

CORNELL
AGRICULTURAL ECONOMICS
STAFF PAPER

AN EXPLORATORY MODELING OF
THE DECISION PROCESS OF NEW PRODUCT
SELECTION BY SUPERMARKET BUYERS

Edward W. McLaughlin
and
Vithala R. Rao

August 1987

No. 87-19

Department of Agricultural Economics
Cornell University Agricultural Experiment Station
New York State College of Agriculture and Life Sciences
A Statutory College of the State University
Cornell University, Ithaca, New York, 14853

AN EXPLORATORY MODELING OF
THE DECISION PROCESS OF NEW PRODUCT
SELECTION BY SUPERMARKET BUYERS

Edward W. McLaughlin

and

Vithala R. Rao

*The authors respectively are Assistant Professor of Food Marketing, Department of Agricultural Economics and Professor of Marketing and Quantitative Methods, Johnson Graduate School of Management, Cornell University, Ithaca, NY 14853.

AN EXPLORATORY MODELING OF THE DECISION PROCESS
OF NEW PRODUCT SELECTION BY SUPERMARKET BUYERS

ABSTRACT

Using data collected from a major supermarket chain, a regression model is estimated to describe buyers' judgments of the profitability of new products. Results indicate how different variables influence these judgments. Implications of new product introductions for private firm strategies and systemwide performance are discussed.

The research here is an initial attempt to describe the new product selection process for supermarket buyers by modeling the factors explaining an intervening variable that effectively serves as a proxy for buyers' ultimate selection decision, namely, buyers' judgments regarding the expected profitability of the new product.

THE PROBLEM

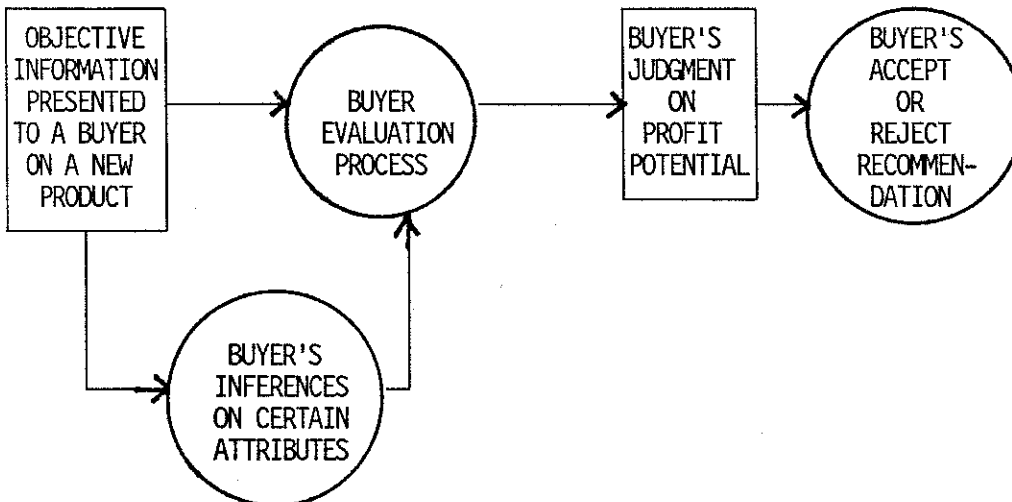
National brand manufacturers cite a number of reasons for the proliferation of new products: to maintain interest of channel intermediaries and consumers, to take advantage of new technologies, to counter competitive thrusts, to transform a commodity to a higher margin value-added item, to partially ensure against new product failure rates as high as 90 percent, and others. While these new products undeniably can create profit opportunities, they also incur substantial systemwide costs for the changes they require in handling, inventory, warehouse and store slotting, shelf signs, price maintenance, etc. The human capital required, too, is substantial: supermarket procurement staffs often evaluate several hundred new products each week and are under continuous pressure for quick decisions (Hamm, 1983). Yet the complex decision calculus employed by these gatekeepers to the supermarket shelves is not well understood. While various pre-test market models attempting to predict sales performance of new products allude to the importance of distribution, these models treat the variable in an ad hoc manner or do not consider it at all (Robinson, 1981).

CONCEPTUAL FRAMEWORK

The marketer of a new product seeking access to consumers must first present the product to the supermarket buyer. Since the product is new, the buyer has no data on historical sales of the product and cannot easily gauge its profit potential. However, he makes a judgment on profit potential utilizing various cues from the large amount of information presented to him.

The product presentation is made to the buyer by the manufacturer representative or a broker. The judgmental process may be conceptualized as shown below. The information presented to the buyer generally includes a physical item description or a sample, details of overall marketing strategy and support given to the item including data on price, various terms of trade, promotional plans, and results of marketing research. After receiving this information, the buyer infers certain attributes and evaluates the item's long term potential. The product may be recommended for acceptance to the buying committee if the judged profit potential exceeds a certain threshold value. About 90 percent of buyer's recommendations are accepted by the buying committee.

FIGURE 1



The objective in this paper is to develop a model to describe buyer's judged profit potential. The long term profit potential, y , for a new product priced at P and an acquisition cost of C may be written as:

$$y = (P-C) * \hat{Q}$$

where \hat{Q} is the expected sales quantity. In addition to price alone, buyers' expected sales quantity is determined by a host of marketing variables. Some of these are: degree of competition, product characteristics, and vendor support. Gross profit margin, is also included since, although directly related to price, it is the most widely employed performance criterion in the supermarket industry and has an important influence in forming buyers' perceptions of long term profit. The variable, synergy, is included to capture the influence of existing families of items; it may be relevant particularly for line extensions. Therefore, we can model the long term profit potential as:

$$y = f(\text{Price, Profit Margin, Competition, Product Characteristics, Vendor Support, Synergy, Other}) \quad (1)$$

To estimate this model, each variable must be measured on the same scale across products and categories. In this paper, we have utilized judgments of buyers on a common scale for the different variables to ensure comparability and to enable aggregation across product categories.

DATA

The data for our model were developed from three primary sources: (i) a new product information form filled out by the vendor (broker or manufacturer representative) of the new product; (ii) a one-page questionnaire completed by the buyer to provide his own judgments of the new product regarding a number of variables; and (iii) a packet of additional vendor supplied materials. The last source was not uniformly complete or available for every product; it consisted largely of test market results, marketing research data, sample point of purchase materials, and advertising and promotion schedules. Experienced coders evaluated this latter source to develop a series of measures on the overall quality of presentation and marketing plan for the new item.

ESTIMATION

The specific model estimated here is a linear version of the model (1) using the judgments of six different buyers. Although data were collected on over 2,000 different products, analysis for this paper is limited to only 730 products in six distinct product categories, each containing over 100 products (beverages; canned fruits, vegetables, juices and drinks; dairy and refrigerated foods; frozen foods; household supplies; and sauces, spices, condiments, oils and dressing). Analysis was thus restricted in an attempt to minimize the heterogeneity present in widely different product categories. Buyer dummy variables are included in the model to account for the different decision processes of the various buyers.

The operationalization of the variables along with direction of the relationships expected are shown in Table 1. The dependent variable, long term profit potential, is judged on a 0-10 scale. We expect positive relationship between judged profit potential and gross margin, vendor effort, category growth, terms of trade and product quality and packaging. The relationships with competition, synergy, and price are less clearcut.

Table 1 Here

The method of ordinary least squares is employed for estimating the parameters. Separate regressions were estimated for all the items and three subgroups of items with suggested retail price ranges of under \$1.00, \$1.00-\$2.00, and over \$2.00.

RESULTS

Table 2 reports the regression results of one particular specification where behavior of the dependent variable, buyer judgment regarding long run product profitability, is explained through a series of quantitative, qualitative (judgments) and dummy variables.

Fit: In the column labelled (ALL), where all data were included in the estimation, a large proportion (R-square of 70 percent) of the variability in buyers' expectations regarding long run profitability is explained by the model. Further, six of the seven variables emerged as highly significant with accompanying signs as expected. The details for each variable are discussed below for the ALL regression followed by comments on the subgroup analyses.

Profit Measure: The effect of gross margin percentage, the profit measure most widely used by food industry executives, on buyer predictions of long run profitability was positive and significant.

Competition: The measure of number of competing firms showed a positive effect on buyers' evaluation of profitability. A buyer may judge that profitability is likely to be higher for a product that has already been positively evaluated and placed on store shelves by other buyers in competing firms. The second measure of competition, the number of other brands against which the new item might compete, was not significant, although its sign was in the direction expected. One explanation is that with the continuing proliferation of new products, an addition to a category that is already crowded might be evaluated as having relatively low profit potential.

Vendor Effort: The qualitative measure of overall vendor's marketing effort (including promotional materials, availability of test marketing results, etc.) was positively and significantly associated with the judgment of long term profit potential of the item, as expected.

Category Growth: The expectations of the likely growth of the category to which the product belonged, as expected, was positive and significant.

Terms of Trade: The availability of other non-price terms of trade (e.g., off-invoice provisions, free goods, etc.) turned out to be significant in the expected direction.

Synergy: The synergy measure was significant but with a negative influence. While there was no expectation for the sign of this variable, it might be argued that those items that simply extend an already successful line are more likely to be profitable, thus a positive influence. However, it may equally be argued that as competition for fixed shelf space intensifies a buyer may perceive an extended family member as a "me-too" item, unlikely to make significant additions to profit.

Product Quality and Packaging: The two dummy variables measuring product uniqueness (e.g., taste, effectiveness) and package design proved not to be significant.

Price: In order to facilitate aggregation across products priced differently, the absolute per unit price of an item was converted to two dummy variables for the three price groups. The effects of these variables were negative and insignificant.

Buyer Effects: Differences in the decision processes of the six individual buyers were captured by the coefficients of the five buyer dummy variables. Buyers 1 and 2, for example, exhibited optimism about a product's potential profitability relative to Buyer 4.

Subgroup Analysis: Although the models fit slightly better for two of the three subgroups based on unit price, several of the parameter estimates were different across these models, implying interactions. The effect of the profit variable, for example, lessens as the price of the product increases. This may arise due to the positive buyer impression formed by a large gross margin accompanying a low price product, resulting in

high volume and subsequent attractive profit. The effect on profit may actually be reversed, however, if the price of the product is so high (say, over \$2.00) that demand is sufficiently dampened. These results may be indicative of risk aversion by the buyers. The same reasoning may apply to the competing firms variable.

Moreover, although the relationship is not monotonic, it appears that when a low price item is included as part of a family, it has a greater chance of receiving a positive buyer evaluation than when it is an expensive item. This may again be related to buyers' judgments regarding the limited number of high priced items than an individual category, or department, can support.

CONCLUSIONS AND IMPLICATIONS FOR RESEARCH

The exploratory model developed in this paper of the complex decision processes of supermarket buyers offers promise. Generally, the statistical results are significant and the explanatory variables behaved as predicted. Such results, especially when refined and validated with subsequent analyses--now in progress--should prove useful to both firm managers and public policy makers.

Grocery product marketers, in particular, are regularly forced to make resource allocation decisions with little information regarding the probabilities of likely outcomes. Operating under limited budgets, for example, a marketing manager of a packaged consumer goods firm might need information regarding the expected payoff for additional investment in marketing effort, say couponing or T.V. advertising, for a proposed new product or to extending the line or family of an existing product or category. The analysis here suggests that the appropriate response to such a question depends inter alia on the product's price. Specifically, there appears to be a large positive impact on buyer profit perception when a low price item (under \$1.00) is evaluated as part of a family; the opposite result seems to hold when the item is priced over \$1.00.

Several limitations of these results should be recognized. These arise due to the quality of the data, incompleteness of data, inability to include actual promotional variables (e.g., Point-of-Sale effort) and aggregation across several categories. Although all data and supporting materials for each product presented to the buyers were collected, information on a substantial number of variables was simply not available. Moreover, often, even when the appropriate information was present, wide variances in the standard merchandising requirements for different product categories coupled with the serious lack of uniform vendor presentation format, resulted in noncomparability of information across products. The use here of buyer judgments regarding product characteristics and performance variables was an attempt to correct for this difficulty, however, with an accompanying loss of precision in the measurements.

Experimental research is currently underway in an attempt to adjust for these data limitations. Buyers' judgments on synthetic products, defined on a set of attributes, should compensate for much of the data incompleteness described above. When combined with actual data already collected, these buyer judgments should allow accurate predictions of decisions on new products.

As better data are developed, calculation of the marginal returns associated with manufacturer investments in marketing mix elements is straightforward. Armed with these elasticities, food manufacturers should be able to make improved decisions regarding the allocation of new product development resources. Public policy makers, too, should find these results useful for their potential to increase systemwide efficiencies as more efficient decisions are made regarding introduction of new products into distribution channels. Increased profits for food manufacturers and distributors or lower food prices for consumers are the likely systemwide performance consequences.

Table 1
VARIABLES, OPERATIONALIZATION AND EXPECTED RELATIONSHIPS

Variable	Operationalization	Measure	Expected Sign
PROFIT	Gross Margin $\left(\frac{\text{Retail Price}-\text{Cost}}{\text{Retail Price}}\right)$	Percentage Gross Margin	Positive
COMPETITION	FIRM - Number of competing firms	Actual buyer determination	Positive (?)
	BRAND - Number of competing brands		Negative (?)
VENDOR EFFORT	Vendor advertising and promotion effort promised	Index of buyer judgment on 0-10 scale	Positive
CATEGORY GROWTH	Expected growth of product category	Index of buyer judgments on 0-10 scales	Positive
TERMS OF TRADE	Non-price marketing incentives	Number of non-price marketing incentives	Positive
SYNERGY	Association with family of existing products	Whether item is a member of a family (0,1)	?
PRODUCT QUALITY AND PACKAGING	Product effectiveness and package design	Buyer judgments on 0-10 scales converted to two dummy variables	Positive
PRICE	Price of item	Manuf. suggested retail price/unit	Positive (?)

Table 2

RESULTS OF REGRESSION OF PROFIT POTENTIAL JUDGMENTS

Group of Items → Variable ↓	ALL	RETAIL PRICE PER UNIT		
		UNDER \$1.00	\$1.00- \$2.00	OVER \$2.00
INTERCEPT	3.12* (15.16)	2.40 (7.36)	3.37 (10.08)	3.90 (8.05)
PROFIT	.02 (5.28)	.04 (7.07)	.02 (2.33)	-.01 (-.82)
NUMBER OF COMPETING FIRMS	.03 (2.39)	.08 (3.71)	.04 (2.11)	-.03 (-1.36)
NUMBER OF COMPETING BRANDS	-.01 (-1.71)	-.03 (-3.71)	-.01 (-1.3)	.01 (.92)
VENDOR EFFORT	.08 (5.46)	.03 (1.20)	.07 (3.93)	.09 (2.12)
EXPECTED CATEGORY GROWTH	.13 (5.33)	.25 (5.26)	.15 (3.98)	.12 (2.49)
TERMS OF TRADE	.07 (2.21)	.13 (2.12)	.07 (1.66)	-.04 (-.51)
SYNERGY (DUMMY)	-.14 (-2.35)	.47 (3.73)	-.28 (-3.23)	-.17 (-1.39)
DUMMY 1 FOR LOW QUALITY	-.25 (-1.18)	-.79 (-2.48)	.38 (.74)	-.39 (-.64)
DUMMY 2 FOR MEDIUM QUALITY	-.02 (-.34)	-.28 (-1.62)	-.13 (-1.42)	.05 (.34)
DUMMY 1 FOR LOW PRICE	-.01 (-.10)			
DUMMY 2 FOR MEDIUM PRICE	-.11 (-1.6)			
BUYER DUMMY 1	1.8 (18.04)	1.65 (8.90)	1.60 (11.14)	2.02 (7.94)
BUYER DUMMY 2	1.06 (7.76)	.95 (4.95)	.39 (1.93)	
BUYER DUMMY 3	.05 (.38)	-.33 (-1.08)	.22 (1.14)	-.23 (-1.01)
BUYER DUMMY 4	-.33 (-1.67)	1.11 (2.17)	-.63 (-2.83)	-.81 (-.86)
BUYER DUMMY 5	.77 (7.12)	.78 (3.84)	.68 (4.57)	.75 (2.89)
R-SQUARE	.70	.79	.67	.74
ADJ. R-SQUARE	.69	.78	.66	.72
F-RATIO	104.46	51.48	46.87	38.55
SAMPLE SIZE	731	204	336	191

*These entries are the regression coefficients and the associated t-values.

REFERENCES

- Nielsen, A.C., Nielsen Early Intelligence Systems, Chicago, IL, 1986.
- Connor, John M., "Food Product Proliferation: A Market Structure Analysis," American Journal of Agricultural Economics 63 (1981): 607-17.
- Connor, John M., et al., The Food Manufacturing Industries, Lexington, MA, Lexington Books, 1985.
- DFS-Dorland, New Product News, Gorman Publishing, Chicago, IL, 1986.
- Food Marketing Institute, "Food Industry Speaks," Washington, D.C., 1986.
- Fortune, "The King of Suds Reigns Again," 1986.
- Grashof, John F., "Supermarket Chain Product Mix Decision Criteria: A Simulation Experiment," Journal of Marketing Research 7 (1970): 235-42.
- Hamm, Larry G., "Food Distributor Procurement Practices: Their Implications for Food System Structure and Coordination," unpublished Ph.D. dissertation, Michigan State University, East Lansing, MI, 1981.
- Heeler, Roger M., Michael J. Kearney, and Bruce J. Mehaffey, "Modeling Supermarket Product Selection," Journal of Marketing Research 10 (1973): 34-7.
- Montgomery, David B., "New Product Distribution: An Analysis of Supermarket Buyer Decisions," Journal of Marketing Research 12 (1973): 255-64.
- Padberg, Daniel I., and Randall E. Westgren, "Product Competition and Consumer Behavior in the Food Industries," American Journal of Agricultural Economics 61 (1979): 620-25.
- Robinson, Patrick, J., "Comparison of Pre-Test Market New-Product Forecasting Models," in Y. Wind, V. Mahajan and R.N. Cardozo (ed.), New-Product Forecasting, Lexington, MA, Lexington Books, 1981: 181-204.