x,i) - p_i$, where $d(x,i) \equiv |x-i|$ is consumer x's distance from firm $i \in \{0,1\}$, p_i the price charged by firm i, and v_1, v_2 are large enough that the market is covered in equilibrium. In this section we assume $v_1 = v_2 = v$.

A consumer can only buy from a firm from which he has received an ad. Thus a consumer who receives an ad from only one firm buys from it, whereas the demand of consumers who receive an ad from both firms is simply the usual Hotelling (1929) demand curve for maximally differentiated firms. The proportion of consumers who receive an ad from a firm which sends out k ads is $\Phi(k)$, where Φ is increasing and concave. Thus firm 0's *per-capita* demand curve is

$$D(p_0,p_1;k_0,k_1) \; = \; \Phi(k_0)[(1-\Phi(k_1)+\Phi(k_1)(t+p_1-p_0)/2t].$$

Letting C denote a total cost function, which we assume weakly convex in output, S market size and b the cost of a single ad, the profits of firm 0 are given by:

$$\pi(p_0,p_1,k_0,k_1) = SD(p_0,p_1;k_0,k_1)\, p_0 - C(SD(p_0,p_1;k_0,k_1)) - bk_0$$

and symmetrically for firm 1. Note that under constant returns to scale, a firm increases its revenue and costs by the same proportion when increasing its advertising; thus it is the other firm's advertising that affects a firm's pricing choice, not its own. Under a more general cost function, a firm's choice of its marginal markup, i.e., price minus marginal cost, is affected by the other firm's advertising and not its own.

We look for a symmetric Nash equilibrium in prices and advertising. The first order condition for price

$$D(p_0,p_1;k_0,k_1) \; + (\partial D/\partial p_0)[p_0 - C'(q_i)] = 0$$

(where q_i is firm i's output) is , in symmetric equilibrium, (MD-1) $$(1-\frac{1}{2}\Phi(k))-[\frac{1}{2t}\Phi(k)]m=0$$

where $m=p-C'(q)$ is the markup of price over marginal cost. It is easy to see that as advertising increases, and under constant marginal cost, this converges to the usual pricing equation (generalized for possibly non-constant marginal cost), $m=t$, (e.g., Tirole, 1988, p. 292).

The first order condition for advertising,

$$S\partial D(p_0,p_1;k_0,k_1)/\partial k_0\ [p_0-C'()]=b\text{, which here is}$$

$$S\Phi'(k_0)[(1-\Phi(k_1)+\Phi(k_1)(t+p_1-p_0)/2t]m_0=b\ ,$$

reduces in the symmetric equilibrium to

(AD-1) $$\Phi'(k)[1-\Phi(k)/2]m=b/S$$

Equations (MD-1) and (AD-1) define a pair of curves in (m,k) space, with (MD-1) sloping down and (AD-1) sloping up. Thus, there is a unique symmetric equilibrium. An increase in S shifts (AD-1) down, as in Figure 1, thus decreasing the markup and increasing k. Intuitively, a proportional increase in demand reduces the cost per potential consumer of an ad (b/S), thus increasing advertising and so reducing the markup. Note that the equilibrium advertising and markup levels are independent of the marginal cost curve.

The shape of the marginal cost curve does determine the effect of a demand shock on price. Obviously, when marginal cost is constant, price behaves like the markup and so falls with an increase in demand. If marginal cost is sufficiently increasing, however, price can increase; in other words, the translation of (MD-1) to price and advertising space is upward sloping. The key to constructing such an example lies in the fact that the equilibrium markup and advertising are independent of the cost curve; since advertising is thus, so is output. Therefore,

$$\frac{dp}{dS} = \frac{dm}{dS} + \frac{dC'(q)}{dS} = \frac{dm}{dS} + C''(q)\frac{dq}{dS}$$

Obviously, dp/dS (and thus dp/dk, along (MD-1)) can be made positive by choice of a cost function with a sufficiently large second derivative at the equilibrium output.

III. A Model of Persuasive Advertising

In this model, consumers are distributed as before, with the same utility function and firms are again located at the two ends of the line. Now, however, all consumers are fully informed about the firms and their prices, but the preference parameters are functions of advertising levels. Specifically, the perceived quality of each firm increases at a decreasing rate with its own advertising: $v_i = v(k_i)$, $v' > 0, v'' < 0$, while the production differentiation parameter is an increasing concave function of the sum of the advertising levels: $t = t(k_0 + k_1)$, $t' > 0, t'' < 0$. This specification captures the (persuasive) view that advertising not only increases the willingness to pay for a product, but also decreases the elasticity of demand (as formalized, for example, in Dixit and Norman (1978)); it also is necessary if each strategic variable is to depend on the other in equilibrium.

Now per-capita demand is

$$D(p_0, p_1; k_0, k_1) = [(1/2) + (v(k_0) - v(k_1) - (p_0 - p_1))/2t(k_0 + k_1)]$$

so that the first order condition for price in the symmetric equilibrium is the usual one,

(MD-2) $\quad m = t(2k)$

The first order condition for advertising is

$$S\{v'(k_0)(1/2t) - t'(k_0 + k_1)(p_1 - p_0)/2t^2\}m_0 - b = 0,$$

which in symmetric equilibrium reduces to

(AD-2) $\quad v'(k)m/t(2k) = 2b/S$

Figure 2 displays both curves. As before, (AD-2) is upward sloping. Now, however, (MD-2) is upward sloping, too. Substituting (MD-2) into (AD-2) shows that the equilibrium is unique and that advertising is increasing in the demand shock S. Since (MD-2) is independent of S and upward sloping, the markup must be unique and increasing in S as well. Thus (AD-2) must cut (MD-2) from below. As before, equilibrium markup and advertising are independent of the form of the cost curve.

IV. Methodology

Both models yield an MD curve, which shows the marginal markup as a function of on advertising, and an AD curve, which shows advertising as a function of the marginal markup. The AD curve is shifted down by the proportional demand shifter, S, while the MD curve is independent of it. This attribute of the models indicates that the slope of the MD curve, which captures the effect of advertising on price and so distinguishes between the two models, can be estimated by the instrumental variable estimation of price on advertising, instrumented by exogenous determinants of S.

We do not, however, observe marginal cost. Clearly this is no impediment when marginal cost is a constant function of quantity. In that case, rewrite the two MD curves as $p = c + t(2 - \Phi(k)) / \Phi(k)$ and $p = c + t(2k)$, and approximate the second term on the right hand side of each equation by a linear term in log advertising expenditure, A. We obtain the *price determination* curve

(PD) $p = \alpha + \beta \ln A + \varepsilon$

where α is the sum of marginal cost and the constant term in the linear approximation and ε captures unobserved differences in product differentiation and firm numbers, as well as costs. The coefficient on log advertising, β, will be negative under informative advertising, and positive under product differentiation-enhancing advertising.

Ordinary least squares estimation of β in equation (PD) is likely to be inconsistent. For example, increases in product differentiation, unrelated to advertising, shift the PD curve up and increase equilibrium advertising in the informative advertising model. Firm entry[5], in either model suitably adopted, shifts the PD curve down, and decreases advertising. In more general models in which the market is not covered[6], input prices provide another source of shocks. If the pass-through rate of marginal cost to price is less than one, an exogenous increase in marginal cost will cause price to rise, but by less than the marginal cost increase, and so decrease advertising, thus generating a negative correlation between the error term and advertising. Variation in any of these three sources of shocks generate a correlation between advertising and the error term, and so impart an asymptotic bias to the OLS estimate of β of unknown size and magnitude.

To deal with the simultaneity problem, we employ monthly dummies as instruments. This is appropriate under the assumption that there are systematic proportional demand shifts across seasons, while any such for the marginal cost function are negligible in comparison. As we saw, proportional shifts in demand will shift the AD curve, but not the PD curve.

Our inference about the slope of the PD curve is much less complete when the marginal cost function is increasing. In that case, the demand shifter shifts the PD curve as well, since at a given advertising levels, higher demand will increase the marginal cost and so price. Consequently, the IV estimator will be biased upwards. To see this, first note that the error term will now include the deviation of the marginal cost from its average value and so will be positively correlated with an indicator of increased demand. More precisely, let $\eta_{A,S}$ denote the total elasticity of advertising with respect to market size, and $\eta_{D,A}$ the elasticity of per capita quantity with respect to an increase in both firms' advertising, and denote by q_0 the output level at which marginal cost equals average marginal cost in the sample. The probability limit of the bias in the instrumental variables estimator of β, $Cov(\ln S, \varepsilon)/Cov(\ln S, \ln A)$, is approximately

[5] See, for example, equation (11a) in Grossman and Shapiro, 1984. Entry need not be a rare event, but might constitute an increase in the share of retail outlets that sell a firm's product.

[6] In symmetric models in which each consumer purchases a single unit, marginal cost increases are wholly passed on to price.

$$
\begin{aligned}
& Cov(\ln S, q_0 C''(\ln q_0)\ln q) / [\eta_{A,S} Var(\ln S)] \\
& = q_0 C''(\ln q_0) Cov(\ln S, (1+\eta_{D,A}\eta_{A,S})\ln S) / [\eta_{A,S} Var(\ln S)] \\
& = q_0 C''(\ln q_0)(1+\eta_{D,A}\eta_{A,S}) / \eta_{A,S}
\end{aligned}
$$

which is positive[7] in both models, when the marginal cost function is increasing.

Finally, we add a trend term to (PD), which will pick up secular changes in both changes in tastes and costs.

V. Data

Our primary analysis requires data on the level of advertising and prices. We have managed to assemble such data for most of the consumer products in Israel, aggregated to 131 sub-sectors in monthly intervals from 1999 to the end of 2005. Advertising figures come from IFAT, a private company, which records the units of advertisements appearing in five different media (newspapers, radio, television, Internet and billboards) and aggregates them with media prices. Our price data come from Israeli Central Bureau of Statistics (CBS). These are price indices built up from the lower level sub-indices used in construction of the Consumer Price Index, but, upon our request, aggregated so as to conform with the IFAT categorization. The January 1999 price is set equal to 100 for all product categories. Prices are nominal. (The annual inflation rate over the period averaged 1.6 percent.)

As noted, certain categories clearly do not fit the assumptions of the model. We drop all categories of fruits and vegetables, where clearly the marginal cost function is not seasonally stable. We also drop categories whose prices are regulated.

Summary statistics are shown in Table 1. The mean, mean (across products) minimum and maximum, and overall minimum and maximum values are shown for advertising, the log of advertising and price. Since for some observations, i.e., month-category pairs, advertising is zero, we measure the log of advertising as the log of 1 plus advertising expenditure.

We also have limited consumption data that we aggregate according to the IFAT categorization from the 1999-2005 micro diary data of the CBS' Consumer

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[7] $\eta_{D,A}$ is positive in the informative advertising model, but zero under persuasive advertising; $\eta_{A,S}$ is positive in both models.

Expenditure Survey.[8] These diaries are filled out by households over a two week period. Households enter the survey continuously over the year. Per year, there are on average 6000 households per year; because of attrition over the two week period, there are about 184 households a day. Households report both the expenditure and the quantity purchased. Unfortunately, quantity is reported in varying and often imprecisely defined units (e.g., “parcel”, “loaf”, “pack”, “box” and even “unit”) across households, which, along with unreported quality differences, limits the usefulness of the quantity variable. Nevertheless we will test for the co-variation of both expenditure and advertising across seasons in order to validate our method.

VI. Results

Our methodology is predicated on seasonal demand fluctuations, which reduce the effective cost of advertising and so cause seasonality in both prices and advertising. It is from the correlation of the seasonal averages in prices and advertising that we mean to infer the effect of advertising on price. Thus as a first step we check for statistically significant seasonality in advertising and prices.

Figure 3 shows the scatter diagram of the F-tests of no months effect from the regressions of price and advertising on eleven month dummies (with December dropped) and a trend. Note that since all the regressions have the same number of observations and regressors, the F-tests are comparable measures of the ratio of the explained (net of the trend) to the unexplained variation of the model; in all cases, the F-test is simply seven (i.e., (84-11)/(12-1)) times the ratio of the month dummies’ marginal contribution to the explained sum of squared errors to the residual sum of squared errors.

There are two major features of Figure 3. First, there are very few observations with an F-test for either the price or advertising first stage regression that is sufficiently great to justify IV estimation, according to Stock and Yogo (2005). They find, for example, that in order to ensure that the IV bias not exceed 10% of the OLS bias, the first stage F-test must meet a threshold of 11.51, and a threshold of 12.23 for a desired maximal size of 25% of a 5% Wald test, both for the single endogenous regressor, 11 instrument case. Only nine categories have an F-test of at least 10.5 threshold for at least one of those two variables. That leads us to consider alternative

[8] More precisely, we also use those households-days observations from the 1998 survey that fall in January 1999, and drop those from the 2005 survey that fall in January 2006.

estimators, specifically, LIML and Fuller-k. Stock and Yogo (2005) have shown that, for our case, an appropriate cutoff for the first stage regression F-test for these estimators is 3.34. [9] That is, seasonal variation needs to exceed about a third of the total variation (net of trend) for a valid second-stage inference.[10] Using these estimators will allow us to investigate many more markets.

The second point is that there are many more categories for which there is significant seasonality in advertising than categories for which that is true for price. Eight categories pass the 3.34 F-test cutoff for the regression of price on month dummies (plus trend), while thirty-five do so for the regression of advertising on month dummies. Furthermore, only two of the eight which pass the price regression F-test threshold fail to do so for the advertising regression as well.

Measured seasonality is also larger for advertising than for price. Figure 4 graphs the peak to trough ratio of advertising against that of price. The average log difference from peak to trough is a hundred times greater for advertising as for price. Admittedly, a large part of that difference comes from categories for which advertising is zero for certain observations; however, even if one considers only those categories for which advertising is always positive, the ratio is still thirty times greater (by the mean) and fifty times (by the median). Figure 5 repeats the exercise for only those categories above the 3.34 threshold, with similar results. This two orders of magnitude difference anticipates our results – very small effects of advertising on price, or, in other words, that the PD curve is typically flat – since the absolute value of the IV estimate of β, which is $Cov(\underline{\ln P}, \underline{\ln A}) / Var(\underline{\ln A})$ (where the underline indicates monthly averages of the de-trended data), is bounded above by $\sqrt{Var(\underline{\ln P}) / Var(\underline{\ln A})}$.

Table 2 presents estimates of the slope of the PD curve for the Fuller, LIML and IV estimators, with corresponding standard errors, and the F-tests of the first stage, for the set of categories for which the first-stage F statistic from the regression of log advertising on months exceeds 3.34. Of the 35 categories, 5 have significant (at the one sided 5 percent level) negative coefficients, 4 have significant positive coefficients, and the remaining 26 have insignificant coefficients. With 9 out of 35

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[9] This is the cutoff for an IV bias that is ten percent of the OLS bias where the Fuller-k estimator is used. The cutoff for a desired maximal size of 10% (15%) of a 5% Wald test when the LIMIL estimator is used is 3.58 (2.76).

[10] Seasonal Var./Residual Var. $\geq$ 3.34 / 7 $\Rightarrow$ Seasonal Var. / Total Var. $\geq$ .323.

categories having significant coefficients, a null hypothesis that the effect is zero for all categories can clearly be rejected. Yet, the effects are extremely small. The most negative effect is that of *books,* where the estimate implies that a ten percent increase in advertising will lead to a one percent decrease in price. The one truly large effect we measure is that of *hotels and guest homes*, where prices rise a quarter of a percent for every percent increase in advertising. Note also that the magnitude of the insignificant estimates are small; they are insignificant for this reason, not because of large standard errors.

Our ability to distinguish informative from persuasive advertising in the categories with significant effects depends on the shape of the marginal cost function. As stated earlier, we take as a reasonable assumption that manufactured, especially imported, storable manufactured, goods, are produced under constant marginal cost. Those goods evidencing significant and negative effects - *books*, *perfumes*, *wines*, *insect killers* and *soup* - are all manufactured goods, although not necessarily imported. The seasonal component of *wines*, *insect killers* and *books* are clear: *wines* are heavily consumed in April, when the Passover holiday falls, *insect killers* are demanded heavily in the summer, when the cockroaches and ants appear, while 'book week' takes place in the beginning of every June. It is unlikely however that demand for books truly increases in June; rather the industry has organized a common sale time, which should be seen as an artificial supply side shock. A priori we expected no particular pattern for *perfumes,* but its hitting an overall peak in advertising and a trough in prices in October and a local peak in advertising and a trough in price in the Spring is consistent with demand increasing around the Jewish holidays. As for *soup*, whose advertising peaks in March and prices fall to a minimum in the same month, we have no explanation. Leaving aside *books*, we feel confident in asserting that these goods exhibit small informative advertising effects.

Of the goods with statistically significant positive effects, *hotels and guest homes* fits neatly into the category of sharply increasing marginal costs, given its nearly fixed capacity, so that we can not assert that advertising has any effect here. (Note that a negative estimated coefficient here would have indicated informative advertising.) Capacity constraints might be relevant for *travel abroad* as well. *Heater* (whose advertising peaks strongly in December), on the other hand, is a storable, importable manufactured good, so that we assign it to the persuasive advertising column – albeit with an extremely small effect. *Swimwear*, being a fashion good, fits neatly into the persuasive advertising column.

Some of the categories with insignificant results are ones with very high degrees of first stage significance, and where we would ex-ante have expected high seasonality. Among those whose demand we would expect to be high in the summer months, *air conditioning* units displays a quite significant degree of seasonality in advertising, with a peak to trough log difference of 1.5, but no effect on price. Likewise, *ice cream*, for which advertising peaks in June, *sunbathing treatment*, for which it peaks in July, *garden furniture* whose advertising plateaus from April through August, *deodorant* and *non-laser depilatory*, both of which plateau from June through September. During those same months, advertising for *nylon stockings* remains very low, then peaks in December and January, as does that for *carpets*. There is another group which peaks sharply at the fall and spring holiday seasons.

It bears noting that a comparison of the IV against the Fuller and LIML estimates (as in Figures 6 and 7) shows that, at least in the present data context, the Stock and Yogo thresholds for IV estimation are typically much too conservative. The results also show clearly the pitfall in using the LIML estimator (which lacks a mean) without the first stage criterion; *car rental*, which has a first-stage F-test of only 1.59, yields an absurdly huge LIML estimate of -31.9 for β.

One possible explanation for the small estimates is that our category selection procedure is biased towards industries with a flat PD curve. Holding both the AD curve and the variability of demand shocks constant, it is precisely such industries that would have the greatest advertising variability, and so pass the first-stage test. To check for this, Table 3 presents estimates for the reverse regression of price on advertising for the set of categories whose first stage price regression has an F-test exceeding 3.34. Those categories thus selected that were also selected on the basis of the advertising first stage F-test have estimates of the inverse slope that are quite close to the inverse of the second stage direct regression estimates. There are two newcomers. *Pants* has a negative and significant coefficient, the inverse of which implies that a doubling of advertising will lead to a ten percent price decrease. The exception is *rental cars*, whose coefficient is insignificant. This then is the one case in which there is evidence of a steep PD curve, albeit of uncertain sign.[11]

A more liberal approach to selecting categories to analyze is to accept all categories that are not rejected by the Hahn-Hausman (2002) test, which has the null of strong instruments, and is based on the difference between the IV estimate and the inverse of the reverse IV estimate, corrected for a bias term. The estimates for this set of categories, using a 10% rejection area, are shown in Table 4. Among the categories with significant negative effects in Table 2, *soup* is dropped, while two categories are added: *pants* and *baby products* (with the latter evidencing a, not surprising, extremely low first stage F-test). Among categories with a positive effect in Table 2, only *travel abroad* remains, and it is joined now by *pools and gyms* (with a first stage advertising F-test of 2.4, which is reasonable for the k-estimators). *Pools and gyms* is clearly a fixed capacity industry; its advertising peaks in August, and its price in September. The excluded categories (*heater*, *hotels and guest rooms* and *swimwear*) have extremely high Hahn-Hausman test-statistics and so would be eliminated under any reasonable significance level; nevertheless, qualitatively and economically, the direct and reverse regressions are consistent in sign and in order of magnitude.[12]

As a supplemental check on the appropriateness of the methodological approach, we also test for a positive correlation between advertising and consumption. We succeeded in matching 99 of the categories to CES products or groups of products. Of those, 43 display significant seasonality in expenditure at the 5% level of the F-test or more; 37 display significant seasonality in quantity purchased at the 5% level of the F-test or more.[13] There are 29 categories with F-tests for expenditure and 15 for quantities that exceed 3.34.

Table 5 present the results for the second-stage IV and Fuller-k regression of log advertising on log expenditure and log quantity. (The LIML and Fuller-k estimates never differ by more that 5 percent of each other.) In nearly all cases, there is a positive, significant relationship between advertising and quantity or expenditure.

[11] Note that *rental cars* may fail the condition for non-seasonal marginal cost functions, as its capital is used commonly by domestic and foreign demand, so that foreign demand shifts will increase the marginal cost function for serving the domestic market (the relevant market for the study, as we use advertising directed to it, and its prices).

[12] The IV estimate of the slope and the inverse of the IV estimate of the inverse slope are: *heater*: .006 and .008; *hotels and guest rooms*: .15 and .35; *swimwear*: .017, and .031.

[13] We normalize both consumption and advertising to a 30 day month.

There are no significant negative relationships. Furthermore, the estimated elasticity almost always exceeds one, usually considerably so, indicating relatively flat AD curves, i.e., that small increases in the markup yield large increases in advertising. It is noteworthy that those categories for which a less than unitary elasticity is estimated mostly exhibit a significant positive relationship between price and advertising: *travel abroad*, *hotels and guest homes* and *heaters*. *Shows* also has an elasticity less than one; like *hotels and guest homes* and *travel abroad*, it is a nearly fixed capacity industry. For such categories, a small elasticity is sensible, if advertising's main effect is to increase demand at given prices, rather than increase willingness to pay.

VII. Interpretations

There are a number of aggregation and timing issues that might throw some doubt on our results. Perhaps we have misspecified the temporal relationship between advertising and prices, and that to be effective, advertising needs to precede the period of high demand. To allow for this possibility, we redid the analysis with advertising lagged one month. The results were virtually unchanged. The selection of categories remained the same, since the first stage regression differed only in the first observation being dropped. The second stage estimates remain essentially unchanged, with the measured effects for all categories retaining their significance levels, magnitudes and signs, with the single exception of *Book*s, where the measured effect, previously significantly negative, turned significantly positive, presumably because of the sharpness of the June price fall and advertising peak. Likewise, including both current and previous month advertising never changes the overall level of significance of the advertising regressor.

Like most, if not all, studies that rely on CPI indices or the underlying micro data, such as Bils and Klenow (2004) and Dhyrnes et al. (2006), we undoubtedly miss most sales, which Chevalier et al have showed to involve very sharp, short lived reduction in price. For some of the goods, total price variation is therefore possibly much greater than we measure it. But the presence of such sales should not bias our results. If the sales are random events that are not generated by demand shifts, as in the Varian (1980) model of sales, for example, they will be randomly "allocated" across months, and so be averaged out of our data, and properly so. If they are generated by sharp, short lived demand peaks that last for a few days only, they should, under the argument presented in this paper, lead to corresponding short lived changes in price and advertising. With prices and advertising aggregated to the monthly level, these changes may be difficult to discern; thus categories in which systematic demand peaks are always brief may fail to pass our first-stage test, but conditional on so doing, they ought to yield up consistent estimates of β.[14]

A similar issue arises for those goods whose seasonal demand is driven by Jewish holidays. The Hebrew calendar works on an adjusted lunar basis, so that over our sample period, the starting date for Passover, for example, ranged over some thirty days of the Gregorian calendar. Passover generated demand shocks will therefore be distributed across two Gregorian months. This will make the seasonality in advertising and prices more difficult to detect, and increase the standard error on the estimate of β. Nonetheless, as we have seen, in our set of categories that evidence sufficient seasonality in either advertising or price, there is little imprecision in our estimation of β.

Finally, consider the consequences of non-proportional demand shifts, which may arise for a number of reasons, such as seasonal differences in the composition of either demand elasticities or buyer search costs. Nevo and Hatzitaskos (2005), for example, have used the first possibility to explain the fall in the price of tuna at high demand (lent), that Chevalier et al (2003) document. Clearly our estimates of the effect of advertising on price will be biased in the presence of non-proportional demand shifts, since changes in elasticity are generally expected to change the equilibrium price under imperfect competition. But given that we generally measure a small effect of advertising on prices, for the bias to be masking large true effects of advertising on prices, it must be that the bias is, in each and every one of some thirty or forty, very different product categories, nearly exactly offsetting the true advertising effects. That strikes us as rather unlikely.

Our conclusion, therefore, is that the effect of changes in advertising on prices at seasonal frequencies is generally small, indeed so small that one can not generally decide between an informative advertising effect and a persuasive one. The MD curve, in other words, is typically flat. Our finding that advertising generally responds

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[14] Thus if demand is at one of two levels, 0 and 1, with corresponding prices (p_0, p_1) and advertising (A_0, A_1), and if the demand level 1 is experienced for only fraction α of the days in one month of the year, β will be estimated as

$$[\alpha p_1 + (1-\alpha) p_0 - p_0]/[\alpha A_1 + (1-\alpha) A_0 - A_0] = [p_1 - p_0]/[A_1 - A_0].$$

more than proportionally to consumption shifts further suggests that the AD curve is relatively flat as well. We emphasize that these conclusions correspond to seasonal frequencies. Advertising effects might be of greater magnitude at lower frequencies (possibly brand loyalty can not be built up over such a short amount of time) although research that shows advertising to depreciate rapidly belies that.[15] Our results are also consistent with the large literature showing a strong, cross-industry correlation between price-average cost margins or profit rates and advertising, to the extent that the correlation is generated by shifts in the MD curve, say by differences in the importance of product differentiation across industries.

[15] See Clarke (1976), Assmus, Farley and Lehmann (1984) and Leone (1995).

References

Ackerberg, D. A. 2001. “Empirically distinguishing informative and prestige effects of advertising” *RAND Journal of Economics* 32, 316–33r.

Assmus, G., J. U. Farley, and D. R. Lehmann, 1984, “How Advertising Affects Sales: Meta-Analysis of Econometric Results”, *Journal of Marketing Research*, 21, 65-74.

Benham, L. 1972. “The effects of advertising on the price of eye-glasses”, *Journal of Law and Economics* 15, 337–52.

Butters, G. 1977. “Equilibrium distribution of sales and advertising prices”, *Review of Economic Studies* 44, 465–91.

Chevalier, J. , A. Kashyap and P. Rossi, 2003. “Why Don’t Prices rise during Periods of Peak Demand? Evidence from Scanner Data”, *American Economic Review*, 93(1), 15-37.

Clarke, D., 1976, “Econometric Measurement of the Duration of Advertising Effect on Sales”, *Journal of Marketing Research*, 13(4), 345-357.

Bils, M. and P. Klenow, 2004, “Some Evidence on the Importance of Sticky Prices”, *Journal of Political Economy*, 112(5):947-85.

Cady, J. F. 1976, “An estimate of the price effects of restrictions on drug price advertising”, *Economic Inquiry* 14, 493–510.

Devine, D. G. and Marion, B. W. 1979. “The influence of consumer price information on retail pricing and consumer behaviour,” *American Journal of Agricultural Economics* 61, 228–37.

Dhyne E., L. J. Alvarez, H. Le Bihan., et al., “Price changes in the Euro area and the United States: Some facts from individual consumer price data”, *Journal of Economic Perspectives* 20 (2): 171-192 SPR 2006

Dixit, Avinash and Victor Norman, “Advertising and Welfare” *Bell Journal of Economics*, 9(1):1-17, 1978.

Glazer, A. 1981. “Advertising, information and prices: a case study” *Economic Inquiry* 19, 661–71.

Grossman, Gene and Carl Shapiro, “Informative Advertising with Differentiated Products”, *Review of Economic Studies*, 51:63-84, 1984.

Hahn, Jinyong and Jerry Hausman, “A New Specification Test for the Validity of Instrumental Variables”, *Econometrica*, 70(1), 2002:163-189.

Hotelling, H. “Stability in Competition”, *Economic Journal*, 39, 1929, 41-57.

Kaldor, N. 1950. “The economic aspects of advertising”, *Review of Economic Studies* 18, 1–27.

Kwoka, J. E., Jr. 1984. Advertising and the price and quality of optometric services. *American Economic Review* 74, 211–6.

Leone, R., 1995, “Generalizing What is Known About Temporal Aggregation and Advertising Carryover”, *Marketing Science*, 14(3), G141-150.

MacDonald, J. M., 2000. “Demand, Information, and Competition: Why do Food Prices Fall at Seasonal Demand Peaks”, *The Journal of Industrial Economics*, 27-45.

Milyo, J. and Waldfogel, J. 1999. The effect of price advertising on prices: evidence in the wake of 44 Liquormart. *American Economic Review* 89, 1081–96.

Nelson, P. 1974. Advertising as information. *Journal of Political Economy* 82, 729–54.

Nevo, A. and Hatzitaskos, “Why does the average price of tuna fall during Lent?”, NBER working paper 11572, 2005.

Stegeman, Mark, “Advertising in Competitive Markets”, *American Economic Review*, 81(1):210-223, 1991.

Stock, James H. and Motohiro Yogo, “Testing for Weak Instruments in Linear IV Regression”, in Donald W. K. Andrews and James H. Stock, *Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg*, Cambridge University Press, 2005.

Telser, L. G. 1964. “Advertising and competition”, *Journal of Political Economy* 72, 537–62.

Tirole, J., 1988, *The Theory of Industrial Organization*, The MIT Press.

Varian, H., 1980. “A Model of Sales”, *American Economic Review*, 651-59.

Table 1: Summary Statistics

	Price	Ln(Price)	Advertising*	Ln(1+Advertising)
Mean	107	4.66	0.77	10.84
S.D.	17	0.20	0.15	4.68
Minimum	15	2.73	0.00	0.00
Maximum	173	5.15	20.7	16.85
Mean Min.**	94	4.52	0.16	5.56
Mean Max.**	121	4.79	2.61	14.33
Mean S.D.**	7.4	0.07	0.51	2.44

* Advertising expenditure is in 100,000s of NIS.
** Mean Min., Mean Max. and Mean S.D. are the values of the corresponding statistics averaged over the categories.

Table 2: The Effect of Advertising on Prices (Direct Regressions)

	Fuller		LIML		IV		1st Stage
Category	Beta	S.E.	Beta	S.E.	Beta	S.E.	F-Test
			NEGATIVE EFFECT				
Books	-0.096	0.016	-0.097	0.016	-0.084	0.014	7.8
Perfumes	-0.047	0.010	-0.048	0.010	-0.040	0.009	8.8
Wines	-0.007	0.004	-0.008	0.004	-0.007	0.004	4.33
Insect Kil	-0.002	0.001	-0.002	0.001	-0.002	0.001	26.42
Soup	-0.001	0.001	-0.001	0.001	-0.001	0.001	6.66
			POSITIVE EFFECT				
Heater	0.006	0.003	0.006	0.003	0.006	0.003	3.8
Swimwear	0.022	0.003	0.022	0.003	0.017	0.003	21.19
Travel Abroad	0.057	0.012	0.058	0.012	0.054	0.012	25.73
Hotels ES	0.244	0.044	0.247	0.045	0.151	0.029	10.84
			INSIGNIFICANT EFFECT				
Nat. Drugs	-0.008	0.011	-0.007	0.011	-0.007	0.011	6.98
Clock&Watch	-0.007	0.005	-0.007	0.005	-0.006	0.005	3.61
Museums	-0.007	0.015	-0.006	0.015	-0.007	0.015	4.36
Mineral Water	-0.004	0.005	-0.005	0.005	-0.004	0.005	8.35
Carpet	-0.004	0.008	-0.003	0.008	-0.004	0.008	13.83
Garden Furniture	-0.003	0.002	-0.003	0.002	-0.002	0.002	4.79
Mattress	-0.003	0.009	-0.003	0.009	-0.003	0.009	4.8
Entrance Fee	-0.003	0.004	-0.002	0.004	-0.004	0.004	10.98
Deodorant	-0.002	0.001	-0.002	0.001	-0.002	0.001	5.59
Cereals	-0.001	0.007	-0.001	0.007	-0.002	0.007	3.38
Drugs	-0.001	0.018	-0.001	0.018	-0.001	0.018	8.24
Nonlaser Depilator	-0.001	0.001	-0.001	0.001	-0.001	0.001	4.36
Nylon Stock.	-0.001	0.001	-0.001	0.001	-0.001	0.001	8.9
Sweet Snacks	0.000	0.001	0.000	0.001	-0.001	0.001	7.42
Bags	0.000	0.003	-0.001	0.003	0.000	0.003	3.43
Beer	0.000	0.004	0.000	0.004	0.000	0.004	5.93
Ice Snacks	0.001	0.001	0.001	0.001	0.001	0.001	7.7
Ice Cream	0.001	0.000	0.001	0.000	0.001	0.000	10.02
Carbonated Drinks	0.001	0.003	0.001	0.003	0.001	0.003	5.28
Jewellery	0.001	0.007	0.001	0.007	0.001	0.008	5.93
Sick Fund	0.002	0.004	0.002	0.004	0.002	0.004	3.61
Sunbath Treat	0.005	0.004	0.005	0.004	0.004	0.003	14.56
Shoes	0.008	0.018	0.008	0.018	0.008	0.018	7.09
Undergarment	0.008	0.010	0.008	0.010	0.009	0.009	8.45
Air conditioner	0.009	0.012	0.009	0.012	0.008	0.012	14.99
Air Travel	0.672	0.589	1.472	1.858	0.025	0.035	3.74

Table 3: The Effect of Advertising on Prices (Inverse Regression).

	Fuller		LIML		IV		1st Stage
Category	1/Beta	S.E.	1/Beta	S.E.	1/Beta	S.E.	F-Test
			NEGATIVE EFFECT				
Books	-10.11	1.66	-10.26	1.69	-8.24	1.35	6.18
Pants	-10.61	5.77	-10.68	5.79	-8.99	5.46	16.4
Perfumes	-20.32	4.19	-20.9	4.34	-13.35	2.7	4.76
			POSITIVE EFFECT				
Hotels&Ghomes	4.01	0.72	4.04	0.73	2.82	0.56	13.74
Travel	16.77	3.41	17.39	3.58	10.95	2.04	3.93
Swimwear	45.06	6.6	45.48	6.66	31.49	4.93	14.97
			INSIGNIFICANT EFFECT				
Air Travel	0.67	0.85	0.68	0.86	0.38	0.73	12.07
Rental Car	-0.05	0.71	-0.03	0.72	-0.26	0.63	6.69

Table 4: The Effect of Advertising on Prices

Category	Fuller Beta	Fuller S.E.	LIML Beta	LIML S.E.	IV Beta	IV S.E.	1st Stage F-Test	H-H Test
NEGATIVE EFFECT								
Books	-0.096	0.016	-0.097	0.016	-0.084	0.014	7.80	0.94
Perfumes	-0.047	0.010	-0.048	0.010	-0.040	0.009	8.80	1.53
Wines	-0.007	0.004	-0.008	0.004	-0.007	0.004	4.33	0.43
Insect Kil	-0.002	0.001	-0.002	0.001	-0.002	0.001	26.42	-1.27
Pants	-0.075	0.037	-0.094	0.051	-0.013	0.005	2.56	0.82
Baby Products	-0.200	0.116	-0.287	0.193	-0.098	0.051	0.66	-0.66
POSITIVE EFFECT								
Travel Abroad	0.057	0.012	0.058	0.012	0.054	0.012	25.73	-0.76
Pools and Gyms	0.188	0.076	0.197	0.079	0.139	0.060	2.40	0.41
INSIGNIFICANT EFFECT								
Ice Cream	0.001	0.000	0.001	0.000	0.001	0.000	10.02	1.05
Sunbath Treat.	0.005	0.004	0.005	0.004	0.004	0.003	14.56	-0.91
Prepared Salads	-0.002	0.001	-0.002	0.002	-0.001	0.001	1.58	-1.17
Shows	-0.045	0.037	-0.048	0.038	-0.026	0.031	2.99	-0.25
Halls	0.048	0.041	0.053	0.043	0.026	0.033	2.18	0.83
Medical Enters	-0.013	0.011	-0.014	0.012	-0.011	0.010	1.78	-1.56
Garden Furniture	-0.003	0.002	-0.003	0.002	-0.002	0.002	4.79	-1.54
Video DVD	0.008	0.007	0.008	0.007	0.007	0.006	2.08	1.47
Air Travel	0.672	0.589	1.472	1.858	0.025	0.035	3.74	-0.69
Spread	-0.002	0.002	-0.002	0.002	-0.001	0.002	1.04	1.19
Iron	-0.002	0.002	-0.003	0.003	-0.001	0.002	0.70	1.02
Diapers	0.010	0.011	0.012	0.013	0.007	0.010	0.73	-1.39
Undergarments	0.008	0.010	0.008	0.010	0.009	0.009	8.45	-1.55
Toilet Paper	0.004	0.005	0.027	0.064	0.000	0.001	0.80	0.95
Tampons	-0.016	0.021	-0.026	0.031	0.001	0.008	1.27	-0.01
Facial Grooming	0.030	0.040	0.036	0.043	0.004	0.030	1.66	0.92
Sweet Snacks	0.000	0.001	0.000	0.001	-0.001	0.001	7.42	-1.33
Razors	0.003	0.005	0.005	0.007	0.001	0.002	0.82	-0.93
Entrance Fee	-0.003	0.004	-0.002	0.004	-0.004	0.004	10.98	-0.93
Juices	-0.001	0.002	-0.002	0.002	0.000	0.002	1.45	-0.82
Washing Powder	0.012	0.020	0.013	0.021	0.012	0.021	1.20	1.63
Tuna	-0.001	0.002	-0.001	0.002	0.000	0.002	1.22	-1.29
Dental Product	-0.001	0.003	-0.002	0.003	-0.001	0.002	1.34	-0.26
Sports Equipment	0.018	0.036	0.055	0.077	0.014	0.034	0.21	-0.71
Manicure	0.016	0.034	0.020	0.036	0.007	0.030	1.41	1.55
Catsup	-0.001	0.002	-0.001	0.002	-0.001	0.002	1.50	-0.91
Hair Colour	0.002	0.004	0.002	0.004	0.001	0.003	1.50	1.18
Beds	0.003	0.008	0.003	0.009	0.002	0.007	1.92	1.12
Television & VCRs	0.020	0.063	0.021	0.066	0.020	0.064	1.11	0.76
Gum	-0.001	0.003	-0.001	0.003	-0.001	0.003	1.20	-1.39
Coffee	0.001	0.004	0.002	0.004	0.000	0.003	1.30	-1.16
Carbonated	0.001	0.003	0.001	0.003	0.001	0.003	5.28	0.75
Candy	0.000	0.001	0.000	0.001	0.000	0.001	1.11	-0.83
Soap Liquid	-0.001	0.005	-0.001	0.006	-0.001	0.005	1.62	-1.16
Prepared Foods	0.000	0.002	0.000	0.002	0.000	0.002	2.88	-1.33

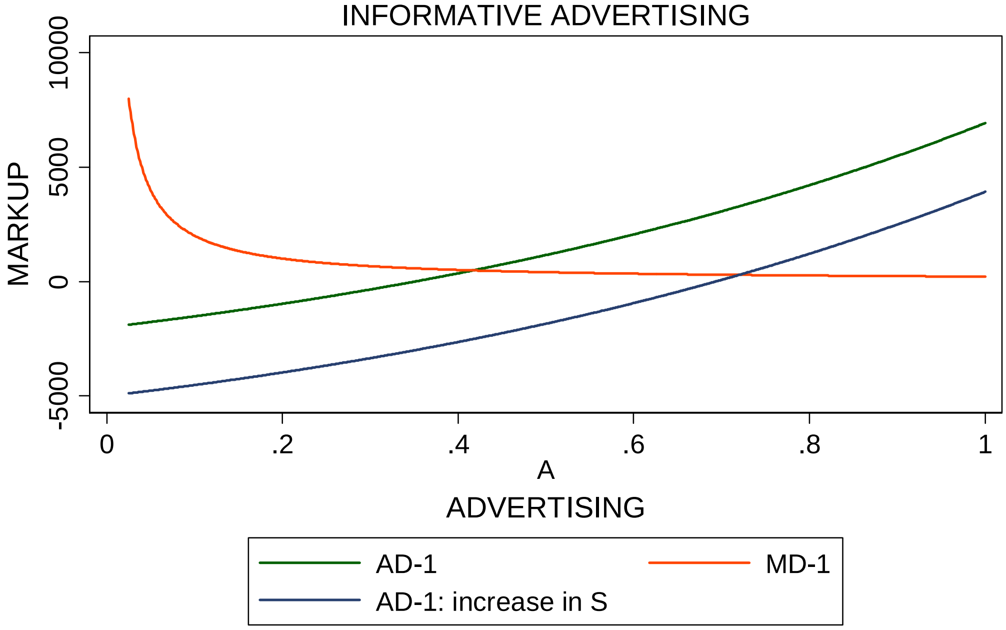
Toys	0.001	0.008	0.001	0.008	0.000	0.008	2.80	1.54
Salty Snacks	0.000	0.003	0.000	0.003	0.001	0.003	3.06	1.01
Microwave	0.000	0.004	0.002	0.006	-0.002	0.003	0.46	1.09
Makeup	0.001	0.028	0.001	0.029	0.000	0.025	1.76	1.12

Table 5: The Regression of Advertising on Consumption Expenditure or Quantity

	Expenditure					Quantity				
	Fuller		IV		1st Stage	Fuller		IV		1st Stage
Category	Coef	S.E.	Coef.	S.E.	F-Test	Coef.	S.E.	Coef.	S.E.	F-Test
SIGNIFICANT POSITIVE WITH ELASITICITY GREATER THAN ONE										
Bags	2.32	0.60	2.13	0.57	13.85	3.16	0.73	2.90	0.70	14.11
Beer	1.87	0.31	1.71	0.29	12.93	1.71	0.28	1.52	0.25	9.24
Carb Drink	4.79	0.92	4.20	0.84	12.15	4.78	0.93	4.02	0.83	8.74
Cereals	4.35	1.07	3.47	0.79	4.05					
Chocolate	7.89	2.78	8.14	2.75	13.88					
Entrance Fee	2.14	0.48	1.37	0.30	3.76	1.80	0.34	1.17	0.22	5.63
Ice Cream	4.71	0.69	4.64	0.70	214.67	4.89	0.76	4.09	0.70	19.92
Insect Ki	7.21	0.68	6.54	0.63	25.79	7.29	0.71	6.47	0.65	23.96
Juices	6.51	2.35	6.04	2.22	5.39	2.18	0.77	2.01	0.74	6.20
MIN. WATER	5.22	1.12	3.30	0.61	3.55	3.76	0.58	3.18	0.49	5.74
Pants	6.84	2.43	4.64	1.94	4.61	4.69	1.73	3.82	1.50	6.69
Pasta	15.88	6.78	11.46	5.72	4.00					
Pools&Gyms	0.08	0.03	0.07	0.03	17.54					
Shoes	3.53	0.83	2.05	0.48	5.38	2.28	0.49	1.66	0.37	9.07
SOUP	12.62	2.46	10.89	2.31	24.59					
Swimwear	2.16	0.35	1.48	0.23	7.89	2.87	0.36	2.26	0.29	15.50
Tea	1.95	1.21	2.13	1.17	15.95					
Toys	1.88	0.67	1.05	0.47	3.82					
Undergarm	3.30	0.83	1.77	0.45	3.95					
Wines	2.54	0.58	2.23	0.51	9.48	2.36	0.53	2.19	0.48	11.75
SIGNIFICANT POSITIVE WITH ELASITICITY LESS THAN ONE										
Travel ABR	0.78	0.14	0.57	0.10	3.76					
Heater	0.30	0.07	0.25	0.07	12.27	0.55	0.13	0.48	0.12	19.27
Hotels&	0.73	0.17	0.46	0.10	3.82					
Shows	0.26	0.10	0.17	0.07	4.58	0.30	0.10	0.20	0.07	4.87
INSIGNIFICANT EFFECTS										
Books	-0.05	0.06	-0.04	0.05	33.22					
Candy	-2.68	2.82	-2.28	2.69	8.13					
Cheese	5.20	5.54	3.99	4.78	4.15					
Meat	1.17	1.35	1.17	1.35	5.24					
Olive Oil	0.88	1.30	1.00	1.26	7.85					
Restaurant	-0.16	0.33	-0.16	0.32	3.93					

FIGURE 1

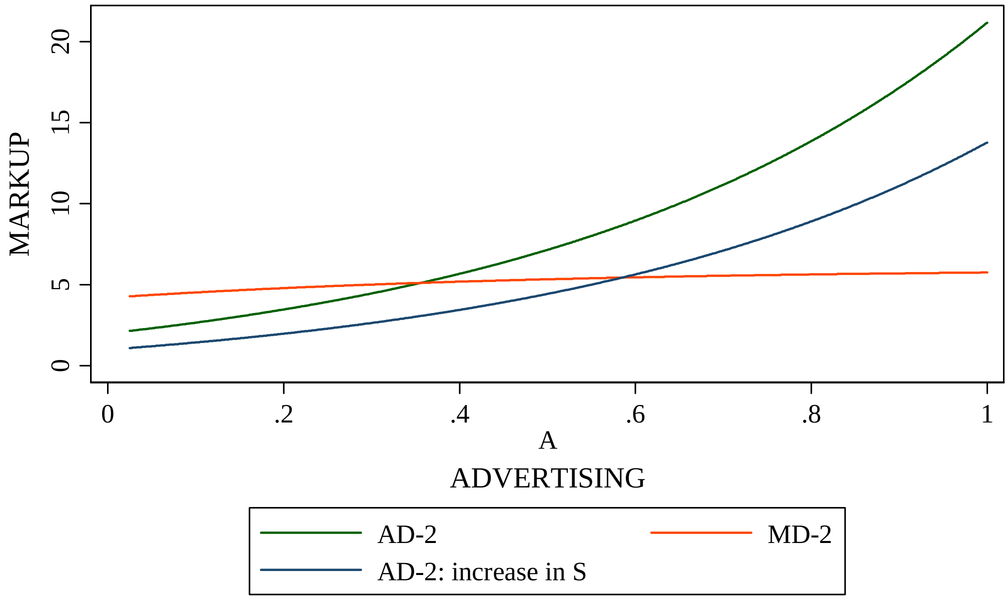
INFORMATIVE ADVERTISING



A proportional increase in demand leads to an increase in advertising and decline in markup

FIGURE 2

PERSUASIVE ADVERTISING



A proportional increase in demand leads to an increase in both advertising and the markup

FIGURE 3

Scatter Plot of F-Tests for Month Effects
In Advertising vs. Price First Stage Regressions

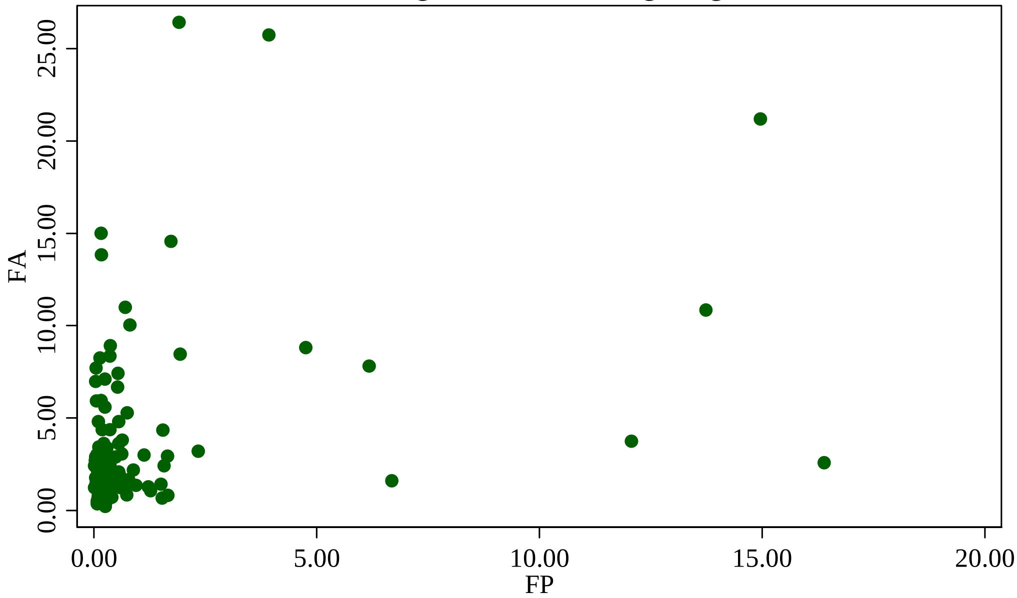


FIGURE 4

Scatter Plot of Peak to Trough Differences in Price vs. Ads

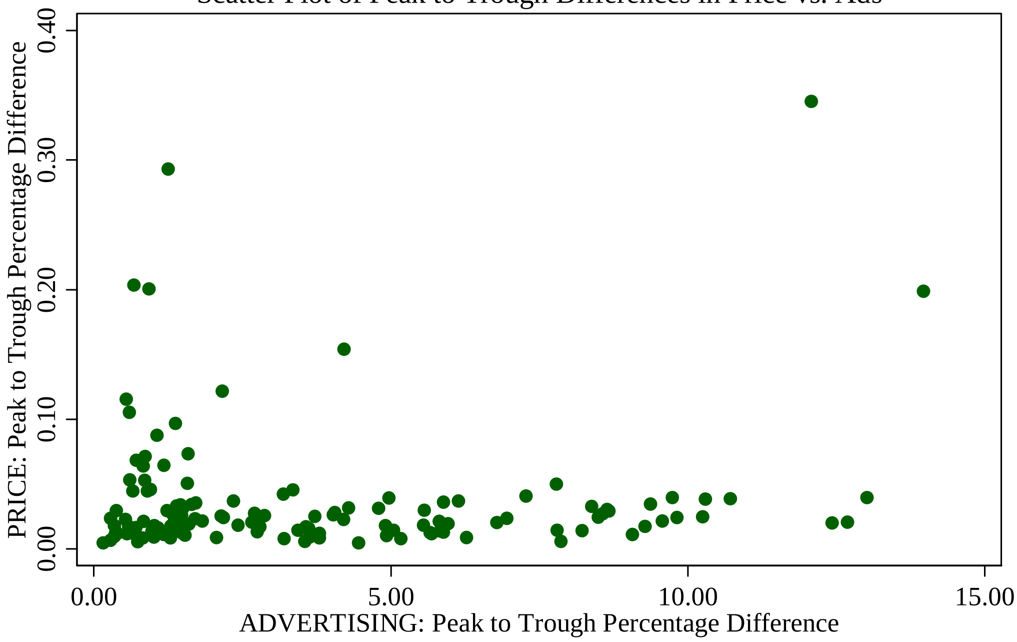


FIGURE 5

Scatter Plot of Peak to Trough Differences in Price vs. Ads
obs. above 3.34 threshold

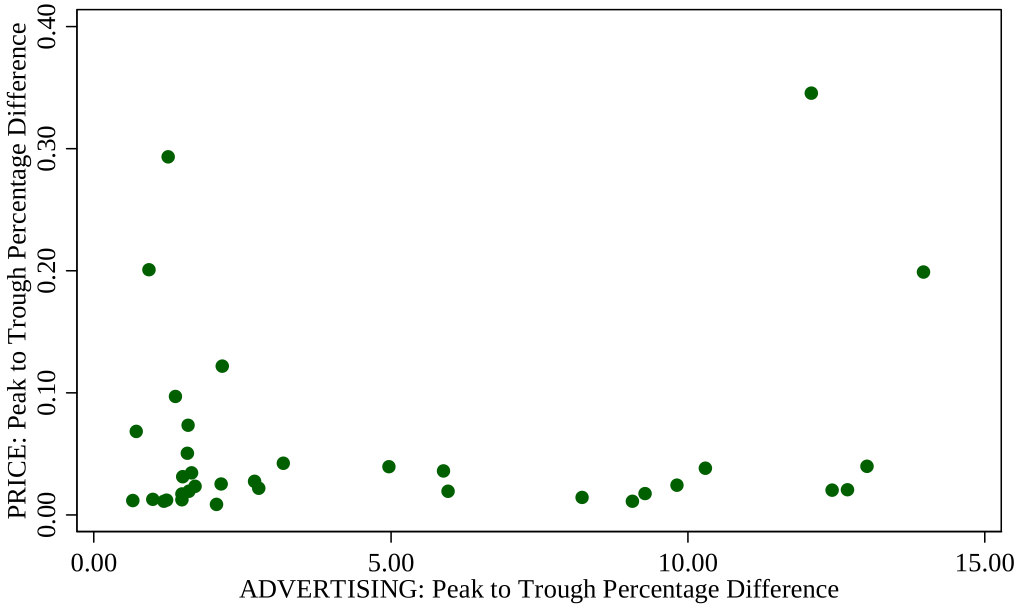
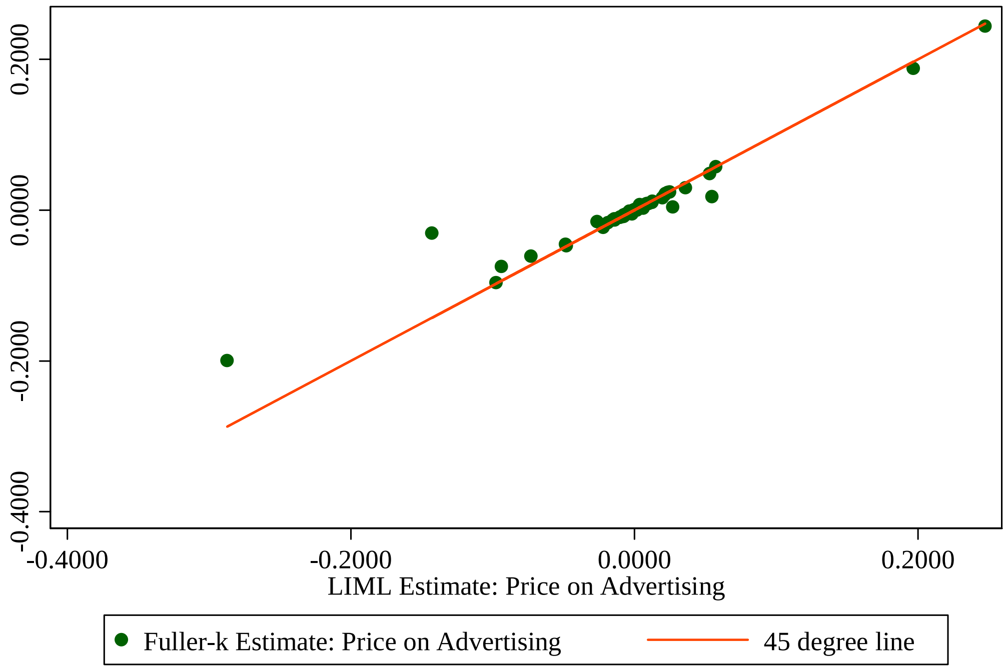
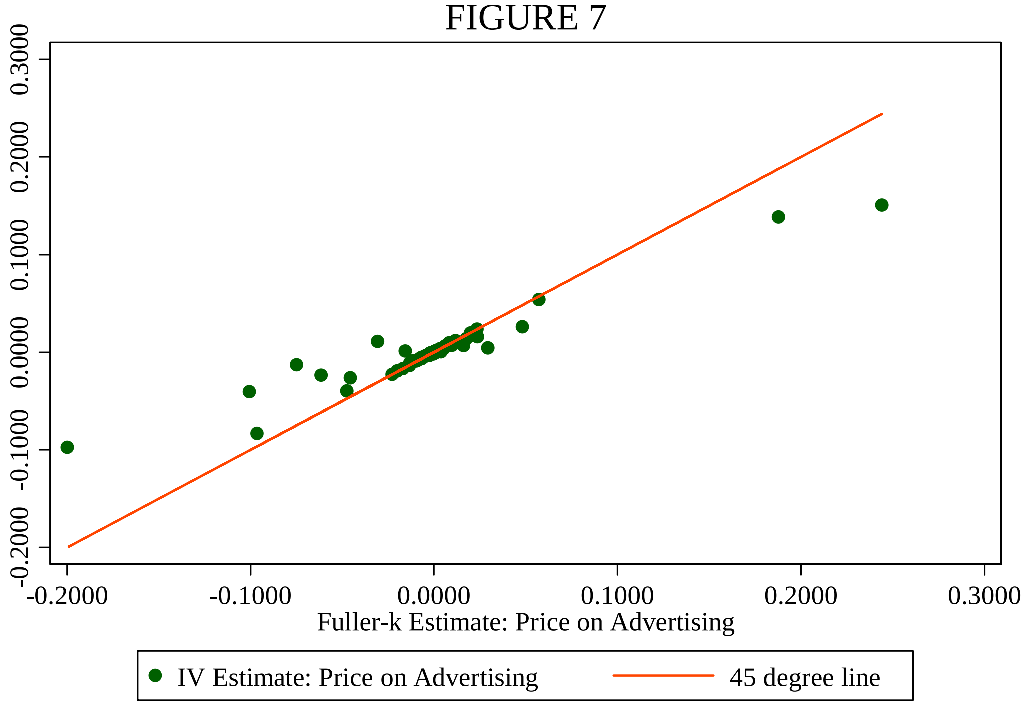


FIGURE 6



Note: Air Travel (Fuller=.67, LIML=1.47) and Car Rental (Fuller=-.10, LIML=-31.9) are dropped.

FIGURE 7



Note: Air Travel (Fuller=.67, IV=.02) dropped.