TARGET MARKETS FOR RETAIL OUTLETS OF LANDSCAPE PLANTS

Steven C. Turner, Jeffrey H. Dorfman, and Stanley M. Fletcher

Abstract

Merchandisers of landscape plants can increase the effectiveness of their marketing strategies by identifying target markets. Using a full information maximum likelihood tobit procedure on a system of three equations, target markets for different types of retail outlets in Georgia were identified. The results lend support and empirical evidence to the premise that different retail outlet types have different target markets and thus should develop different market strategies. The estimated target markets are identified and possible marketing strategies suitable for each type of retail outlet are suggested.

Key words: landscape plants, target markets, simultaneous equations, tobit.

The success of retail merchandisers in identifying target markets is important to plant growers. Ornamental horticulture grower cash receipts grew from 5.0 percent of all cash crop receipts in 1981 to 9.1 percent in 1986. Receipts were estimated to be about $7.0 billion or 11 percent of all cash crop receipts in 1987 (USDA). This rapid growth exerts pressure throughout the marketing system, with the retail level experiencing the direct influence of changing demand and supply.

Merchandisers of landscape plants attempt to differentiate themselves by offering different services and products. Consumer perception is also important in merchandiser differentiation. These perceptions are often influenced by advertising. Certain individuals can be targeted in advertising campaigns to maximize the efficiency of advertising expenditures. Information on these target consumers could be helpful to merchandisers as they make advertising decisions.

Research on retail store choice in general has investigated the influence of socioeconomic variables, store characteristics, and situational attributes on the decision of where to purchase merchandise (Bellenger *et al.*; Malhotra; Mattson; Arnold *et al.*). Bellenger *et al.* recommended segmentation of female shoppers by age and education as an effective retail strategy. With respect to landscape plants, Turner investigated the influence of socioeconomic characteristics on retail purchases, while Gineo examined the characteristics of plants that influence landscaper and retailer purchases.

The objective was to investigate the socioeconomic characteristics of consumers that can be used by different types of landscape plant retailers to segment their markets. This information can be used in identifying different target markets, which could lead to more efficient allocation of marketing and advertising resources.

THE MODEL

Identifying target markets is important to retailers of landscape plants (Phelps; Altorfer). The success of various retailer decisions, such as store location, product pricing, and advertising strategies, are dependent on a better understanding of clientele. Identifiable characteristics of consumers or situations are used to develop strategic marketing plans.

Strategic marketing is characterized by segmenting, targeting, and positioning. Segmenting is accomplished by identifying consumers that have a propensity to consume a particular product or utilize a specific outlet. Geographic, demographic, psychographic, and behavioral variables are often used to segment markets (Kotler). Other variables associated with the outlet, such as location, price, and advertising, influence the purchasing decision but are not used to segment consumer markets. Demographic variables were hypothesized to influence and explain the percentage of landscape plants purchased at large retail stores, large garden centers, and local garden centers. It was hypothesized that distinct primary segments existed for each outlet type and the segment could be characterized by age, sex, income, education, marital status, race, and the market value of the home.

Age was hypothesized to have a nonlinear relationship to plant purchases. That is, persons would purchase more plants as they grow older but at a

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certain age their purchases would start decreasing. For this reason both age and age squared were included as explanatory variables. The relationship between the sex of the purchaser and the retail outlet selected was uncertain *a priori*. Income was hypothesized to be related positively to percentages purchased at local garden centers and negatively related to large retailers or mass merchandisers. Education was hypothesized to be a positive influence on plant purchases, as was being married. No *a priori* hypothesis existed for the race variable, which was measured as Caucasian or non-Caucasian. The market value of the purchaser's home was hypothesized to have a positive influence on landscape plant purchases in general but less with respect to the large retailer. Thus, the following models were developed to identify targets for the three types of retail outlets:

(1) LRET = f(AGE, AGESQ, EDUC, MAR, RACE, INC, HMV, SEX),

(2) LGC = f(AGE, AGESQ, EDUC, MAR, RACE, INC, HMV, SEX),

(3) LOC = f(AGE, AGESQ, EDUC, MAR, RACE, INC, HMV, SEX),

where LRET, LGC, and LOC represent the percentage of purchases at large retail stores, large garden centers, and local garden centers, respectively. Descriptions, means, standard deviations, and measurements of the explanatory factors are presented in Table 1.

Different methods used in the retailing literature to identify target markets have been multinomial logit (Arnold *et al.*), analysis of variance (Mattson), stepwise discriminant analysis (Bellenger), and

Table 1. Factors Hypothesized To Explain The Percentage Of Plants Purchased At Different Retail Outlets In Georgia In 1988

Variables	Description	Mean	Standard Deviation	Measurement	
LRET	Percentage of purchase at large retail stores	32.62	37.7667	Percentage (0-100)	
LGC	Percentage of purchase at large garden centers	27.69	37.6061	Percentage (0-100)	
LOC	Percentage of purchase at local garden centers	26.12	37.72	Percentage (0-100)	
AGE	Age of respondent	43.32	14.255	Years Reported	
AGESQ	Age squared	2079.2	1337.3	Years reported squared	
EDUC	Highest level of schooling reported	15.272	3.6073	Amount reported	
MAR	Marital status of respondent	.6810	.4670	0 = unmarried 0 = married	
RACE	Race of respondent	.8319	.3747	0 = nonwhite 1 = white	
SEX	Gender of respondent	.5172	.5007	0 = female 1 =male	
				Midpoint	Measurement
INC	Family income	38,136	17,097	2,500	0-4,999
				7,500	5,000-9,999
				12,500	10,000-14,999
				17,500	15,000-19,999
				22,500	20,000-24,999
				30,000	25,000-34,999
				42,500	35,000-49,999
				75,000	>50,000
HMV	Market value of home	78,879	71,131	5,000	0-10,000
				20,000	10,001-30,000
				45,000	30,001-60,000
				80,000	60,001-100,000
				125,000	100,001-150,000
				200,000	150,001-250,000
				375,000	>250,000

tobit models (Malhotra). When attempting to identify a target market, expenditures on a product are modeled as a function of socioeconomic characteristics of consumers and, perhaps, attributes of the product. Many consumers may not have purchased a specified product at a particular type of outlet, therefore the sample will be truncated at zero purchases. That is, a portion of the sample will have zero expenditures on a product at a particular type of outlet, causing parameter estimates from an ordinary least squares procedure to be biased. Instead, use of the tobit procedure developed by Tobin leads to unbiased and efficient parameter estimates for such an equation (Madalla).

However, the process of identifying target markets for several types of retail outlets of landscape plants cannot be accomplished simply by obtaining parameter estimates for each type of retail outlet model. This would require an assumption of independence between each model. That is, a consumer's expenditures on plants are independent of the type of retail outlet. Clearly, this assumption is not valid because an individual may purchase plants from several types of retail outlets.

One solution to the above problem would be to use a seemingly unrelated (SUR) tobit procedure to estimate parameters of each model. The estimates obtained would be more efficient than those from a single equation approach, but would still not be maximum likelihood estimates. In order to obtain maximum likelihood estimates, a standard technique of iterating the SUR regression system until convergence is followed. This technique is common in linear regressions and is easily adapted to the present problem. Therefore, a full information maximum likelihood tobit (FIMLT), was used to estimate parameters for the previous models.

PROCEDURE

As discussed above, equations (1) – (3) were estimated using an iterative SUR technique that at convergence yields full information maximum likelihood tobit estimates for all the parameters in the system. The technique is very similar to that used on systems of linear equations, although complicated by the use of a packaged program (LIMDEP) to accomplish the tobit estimation.

The first step in achieving FIML tobit (FIMLT) estimates is to obtain ordinary, single-equation tobit estimates of each equation's parameters. Equations (1) – (3) in matrix notation, with obvious definitions, are as follows:

(4) $Y_1 = X_1 \beta_1 + \varepsilon_1$

(5) $Y_2 = X_2 \beta_2 + \varepsilon_2$

(6) $Y_3 = X_3 \beta_3 + \varepsilon_3$

Denote these estimates as $\hat{\beta}_1^1$, $\hat{\beta}_2^1$, and $\hat{\beta}_3^1$, where subscripts and superscripts identify equation and iteration, respectively. These estimates may be used to construct an estimated system covariance matrix with the following (standard SUR) assumptions:

(7a) $E(\varepsilon_{it}) = 0 \quad \forall\ i, t$

(7b) $\mathrm{Cov}(\varepsilon_{it}, \varepsilon_{js}) = \begin{cases} \sigma_{ij} & s = t \\ 0 & s \neq t \end{cases}$

This yields an estimated covariance matrix for the system of three equations of $\Omega^{(1)} = (\Sigma \otimes I)$ where Σ is a (3 x 3) matrix of the σ_{ij} and I is a (T x T) identity matrix with T = sample size. Because imposing such a covariance structure on the tobit estimation procedure would greatly complicate the likelihood function, the data were transformed to have the normal error structure assumed when performing tobit regressions. This is done by Cholesky decomposing Ω^{-1} into P′P where P is upper triangular and partitioned into

(8) $$P = \begin{bmatrix} P_{11} & P_{12} & P_{13} \\ 0 & P_{22} & P_{23} \\ 0 & 0 & P_{33} \end{bmatrix}.$$

Then the transformed equations can be written as a single matrix equation

(9)
$$Y = \begin{bmatrix} Y_1^* \\ Y_2^* \\ Y_3^* \end{bmatrix} = \begin{bmatrix} P_{11}X_1 & P_{12}X_2 & P_{13}X_3 \\ 0 & P_{22}X_2 & P_{23}X_3 \\ 0 & 0 & P_{33}X_3 \end{bmatrix} \begin{bmatrix} \beta_1 \\ \beta_2 \\ \beta_3 \end{bmatrix} + \begin{bmatrix} \varepsilon_1^* \\ \varepsilon_2^* \\ \varepsilon_3^* \end{bmatrix}$$

with the following definitions, $Y_1^* = P_{11}Y_1 + P_{12}Y_2 + P_{13}Y_3$, $Y_2^* = P_{22}Y_2 + P_{23}Y_3$, $Y_3^* = P_{33}Y_3$. The ε_i^* are similarly defined. Equation (9) can be estimated as a single equation tobit model that will provide a second round of estimated parameters: $\hat{\beta}_1^2$, $\hat{\beta}_2^2$, and $\hat{\beta}_3^2$. The residuals from these regressions are then used to provide a second covariance estimate of $\Omega^{(2)}$ and to repeat the transformation process.

This iterative process was continued until the log likelihood function for the entire system converged to a maximum. The log likelihood function was checked at each iteration to ensure that the procedure was not converging to a suboptimal solution. This procedure allowed for a simple implementation of a FIML algorithm for systems of tobit equations without having to write a special program to maximize the system's likelihood function.

DATA

A random telephone survey of Georgia residents was conducted in the fall of 1988 by the Survey

Research Center at the University of Georgia. Of the total sample (418), 232 had purchased landscape plants in 1988. The questionnaire included questions about the dollar amount of landscape plants purchased in 1988, the percent of purchases at different outlets, home ownership, and market value of homes. Other economic and demographic characteristics included family income, education, age, race, sex, and marital status.

The different outlets analyzed were large retail stores (K-Mart, Sears, etc.), large lawn and garden centers (Pikes, Franks, etc.), and local lawn and garden centers. Producers, mail order, and other outlets were cited by respondents, but the percentage of plants purchased at these outlets was small relative to the first three outlets.

RESULTS

Parameter estimates for the FIMLT estimation procedure are presented in Table 2. The model for each retail outlet is discussed separately.

For large retail stores or mass merchandisers, the Georgia target market appears to be segmented by age, race, income, and the market value of homes, because these explanatory variables were significant at the .10 level. The significance, signs, and parameter estimates for AGE and AGESQ indicate that as age increases, the percentage of expenditures at large retail stores increases at a decreasing rate until age 46. After age 46, increases in age decrease the percentage expected to be spent at large retail stores. Nonwhites were more likely to purchase plants at large retailers. Rising income levels were associated with a slightly decreased percentage of plants purchased at these stores. Furthermore, there was a negative relationship between home market value and purchases at large retailers. That is, respondents with homes of higher market value purchased a lower percentage of their plants from large retail stores.

Mass merchandisers in Georgia can position themselves to take advantage of their identified target markets by locating in areas with large young- to middle-age populations that live in lower- to middle-class neighborhoods. Advertisements targeted to include nonwhite populations and lower- to middle-income groups could be a priority. Ideally, price, product, promotion, and physical distribution strategies would take into account the identified target market.

For large lawn and garden centers, marital status, income, and home market value were the significant explanatory factors. The results indicated that unmarried households with higher incomes and homes of greater market value purchased greater percentages of their plants from large garden centers. Age, education, race, and sex were not significant (.10 level) explanatory factors associated with plant purchases at large garden centers.

A surprising component of this target market was the unmarried component, which was significant at the .05 level. Combined with higher incomes and houses of higher market value this target market would appear not only to be interested in purchasing

Table 2. Full Information Maximum Likelihood Tobit (FIMLT) Parameter Estimates And Student T-values For The Percentage Of Plants Purchased At Large Retail Stores, Large Lawn And Garden Centers, And Local Garden Centers

Factors (Independent Variables)	Different Outlets (Dependent Variables)		
	LRET	LGC	LOC
	------ Estimated Coefficients------ (student t-values)		
Intercept	35.3746	21.9970	-9.31807
	(.989)	(.701)	(-.212)
AGE	2.71419*	-1.57191	-.280200
	(1.756)	(-1.159)	(-.147)
AGESQ	-.0294053*	.0159230	.00410808
	(-1.784)	(1.099)	(.202)
EDUC	.117217	1.28104	-1.42491
	(.115)	(1.430)	(-1.144)
MAR	-5.05980	-19.3406**	35.2652**
	(-.619)	(-2.731)	(3.409)
RACE	-23.7280**	10.5915	26.0621**
	(-2.489)	(1.263)	(2.167)
SEX	8.66512	7.15576	-22.0000**
	(1.279)	(1.204)	(-2.643)
INCOME	-.000421561*	.000391149*	.0000702164
	(-1.703)	(1.804)	(.232)
HMV	-.000113530*	.0000965772**	-.0000347794
	(-1.947)	(1.891)	(-.490)
R^2	.098[a]	.111[a]	.166[a]
Log Likelihood function for total system		-998.154	

*Significant at .10 level.
**Significant at .05 level.
[a]The R^2 reported here is the squared correlation coefficient between the forecast and actual expenditure shares. This measure was used due to the nonlinearity of the FILMT procedure. See Kvålseth for a discussion of R^2 measures.

landscape plants but also to have the means to do so. Promotion, product, and physical distribution strategies could be developed to capture this market segment further. For example, a wide variety of plants would probably appeal to this segment, as would delivery and other auxiliary services.

In contrast, the percentage of plants purchased at local garden centers was significantly (.10 level) explained by marriage, race, and sex. Being married, white, and female appeared to identify the segment of the sample most likely to purchase higher percentages of plants from local garden centers. An extension of this research would be to develop a focus group of this segment and explore strategies that appeal to them. Other explanatory variables were not significant at a .10 level.

A technique developed by McDonald and Moffitt for tobit models allows the change in the dependent variable with respect to a change in an independent variable to be decomposed into two parts: one due to changes in existing customers' behavior and one due to changes in new customers' behavior. This information can be useful to stores in anticipating changes in both the number of customers and in the behavior of particular customers.

The technique is based on a decomposition of a derivative. Consider the Tobit model:

$$(10)\quad \begin{aligned} y &= X\beta + \varepsilon, & X\beta + \varepsilon &> 0 \\ y &= 0, & X\beta + \varepsilon &< 0. \end{aligned}$$

Denote all observations of y that are positive (visible to the researcher) as y^*. Now, note that due to the special error structure of the model, the expected value of y is different than in an ordinary regression model,

$$(11)\quad E(y) = X\beta\Phi(z) + \sigma\phi(z)\,.$$

Further, the expected value of the positive observations is

$$(12)\quad E(y^*) = X\beta + \frac{\sigma\phi(z)}{\Phi(z)},$$

where ϕ and Φ are the probability density function (pdf) and cumulative density function (cdf) of the standard normal distribution, σ is the variance of the ε's, $X = (x_1, x_2, ..., x_k)$, and $z = X\beta/\sigma$. If (11) is differentiated with respect to a single x_i, the result is

$$(13)\quad \frac{\partial E(y)}{\partial x_i} = \Phi(z)\left[\frac{\partial E(y^*)}{\partial x_i}\right] + E(y^*)\left[\frac{\partial \Phi(z)}{\partial x_i}\right].$$

The first term on the right-hand side of (13) is the expected change in the dependent variable due to changes in the expected behavior of existing customers. The second term on the right-hand side is the expected change in the dependent variable due to changes in the likelihood that new people are customers (i.e., changes due to new customers).

The two derivatives on the right-hand side of (13) can be solved for and are

$$(14)\quad \frac{\partial E(y^*)}{\partial x_i} = \beta_i\left[1 - \frac{z\phi(z)}{\Phi(z)} - \frac{\phi^2(z)}{\Phi^2(z)}\right],$$

$$(15)\quad \frac{\partial \Phi(z)}{\partial x_i} = \frac{\phi(z)\beta_i}{\sigma}\,.$$

Substitution of (12), (14), and (15) into (13) shows that

$$(16)\quad \frac{\partial E(y)}{\partial x_i} = \Phi(z)\beta_i\,.$$

Therefore, because equation (13) tells us that the part of the change in the dependent variable with respect to a change in an independent variable due to existing customers is the right-hand side of (14) times $\Phi(z)$, the percent of the change due to existing customers is just this expression divided by the entire change. So the percent change due to existing customers is

$$(17)\quad \frac{\Phi(z)\beta_i\left[1 - \frac{z\phi(z)}{\Phi(z)} - \frac{\phi^2(z)}{\Phi^2(z)}\right]}{[\varphi(z)\beta_i]} = \left[1 - \frac{z\phi(z)}{\Phi(z)} - \frac{\phi^2(z)}{\Phi^2(z)}\right].$$

The percent change due to new customers is then

$$(18)\quad 1 - \left[1 - \frac{z\phi(z)}{\Phi(z)} - \frac{\phi^2(z)}{\Phi^2(z)}\right] = \frac{z\phi(z)}{\Phi(z)} + \frac{\phi^2(z)}{\Phi^2(z)}\,.$$

The expressions in (17) and (18) can be evaluated for any level of the independent variables desired using only standard mathematical tables or several computer packages that contain standard normal pdf and cdf generating routines. For further details, see McDonald and Moffitt or Malhotra.

The evaluation of the expressions in (17) and (18) was performed for the model estimated here with the values of the independent variables at their means.[1] For large retail outlets, 40.8 percent of the total change in expenditures would be expected to come from existing customers, while 59.2 percent would be due to noncustomers becoming customers. On the other hand, for both large garden centers (LGC) and local garden centers (LOC) the percentages were reversed. That is, 60.8 percent and 60.1 per-

[1] To compute expression (17) and (18) for large retail outlets, $\Phi(z) = .5775$ (134 of the sample of 232 had purchases at large retail outlets), $\phi(z) = .3914$, and $z = .195$.

cent of the total change in expenditures for LGC and LOC, respectively, would be expected to come from existing customers. Therefore, 39.2 percent and 39.9 percent of the total change for LGC and LOC, respectively, would be associated with new customers.

IMPLICATIONS

Identification of target markets is a crucial step in developing a marketing strategy for a landscape plant retailer. The firm can change the price, place, promotion, and product to position itself to appeal to its target market segment. These results indicate different strategies for these three types of landscape plant retail outlets. Large retailers and mass merchandisers should be aware of the curvilinear relationship between age and percentage of plants purchased from them. As persons mature, they buy increasing percentages of plants from large retailers. This relationship holds until the mid-forties when they begin purchasing fewer plants from large retailers. Age did not appear to have explanatory power for the other two retail outlets examined. Nonwhites appeared to purchase greater percentages of plants at large retailers. On the other hand, increased income and higher home market values were associated with lower purchase percentages.

Market strategies to reach this target market of large retailers and mass merchandisers should concentrate on price, promotion, and place. Because income was identified as a segmenting variable, it appears that low prices would be important to the target market. As concerns promotion, advertising should stress price and be targeted to young, lower- to middle-class families. Firm location is a longer term decision but should take into account locales that contain a large population of the above target market. Of course, landscape plants are but one product category included in the mass merchandiser product mix. Nevertheless, the identified target market for landscape plants could be used to draw customers for other product categories.

Respondents with higher incomes and homes of greater market value were more likely to purchase plants at large garden centers. Nonmarried respondents were also found to purchase a greater percentage of plants from large garden centers. This target market suggests a strategy for large garden centers that might include: (1) location in affluent housing areas, (2) product variety and the correspondingly higher prices, and (3) promotions that appeal to divorced persons, widows and widowers, and single households. This last component could include travel promotions or contests and landscaping classes.

Married, white females appear to be a target market for local garden centers. Strategies effective in reaching this group could include: (1) discount pricing during certain periods, such as weekday mornings, (2) programs that encouraged child participation through local schools, such as plant growing contests, and (3) sponsorship of family-oriented activities, such as a little league baseball team.

The research reported here is an initial attempt to identify target markets for different retail outlets of landscape plants. There appear to be definite differences in the demographic characteristics of these consumers. Additional research to identify why these different consumers select these types of retail outlets would further enhance retail operators' abilities to develop profitable marketing strategies.

The results also indicate that a majority of the total change in the percentage spent at large retail stores resulting from a change in an explanatory factor would be generated by new customers. For both large and local garden centers, the opposite occurs with the major contribution to change being generated by existing customers. Of course, the results of this analysis may be specific to the sample area (Georgia) and time (1988). Data from larger and different sample areas could be used to test the robustness of these results to other areas and time periods.

REFERENCES

Altorfer, K. "Targeting Market Can Greatly Increase Sales." *Am. Nurseryman,* 158(8):69-77.

Arnold, S.J., T.H. Oum, and D.J. Tigert. "Determinant Attributes in Retail Patronage: Seasonal, Temporal, Regional, and International Comparisons." *J. Mar. Res.* 20(May, 1983):149-157.

Bellenger, D.N., D.H. Robertson, and Elizabeth C. Hirschman. "Age and Education as Key Correlates of Store Selection for Female Shoppers." *J. Retailing* 52(Winter, 1976-1977):71-78.

Gineo, Wayne. "The Impact of Product Attributes on Nursery Stock Purchases." University of Connecticut, Dept. of Ag. Econ. and Rural Soc. AERS Staff Paper 89-1, February, 1989.

Kotler, Philip. *Marketing Management: Analysis Planning, Implementation, and Control.* Englewood Cliffs, NJ: Prentice-Hall, 1988.

Kvålseth, Tarald O. "A Cautionary Note About R^2." *Am. Statist.* 39(November, 1985):279-285.

Madalla, G.S. *Limited-Dependent and Qualitative Variables in Econometrics."* Cambridge, MA: Cambridge University Press, 1983.

Malhotra, N.K. "Modeling Store Choice Based on Censored Preference Data." *J. Retailing* 62(Summer, 1986):128-144.

Mattson, B.E. "Situational Influences on Store Choice." *J. Retailing* 58(Fall, 1982):46-58.

McDonald, J.F., and R.A Moffitt. "The Uses of Tobit Analysis." *Re. Econ. and Stat.* 62 (May):318-321.

Phelps, E.D. "Identify Customers and Their Motives to Expand Retail Markets." *Am. Nurseryman,* February 1, 1984:75-83.

Tobin, J. "Estimation of Relationships for Limited Dependent Variables." *Econometrica* 26(1958):24-36.

Turner, S.C. "An Analysis of Expenditures on Landscape Plants in Georgia." *Proceedings of SNA Research Conference* 33(1988): 208-212.

U.S. Department of Agriculture. *Agricultural Outlook,* July, 1988:12-15.