PREDICTING THE DIRECT BENEFITS OF A FOOD PRICE REPORTING OR PREFERENCE CHANGING PROGRAM

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ABSTRACT

Predicting the Direct Benefits of a Food Price Reporting or Preference Changing Program

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A method is developed for estimating returns to food price reporting and store selection preference changing programs. The approach is demonstrated by an example. While the extimated return to preference changing is small, the direct savings for price reporting can be substantial. Further replications are required to verify these results.

Introduction

Along with the sharp retail food price increases of 1972 came substantial public pressure to "do something" about them. The public perception appeared to be that the food industries and particularly the food-retailing industries were largely to blame for the price increases. Possibly in response to these pressures several governmental sponsored investigations of the food-retailing industry were begun around this time, e.g., Joint Economic Committee, Council on Wage and Price Stability. These studies may have contributed to a longer term stabilization or even reduction in the retailer's margin (see, e.g., Mueller) but the immediate effect visible to food shoppers was negligible. Thus interest persisted in finding some other approach to help constrain retail food prices.

An experiment conducted by Dr. Grant Devine in Ottawa, Canada, in 1974 and 1975 suggested a possible course of action. This experimental public reporting of retail food prices was credited, among other desirable changes, with increasing the consumer surplus by an estimated $900,000 a month for a net benefit to society of $8,834 per month after adjusting for the loss to retailers (Devine and Marion p. 235). These benefits are based on the aggregated indirect effects of price reporting--the areawide decline in average food prices associated with the interstore competition spurred by the improved price information. In addition, savings will be realized by shoppers who switch from relatively high- to relatively low-priced stores as a result of the improved price information. These savings in aggregate are referred to as the direct effects of price reporting.

The report on the Ottawa study and subsequent replications of that experiment in the US and Canada have given little attention to the direct effects (see, e.g., Uhl). To help rectify this incomplete treatment, this study focuses on direct effects. In particular, we attempt to develop a method for estimating a priori the direct effects of a price-reporting program in a particular market area.

This methodology is then applied to estimate the effects of changing consumers' store selection criteria to emphasize price over non-price factors.

There are two principal reasons why a prepublication estimate of the expected direct savings is of interest. First, where resources for operating price-reporting programs are scarce, the estimated direct savings can be used to rank market areas. Those with the higher estimated direct payoffs would be preferred for reporting programs. Area selection decisions should ideally also include a consideration of expected indirect savings. To date this has not been possible since the effects of price reporting on average food price levels during the price-reporting experiments has been highly variable with the casual factors incompletely explained (Uhl pp. 12-16). The direct effects on the other hand are not as closely related to store reponse and hence are more assured and predictable.

Additionally, an estimate of the direct effects of price reporting would be of interest to a subsample of an area's population considering a nonpublic information program. Such groups could include church organizations, ad hoc groups of homemakers, program aides assigned to work with low-income families, or even subscribers to cable television services. Where groups are small, relative to the total retail expenditures on food in the area so that no store response is expected among nonprice discriminating retailers, the direct benefits correctly estimate the total gross returns of the reporting program.

Another approach to lowering consumers' food expenditures is to enhance price consciousness in store selection. Such efforts might be particularly appropriate for lower income families who underestimate the potential long-term savings from careful price-conscious shopping. These educational programs could be conducted as part of the Expanded Food and Nutrition Education Program (EFNEP) or through comparable public or private efforts. The method developed in this paper may also

be used to determine the expected benefits from these educational programs.

The methodology involves two steps--an identification of the lower prices store(s) in a market area and a determination of consumers' awareness of relative store prices and store selection criteria. Shoppers were classified as informed and uninformed regarding their knowledge of relative costliness among stores, and as price, convenience or amenity shoppers based on their stated store selection criteria. Conditional probabilities were used to project price-reporting responses based on ex ante behavior. The procedures were developed by means of a pilot example using data from Ithaca, New York. Ithaca is a small community and the major shopping center for a generally rural area with a 1979 county population of 22,500 households (Larson, Table 36).

Funding limitations necessitated the selection of sample sizes and timing of data collection based on pragmatic considerations rather than strict statistical sample design procedures. Two sample-related factors are particularly noteworthy. First, the basket of items used to determine the relative costliness of area food stores contained 26 items including seven meat items and relatively few dry goods. In size and composition this basket differs from those used by Devine and Marion, and Uhl. This may result in an incorrect ranking of stores in order of costliness compared to rankings based on a more balanced market basket. Second, the consumer survey was conducted five months after the price survey. For the results to be valid it is necessary to assume the relative store price rankings observed in summer 1978 remained valid through early 1979. With these possible data limitations this paper should be considered methodological with the application to Ithaca included for primarily heuristic purposes.

Two data sets were collected in the study area during 1978 and 1979. Relative store costliness rankings were developed from data on 26 items collected from seven stores for 12 weeks during the summer of 1978. These prices were ad-

justed by using Consumer Price Index weights and a weighted market basket price was compiled. In the cases of four chains which operated multiple outlets in Ithaca, all branches of a chain are assumed to charge the same price for identical items. This assumption was not contradicted during several spot checks. Telephone interviews were used to collect data on consumers' knowledge of the relative costliness of area stores and store selection criteria. A total of 127 questionnaires were completed during January 1979 from a random digit sample. Only those interviews with the major food shopper of the household who shopped predominately in the Ithaca market area were used.

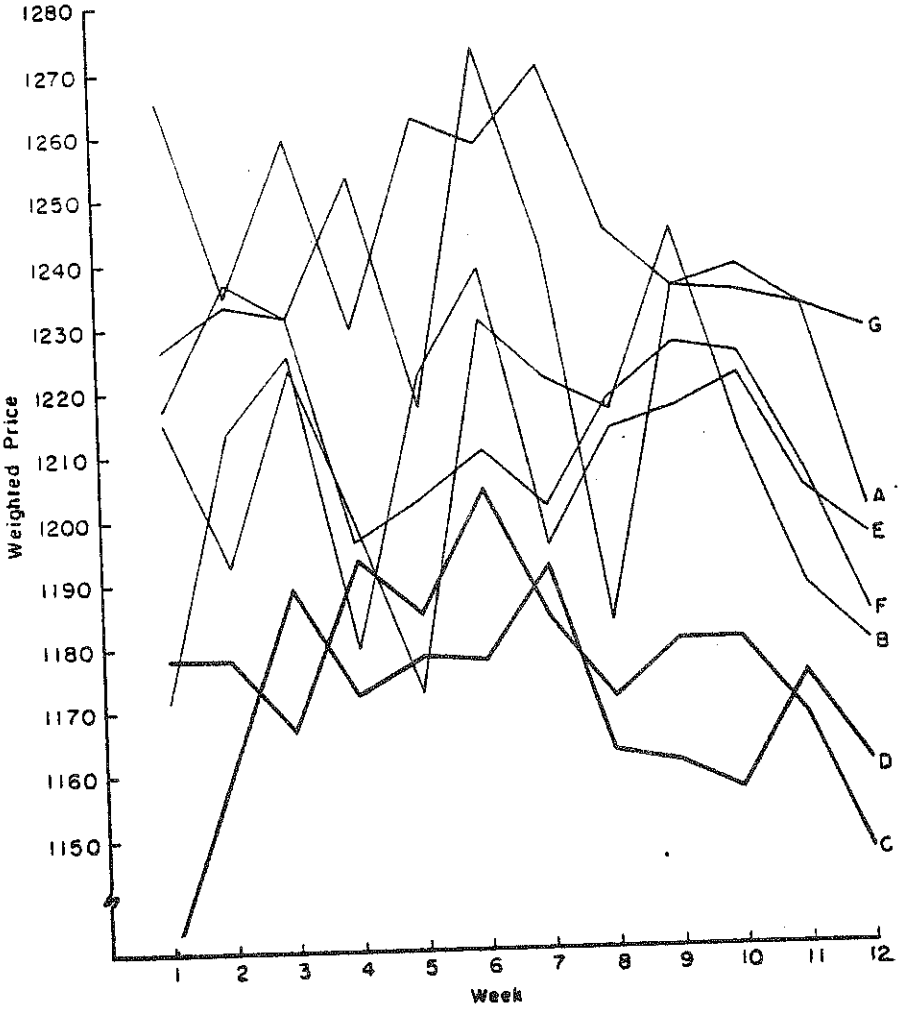
Estimating the Direct Effects of Price Reporting and Preference Charging Programs

Weighted market basket prices by stores are plotted in figure 1 for the 12-week data collection period. From this plot it is apparent that stores C and D were, with few exceptions, less expensive than the remaining stores for the particular items and weights selected. In the subsequent analysis stores C and D are identified as the low or lowest priced stores.

During the telephone survey, respondents were asked to (1) identify the store(s) they believed to have the lowest overall prices for the items they buy, (2) list the store(s) they shopped at regularly, (3) identify the reasons they shop at their regular food store(s), and (4) supply the location of their residence and travel route. These questions provided measurements of four variables involving whether the consumer, (a) shopped at either of the two lowest priced stores, C and D, (b) could identify the lowest priced stores in the Ithaca market, (c) identified price, convenience or amenity factors as paramont in their store selection choices, and (d) lived as close or closer to the low priced stores than to other stores.

Each respondent was classified into one of six categories according to the

FIGURE 1. COMPARISON OF WEIGHTED MARKET BASKET PRICES FOR COMPETING FOOD RETAILERS, ITHACA, NEW YORK, SUMMER 1978



following definitions. Shoppers who identified store C and D as being low priced were classified as informed (I); others are considered uninformed ($\overline{I}$). Those who mentioned a price related factor ("saves money," "good prices," "specials") either first or second when describing why they selected the store(s) they shop-pred at regularly were classified as price shoppers (PS). Shoppers mentioning convenience ("close," "convenient," "habit") or amenities ("good quality," "variety," "good deli," "nice cashiers") as the first two selection reasons were classified as nonprice shoppers ($\overline{PS}$). Finally, shoppers were classified as living "close"

to a low priced store if stores C and D were among the most approximate stores to the section of the city where the shoppers reside.

Table 1 presents the results of the consumer survey in the form of frequencies for the 127 completed questionnairs. Shoppers were classified according to where they shop, their level of price information, their store selection criteria and their residence location. The frequencies may be used to determine for instance what portion of shoppers do not regularly partronize the low priced stores (59/127 = 46.5%). The data are also presented in the form of conditional possibilities in Table 2. Conditional probabilities are used to estimate for example the likelihood that an informed price shopper will shop at the lowest priced store as Pr[LP/I,PS] = .81. Here "Pr" refers to the probability of the event to the left of the slash occurring given that the conditions on the right hold. This allows estimating the change in the probabilities of shopping at the lowest price stores given changes in information and price preferences and holding other factors constant. If a price shopper becomes informed via a price publication program, then the probability that he or she will shop at the lowest price store will increase by .95 - 0.0 = .95 if he/she lives close to a low price store and by .71 - 0.0 = .71 if he/she does not. However, if an uninformed non-price shopper becomes informed through a price publication program, the probability that he or she will shop at a low price store will increase by .75 - .1 = .65 if he/she lives close to and by .50 - 0.0 = .50 if far from a low price store. As one would expect, the responsiveness to an information program is strongly related to consumer preferences about low prices in relation to other store attributes, and to residence location.

Estimating Effects of Improved Information

An important application of the conditional probabilities is estimating

Table 1 Frequency of Shopping at Lowest Price Stores by being Informed, being Price Shopper and by Living Close to Lowest Price Store

	Informed (I)				Uninformed ($\bar{I}$)				
	Price Shopper (PS)		Not Price Shopper ($\bar{PS}$)		Price Shopper (PS)		Not Price Shopper ($\bar{PS}$)		
	Lives close to lowest price stores (CLP)	Doesn't live close to lowest price stores ($\bar{CLP}$)	Lives close to lowest price stores (CLP)	Doesn't live close to lowest price stores ($\bar{CLP}$)	Lives close to lowest price stores (CLP)	Doesn't live close to lowest price stores ($\bar{CLP}$)	Lives close to lowest price stores (CLP)	Doesn't live close to lowest price stores ($\bar{CLP}$)	Total
Shops at lowest price store (LP)	18	17	15	17	0	0	1	0	68
	35		32		0		1		
Doesn't shop at lowest price store ($\bar{LP}$)	1	7	5	17	6	5	9	9	59
	8		22		11		18		
Totals	19	24	20	34	6	5	10	9	
	43		54		11		19		
	97				30				127

Table 2 Conditional Probabilities of Shopping and Not Shopping at Lowest Price Stores Given State of Respondent's Price Information, Preferences with Respect to Price and Residence Location Relative to Lowest Price Stores

	Informed (I)				Uninformed ($\overline{I}$)				Total
	Price Shopper (PS)		Not Price Shopper ($\overline{PS}$)		Price Shopper (PS)		Not Price Shopper ($\overline{PS}$)		
	Lives close to lowest price stores (CLP)	Doesn't live close to lowest price stores ($\overline{CLP}$)	Lives close to lowest price stores (CLP)	Doesn't live close to lowest price stores ($\overline{CLP}$)	Lives close to lowest price stores (CLP)	Doesn't live close to lowest price stores ($\overline{CLP}$)	Lives close to lowest price stores (CLP)	Doesn't live close to lowest price stores ($\overline{CLP}$)	
Shops at lowest price stores (LP)	.95	.71	.75	.50	0.0	0.0	.1	0.0	.54
	.81		.60		0.0		.05		
	.69				.03				
Doesn't shop at lowest price store ($\overline{LP}$)	.05	.29	.25	.50	1.0	1.0	.9	1.0	.46
	.19		.40		1.0		.95		
	.31				.97				1.00

market shares of the lowest priced stores and how they might change with different programs. This is possible given the random nature of the sample which, in the assumed absence of response bias, gives an unbiased estimate of the market share of area shoppers of the lowest price stores. The low-priced stores have a market share of 68/127 = 53.5% of all area shoppers. A price publication program can be expected to have the greatest effect on the 46.5% of all shoppers who currently do not shop at the low-priced stores. Of these consumer, 49% (29/59) are classified as uninformed. It is to this 23% (29/127) of all consumers in this market that any price publication program would be principally directed. Other individuals may also be affected, and the impacts on them are discussed below.

Assuming that once informed, the currently uninformed price shoppers would behave like the currently informed price shoppers, and the currently uninformed nonprice shoppers would behave like the currently informed nonprice shoppers, then 6(.95) - 5(.71) + 9(.75) + 9(.50) = 20.5 sample consumers might be expected to switch to the lowest price stores as a result of a price information program. This implies the market share of the lowest priced stores would increase from a preprogram 53.5% to a post program (68 + 20.5)/127 = 70 percent, an increase of 16.5 percentage points or a 31% increase. A minimum estimate of changes in shopping patterns following price reporting would be to assume that once informed, only the uninformed price shoppers who live closest to a low price store would behave like informed shoppers. Under this assumption 6(.95) = 5.7 sample consumers would shift to the lowest price stores. In this case the share of the lowest period stores would increase to (68 + 5.7)/127 = 58%, a positive change of 4.5 percentage points or an 8.4% increase.

There are several practical and behavorial reasons why these estimates might over- or undershoot the true value. First, these results are based on

the assumption of 100% efficiency of the price publication program, i.e., all previously uninformed shoppers are reached and their perceptions of the lowest priced stores are changed. This is extremely unlikely in the case of a public-reporting program as not all shoppers read local newspapers, watch local TV stations or listen to local radio programs and hence would not be exposed to the price information. In practice, Uhl found an average of 38% of the shoppers were aware of an experimental newspaper price reporting program run for six to twelve weeks in eight cities (p. 10, 16). In Buffalo, New York, 20% of area shoppers were aware of a retail food price-range reporting program run in the major newspaper for seven years (Lesser, unpublished data). Of course if a price-reporting program were conducted within a private group all participants would likely be informed.

Second, it is possible some price shoppers perceive interstore price differences as being greater than the true value and once informed would shift from the reported low-priced store to one with higher nominal prices but lower shopping costs and/or greater satisfaction. This could be characterized as kind of "reverse flow" due to price reporting. The magnitude of this effect is difficult to measure although potentially it could include the entire share of the low-priced stores. A more likely subgroup for this reverse flow would seem to be the informed, nonprice shoppers not living close to the low priced stores, or, from Table 1, 13/127 = 13% of shoppers.

Third and of greater consequence in terms of numbers is the possible misclassification of price shoppers as nonprice shoppers. This would happen if shoppers perceived all or most stores as charging essentially the same prices for their market basket. This group may then have responded to our question about reasons for store selection by mentioning a convenience or amenity attribute rather than price because prices in their perception are virtually

constant across stores. As a result, following price reporting these latent price shoppers could act similarly to informed price shoppers, rather than informed nonprice shoppers. Thus the post information probability of shopping at a low-priced store would increase from $Pr[LP/I,\overline{PS}] = .60$ to $Pr[LP/I,PS] = .81$, which is an increase of .81 - .60 = .21 in probability. There are several reasons to expect this effect would not be nearly so large. Our sample displays a relatively large amount of price-conscious store selection behavior with (43 + 11)/127 = 42.5% classified as price shoppers (Table 1). This is substantially greater than the proportion of predominately price-conscious shoppers recorded by other studies using different methodologies. Skinner for example found "prices" explained by only six percent of the total variance among motivational statements related to supermarket shopping (pp. 1154-56). Additionally, in our sample only two percent responded that all stores charged about the same prices while 13% said they could not identify the low priced store(s). One might expect a greater proportion of "all the same" or "don't know" answers in a situation where prices were perceived as being highly uniform across stores. Nevertheless, this remains an empirical question which can be answered through several replications by matching revealed behavior to expected behavior following an actual reporting effort.

Finally, the lowest priced stores were identified relative to a specific weighted food basket and, since baskets and weights differ among shoppers, some fraction of shoppers may be improperly classified. Measuring the extent of misclassification would require comparing store rankings over a range of baskets and weights. This goes beyond the purposes of the current study.

Estimated Effects of Preference Changing

A further use of the conditional probabilities methodology for predicting post-program behavior is estimating the effects of education programs on shifting

preferences away from other store attributes and toward low price. The probability of uninformed shoppers who remain uninformed shopping at the lowest price stores would decline slightly or not change at all (-.1 or 0.0.). In contrast, the probability would increase by .95 - .75 = .20 and by .71 - .50 = .21, respectively, depending on residence location, if the informed nonprice shopper becomes a price shopper as a result of a preference shifting program. By changing preferences the uninformed shopper might search more, becoming informed over time. But as a direct program result, the comparison between a preference-shifting program is clear and expected: price publication which actually improves consumers' price information is the more effective program, although the programs may overlap.

CONCLUSIONS

A method has been introduced for estimating ex ante the direct effects of a retail food price-reporting program and a store selection preference-changing program. The procedure has been purposely kept relatively simple so that groups interested in applying it may do so without prior statistical analytical experience or access to electronic data-processing equipment. Our process should be used in conjunction with other information such as concentration of retail food stores in the study market, spreads in prices among stores, capacity utilization by the lower priced stores and ease of access to these stores. In larger areas where some stores will be a considerable distance from many shoppers, relevant subshopping areas must be identified and the analysis focused on these areas.

The application of this method to data from the Ithaca, New York shopping area was done with several acknowledged sample size and timing limitations meaning it should be read as a methodological study rather than as empirical one. Several applications employing larger market baskets and larger telephone interview samples with consumers will be required to verify the usefulness of our

procedure. The results from Ithaca, nevertheless, give some interesting insights and appear reasonable.

Our results point up the preferability of programs for increasing information over programs for changing preferences toward price conscious store selection in cases where shoppers remain uninformed. In fact, if, as some believe (Cf. Devine and Marion, p. 229), improved price information changes latent price-conscious shoppers into active one, then the preference for a price-reporting program is even stronger.

We estimate that a price publication program will increase the market shares of shoppers of the identified low-priced stores by 4.5 to 16.5 percentage points, depending on responses by resident location. This initial estimate must be modified to reflect the (1) the program will not inform 100 percent of area shoppers, (2) some shoppers may rationally switch from low- to high-priced stores, (3) some shoppers may be improperly classified as nonpriced conscious shoppers and would respond to the information as would informed price conscious shoppers, and (4) differences in individual shoppers' baskets and weights may have caused them to be misclassified as informed or uninformed. Point (4) is difficult to measure while (2) and (3) lead store changes in opposite directions and, from our partial information, appear to be modest and self-cancelling.

Assuming points (2) through (4) to be insignificant, the maximum direct savings to shoppers from a public price-reporting program in Ithaca can be estimated by using

$$HS = \sum_{i} \Delta Pr_i (P_i - \overline{P}_{c,d,})$$

where: HS = savings per household per weekly shopping trip
i = higher priced stores A,B,E,F, and G
ΔPr_i = change in probabililty of shopping at store i following a price information program
P_i = unweighted market basket price in store i
$\overline{P}_{c,d}$ = weighted (by market share) average basket price of stores C and D.

Assuming one week during the study period (July 27, 1978) represents weekly savings between stores, then HS = .111($1.40) + .136($1.13) + .138 ($-.35) + .079($.49) + .071($2.09) = $.4479. Expected savings are nearly 45 cents per household per week giving savings for the Ithaca market area of $10,000 or one-half million dollars annually. This estimate should be adjusted to reflect that probably less than fifty percent of shoppers will be aware of the information.

These results suggest that, even in areas like Ithaca where many shoppers appear adequately informed, the potential gross direct payoff to a price-reporting program is rather large. Additional savings may be seen through a general decline in area-wide food prices unless the reported prices contribute to collusion rather than to competition. Further substantiation is required before much reliance can be placed on these results. In addition, further research is needed to better understand shopper uses of and responses to price information. Of particular relevance is research on store selection criteria and the interaction or "continum" between information and store selection. These are tasks for economists. For local groups interested in price reporting, the methodology presented here may make it easier to estimate the payoff to a program, particularly a program geared to individuals whose demand for and use of information is known.

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