An Exploratory Analysis of the Determinants of Cooperative Advertising Participation Rates

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Abstract

The paper offers an exploratory empirical investigation of the determinants of cooperative advertising participation rates. Using data for 2,286 brands, we examine the relationship of participation rates to national advertising expenditures by brand. We also consider how participation rates vary with average manufacturers' margins by industry, average retail margins by category, and additional category-level variables. Reflecting the discrete nature of the dependent variable, the analysis employs discrete choice estimation techniques instead of OLS regression. The results reveal a significant quadratic relationship between advertising and participation rates. We interpret this and other significant findings in the context of existing work.

Keywords: cooperative advertising, national advertising, discrete choice models

Cooperative advertising arrangements, through which manufacturers reimburse retailers for promoting the manufacturer's product, have become a mainstay of marketing practice. Manufacturers take advantage of retailers' access to a broad array of locally-focused promotional tools, ranging from the retailer's circular and local newspapers to reduced-rate television advertising, thereby enriching their marketing mix and improving overall effectiveness. With recent innovations in information technology, the advantages of cooperative advertising are made more compelling for the manufacturer, as the retailer's ability to provide benefit through its access to local information is further enhanced (Clark, 2000).

Trends in manufacturer funding of cooperative advertising reflect the phenomenon's increasing importance. Total expenditures on cooperative advertising in 2000 were estimated at $15 billion,[1] compared to $900 million in 1970,[2] nearly a four-fold increase in real terms. Real total advertising expenditures grew by a factor of less than three during the same period.[3] The overall significance and growth trend of cooperative advertising suggest that marketers should seek a thorough understanding of its role and use in practice.

The percentage of advertising costs that manufacturers reimburse, known as the *participation rate*, is a key decision variable in cooperative advertising management. Past empirical research on this variable has been scarce. The sole systematic analysis in the literature (Dutta et al., 1995) sheds light on how participation rates vary by broad product category – consumer vs. industrial products and convenience vs. nonconvenience consumer products – and by one industry-level variable, manufacturer concentration. Yet there is still much that is not understood about participation rate variation, with particularly little comprehended about variation at the brand level.

This paper offers an exploratory empirical investigation of the determinants of cooperative advertising participation rates. Using data for 2,286 brands representing a broad cross-section of products, the paper examines the relationship of participation rates to lagged national advertising expenditures by brand. Previous research (Somers, Gupta and Herriott, 1990) has drawn a connection between manufacturers' national advertising and retailers' expenditures using cooperative advertising funds, but the relationship of national advertising to the terms of cooperative advertising has not been studied. We also consider how the participation rate varies with the average manufacturer's margin by industry, the average retail margin by narrow product category, the category's growth rate and relative importance to the retailer, and whether the plan is for a convenience or non-convenience consumer product. In part, these variables are included so as to isolate the effects of incentives that vary at the industry and category levels from the brand-level effects represented by the advertising variable. The results show a significant quadratic relationship between brand-level advertising and participation rates, suggesting that dual, opposing influences underlie the advertising variable that differ in their tendency to dominate the participation rate relationship for small versus large advertisers.

Two methodological innovations are incorporated as part of the empirical work. First, to better account for the discrete nature of the participation rate choice variable, the analysis uses discrete choice estimation techniques instead of OLS regression. Second, we employ a two-stage model that explicitly accounts for the manufacturer's decision regarding whether to offer a cooperative advertising plan prior to deciding how the plan should be structured.

1. Data Sources and Variables

Data for participation rate were obtained from a proprietary database compiled by MultiAd, Inc., a consulting firm serving media clients. MultiAd contacts manufacturers and service providers marketing through conventional channels and requests the terms of their cooperative advertising plans. The result of these efforts, described by MultiAd as "the largest co-op data base ever accumulated,"[4] is made available to MultiAd clients, who encourage retailers in their local service areas to use the available funding. The data for this study reflect the period 1991-92. The plans represented cover a wide range of predominantly consumer products, including apparel; durable goods such as luggage, bicycles, computers, air conditioners, and lawn and garden equipment; and nondurables such as paint, adhesives, candy, stationery, and cosmetics.

A total of 1,470 plans made available from the database explicitly listed a single participation rate.[5] From these, the 1,446 plans that reflected branded products from manufacturing industries (i.e., SIC codes beginning with a 2 or 3) were utilized for the study. These data points were combined with 840 observations chosen at random from brands in the database that did *not* offer a cooperative advertising plan; the number of non-plan observations was chosen to keep the proportion of plan to non-plan observations consistent with proportions in the overall database. The resultant 2,286 observations formed the sample for analysis.[6]

The explanatory variables include the following:

1.1. Brand-level national advertising expenditures. For each brand in the sample, advertising data were taken from the *Ad $ Summary* (January-December 1990) produced by the LNA/Arbitron Multi-Media Service. This source comprises advertising expenditures (including co-op) across ten media for all brands of companies that spend at least $25,000 during the year covered.[7] 1990 data (i.e., lagged data) was chosen to address the potential for simultaneity bias,

ensuring that the advertising variable would be "predetermined" relative to the 1991-2 participation rate data. To obtain advertising for the brand, expenditures were aggregated over all products bearing the brand name in question. Products that consumers would likely consider completely unrelated to the product covered by the cooperative advertising program were left out of the totals, but the aggregation process erred on the side of inclusiveness. If a brand was not listed, its advertising expenditure was presumed to be zero. As Table 1 shows, brand advertising levels in the data range up to US$204 million, but with the distribution skewed toward levels much smaller than that.

[INSERT TABLE 1 APPROXIMATELY HERE]

1.2 Industry-level manufacturer margin. Each brand was matched to a four-digit SIC code. Using data from the 1989 *Annual Survey of Manufactures*, the average manufacturer's margin was calculated for each SIC code as:

$$\text{(1)} \qquad \text{Industry-level manufacturer margin} = \frac{\text{Value added - Payroll}}{\text{Value of Shipments}} \times 100$$

The calculation attempts to measure returns to the manufacturer directly attributable to selling a given product by netting out all direct costs measurable at the four-digit SIC level. Value added, as measured by the Census Bureau, represents total shipments net of cost of goods sold; payroll represents a further direct cost not covered in that calculation, but which must be removed to measure true returns to the product. The calculation is described in greater detail by Collins and Preston (1969, p. 285).

1.3 Product category-level retail margin. Data for retail margins were taken from four sources: the International Mass Retail Association (1990), the National Retail Hardware

Association (1991), the Menswear Retailers' Association (1990), and Robert Morris Associates (1991). In total, these sources provided retail margins by 61 narrowly-defined product categories, such as women's dresses, photo supplies, and lawn and garden. Each brand in the sample was matched to one of the 61 categories. To ensure consistency of relative margins across sources, each product category was also matched to one of nine retail groupings defined the Census Bureau's *1989 Retail Trade* report, and the category margins were adjusted to center deviations around the relevant Census margin.[8]

1.4 Category growth rate and importance level. Each of the 61 product categories was identified with a broad merchandise line from the 1987 and 1992 *Census of Retail Trade*. The category growth rate was measured for each brand using the change in associated merchandise line sales from 1987 to 1992.

A separate variable measuring the importance of the brand's product category to the typical retailer selling that category was calculated from the 1992 *Census* using merchandise line sales by type of retail establishment (e.g., supermarket, conventional department store, men's shoe store, etc.). Each merchandise line's share of the total sales of each establishment type was calculated, and a weighted average of these shares was taken across establishment types carrying the line.

1.5 Convenience product dummy variable. Following Dutta et al. (1995), we sorted brands into convenience (e.g., books, stationery, health and beauty aids) and nonconvenience products (e.g., shoes, tires, furniture) using Porter's (1974) classification of consumer products. Brands that were not explicitly classified by Porter (1974) were sorted based on

the majority opinion of three independent coders. The coders adhered to Porter's (p. 422) definition of convenience products as those predominantly distributed through "densely located" outlets such as supermarkets, drug stores, and gas stations.

2. Analysis

The estimation procedure we employ accounts for the potential interrelatedness of two decisions the manufacturer must make with respect to cooperative advertising: whether to offer a cooperative advertising program, and if so, what participation rate to offer. Following a procedure developed by Krishnamurthi and Raj (1988) to estimate sequential discrete and continuous consumer decisions (e.g., whether to buy and how much), we first estimate the decision to offer a cooperative advertising program on the full sample (the "first stage"). Then we estimate the participation rate choice on the subsample of brands for which a cooperative advertising plan is offered (the "second stage"), incorporating a conditionality term calculated from the results of the first regression.[9]

The first stage model is written thus:

$$\Pr(y_i > 0) = \frac{\exp(\theta_1 x_{1i} + ... + \theta_k x_{ki})}{1 + \exp(\theta_1 x_{1i} + ... + \theta_k x_{ki})} \tag{2}$$

and the second stage model thus:

$$y_i = b_1 x_{1i} + ... + b_k x_{ki} + \gamma S_i + \eta_i \quad \text{for } y_i > 0 \tag{3}$$

where y_i is the participation rate, $x_{1i}, ..., x_{ki}$ are the regressors, S_i is the conditionality term, and η_i is the disturbance term. The specification involves a generalization of the standard Tobit model, allowing the coefficients for the participation rate decision to vary from those for the

decision to offer cooperative advertising (i.e., $\theta_1,...,\theta_k$ and $b_1,...,b_k$ are allowed to differ). A hypothesis test is used to determine whether the two stages of the manufacturer's decision process are independent, hence whether the conditional model or an unconditional model is the more appropriate for final estimation of the participation rate decision. The reason for using this two-stage approach is that unobserved characteristics that influence the manufacturer's choice of participation rate may also influence its decision of whether to offer a cooperative advertising program at all. If so, failing to account for the relationship between the decisions may result in sample selection bias (Heckman, 1979). Including the conditionality term assures $E\left(\eta_i \left| y_i > 0\right.\right) = 0$ and that η_i will be uncorrelated with the regressors.

The decision of whether to offer a cooperative advertising plan is estimated using binomial logit. The choice of participation rate is then estimated using either ordered probit or binomial probit. Ordered probit presumes a dependent variable consisting of a set of discrete, ordered realizations. The reason for using ordered probit here can be seen in Table 2. The participation rates observed in our sample do not cover a continuum, but rather take on 11 discrete values, with 50 and 100 percent being most common. In using ordered probit, we not only acknowledge this empirical reality; we also, in effect, make a behavioral assumption that the manufacturer does not choose the "optimal" percentage between 0 and 100 for its participation rate, but rather the best choice from a menu of generally-accepted options between 0 and 100. Discrete choice seems to accord closely with how manufacturers actually set participation rates (Berger, 1972) and is also consistent, with respect to theory, with the "all or nothing" participation result derived by Doraiswamy, McGuire and Staelin (1979).

*** [INSERT TABLE 2 APPROXIMATELY HERE] ***

Binomial probit, which can be thought of as ordered probit with only two choices, is employed as an alternative to the full 11-choice ordered probit. The rationale for doing this is that two of the observed realizations, 50 and 100, account for approximately 95% of the participation rate observations in our sample, as can be seen in Table 2. One possible inference is that the other nine values do not indicate significant departures from a choice of 50 or 100. Two different specifications of binomial probit are used: one in which the manufacturer is viewed as choosing between a participation rate of 100% or some lower value; and one in which the manufacturer is viewed as choosing between a participation rate of less than or equal to 50%, or some higher value.

Table 3 presents the results of the hypothesis test for independence of the manufacturer's two decisions. We use a likelihood ratio test that compares the log-likelihood from the estimation of (3) when the conditionality term is included with the log-likelihood that arises with when the conditionality term is omitted (i.e., when $\gamma = 0$). As the table shows, we fail to reject the hypothesis of $\gamma = 0$ for all three specifications, so we may proceed with the unconditional model for estimation of the participation rate decision.

[INSERT TABLE 3 APPROXIMATELY HERE]

3. Results

The estimation results for the manufacturer's two decisions are shown in Tables 4 and 5. We discuss the results for participation rate choice first, as these are the main focus of the paper, and reserve a brief discussion of the decision to offer cooperative advertising for the end of this section.

[INSERT TABLES 4 AND 5 APPROXIMATELY HERE]

3.1. Participation rate choice

The results were essentially robust with respect to the choice of estimation technique.[10] All slope coefficients were significant either at the $p < 0.01$ or $p < 0.05$ level. The discussion that follows is organized around the explanatory variables, covering the results first for the industry- and category-level variables and then for the brand-level variable.

3.1.1. Manufacturer margin and retail margin. Participation rates appear to increase with industry-level manufacturer margins. This result is consistent with the empirical finding of Dutta et al. (1995) of a positive relationship between concentration ratios and participation rates. It is also consistent with prior theoretical research. In industries with higher manufacturer margins, manufacturers on average have more to gain from additional sales and are therefore more willing to subsidize their retailers' local advertising through higher participation rates (Berger, 1972; Bergen and John, 1997).

Meanwhile, the results suggest that participation rates decrease with product category-level retail margins. The existing literature appears not to have discussed the relationship of retail margins to participation rates. However, we may deduce from the discussion of manufacturer margins that retailers on average have more to gain from additional sales in product categories with higher retail margins. They should therefore be more willing to pick up a larger share of the cost of local advertising in those categories. The results for manufacturer and retail margins, taken together, suggest that cooperative advertising participation may serve as a mechanism for achieving improved channel coordination.

3.1.2. Category importance. Participation rates appear to be lower for product categories that represent a larger share of the sales of their distribution channels. One would expect that manufacturers have greater relative power with respect to these categories, and the results appear to confirm that this power translates into lower participation rates.

3.1.3. Category growth rate. The sample results suggest that participation rates increase with the rate of growth of the product category. This may seem counterintuitive: one might expect high-growth categories to exhibit lower participation rates similar to categories that are important to the retailer based on their share of distribution. The traditional view suggests that growth categories represent products that have moved beyond the development stage of the product life cycle and have gained distribution channel acceptance (Levitt, 1965). However, high-growth categories may also represent products that are earning high margins not yet eroded by competition. Category growth rate, then, may reflect the co-op plans of manufacturers with relatively more to gain from incremental sales (i.e., high brand-level margins), but for whom these incentives are not reflected in high margins at the manufacturer's industry level.

3.1.4. Convenience products. Our results show higher participation rates for convenience products than nonconvenience products. This result is consistent with previous empirical work (Dutta et al., 1995) and likely reflects the greater horizontal coordination problems inherent in distribution for convenience products. First, as Dutta et al. (1995) discuss, convenience products are sold through more intensive distribution channels than nonconvenience products, and such channels typically experience greater intrabrand competition. Second, convenience products are likely to exhibit greater advertising spillovers. This is both because convenience

products are mass marketed, making it more difficult to target individual consumers; and because consumers patronize outlets for convenience products based chiefly on their convenience, making it more likely that they will select a retailer for an advertised product other than the retailer that reached them with the advertisement (Dutta et al., 1995).

3.1.5. Advertising. Participation rates increase with brand-level national advertising expenditures, but decrease with the square of advertising expenditures. The significant coefficient on the squared term (e.g., -0.000122, t = -3.16 in the ordered probit estimation) causes us to reject the hypothesis of a linear relationship in favor of a quadratic relationship. Participation rates grow with advertising expenditures for the brand over low levels of expenditure, but they grow at a steadily decreasing rate as the expenditure levels increase. At a certain point, they stop growing with advertising expenditures and start to decline.

The level at which the relationship turns negative can be obtained by taking the maximum of the quadratic function that relates participation rate to advertising, $y = bx + cx^2 + z$, where y is participation rate; x is advertising; b and c are the coefficient estimates for advertising and advertising-squared, respectively; and z represents other terms that are not a function of advertising. First-order conditions yield a maximum point of $-b/2c$, or approximately \$94 million, using the coefficient estimates from the ordered probit results. This means that, in the time period covered by the data, participation rates generally increased with advertising across those brands that spent less than \$94 million per year, and they decreased with advertising for brands that spent more. According to LNA's *Ad $ Summary*, 73 companies spent more than \$94 million on advertising in 1990, so the relationship of participation rates to national advertising expenditures is positive except for the highest-spending brands.

The quadratic relationship is consistent with the existence of opposing influences underlying the national advertising variable. It is generally accepted that advertising intensity is positively correlated with rate of return to the manufacturer (Comanor and Wilson, 1967; Round, 1983; Geroski, 1982). Evidence suggests, moreover, that advertising expenditures at the brand level are inversely associated with brand-level retail margins.[11] As discussed above with respect to category-level effects, higher margins imply willingness to take on a larger share of the cost of cooperative advertising. Applied at the brand level, this suggests that national advertising should exhibit a strong positive correlation with participation rates. Thus, brand-specific margins may be driving the positive correlation we witness between advertising and participation rates over the low range of brand-level advertising expenditures.

Another influence underlying national advertising relates to brand equity. Advertising creates brand equity, which, evidence suggests, gives manufacturers increased power in channel relationships (Aaker, 1991, p. 48). This power may translate into the ability to dictate advantageous terms on cooperative advertising contracts. Moreover, products with substantial brand equity may become a focus of retail promotional activity, as discussed by Steiner (1973, 1991, 1993). Because of their high "identifiableness" (Steiner, 1973, p. 20), highly advertised brands send a clear signal to consumers of the competitiveness of the retailers that carry them. Therefore, retailers are motivated to offer low prices on these brands and invest in advertising to tell the consumer that they stock the brands at low prices. The implied inverse correlation of national advertising expenditures to participation rates may be what we witness over the upper range of advertising expenditures.

The idea of opposing influences implies a departure from earlier theory (e.g., Bergen and John, 1997) that greater intrabrand competition and lower interbrand competition, both

associated with national advertising, unambiguously correlate with higher participation rates. Bergen and John relate participation rates to the ability of the manufacturer or retailer to capture a larger fraction of the benefit of the cooperative advertising (pp. 363 and 366). For example, lower interbrand competition implies higher manufacturer margins, meaning a greater ability for the manufacturer to capture cooperative advertising benefits, thus higher participation rates. Bergen and John's (1997) theoretic result derives from assuming that local advertising is not a competitive tool for either the manufacturer or the retailer, but simply a tool to precipitate the purchase decision (p. 359). They assume, consistent with the standard textbook treatment (e.g., Hawkins, Best and Coney, 2004, p. 30), that choice of outlet is made concurrent with the final purchase decision in the consumer's decision process; however, they maintain that local advertising messages only trigger this process, whereby the consumer makes an outlet choice based on extant information and preference orderings. Local advertising in Bergen and John's (1997) model does not tip consumers' preferences across outlets in favor of the advertising retailer nor, for that matter, does it change consumers' preferences with respect to brands. [12]

Evidence suggests, however, that retailers and manufacturers do use local advertising as a competitive tool. Steiner (1973) notes that, starting in the late 1950s, retailers found cut-price advertising of leading-brand toys in newspapers to be an effective way to attract customers at Christmas time (p. 22). Similar evidence is provided by the trade press with respect to competitive (or preference-influencing) use of cooperative advertising by retailers, manufacturers, or both (Crimmins, 1985; Everett, 1986; Clark, 2000).

Factoring in the use of local advertising as a competitive tool, the theoretical relationship between national advertising and participation rate becomes ambiguous: national advertising implies higher participation rates through its relationship to brand-level margins, but lower rates

through the effect of brand equity on manufacturer power and on the importance of cooperative advertising as a retail competitive tool. The quadratic *empirical* relationship between participation rate and the brand-level advertising variable may be indicating how these seemingly contradictory effects play out.

3.2 The decision to offer cooperative advertising

The estimation results for the decision to offer cooperative advertising, presented in Table 4, show three variables with coefficients that switch sign relative to the participation rate choice model. Of these, only the category importance coefficient is significant, taking a positive sign in the decision-to-offer results, though negative and significant in the participation rate choice results. One possible explanation is that a category will not elicit any cooperation from a retailer, the manufacturer's participation rate notwithstanding, unless it meets some requisite level of importance. Without cooperation, there is no point in the manufacturer offering a co-op program.

The remaining explanatory variables – advertising, advertising squared, retail margin, and category growth rate – appear influence the decision to offer cooperative advertising in a way that is consistent with their effect on participation rate (e.g., there is a quadratic relationship between brand-level national advertising and the decision to offer cooperative advertising).

4. Conclusions

This paper has shown that participation rates in cooperative advertising plans vary not only along industry and product category dimensions, but also by brand-level characteristics. Specifically, the empirical results demonstrate a quadratic relationship in which a positive

correlation between participation rates and national advertising expenditures over the range of most brands gives way to an inverse correlation of the two variables for the most intensely advertised brands.

An implication of this study for the cooperative advertising practitioner is that one should not only look at the degree of intrabrand and interbrand competition in the market for strategy cues; one must also consider characteristics of the brand itself. Specifically, marketers should ask whether the brand has such a great degree of equity that it has become a "must-have" (and a "must-promote") for retailers. When interbrand competition is low and intrabrand competition intense because the manufacturer has created a universally-recognized and beloved brand, then it may actually make sense to set participation rates lower.

More research is needed on brand-level effects in cooperative advertising. This paper has examined the effect of only one brand-level characteristic, national advertising. Other brand-level variables such as margins, market share, and stage of life cycle may also have significant relationships with the participation rate. The omission of these variables represents a limitation of the current paper. As discussed, the non-linearity of the relationship between national advertising and participation rates likely reflects the presence of separate factors underlying the advertising variable that work on participation rates in opposite directions. Measures could be developed for each of these effects so that they could be incorporated individually in a model of the participation rate. The results would shed light on the conditions under which each factor has influence. Latent class models (e.g., Oh, Choi and Kim, 2003), which allow incorporation of unobservable sources of heterogeneity, could offer another, complementary approach for measuring brand-level influences.[13]

Notes

[1] Clark (2000), p. 60.
[2] *Discount Store News* (1986), p. 27.
[3] *Statistical Abstract of the United States*, 1994 and 2001.
[4] MultiAd's *Advertising Trends Report*, Spring 1985, p. 2.
[5] For the vast majority of brands, only one cooperative advertising program was offered. A few brands offered multiple programs, but participation rates were almost always the same across programs for a given brand. In the rare instances (fewer than 10) where programs with different rates were shown for a single brand, the programs were dropped from the study, as no information was available to associate different rates with different analytic conditions.
[6] Data were not available on seasonal and irregularly scheduled incentives offered by the manufacturers, such as rebates. Such incentives typically complement cooperative advertising programs, which are intended as "permanent" year-round promotional support.
[7] The truncation of small advertisers and the restriction of the data to the ten media covered by LNA/Arbitron are possible limitations of this measure.
[8] A more detailed description of the retail margin calculation, with a full listing of retail product categories, is available from the author on request.
[9] The conditionality term used in the present study assumes a logistic distributed error for the first stage and a normally distributed error (as associated with probit) for the second stage. For a detailed description of the calculation, see Train and Toyama (1989, pp. 93-97).
[10] The model incorporates explanatory variables at different levels of aggregation. This gives rise to the concern that conventionally calculated standard errors may be biased downward, hence the *t*-ratios biased upward (Moulton, 1990; Steenburgh, Ainslie and Engebretson, 2003). Estimating standard errors using clustering by aggregated group can alleviate the bias risk (Rogers, 1993). We calculated an alternative set of standard errors based on clustering at the retail category level, and found that using these standard errors would not have substantially affected our main results. The other level at which data are aggregated in the model, manufacturer industry, accounts for no groups exceeding 5% of the sample size; thus the standard errors are unlikely to be biased by ignoring industry-level aggregation (Rogers, 1993, p. 23).
[11] See Steiner (1993) for a survey of evidence.
[12] There are alternative precedents in the theoretic literature. For example, Doraiswamy, McGuire and Staelin (1979) offer a model in which cooperative advertising increases sales of one brand at the expense of others.
[13] A further, general benefit of future empirical work would be its ability to shed light on recent trends in cooperative advertising practice, to the extent that newer data are available. For example, with the recent growth "big box" discount retailers such as Wal-Mart, a widening array of products may exhibit the characteristics of convenience goods, and participation rates may have adjusted accordingly (upward). Clark (2000) and Boyle (2003) provide some background on these developments and related recent trends in channel relationships.

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Table 1. Descriptive Statistics for Brand-level Advertising Expenditure.

Total brands	2286
No. of brands with national advertising	599
Mean expenditure[a]	$6,423.0
Highest	$203,948.9
1st quartile (150th)	$2,768.5
Median (300th)	$346.2
3rd quartile (450th)	$99.6
No. of brands without national advertising	1687

[a]All figures in thousands of US dollars

Table 2. Frequency Distribution - Participation Rate.

Participation rate (%)	Frequency	Percent
25	2	0.1
33	2	0.1
40	4	0.3
50	890	61.5
60	5	0.3
65	4	0.3
66	2	0.1
70	5	0.3
75	39	2.7
80	8	0.6
100	485	33.5
Total - all plans	1446	100.0
Total - no plan	840	
Grand total	2286	

Table 3. Hypothesis Test Results.

H_0: $\gamma = 0$ [in equation (3)]. N = 2286

$\chi^2(1)_{.05} = 3.84$

Model	L_U	L_R	Test Statistic $2(L_U-L_R)$	Result
Ordered probit	-1224.79	-1224.80	0.02	Fail to reject H_0 at $p > 0.05$ level
Binomial probit (≤50 vs. >50)	-889.55	-889.66	0.22	Fail to reject H_0 at $p > 0.05$ level
Binomial probit (100 vs. <100)	-860.48	-861.09	1.22	Fail to reject H_0 at $p > 0.05$ level

L_U = log-likelihood of the estimation of (3)
L_R = log-likelihood of the estimation of (3) with γ=0

Table 4. Estimation of Decision to Offer Cooperative Advertising.

t-ratios are in parentheses

Variable	Binomial logit
Constant	1.1474 (3.13)[a]
Advertising	0.3832 (5.40)[a]
Advertising squared	-0.0019 (-5.38)[a]
Manufacturer margin (industry-level)	-0.0107 (-1.76)
Retail margin (category-level)	-0.0364 (-5.39)[a]
Category growth rate	1.2294 (2.99)[a]
Category importance	1.5360 (3.88)[a]
Convenience	-0.1484 (-0.82)
N	2286

[a]Significant at $p < 0.01$ level.

Table 5. Estimation of Participation Rate Choice.

t-ratios are in parentheses

Variable	Ordered probit	Binomial probit (≤50 vs. >50)	Binomial probit (100 vs. <100)
Constant		0.4982	0.3376
		(1.71)	(1.15)
Advertising	0.0230	0.0312	0.0166
	(3.92)[a]	(4.68)[a]	(2.72)[a]
Advertising squared	-0.000122	-0.000169	-0.000085
	(-3.16)[a]	(-3.92)[a]	(-2.14)[b]
Manufacturer margin	0.0131	0.0133	0.0123
(industry-level)	(3.03)[a]	(2.94)[a]	(2.74)[a]
Retail margin	-0.0322	-0.0350	-0.0353
(category-level)	(-5.88)[a]	(-6.03)[a]	(-5.94)[a]
Category growth rate	0.6607	0.6254	0.7793
	(2.89)[a]	(2.65)[a]	(3.35)[a]
Category importance	-0.5901	-0.7896	-0.6605
	(-2.05)[b]	(-2.61)[a]	(-2.17)[b]
Convenience	0.6383	0.4982	0.7090
	(4.99)[a]	(5.05)[a]	(5.39)[a]
N	1446	1446	1446

[a]Significant at $p < 0.01$ level.

[b]Significant at $p < 0.05$ level.