DEMAND SHIFTS IN OUTLET SELECTION IN THE UNITED STATES MARKET FOR FRESH FLOWERS

By

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To Mami Lety.

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Over the past decade consumers' outlet selection in the fresh flower industry has shifted among outlet types, and primarily with changes in using florists and supermarkets. This study focuses on demand shifts in outlet selection in the fresh flower industry at the retail level. Florists and supermarkets were chosen because of their high market share levels seen throughout the industry for these two outlet types. Historically, florists have attained higher levels of market shares expenditures justified in part by the creative value added to their products, particularly in the arrangement sector of the industry. In contrast, supermarkets have focused on the non-arrangement sector which has higher levels of market share transactions. Over time, supermarkets have increased their market shares while florists have experienced a decline. If this trend continues, the industry will experience significant restructuring at the retail level. To quantitatively measure these outlet shares, an initial sample of households of approximately 189,000 observations was collected by a professional survey agency. Over a period ten years the agency recorded

the purchasing pattern of approximately 9,000 households using consumer diaries. This paper used socioeconomic and demographic variables to describe outlet selection in the fresh flower industry. A two-stage estimation model was used to describe the decision process faced by potential flower consumers with the first stage estimating the entry of buyers and the second the level of purchases among buyers. Simulations were used to forecast consumers' intensity of buying. It is the goal of this study to facilitate the understanding of factors influencing outlet selection when purchasing fresh flowers. This knowledge then is important to understanding structural change and for designing policies that could alter the structure if needed.

CHAPTER 1
INTRODUCTION

Overview

The present research paper addresses issues of consumers' outlet selection in the fresh flower industry. Flowers fall within the category of goods that are usually purchased for their perceived aesthetic value. Aesthetic characteristics include decorative, emotional, environmental, and visual needs of the customer at any given time. For several years now the flower industry has been experiencing major structural changes. Some of this change may be attributed to outlet changes, import dependency, direct marketing practices, packaging, and promotions. This study focuses on outlet changes and how they may affect market shares distribution in the fresh flower industry. Specifically, changes in florists and supermarkets shares are of particular interest.

Many factors influence consumer preferences for using a particular outlet type. Price differences usually reflect the type of product that consumers buy with high value products usually associated with florists. Florists are usually able to charge a higher price because of the creative valued added to the flowers (i.e., arrangements). Supermarkets, which usually sell lower priced products, specialize in selling larger quantities of fresh flowers with less value added to the flowers. Up to a certain extent, this change in product preference mix is changing the industry's market structure.

Current demand for cut-flowers among different value added products goes beyond pricing considerations. Packaging, purpose, occasions, and product range also influence consumer buying decisions. Historically, supermarkets and florists have differed in the

range of flower products and services provided. As we may see later in this study, florists have experienced a decline in their market share, thus suggesting underlying preference changes or alternative sources for the same products. In contrast, supermarkets have experienced increases both in transactions and expenditures on fresh flowers. Changing market shares have significant implications to the flower industry in terms of the competitive buying structure and the types and volumes of purchases by a single outlet. Historically, florists are quite small and have minimal buying power. Whereas, considerable concentration among the major retail food chains suggest that more pressure from the buyers could occur. Yet, growth through supermarkets has the potential for widely expanding the exposure to fresh flowers simply because of the high traffic through most grocery stores. Buyer pressure versus expanded consumer exposure to fresh flowers is a real potential tradeoff that must be considered. Ultimately, for both of these outlets one must establish the degree of share change and measure what is driving the changes.

Retail outlets can easily be grouped into four categories defined as: specialty shops, mass merchandisers, internet, and others. Specialty shops are further divided in florists and in others subcategories. Florists have historically had a major share of the arrangement section of the market, providing value added to the retail flowers. Their business is highly seasonal and influenced by calendar occasions such as Mothers Day, Valentines, and Christmas, etc. Florists have experienced declining market shares over the past decade, with supermarkets capturing most of this loss. It is particularly important to know whether this decrease in overall sales has been the consequences of major supply changes throughout the vertical market system (e.g. higher costs, low prices).

Mass merchandisers stores are also subcategorized in supermarkets and others. Supermarkets have focused mainly in the non-arrangement section of the market providing low cost products for a larger share of the consumers' base. Their main business are repetitive purchases for non-calendar occasions although they also experience high peak sales in the above mentioned calendar occasions. Overall, supermarkets have increased their share of the market relatively to florists. Many factors could be affecting this trend in the industry, including better inventory practices (economies of scale applied on highly perishable goods such as flowers), a lower cost structure, and a bigger target audience.

Other reasons that may influence consumers' preferences are purpose and convenience. For the present study purpose is divided into two categories; self and gift. Self often comprises fresh flowers with little value added characteristics, such as non-arrangements. Gifts are mostly purchased for special or calendar occasions throughout the years. More recently, internet sales have grown as a visible outlet for fresh flowers. Internet sales are probably more convenient for the average customer. It might be particularly important to determine whether the appearance of these sales undermine florists or supermarkets market share in the long run. Note, however, that internet sales still usually require delivery of a perishable product that normally requires local services and particularly florists. Hence, there may be both competition and complementarities among some of the outlets. In order to avoid data duplication, internet sales are catalogued as such if they take place on internet retail stores. Internet purchases have been steadily growing in the past years; however, current data are not sufficient to be included extensively in the present study.

Objective

This study focuses on expenditures levels and number of transactions at the retail level in the fresh flower industry using quarterly data over the 1992 through 2004 period. In general terms, florists consistently have a larger share of household expenditures relative to supermarkets and other retail outlets. Whereas, supermarkets account for a larger share of household transactions on fresh flowers. The trend shows that florists are loosing market share to mass merchandising. A primary objective of this study to evaluate market share changes in the industry based on household demographic variables, purpose, flower forms, and occasions.

Hypotheses

Demand for flowers and plants as ornamentals or as environmental investments, as well as, the emotional needs should depend on the household discretionary incomes. That is, rising incomes should have a positive effect on demand. Since flower purchases are somewhat discretionary, sales of floral products may be more responsive to income changes than more essential goods such as food. However, the expenditure response to income is expected to reach a point where continual higher incomes would generate marginal declining response rates. Identifying that particular level would be of particular importance when developing marketing strategies in the flower industry.

It is expected that upon completion of this study the reader will have a better understanding of the current and future changes in the outlet structure for the U.S. fresh flower industry at the retail level. From preliminary data and current trends it is expected that the increase in expenditures levels and transactions can be explained by identifying demographics changes, reasons, and product offerings. Beyond those variables expected to influence the share changes, it is possible that linkages between the shares and the

outlet identifiable variables have also changed. For example, has income become more or less important as an outlet demand driver? Hence, a major hypothesis is that beyond the measurable variables driving share changes, there is an underlying shift in the coefficients linking the shares to the causal variables. In this case, we test if the variables are time varying.

Problem Statement

Market share changes at the retail level in the flower industry can be illustrated by determining the probability of selecting these outlets based on household expenditures or transactions. For the present study we assume a relationship between the characteristics of the buyer, the product, and the reasons for purchasing among other variables. Demographics are measured with income levels, gender, and buyer age. Econometric analysis will capture the importance of each of the variables included in the market share models. By definition all outlets shares must sum to one if the list of outlet selection is exhaustive. Yet if one looks at a subset of outlets such as florists or supermarkets, the share models can possibly be considered separately. Furthermore, depending on the subclasses for expressing the shares, it is feasible that within some combination of subclasses that an outlet shares is zero or even one-hundred percent. That is, the shares may be censored from above and below. Thus the problem becomes one of measuring market share and their drivers (i.e., causal variables) while dealing with the censored values. We will see that this is a classic doubled-censored Tobit model where market shares are estimated while dealing with these upper and lower limits to these shares.

Scope

Reports are compiled from information reported by a panel of around 9,000 nationally representative households who maintain purchasing diaries (Ipsos-NPD).

Ipsos is one of the world's leading market research organizations with one of their major products being the collection of household purchasing data. Specifically, the household purchasing data for flowers is from Ipsos-NPD and organized and funded by the American Flower Endowment through an ongoing consumer tracking study.

Types of Stores Selected

In this study, flowers are grouped into three categories: cut-flowers (arrangements and non-arrangements), flowering and green house plants (flowering plants and foliage), and dry/artificial. The retail stores are also grouped into categories such as: specialty, mass merchandisers, florists' shops, supermarkets, warehouses/price clubs, internet retailers, and others. According to Ward (2003), most specialty sales are from traditional florists while supermarkets account for most of the mass merchandising sales. The demand for floral products, and especially cut-flowers, is highly seasonal. Sales are normally highest from February through May and drop precipitously in the fall. Sales of cut-flowers peak during holidays such as Valentine's Day and Mother's Day. Cut-flowers and foliage plants, however, are increasingly popular throughout the year as indoor home and workplace decorations.[1]Aspects of the models will measure these seasonal effects.

Nature of the Data

The data collecting were funded by American Flower Endowment.[2] The database as organized for this thesis includes 82,232 observations at the household level and only comprises non-commercial purchases. The observations were the result of a professional

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[1] Economic Research Service. United States Department of Agriculture. The Economics of Food, Farming, Natural Resources, and Rural America. Floriculture Crops: Background. http://www.ers.usda.gov/Briefing/floriculture/Background.htm

[2] The American Flower Endowment (AFE) is the leading not-for-profit, non-governmental source for floriculture/environmental horticulture research and development funding in the US. For more information see: http://www.endowment.org/pressrelease/general/spcrpt2001.htm

firm investigates in a method called waves. Within each wave, information is compiled every two week period. Consumers were given a very detailed consumer diary and they reported their purchasing habits. The wave dairies can be matched to specific months and years, thus giving a continuous time series of data. One important consideration is that the information filled in the diaries is not a recall but the actual purchases made by the household consumer. Approximately 9,000 demographically balanced households are included in the survey.

From the database major divisions can be obtained: we know the population, the number of households, the amount spent, number of transactions or making a purchasing event, and the quantity of the flowers bought. Note that the quantities have less meaning because of the diversity of product purchases such as a bunch, arrangement or single stem. Although the average of weeks that a household remains in the program is about 3 weeks some studies by Ward (2003) have shown that there is no negative influence to the integrity of the data. From the database we can calculate market penetration (buyers over households), and frequency (transactions over buyers). Two major limitations of the database are that it leaves out commercial purchases and only the retail level of the vertical market system is presented. The present study demonstrates and assesses the impact of marketing strategies, spending levels, and consumer behavior through the use of econometric simulations.

CHAPTER 2
LITERATURE REVIEW

The three sections included in this chapter will provide the reader with a basic understanding of the major topics covered in this study. The first section introduces consumer choice theory and the effect of preferences in modeling demand. Included in this section are concepts like utility maximization, product acceptability, and the decision making process faced by consumers. Market share analysis concepts and alternative methodologies are discussed in the second section. This section also discusses model constraints, variable specification, and data aggregation considerations. Finally, the third section presents econometric models used for censored data. Particular emphasis is given to models that use a two-step decision process approach to estimate future purchases.

Consumer Demand and Preferences

It is widely accepted that marketing effort can be more successful if it is based on knowledge regarding consumer preferences. Taking an economics point of view, Rhodes (1955) presents a general approach to the preference determination problem in consumer demand. According to him, preference is manifested if the consumer chooses the most desirable product available to him. However, this presents a problem to the researcher when the most desirable product is not consumed. It is then important to recognize the difference between product preference and product acceptability or actual purchases. He concludes distinguishing that while acceptance of products among consumers is an absolute definition preference over products is often hard to record. The problem then

becomes one of measuring consumers' preferences and finding appropriative methodologies that capture the effect on actual consumption.

Traditional economics depicts the consumer as a logical or rational thinker that maximizes his utility function based on a given budget constraint. Following that line, Basmann (1956) formulates a theory of demand linking preferences changes and ordinal utility functions faced by the consumer. However, Hollbrook and Hirschman (1982) argue that the study of consumer behavior should look beyond the information processing model of the logical thinker. For him, consumer behavior is also influenced by what he called "experiential views" which incorporates aesthetic values, enjoyment, sensory pleasures, and emotional responses. Acknowledging such influence on consumers could help understand the demand for products that are usually purchased for their aesthetic and emotional attributes.

It is widely accepted in consumer theory that the analysis of product attributes linked to expected preferences allows a better forecast of the consumers' future choices. In their article, Blin and Dodson (1980) analyze the underlying relationships between attributes, preferences, and choice. In addition, they present two traditional marketing theories to model consumer choice. First, he describes the multi-attribute expectancy value model in which attributes are identified, measured, and evaluated based on stated preference. Second, he presents the stochastic choice model which tries to explain the complexity of the choice process by using consumer panel diaries to record the purchasing pattern of consumers over time. One of the shortcomings of the multi-attribute expectancy model is that it assumes that the consumer will always choose its preferred brand and that may not always be the case. Furthermore, the model follows a

one-time purchase approach when in fact most questions in consumer theory are oriented to the frequency of purchases. The strength of the stochastic model relies on the ability to predict a quantifiable likelihood of choice. However, one of the drawbacks of the model appears when no product has a higher probability over the other in which case the model becomes one of attribute differentiation.

Frequency of buying sometimes influences the decision making process of consumers. In his article, Hoyer (1984) states in that there is a variance associated with estimating consumer choices over time that could be attributed to the intensity of buying. Furthermore, he argues that repetitive purchases may reflect not optimal but satisfactory purchasing decisions in an attempt to minimize consumers' effort and time. Contrasting the traditional view that assumes that an evaluation is done each time the consumer makes a choice, he indicates that an evaluation may occur after the product is purchased. If the evaluation is satisfactory then it will guide future consumption if not then more refined choices are made by consumers. For products that experience repetitive purchases throughout the year the issue becomes one of recognizing between product loyalty and habitual purchases. Brand loyalty purchases usually reflect strong reasons for buying while habitual purchases are generally done for convenience. Gilboa and Schmeidler (1997) argue that consumers whose income greatly exceeds the cost of the product will less likely follow a budget constraint. He based his remarks on the high level of expenditures seen in higher income groups in the consumption of non-essential products. In addition, he proposed that repetitive purchases denote "small" choices where the consumer can afford not to calculate how much they will have left after the purchase.

This would seem to explain why the difference in the demand for nonessential products can only by partly explained by income disparities.

Finally, Feinberg et al. (1992) presents the long term market share implications of changes in variety-seeking consumers. He argues that variety seeking is an important determinant of consumer behavior and should be accounted for in consumer choice models. Regarding the choices faced by consumers Walsh (1995) argues that the consumer chooses the alternative most appropriate to him using a cost-benefit ratio. He concludes that seasonal sales for products that maintain the same attributes or meaningless differentiation over time can be partly be explained by the occasion of buying. Carpenter et al. (1994) state that consumers apparently value these differentiating attributes even though they are irrelevant. According to him, meaningless product differentiation can stimulate demand by changing consumers' preferences in the long run.

Market Share Concepts

Bothwell et al. (1984) argue that since economics is a non-experimental science, restrictions should be imposed in models that generate observations. However, his main concerns are the validity of the restrictions and the statistical models used to analyze data. It is therefore the role of the research to avoid uncertainty in the model specification since it could lead to inconsistencies in the estimated parameters of primary interest. In order to do this, meaningful variables should be selected to conduct verifiable empirical research that yields meaningful results. Clodius and Miller (1961) provide and interesting framework for understanding market structure in agricultural products. In his study, he points out several topics ranging from problems in hypotheses testing, to what the end goal of market shares studies should be and concluding with some shortcomings of

market share theory. He points out that the degree of product homogeneity should be considered when choosing the theoretical framework of the study.

At this point it is necessary to define the subject matter of this study by understanding the difference between industry and market. Two of the clearest concepts of industry and market were provided by Smith and Dahl (1965), according to them" industry is usually defined, in practice, as a group of firms that produce a like output using similar inputs and production processes. A market, on the other hand, involves two groups of firms – buyers and sellers – representing the forces of supply and demand in a state of interaction" (p. 466). His paper also provides interesting concepts of the assumption of perfect competition, the effect of technical innovation and capital accumulation. Ghosh (1966) also provides definitions for both industry and market preferring the latter for empirical studies. He argues that that since market studies are more comprehensive in nature since they comprise both the buyer and seller side.

In this study there are some restrictions imposed in the parameters of the regression model. Whenever that is the case the validity of the model's estimations could be compromised by the restrictions imposed. Since models are evaluated in terms of the parameter validity and predictive accuracy, it is important to determine if the restrictions imposed in the model compromise outlet market shares estimations. However, Ghosh et al. (1984) argue that constraining parameters values improves the predictive performance of market share models. He uses the functional form, the error distribution assumption, and the parameters description to compare the performance of market shares models.

The most used market share modeling approaches are the linear additive, multiplicative and the attraction models. The functional form of the linear additive model to estimate outlet market is given by

$$MS_{jt} = \beta_j + \sum_{k=t}^{k} \beta_{jk} X_{jkt} + \varepsilon_{jt} \qquad (2\text{-}1)$$

where MS denotes market shares, β is a vector of the parameters of the regression, X is a vector of explanatory variables, and ε is the error associated with the regression. The attraction model is based on Kotlers' market share theorem where the market share of a firm is given by the firm's marketing effort divided by the marketing effort of the rest of the firms in the market (Kotler 1984). Using the profit impact of market strategies (PIMS) database over a period of nine years, Buzzel et al. (1981) utilized a cross-sectional regression analysis to prove the consistency of the attraction model over the linear additive model. He argues that linear additive models generally have limited data, defining the product of study requires too much effort, and suggestions are often not relevant for managers. Naert and Bultez (1973) also criticize the linear additive model on the grounds that it assumes that shares fall between zero and one and sum to one. They conclude that for a market share function to be logically consistent the functional form should be non-linear. However, estimating parameters in non-linear functions is less straightforward than in linear case. More importantly, the statistical properties of non-linear parameters are generally weaker than linear parameters and thus the predictions are not necessarily better. Furthermore, as stated by Ghosh et al. (1984) "if we consider both parameter validity and forecast accuracy, linear and multiplicative models performs at least as well as the attraction model" (p. 208). For him, the market share model

specification should depend on the purpose of the analysis and the type of data available to the researcher.

The nature of the data also presents issues to the validity of the model estimates. Moriarty (1975) criticizes large databases because the variance across different products and regions is usually lost. He argues that disaggregated models offer particular advantages in policy formulation as they are able to target specific groups of interest. Any source of variation from pooled data can then be eliminated by the dummy variable technique. Grover and Srinivasan (1989) also state that data aggregation can comprise the integrity of the data. Beyond a mere critique to the aggregation problem they propose a different approach to the problem by dividing the data into within-switching and brand-loyal segments. In doing so, they attempt to capture some of the variation in the model while allowing some degree of data aggregation. In addition, they assume that a market segment is a group of homogeneous consumers with equal probabilities of selecting the goods of a product category. Two possible shortcomings in their analysis are that they assume that the size of the segments remains the same for all periods and that homogenous consumers have homogenous utility functions. Their assumptions however may not always hold in panel data thus comprising their initial argument against data aggregation. Regarding panel data, Ahl (1970) acknowledges the use consumer diaries to record the cumulative growth in product class volume, as well as, the rate of repetitive purchases. He stresses the importance that the sample obtained from consumer diaries should be demographically balanced, demographic variables should capture consumption differences, and seasonal patterns properly acknowledged. He concludes stating that predictions based on this sampling method have proven to be highly accurate even in

products that show seasonality patterns. This is generally the case unless major upsets are experienced in the market.

Chauvin and Hirschey (1997) argue that high market shares do not appear to be a clear advantage for a firm's ability to expand in the future successfully. Chauvin challenge the belief that bigger firms are more profitable by saying that high market shares do not necessarily give rise to Ricardian rents. Furthermore, he points out that market shares is simply "a measure of the size distribution of competitors, and a useful dimension of the competitive environment faced by the firm" and does not influence profit levels (p. 248). A similar argument was presented by Bradburd and Ross (1989) in which they state that smaller firms may be able to find niches from which they can "diminish or reverse the profit advantage of larger firms" (p. 258). In other words, in market niches oriented firms the performance (and service) usually equals or exceeds that of larger firms. Large firms generally exploit economies of scale by offering large quantities of products that require a small degree of specialization. To the contrary, small firms concentrate in sectors where customer support and one-to-one service is important. Finally, both authors agree that the intensity of research, development and product promotion are among the few factors that influence market shares levels in the long run.

Censored Models

When the observations follow a cumulative logistic function with zero and one hundred percent probabilities the data could be censored in order to calculate more accurately future demand expectations. As described by Chay and Powell (2001) "a regression model is censored when the recorded data on the dependent variable cuts off a certain range with multiple observations at the end points of that range" (p. 29). Tobin (1958) was among the first ones to recognize the censoring problem by taking into

account the concentration of observations on the limiting points when trying to estimate the effect of several variables on the limited dependant variable of the relationship. Tobin argued that one should not discard the limiting values of data in order to fit a multiple regression model. Instead, he suggested incorporating such values in a model which has the characteristics of a probit and a multiple regression model. Such a model could be used, particularly on consumer purchases data, when one can not incorporate into the model the probability of events if the event does in fact occur.

Tobin's analysis assumes that the decision to consume is the same as how much of the good to consume (Haines et al., 1988). However, this may not always be the case for several consumer goods. Furthermore, Tobin also assumes that when "corner solutions" are present, changes in prices and income can make such solutions disappear. Cragg (1971) analyses in more dept the implications on censoring data and its effect in the limited dependable variable. He validates Tobin's arguments about multiple occurrence of the dependent variable on regression models. However, Cragg makes a distinction in studying consumer behavior when no purchase is made by the consumer. He proposed an alternative model to simulate the two-step decision process that consumers typically face when buying goods. In his "double hurdle" model, Cragg use a probit model to calculate the probability of the event take place (e.g. the decision to purchase the good) and then a standard regression model estimates the magnitude of the change (e.g. how much of the good to purchase). The strength of Cragg's model relies on the truncation of the probabilities of the values while accounting for the values that were closer to zero or hundred percent. In fact, Cragg's the two-step decision model has been widely used by economists to estimate demand for agricultural commodities.

Blisard and Blaylock (1993) used the two-step decision process as a market participatory model to estimate the demand for butter. The article shows the distinction between households that never consume and those who consume butter infrequently. The article proposes a purchase infrequency model because the butter unlike most agricultural commodities has storage capabilities. Being that flowers are a highly perishable product this model was not considered in the present study. In a previous article, Blisard et al. (1992) used the double hurdle model on cigarette consumption to test the validity of Tobin's corner solutions. By using a set of demographic variables to show how low income women's consumption of cigarettes was affected, he was able to conclude that change in income and prices may not necessarily have a proportional change in consumption. Thus showing that consumer preference structure is not homogeneous and that they respond to different utility maximization functions which model their purchasing behavior. Haines et al. (1988) also compared the Tobit model proposed by Tobin and Cragg's double hurdle as analytical models to estimate the dietary needs of approximately 15,000 households over one year. He concluded that the Tobit model underestimated consumption responses. Gould (1992) reached the same conclusions when modeling the purchase frequency of cheese.

Heckman (1979) stated that Cragg's model can suffer from a sample selection bias as a specification error. According to Heckman (1979), "the bias that results from using non-randomly selected samples to estimate behavioral relationships is see to arise from the ordinary problem of omitted variables" (p. 155). Because of the bias he proposed an alternative model which links the two-step decision by introducing the Inverse Mills Ratio calculated in the first stage as a regressor in the second stage. The Inverse Mills

ratio is a decreasing function of the probability that an observation is selected into the sample (Heckman 1979). Byrne et al. (1996) used Heckman's model to model the two-step decision process for consumption of food-away-from-home. In his article, he used demographic variables such as education, age, and ethnicity to account for the consumer preferences on actual purchases. They stressed the importance of demographic factors to exploit the marketing potential in the consumer-driven food industry. Also, by understanding consumer trends one may more accurately forecast future household demand. Chay and Powell (2001) argue that even though a censored sample can compromise the integrity of the regressors, that is efficiency is lost, the model still yields consistent results. Amemiya (1973) provides a thorough explanation of truncation particularly to the left of zero. He proposes a different model that Heckman in which all observations are considered for the second step.

In all, the strength of Heckman's model relies on differentiating between the propensity to consume and the quantity demanded among existing consumers linked through the Inverse Mills Ratio. Since non-consumers have no influence on demand they should be accounted out of the model regression but properly accounted for in order to avoid bias in the estimation.

CHAPTER 3
US FRESH FLOWER DEMAND

This chapter is primarily oriented to understand the composition of the sample used in this study, as well as, to understand the underlying reasons behind the decision to focus on florists and supermarkets as the subject of study. The chapter presents an overview of the US fresh flower demand divided in to cut-flower and flowering/green house plants market share distributions. Expenditure and transaction levels were considered as measurements to compare market share changes among both fresh flower categories. Later on, the chapter covers the relative change in florists and supermarkets market shares over the time. In addition, to understand the distribution of the sample market shares are presented in terms of the demographic and socioeconomic variables described in Chapter 1. Finally, florists and supermarkets market shares of cut-flowers and flowering/green house plants are compared to the rest of the outlets in the specialty and mass merchandising categories, as well as, to internet retail and others.

Indoor Flower Categories

Data on U.S. fresh flower consumption from 1992:7 to 2004:4 were obtained from the American Floral Endowment (AFE) and Ipsos-NPD group. The data were obtained from consumer diaries of approximately 9,000 demographically balanced households that recorded their flower purchases every two weeks. Indoor flowers were grouped into three subcategories: cut-flower, flowering and green house plants, and dry and artificial. In addition, fresh flowers were grouped into four main types of retail outlet stores: specialty, mass merchandising, internet retail, and others. Furthermore, specialty was divided in

florists and others while mass merchandising was divided in supermarkets, warehouse/price club stores, and others.

Figure 3-1 shows the market share distribution for indoor flowers by expenditures and transactions. The graph shows that fresh flowers comprise more than 80 percent of the indoor flower market. More specifically, cut-flowers accounted for 57.4 percent of total household expenditures and 44.7 percent transactions; flowering/green house plants accounted for 29.5 percent in terms of expenditures and 37.3 percent in terms of transactions; and finally dry/artificial accounted for 13.2 percent in expenditures and 18.0 percent in transactions. Cut-flowers and flowering/green house plants were separated throughout the chapter see the relative difference in the distribution of market shares over outlet categories.

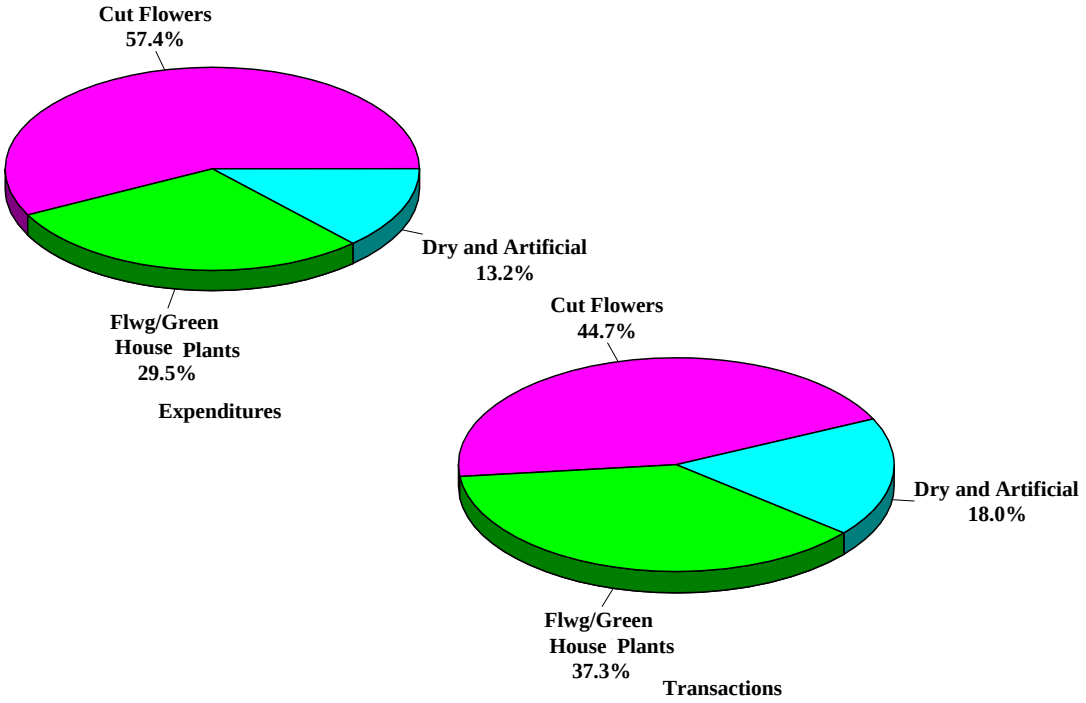

Figure 3-1 Percent of household market shares expenditures and transactions on indoor flowers. Source: AFE and Ipsos-NPD group.

Flower Retail Outlets

Figure 3-2 presents the distribution across different outlet groups. Specialty and mass merchandising accounted for over 90 percent of cut-flower market shares in terms of expenditures and transactions during the 1992 to 2004 period. For expenditures, specialty accounted for 68.7 percent of market shares followed by mass merchandising with 25.8 percent. For the transactions, however, mass merchandising with 53.6 percent of the market showed higher market shares than florists which accounted for 41.3 percent. Within the cut-flower category, florists accounted for the largest component with more than 80 percent in both expenditures and transactions. Alternatively, other outlets in the specialty category accounted for 12.2 percent in expenditures and 21.9 percent in transactions.

Figure 3-3 presents the distribution across different outlet groups focusing on mass merchandising. The outlets in mass merchandising show similar market share levels in expenditures and transactions. Clearly, supermarkets compromise most of the mass merchandising outlets with approximately 80 percent of the market followed by warehouses/price club outlets with 5 percent and other outlets with close to 12 percent. Both Figure 3-2 and 3-3 provide insight as to the relative importance of using in florists and supermarkets changes as proxies to forecast changes in specialty and mass merchandising outlet groups respectively. Differences in the two measurements are apparent with the specialty group accounting for the majority of expenditures shares and mass merchandising group the majority in transactions. Figure 3-4 shows that flowering/green house plants expenditures and transactions shares follow a different distribution among outlet groups. Unlike cut-flowers, flowering/green house plants expenditures levels are more equally distributed among specialty and mass

merchandising. More specifically, specialty accounted for 48.5 percent of expenditures shares while mass merchandising accounted for 44.3 percent. Transactions share distribution was similar to that of cut-flowers with mass merchandising accounting for the majority of the market shares. With a market share of 64.4 percent, mass merchandising more that double specialty shares which accounted for 29.3 percent of the market. The graph also shows that in the specialty category other outlets account for 54.4 percent while florists account for 45.6 percent of the total specialty group in terms of expenditures. The difference is greater in terms of transactions where other outlets accounted for 73 percent of the market while florists only accounted for 27 percent.

Figure 3-5 shows the outlet division for the mass merchandising group. The graph shows that supermarkets and warehouse/price club shares combined accounted for less than the rest of the outlets in the same category. In this case, other outlets accounted for approximately 55 percent of the market while supermarkets and warehouses/price club accounted for 43 and 2 percent respectively in both measurements.

Market Shares by Product Form

Figure 3-6 presents the distribution of cut-flowers market shares based on specific outlet types. In addition, florists' product form is presented to show the distribution of arrangements and non-arrangements on both outlets. The graph shows that for florists the flower arrangements accounted for 70.5 percent while non-arrangements accounted for 29.5 percent in terms of expenditures. The distribution is more evenly distributed in terms of transactions with both forms accounting for approximately 50 percent of the market each. Figure 3-7 shows that the difference in flower form was considerable in supermarkets where non-arrangements accounted for the 82.1 percent and arrangements accounted for 17.9 percent based on expenditures. Alternatively, in terms of transactions

the difference was greater with non-arrangements accounting for 91.8 percent and arrangements 8.2 percent.

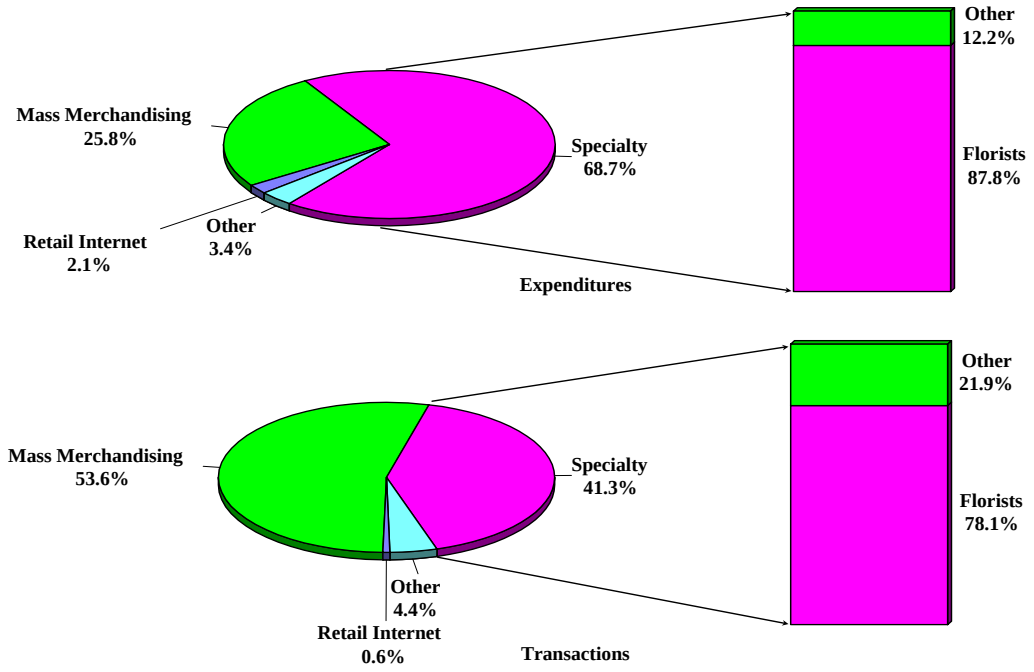

Figure 3-2 Percent of specialty market shares on expenditures and transactions for cut-flowers. Source: AFE and Ipsos-NPD group.

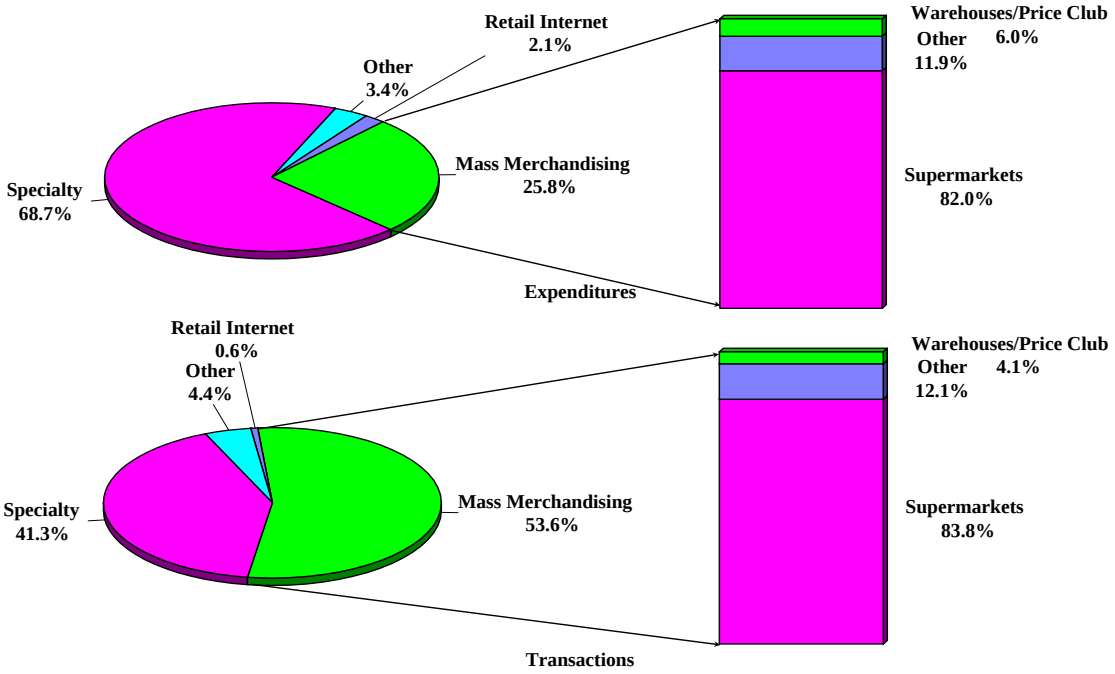

Figure 3-3 Percent of mass merchandising market shares on expenditures and transactions for cut-flowers. Source: AFE and Ipsos-NPD group.

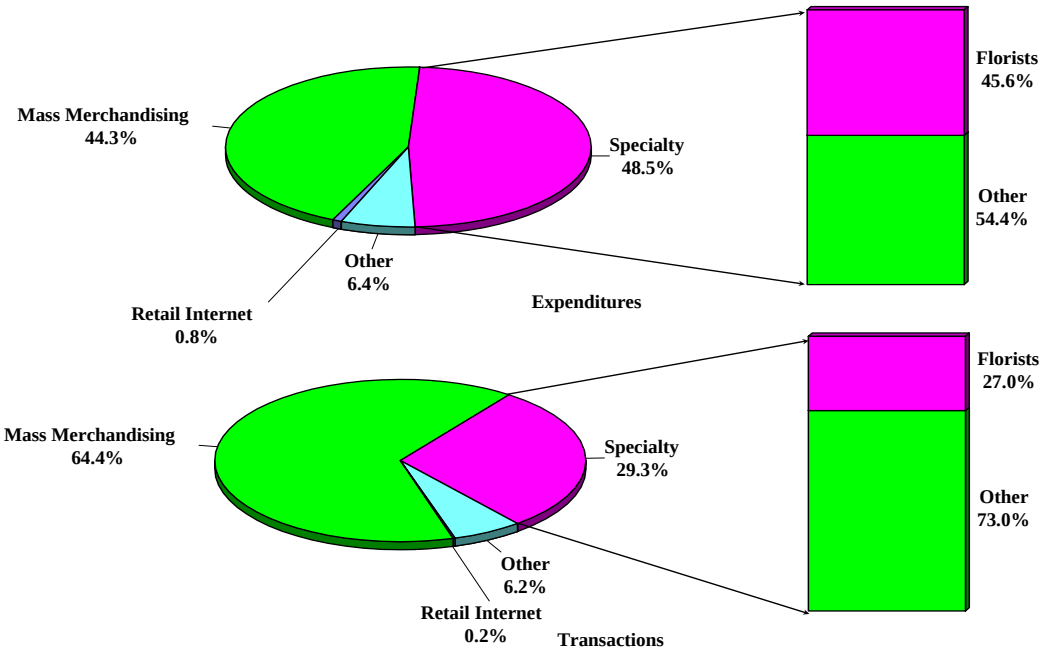

Figure 3-4 Percent of specialty market shares on expenditures and transactions for flowering/green house plants. Source: AFE and Ipsos-NPD group.

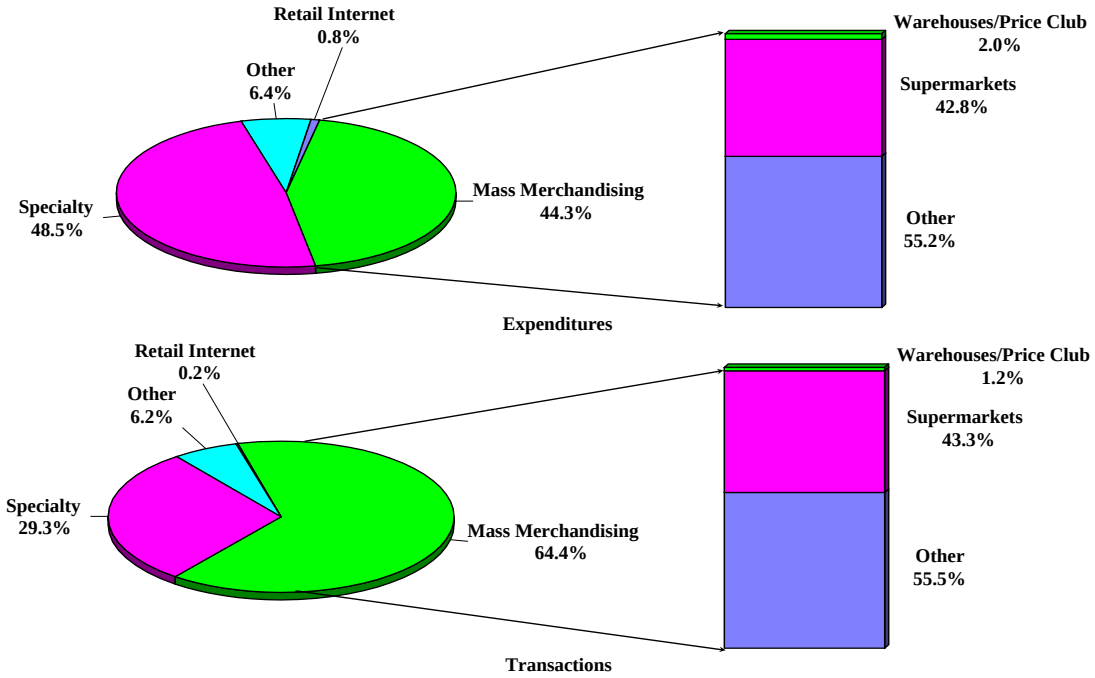

Figure 3-5 Percent of mass merchandising market shares on expenditures and transactions for flowering/green house plants. Source: AFE and Ipsos-NPD group.

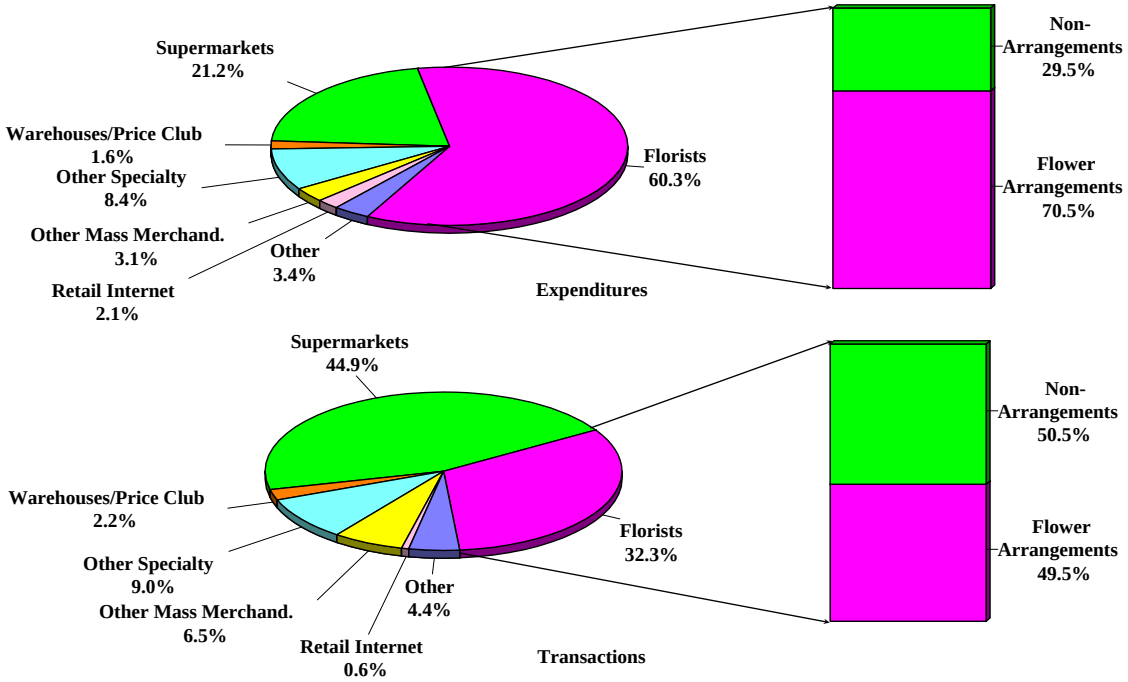

Figure 3-6 Percent of household market shares for florists by product form. Source: AFE and Ipsos-NPD group.

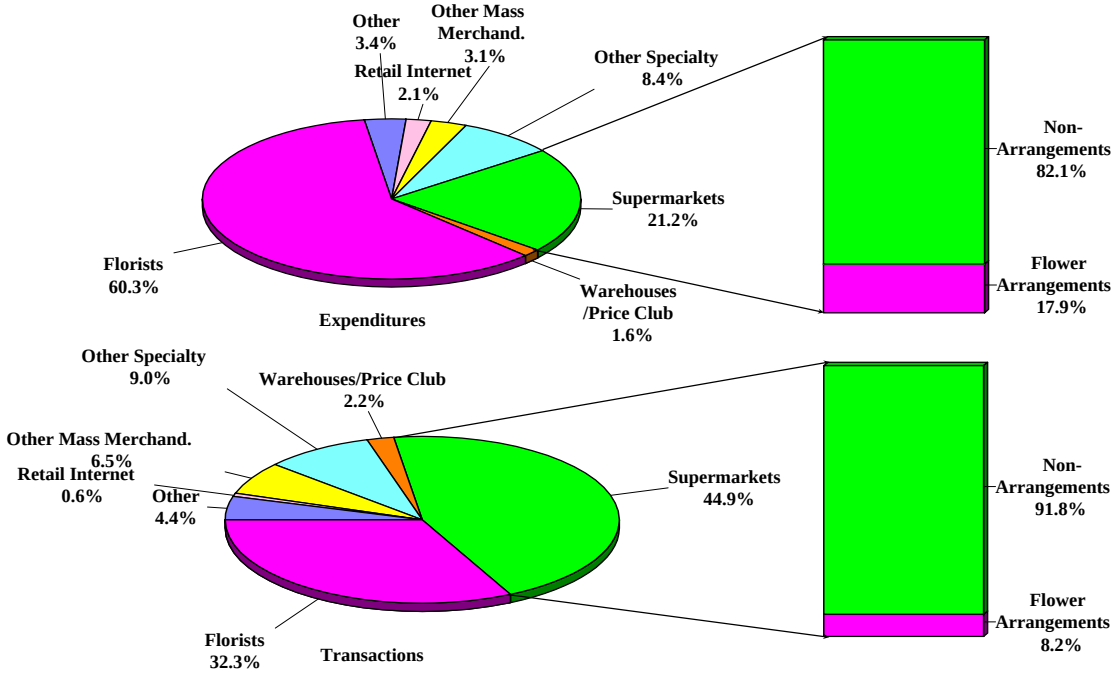

Figure 3-7 Percent of household market shares for supermarkets by product form. Source: AFE and Ipsos-NPD group.

Share Distribution over Time

Yearly percent of cut-flowers market shares expenditures and transactions on the different outlet groups are presented in Figure 3-8. To facilitate the discussion only whole years where considered for graphing purposes. Over time mass merchandising market share levels tended to increase during the 1993-2003 period. In terms of expenditures, mass merchandising increased from approximately 27 to 40 percent and in transactions from 50 to 70 percent. To the contrary, specialty decreased over the ten years showing a slight increase in 1998 but then falling back again in the last three years. Overall, specialty decreased from 60 to 50 percent in expenditures and from 35 to 29 percent in transactions. Since data on internet retail purchases was only available from 2000 the shares increase from that period up until 2003. Other outlets experienced reasonably stable market share levels up until the 1997 to 1998 period where a sharp decrease was seen in expenditures and transactions. Other outlets decreased from approximately 13 to 5 percent. In spite of all the changes in market shares, specialty continued to dominate in cut-flowers expenditures although the gap could reduce if the current trend continues. The graph also shows that the difference between mass merchandising and specialty is widening with the former gaining more shares over the latter throughout time.

Figure 3-9 shows the yearly trends for flowering/green house plants outlet groups. Over the 10 year period specialty shares reduced from 53 to 44 percent in expenditures and from 32 to 25 in transactions. To the contrary, mass merchandising outlets experienced an increase in market shares from 40 to 53 percent in expenditures and from 60 to 71 percent in transactions. The market share levels for internet retailers and other outlets for flowering/green house plants follows the same trend as the cut-flowers distribution previously presented.

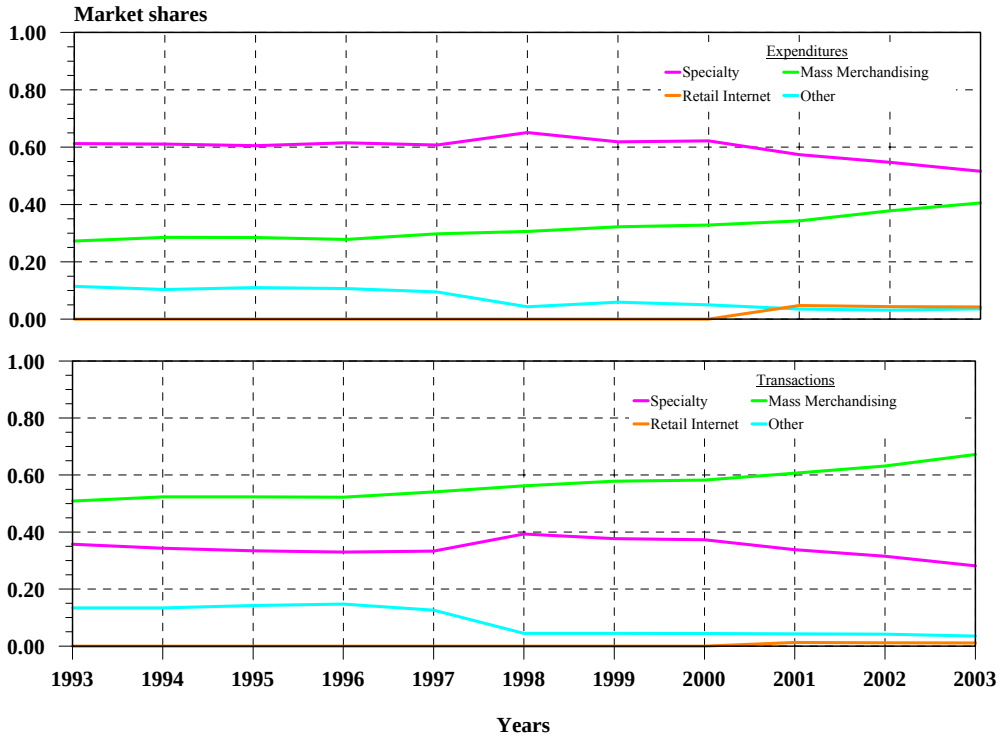

Figure 3-8 Percent of yearly market shares in cut-flowers for outlet groups by expenditures and transactions. Source: AFE and Ipsos-NPD group.

Unlike cut-flowers, mass merchandising outlets dominate the market in both measurements. More specifically, in 2001 the mass merchandising shares of expenditures superseded florists' shares with the gap widening in the last years. The difference is even greater in terms of transactions with mass merchandising capturing more than the rest of the outlets combined.

While the two previous graphs presented the relative changes in market share levels over time, the next two graphs show the variation that florists and supermarkets over the 10 year period. Figure 3-10 shows the yearly trends in cut-flowers expenditures and transactions for florists and supermarkets. In terms of expenditures, florists show a steady decline in market share levels particularly from the year 2000 onward. To the contrary, supermarkets' market share levels have increased through time by nearly 10 percent.

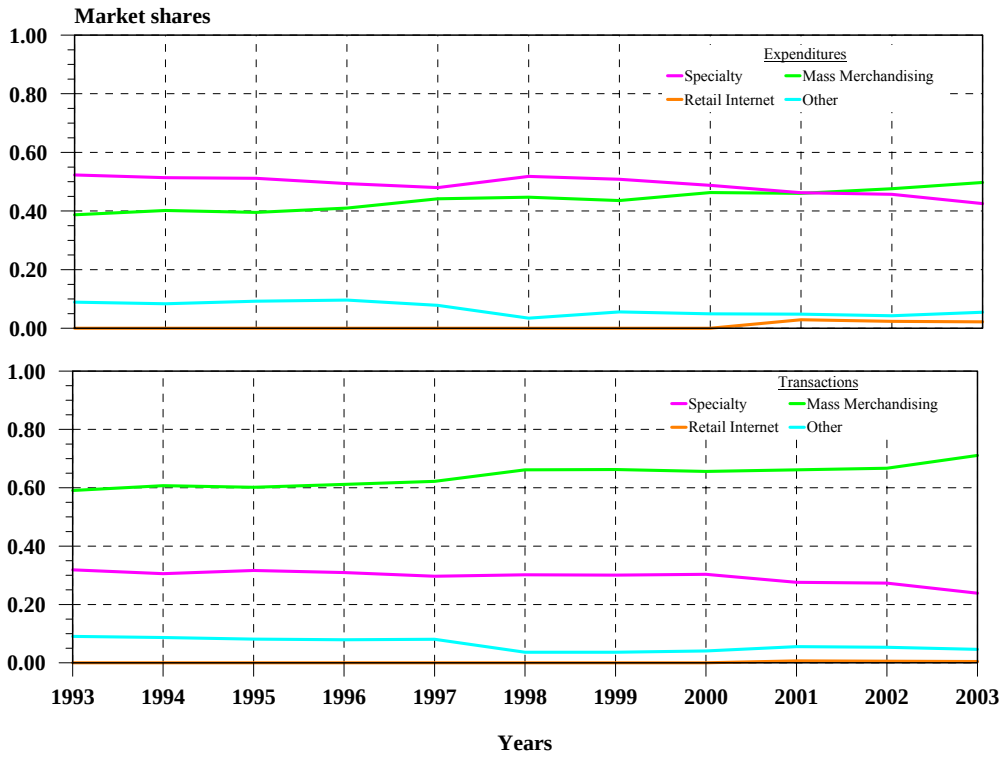

Figure 3-9 Percent of yearly market shares in flowering/green house plants for outlet groups by expenditures and transactions. Source: AFE and Ipsos-NPD group.

It is important to notice that the difference in supermarkets share gains is not the same as that of the loss of florist which might suggest that other outlets are capturing part of the market as well. This could be particularly true for internet purchases, which as we mentioned earlier started to capture market shares in the year 2000. In terms of transactions, we see that both outlets start out at approximately the same level at 40 percent of the market each. However, as time passed a gap between the two outlets develops with supermarkets increasing its market share levels to nearly 52 percent with florists reaching 20 percent of the market. Clearly, there has been a decline in the florists' purchases in cut-flowers over the last decade and the gap is increasing over time.

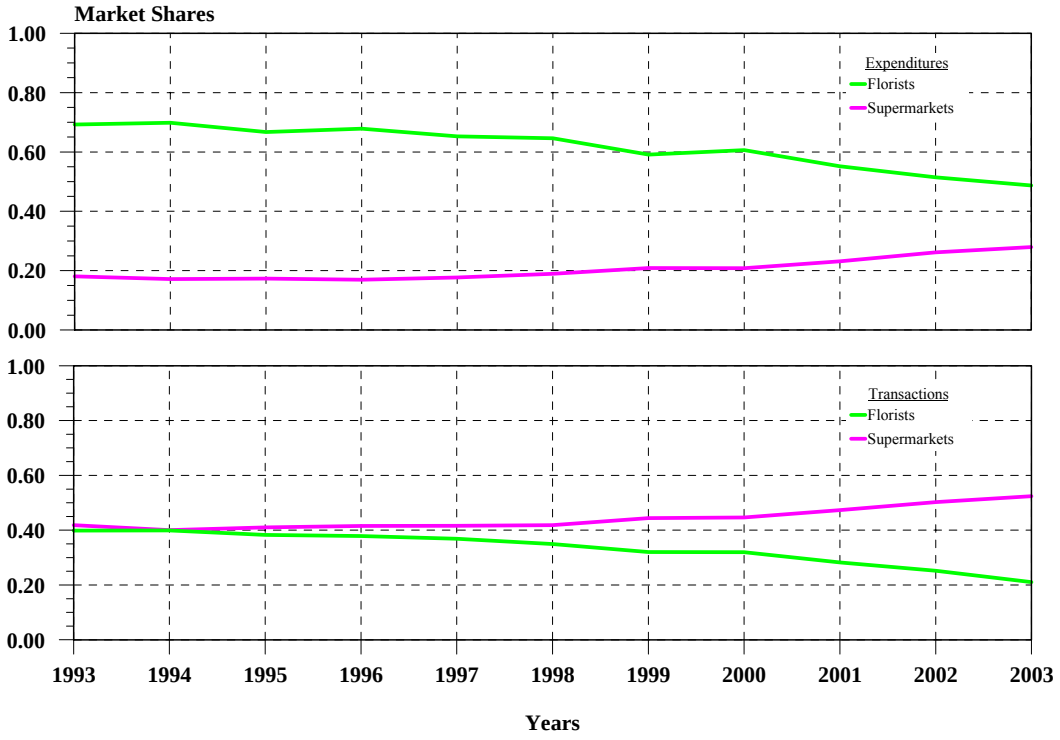

Figure 3-10 Percent of yearly market shares in cut-flowers for florists and supermarkets by expenditures and transactions. Source: AFE and Ipsos-NPD group.

Figure 3-11 shows the trend in market share levels for flowering/green house plants for the same two outlets. Unlike the cut-flowers' graph that showed a clear disparity in the market share levels of florists and supermarkets over time, flowering/green house plants levels do not seem to vary as much over time. Except for a few instances, both expenditures and transactions levels remain fairly stable over the years without showing major disturbances. It is important to notice however that florists' expenditures levels started at 30 percent in 1993 and then declined to the same level as supermarkets at approximately 20 percent by 2003. In terms of transactions, both outlets maintain the same markets share level over time with 30 and 10 percent levels for supermarkets and florists respectively.

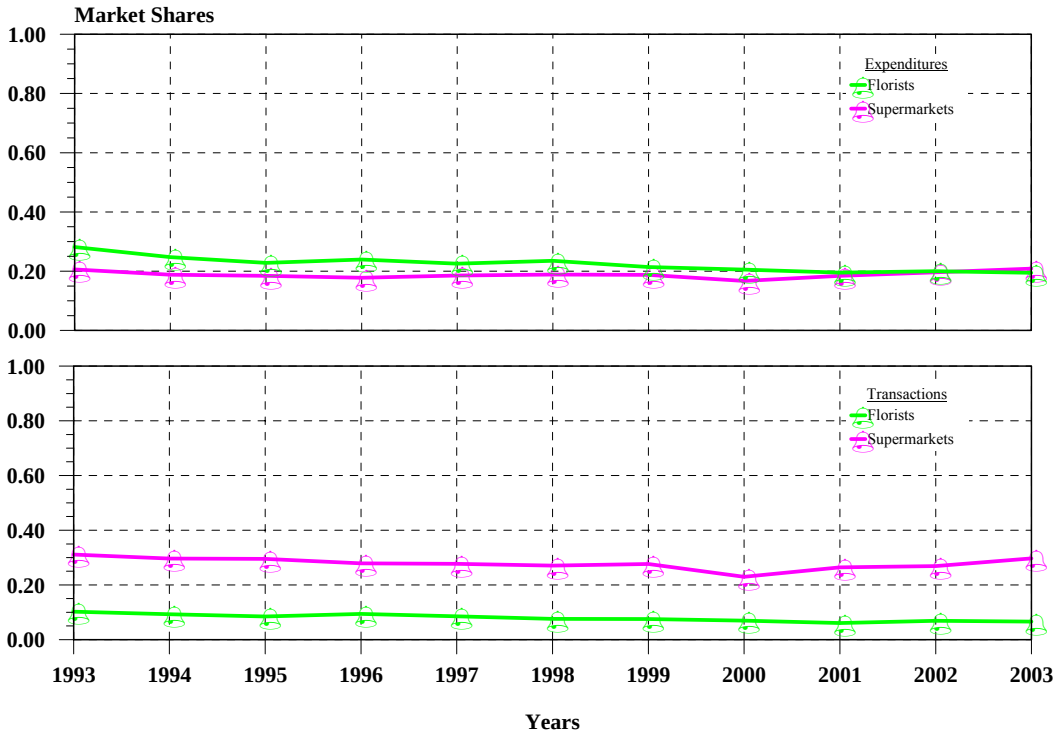

Figure 3-11 Percent of yearly market shares in flowering/green house plants for florists and supermarkets by expenditures and transactions. Source: AFE and Ipsos-NPD group.

Figure 3-12 shows the percent of market shares for arrangements through both florists and supermarkets. As expected, in terms of expenditures florists dominate the market with approximately 77 percent by 2003 suffering a 10 percent loss since 1993. The low level of market share of supermarkets in this category (approximately 7 percent) was expected as well as the relatively small (3 percent) gain at the end of the period. The transactions graph shows that the market share gap between the two outlets is decreasing over time particularly since 2000. The graph not only shows that in general people tend to purchase through florists when it comes to buying flower arrangements.

Figure 3-13 shows the percent of market shares in non-arrangements for florists and supermarkets over time. At the beginning of the period florists had a greater market share in terms of expenditures than supermarkets, however florists with 50 percent of the

market lost the initial 10 percent advantage over supermarkets by the middle of 1998. From that year on we see a steady decline in florists' market share reaching nearly 22 percent of the market while supermarkets ended with 53 percent. In other words, during the 10 year period florists and supermarkets switched positions in the industry. The situation in terms of transactions was also expected with supermarkets increasing their market share levels over time. This can be partly justified by the bigger base of potential consumer that supermarkets have over florists. By differentiating between arrangements and non-arrangements we can appreciate that most of the florists decline in market share over time can be explained by the great loss in the non-arrangement sectior of the market. Here again, the marketing and product mix seems to have a greater effect in supermarkets than in florists.

Market Shares across Variables

Figure 3-14 shows cut-flowers market share distribution by expenditures and transactions across the variables considered in the present study. The graph shows that the distribution of expenditures and transactions follows the same pattern in all the variables except purpose. In purpose, gift buying has a greater market share in expenditures which consequently is the highest level of market concentration when compared to the rest of the variables. Gender also denotes a marked difference in the distribution with female buying having more market shares than males. The first three age groups denote an increasing market share distribution while the last one shows a slight decrease. Consequently the first age group has the least percentage of market

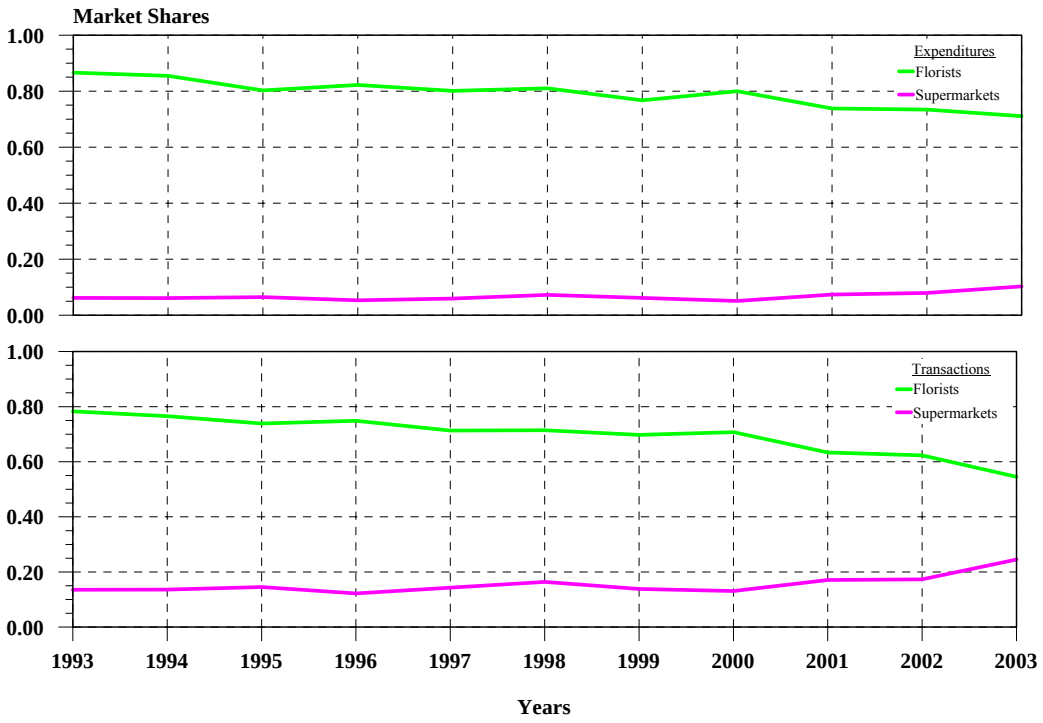

Figure 3-12 Percent of yearly market shares in arrangements for florists and supermarkets by expenditures and transactions. Source: AFE and Ipsos-NPD group.

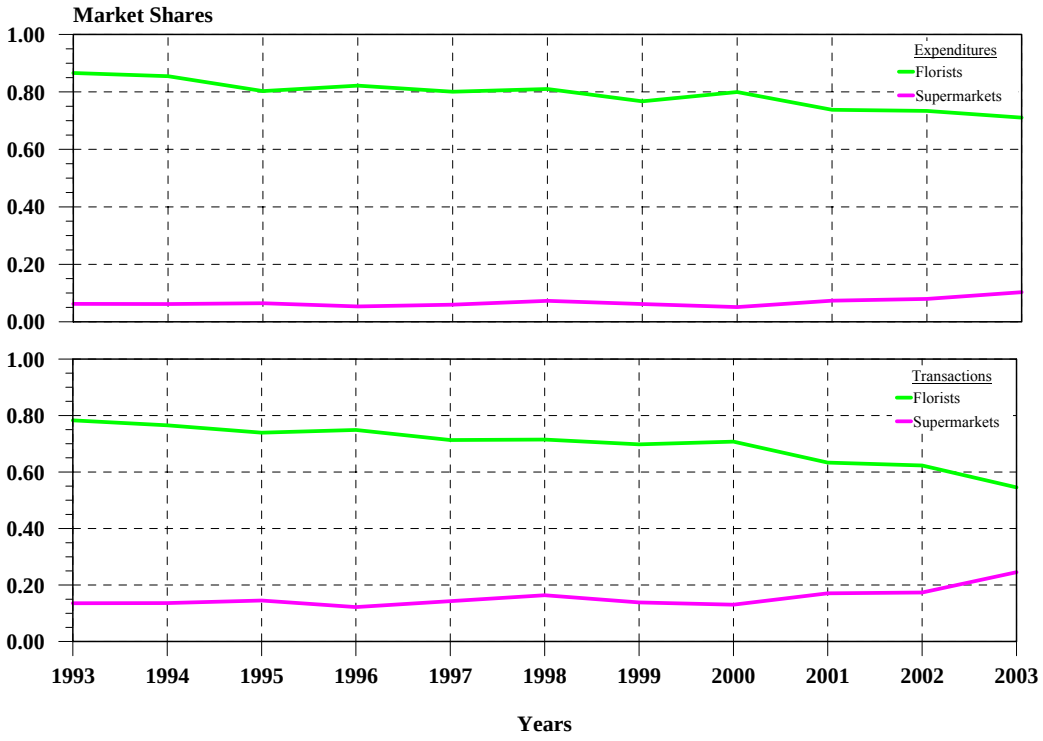

Figure 3-13 Percent of yearly market shares in non-arrangements for florists and supermarkets by expenditures and transactions. Source: AFE and Ipsos-NPD group.

shares of all the divisions within the variables. The fact that market share concentration decreases by nearly 10 percent in the fourth group tells us that people tend to buy cut-flowers up to a certain age and then on consumption drops to a level similar to people that fall in the second category. Unlike age, cut-flower consumption does not increase as income rises. The four income groups follow a more erratic distribution with the first and third groups having approximately the same market share level at 20 percent. The same is true for the second and fourth groups with approximately 30 percent of the market each. Surprisingly, the third income group does not seem to be buying to a level proportional to their purchasing power. In general, the graph shows that major combinations of variables peak demand in cut-flowers such as gift, female, of approximately 41 to 54 years of age and with an income of either the second or fourth income group. The same is true for the combinations that show a decrease in market share percent relative to the average consumer such as a male buying for self who is under 25 years and with an income in either the first or third group. Note that these are simple percentages without any constraints on the other variables when calculating the distribution.

It was expected that the distribution of the variables differ when comparing cut-flowers and flowering/green house plants. As presented by the variables for flowering/green house plants in Figure 3-15, this difference is more noticeable when comparing purpose and gender. When it comes to the purpose, the distribution is equally distributed among the two divisions in expenditures. However, in terms of transactions self buying market shares, at 64 percent, nearly doubles the gift percentage of the market. In gender, females have approximately 80 percent of the market in both expenditures and

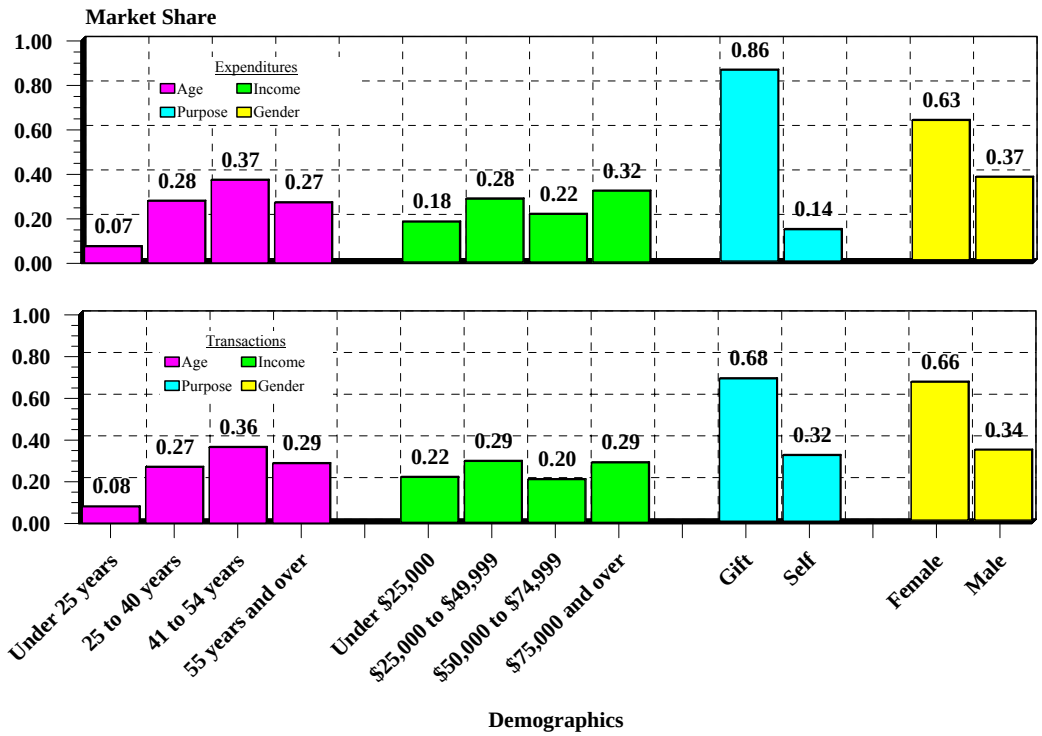

Figure 3-14 Percent market shares of cut-flowers expenditures and transactions by demographics. Source: AFE and Ipsos-NPD group.

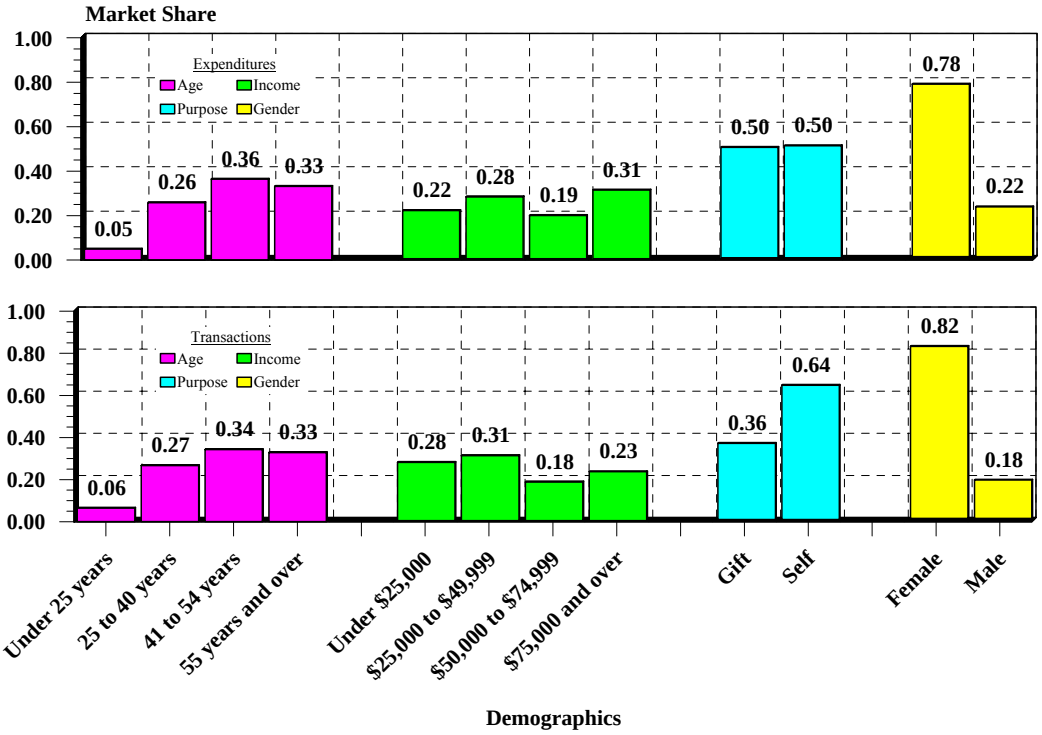

Figure 3-15 Percent market shares of flowering/green house plants expenditures and transactions by demographics. Source: AFE and Ipsos-NPD group.

transactions. The rest of the variables follow the same distribution showed in the previous graph.

Figure 3-16 shows that in terms of cut-flowers florists and supermarkets dominate the specialty and mass merchandising sections of the market. Florists have approximately 60 percent of the market in terms of expenditures followed by supermarkets with 21 percent. To the contrary, supermarkets have the highest market share concentration with approximately 45 percent followed by florists with 32 percent. In both cases, the combined market share of both outlets exceeds by more than 80 percent the total market share of the cut-flower section of the market.

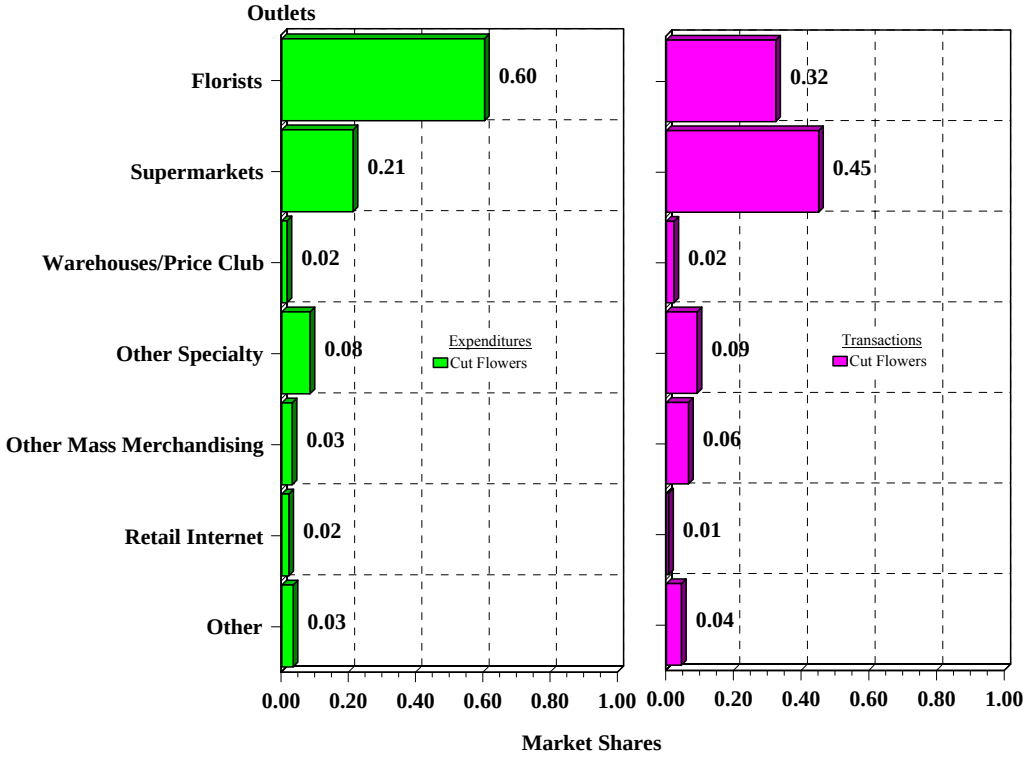

Figure 3-16 Percent of cut-flowers market shares expenditures and transactions by outlets. Source: AFE and Ipsos-NPD group.

When considering flowering/green house plants the dominating outlets also fall within the specialty category and the difference to the mass merchandising shares is of

only 3 percent. Figure 3-17 shows that even though specialty and mass merchandising stores have the greatest market shares in the industry; neither florists or supermarkets capture the majority of the percentage in their respective groups. The graph shows that the other specialty and mass merchandising stores grouped together have more than florists and supermarkets market shares. In the flowering/green house plants the tendency to buy through the internet is low as described by the low market share percentage both in expenditures and transactions. Both Figure 3-16 and 3-17 show the importance of florists and supermarkets when selecting fresh flowers, particularly in the cut-flower section of the market.

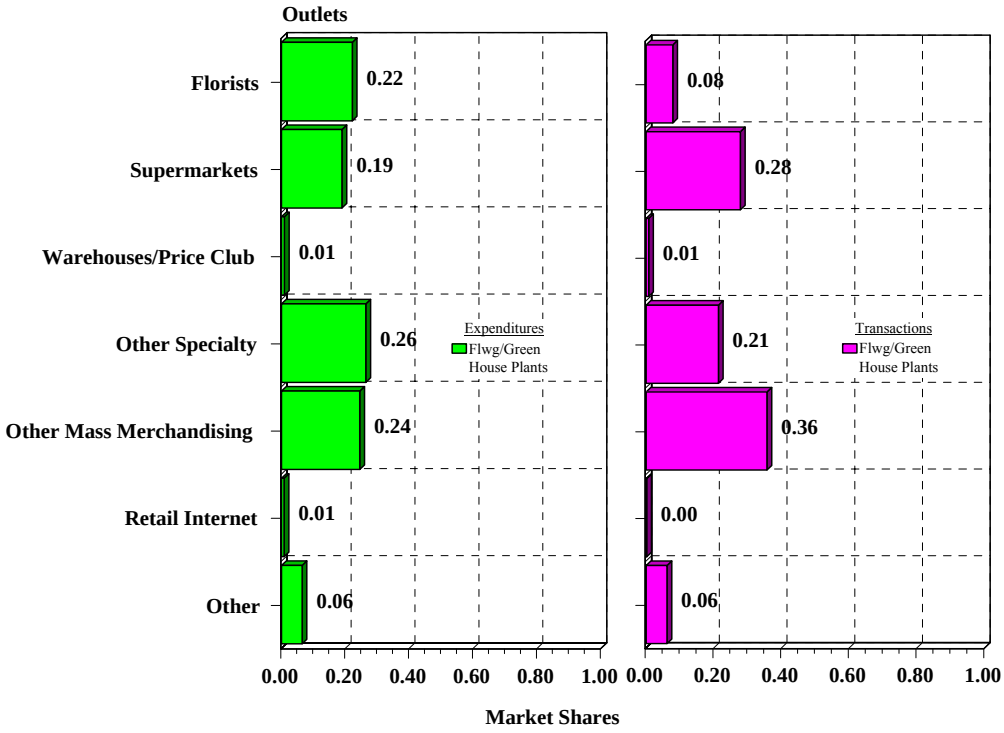

Figure 3-17 Percent of flowering/green house plants market shares expenditures and transactions by outlets. Source: AFE and Ipsos-NPD group.

CHAPTER 4
THEORETICAL MODEL AND MODEL SPECIFICATION

This chapter presents a general consumer demand concept to illustrate the buying decision by outlet among U.S. households Later, Heckman's censored model is developed along with the model specification for the present study. Socioeconomic and demographic variables incorporated into outlet market share models used in this study to are presented and discussed. Finally, outlet market share estimates are presented in the form of econometric parameters and their statistical properties.

Consumer Demand for Flowers

Consumer demand theory analyses the behavior of consumers as they purchase a set of goods to satisfy personal needs given a specific utility function. Generally, consumers have a budget constraint that limits the choices that they make in their purchasing behavior. The theory assumes that the consumer acts as a rational economic agent, maximizing his utility function given his own budget constraint. In the general form, maximization of the utility function as described by Girapunthong and Ward (2003) is given by:

$$\text{Max} \quad u = u(q_1,...,q_n) \tag{4-1}$$
$$\sum_{j=1}^{n} p_j q_j = m$$

where p_j and q_j are the price and the quantity of the jth good, respectively, and m is the total expenditures or income on all n goods.

In this study, flowers are divided in outlet market shares for cut-flowers, flowering/green house plants and dry/artificial. As shown in a previous chapter cut-

flowers and flowering/green comprise most of the flowers industry in the U.S. The analysis further divides cut-flowers in arrangements and non-arrangements due to the importance as a source of business for the two major outlets of this study, florists and supermarkets.

Details on the Data

Outlet market shares in the cut flower industry can be modeled by changes in consumer preferences. A set of socioeconomic and demographic data were defined such as age, income, gender, and purpose for buying to determine their influence on consumer outlet selection. In models that use information from panel data the question on the sample representative from the population is always present. Ahl (1970) states that *"if, as occasionally happens, the test panel is not perfectly balanced to the test market along one or more key demographic characteristics, it may be necessary to take these imbalances to account in the prediction."* If that is the case, then the predictions for each demographic group would have to be weighted according to the percent of the population it represents. That however is not the case for the data used in this study as it is collected by Ipsos, a private organization that specializes in retrieving balanced consumer information from targeted population. That is, the sample is demographically representative of the population.

Censored Data Model

The data of the study follow a function form with a substantial number of observations having zero/near-zero and one hundred percent values. This tendency is often seen in data that models consumer demand of certain commodities where zero is a possibility. When the data follow this functional form, the problem of censoring of the dependent variable arises. The researcher may be tempted to erase such occurrences from

the dataset and work with the rest of the sample. However, by doing so, the integrity of the data, as well as the validity of the findings and policy suggestions are seriously compromised. The significant portion of observations on cut-flowers and flowering/green plants taking a zero or one hundred percent values (insert figures) provides justification for considering censored regression models as an appropriate framework for conducting the present investigation.

Tobin proposed an estimation method for data with truncation problems later called the Tobit model (Tobin, 1958). According to Tobin, probability and multiple regression models fail to present thoroughly information about the dependent variable because of the probability of limit and non-limit responses.

The general formulation of the Tobit double-censored model is

$$y_i^* = \boldsymbol{X_i\beta} + \varepsilon_i, \qquad \varepsilon_i \sim N(0, \sigma^2) \tag{4-2}$$

$$y_i = \begin{cases} 0 & if \quad y_i^* \leq 0, \\ y_i^* & if \quad 0 < y_i^* < 1.0, \\ 1 & if \quad y_i^* \geq 1.0 \end{cases}$$

where y_i^* is defined as the latent variable and y_i is the dependent variable (Greene, 2003). However, Tobin assumes that the decision to consume is the same as the decision of how much to consume of the good and this is not always the case (Haines et al., 1988). In cases in which the decision to consume and the amount of the good consumed differ, the Tobit model understates the actual magnitude of the dependent variable. Therefore, it is necessary to redefine the concept of the Tobit model to account for what Cragg called a double hurdle model (Cragg 1971). According to Cragg, there is a clear distinction between the propensity to consume and what is actually purchased. In his double hurdle model, he utilizes a probit model to calculate the probability of buying the good (first

hurdle) and a standard regression model (second hurdle) for the amount of the good purchased. In this research the analogy is to have selected outlet, you first had to be a buyer. Hence, the first hurdle is being a buyer. Then the Tobit is part of the second equation.

The nature of the data makes it necessary to censor the data in the present study and agreeing with Long (1997) that if such procedure occurs Ordinary Least Squares (OLS) is inconsistent, an alternative to the Tobit model was considered for the present analysis. This papers uses the two-step decision proposed by Heckman instead of the double hurdle presented by Cragg and discussed earlier mainly due to the fact that the portion of the residual that arises from the use of an estimated value of λ_i, in place of the actual value of λ_i is not orthogonal to the x_i data vector (Heckman, 1979). Heckman proposed a model similar to Cragg by acknowledging the two-decision approach in purchasing behavior. However, Heckman used an inverse Mills ratio to link both processes.

As described by Heckman and further explained by Long (1997) the sample selected in the probit model is given by

$$y_i^* = \boldsymbol{X_i \beta} + \varepsilon_i \text{ , assuming that } \varepsilon_i \sim N(0, \sigma^2) \tag{4-3}$$

and

$$y_i = \begin{cases} 0 & if \quad y_1^* \leq 0, \\ 1 & if \quad y_1^* > 0. \end{cases}$$

where $\boldsymbol{X_i}$ is a $1 \times K_j$ explanatory vector of socioeconomic or demographics variables. Also, $\boldsymbol{\beta_j}$ is a $K_j \times 1$ vector of parameters with j=1,2,…,n. and ε is a residual that captures unobserved influences in the dependent variable. The magnitude of the $\boldsymbol{\beta}$ parameters reflects the impact of changes in the $\boldsymbol{x}$ vector on the probability. The subscript 1and 2 denote the probit and Tobit model specification respectively.

To simplify the formulas that follow, let

$$\mu_1 = \boldsymbol{X_i \beta} \tag{4-4}$$

and so the decision to become a fresh flower buyer follows a standard normal probability function given by

$$f(y_1^* | \mu_1, \sigma_1) = \frac{1}{\sigma_1\sqrt{2\pi}} \exp\left[-\frac{1}{2}\left(\frac{y_1^* - \mu_1}{\sigma_1}\right)^2\right] = \frac{1}{\sigma_1}\phi\left(\frac{y_1^* - \mu_1}{\sigma_1}\right) \tag{4-5}$$

with the cumulative distribution function of y* given by

$$F(y_1 = 0 \mid \mu_1, \sigma_1) = \int_{-\infty}^{xb} f(z \mid \mu_1, \sigma) dz = \Pr(y^* = 0) \tag{4.6}$$

and by default

$$\Pr(y_1 = 1) = 1 - F(y_1^* \mid \mu_1, \sigma_1) \tag{4-7}$$

which can rewritten as:

$$\Pr(y_1 \leq 0) = \Phi\left(\frac{y_1^* - \mu_1}{\sigma_1}\right) = F(y_1 = 0 \mid \mu_1, \sigma_1) \tag{4-8}$$

$$\Pr(y_1 > 0) = \Phi\left(\frac{\mu_1 - y_1^*}{\sigma_1}\right) = 1 - F(y_1^* \mid \mu_1, \sigma_1)$$

since we are dealing with a symmetric standard normal distribution.

In order to calculate the probability distribution function of the censored part of the distribution the original distribution is divided by the region to the right of zero (positive purchases). The function is given by

$$f(y_b \mid y_1^* > 0, \mu_1, \sigma_1) = \frac{f(y_1^* \mid \mu_1, \sigma_1)}{\Pr(y_1 = 1)} \tag{4-9}$$

and since the data has been censored to the left of zero, $E(y \mid y_1^* > 0) > E(y_1^*) = \mu_1$. Then, the expectation of becoming a buyer is given by

$$E(y_b \mid y_1 * > 0) = \mu_1 + \sigma\lambda_1 \left(\frac{\mu_1 - 0}{\sigma_1} \right) \tag{4-10}$$

where

$$\lambda_1 = \frac{\phi\left(\frac{\mu_1 - 0}{\sigma} \right)}{\Phi\left(\frac{\mu_1 - 0}{\sigma} \right)} \tag{4-11}$$

is a monotone decreasing function of the probability that an observation is selected into the sample known as the Inverse Mills ratio. The value of λ_1 is saved and used as a regressor in the second stage estimation.

Heckman's two-stage method generally utilizes a probit for participation (probability of purchasing) and an ordinary least squares (OLS) procedure for the actual consumer purchases. Both decisions are independent and thus no corner solution is observed. However, in this study corner solutions can be seen in the second stage and would imply that a consumer did not buy in either two outlets. Instead of an OLS procedure a Tobit was used to model intensity of buying among florists and supermarkets.

The formulation for the Tobit model is set as

$$y_i = \begin{cases} 0 & if \quad y_2^* \le 0, \\ y_2^* & if \quad 0 < y_2^* < 1.0, \\ 1 & if \quad y_2^* \ge 1.0 \end{cases} \tag{4-12}$$

The second stage Tobit is a function of both the variables considered in the probit and the Inverse Mills Ratio estimated by the model. The notation for the Tobit is as follows:

$$Z = f(X, \lambda_1) \tag{4-13}$$

and to simplify the formulas that follow let

$$\mu_2 = Z\alpha \tag{4-14}$$

and since we are dealing with a standard normal distribution the probability that an observation is censored from below is given by

$$\text{prob}(y = 0 \mid Z_i) = \Phi\left(\frac{-Z\alpha}{\sigma_2}\right) \equiv \Phi\left(\frac{-\mu_2}{\sigma_2}\right) \tag{4-15}$$

and censored from above by

$$\text{prob}(y = 1.0 \mid Z_i) = 1 - \Phi\left(\frac{1-Z\alpha}{\sigma_2}\right) \equiv 1 - \Phi\left(\frac{1-\mu_2}{\sigma_2}\right) \equiv \Phi\left(\frac{\mu_2 - 1}{\sigma_2}\right) \tag{4-16}$$

with the uncensored portion given by

$$\text{prob}(0 < y < 1.0 \mid Z_i) = \Phi\left(\frac{y - Z\alpha}{\sigma_2}\right) \tag{4-17}$$

and for facilitation purposes let

$$\Phi_0 = \left(\frac{0 - Z\alpha}{\sigma_2}\right) \qquad \Phi_1 = \left(\frac{1 - Z\alpha}{\sigma_2}\right) \tag{4-18}$$

$$\phi_0 = \phi\left(\frac{0 - Z\alpha}{\sigma_2}\right) \qquad \phi_1 = \phi\left(\frac{1 - Z\alpha}{\sigma_2}\right)$$

so notation for the expected market share for the two outlets is given by

$$E(y) = \Phi(0) + \Phi(1) + (\Phi_1 - \Phi_0)\left\{Z\alpha + \sigma_2\left(\frac{\phi_0 - \phi_1}{\Phi_1 - \Phi_0}\right)\right\} \tag{4-19}$$

$$\equiv \Phi_1 + Z\alpha(\Phi_1 - \Phi_0) + \sigma_2(\phi_0 - \phi_1)$$

which is presented in the Tobit model. Next, the model specification is presented for the probit and Tobit models in terms of the variables of this study.

Tobit Model for Outlet Selection

Several socioeconomic and demographic variables are included in Heckman's model: the respondents' age, income level, gender, and purpose for buying, flower form, and months to account for seasonality. Furthermore, the dependent variable can be expressed in terms of transactions or expenditures levels. First, dummy variables are defined for the right-hand-side were the sum of the parameters for each set of dummy variables are restricted to zero. And so the function for the first step of the Heckman estimation process using the probit model for positive expenditures and transactions is given by

$$X\beta = \beta_0 + \sum_{i=1}^{4} \beta_i DAge_i + \sum_{i=1}^{2} \beta_{i=4} DGnd_i + \sum_{i=1}^{2} \beta_{i=6} DPur_i + \tag{4-20}$$

$$\sum_{i=1}^{4} \beta_{8+i} DInc_i + \sum_{i=1}^{12} \beta_{12+i} DMt_i + \sum_{i=1}^{3} \beta_{24+i} DForm_i$$

Since each dummy class is exhaustive and mutually exclusive, inclusion of all discrete values within a class immediately creates the well known dummy variable trap. One convenient solution to this problem is to restrict the sum of the coefficients to zero where, for example, $\sum_{i=1}^{4} \beta_i = 0$ then $\beta_4 = -\beta_1 - \beta_2 - \beta_3$. Substituting for β_4 (for the other appropriate coefficients) then gives equation (4-22) where the dummy variable trap no longer exists. The rest of the coefficients are described by

$$\beta_4 = -\beta_1 - \beta_2 - \beta_3 \tag{4-21}$$

$$\beta_6 = -\beta_5$$

$$\beta_8 = -\beta_7$$

$$\beta_{12} = -\beta_9 - \beta_{10} - \beta_{11}$$

$$\beta_{24} = -\beta_{13} - \beta_{14} - \beta_{15} - \beta_{16} - \beta_{17} - \beta_{18} - \beta_{19} - \beta_{20} - \beta_{21} - \beta_{22} - \beta_{23}$$

$\beta_{27} = - \beta_{25} - \beta_{26}$

and defining

$$XAge_j = DAge_j - DAge_4 \tag{4-22}$$

$$XGnd_j = DGnd_j - DGnd_2$$

$$XPur_j = DPur_j - DPur_2$$

$$XInc_j = DInc_j - DInc_4$$

$$XMt_j = DMt_j - DMt_{12}$$

$$XForm_j = DForm_j - DForm_3$$

The probit equation variables now corrected for the dummy trap are

$$X\beta = \beta_0 + \sum_{i=1}^{3} \beta_i XAge_i + \beta_5 XGnd_1 + \beta_7 XPur_1 + \sum_{i=1}^{3} \beta_{8+i} XInc_i + \tag{4-23}$$

$$\sum_{i=1}^{11} \beta_{12+i} XMt_i + \sum_{i=1}^{2} \beta_{24+i} XForm_i$$

defined as the dummy variables in the probit model. The impacts of the variables are then compared relative to the average household measured with β_0.

The second stage is depicted by a Tobit model with the same variables of the probit model including the Inverse Mills Ratio as a regressor in the equation. The function is given by

$$Z\alpha = \alpha_0 + \sum_{i=1}^{3} \alpha_i XAge_i + \alpha_5 XGnd_1 + \alpha_7 XPur_1 + \sum_{i=1}^{3} \alpha_{8+i} XInc_i + \tag{4-24}$$

$$\sum_{i=1}^{11} \alpha_{12+i} XMt_i + \sum_{i=1}^{2} \alpha_{24+i} XForm_i + \alpha_{28} Mills_1$$

The explanatory variables used in the model are described in Table 4.1. Tables 4.2 and 4.3 present the estimated Probit and Tobit coefficients and t-values. The coefficients reflect the sign of the relationship to the dependant variable, in this case market shares,

while the t-values reflect the significance of the relationship. Next, the Probit and Tobit coefficients are discussed outlining the most statistically significant variables in the model.

First-Step Results: Decision to Become a Buyer

The decision to become a buyer was estimated by a probit model using expenditures and transactions. The β parameters in Tables 4.2 and 4.3 denote the effect on the probability of buying flowers from an initial sample of 27,072 household observations with that 8,040 households not becoming buyers of fresh flowers. An econometric programming code using TSP are included in Appendix C. The results indicated that there was little distinction between the estimated coefficients and t-values in terms of expenditures and transactions as should be the case since one cannot have expenditures without transactions. Thus in the second stage Tobit we could have equally included the Inverse Mills Ratio from each model when establishing both the second stage expenditures and transaction models.

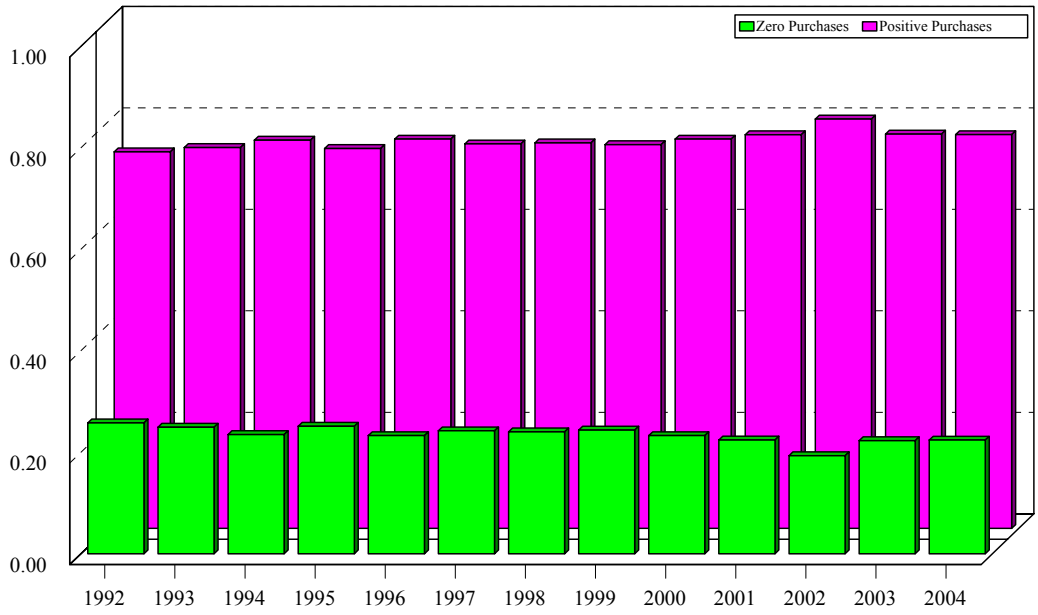

Figure 4-1 Distribution of values in the first stage probit model.

Table 4-1 Description for the Variables in the Heckman model

Variables	Definition
β_0	Intercept
Age_1	1 if = under 25 years of age, 0 otherwise.
Age_2	1 if = 25 to 39 years of age, 0 otherwise.
Age_3	1 if = 40 to 54 years of age, 0 otherwise.
Age_4	1 if = 55 and more years of age, 0 otherwise.
Gnd_1	1 if = female, 0 otherwise.
Gnd_2	1 if = male, 0 otherwise.
Pur_1	1 if = gift, 0 otherwise.
Pur_2	1 if = self, 0 otherwise.
Inc_1	1 if = under $25,000 dollars, 0 otherwise.
Inc_2	1 if = $25,000 to $49,999 dollars, 0 otherwise.
Inc_3	1 if = $50,000 to $74,999 dollars, 0 otherwise.
Inc_4	1 if = $75,000 dollars and more, 0 otherwise.
Mt_1	1 if = January, 0 otherwise.
Mt_2	1 if = February, 0 otherwise.
Mt_3	1 if = March, 0 otherwise.
Mt_4	1 if = April, 0 otherwise.
Mt_5	1 if = May, 0 otherwise.
Mt_6	1 if = June, otherwise.
Mt_7	1 if = July, 0 otherwise.
Mt_8	1 if = August, 0 otherwise.
Mt_9	1 if = September, 0 otherwise.
Mt_{10}	1 if = October, 0 otherwise.
Mt_{11}	1 if = November, 0 otherwise.
Mt_{12}	1 if = December, 0 otherwise.
$Form_1$	1 if = Arrangements, 0 otherwise.
$Form_2$	1 if = Non-arrangements, otherwise.
$Form_3$	1 if = Flowering, 0 otherwise.
Mills	Monotone decreasing function of the probability that an observati selected into the sample
Sigma	Function that describes the probability of using each outlet among buyers.

Source: AFE and Ipsos-NPD group

Table 4-2 Estimated Probit and Tobit Coefficients for Expenditures

	Buyers based on Expenditures				Expenditures Shares Models			
					Florists Share		Supermarkets Share	
Variables	Probit	Coefficients	T-values	Tobit	Coefficients	T-values	Coefficients	T-values
	β_0	0.88693	74.69340	α_0	0.11087	8.30978	0.17627	15.78032
$XAge_1$	β_1	-1.16447	-63.36020	α_1	-0.13624	-9.90005	-0.05390	-4.60476
$XAge_2$	β_2	0.21657	11.98300	α_2	0.01543	2.07795	-0.01065	-1.71780
$XAge_3$	β_3	0.51074	26.56230	α_3	0.08026	9.99890	0.01673	2.47201
$XGnd_1$	β_5	0.51251	46.35180	α_5	0.05111	9.24886	0.05429	11.53462
$XPur_1$	β_7	0.77493	65.63670	α_7	0.32441	44.13356	-0.04534	-7.65187
$XInc_1$	β_9	0.11155	6.23783	α_9	-0.00742	-1.04646	0.00330	0.56182
$XInc_2$	β_{10}	0.32632	17.49510	α_{10}	-0.00173	-0.24044	0.04686	7.79006
$XInc_3$	β_{11}	-0.16054	-9.12933	α_{11}	0.01908	2.63217	-0.03805	-6.26596
XMt_1	β_{13}	-0.19032	-5.79866	α_{13}	0.00485	0.34961	0.03256	2.83263
XMt_2	β_{14}	0.16311	4.70352	α_{14}	-0.00526	-0.40329	0.05487	5.08086
XMt_3	β_{15}	0.08701	2.55200	α_{15}	-0.00669	-0.50571	0.00736	0.67069
XMt_4	β_{16}	0.26365	7.15948	α_{16}	0.01653	1.22499	0.00871	0.77439
XMt_5	β_{17}	0.39670	10.52040	α_{17}	-0.00998	-0.74081	-0.04652	-4.11431
XMt_6	β_{18}	-0.07695	-2.21238	α_{18}	-0.03266	-2.29710	-0.02143	-1.82304
XMt_7	β_{19}	-0.20605	-6.29466	α_{19}	0.00705	0.50564	-0.02349	-2.02520
XMt_8	β_{20}	-0.17209	-5.22000	α_{20}	0.01311	0.94799	-0.03978	-3.44277
XMt_9	β_{21}	-0.20298	-6.21451	α_{21}	0.00200	0.14352	-0.02392	-2.06175
XMt_{10}	β_{22}	-0.03584	-1.07392	α_{22}	0.01908	1.41980	0.00729	0.65248
XMt_{11}	β_{23}	-0.02847	-0.84993	α_{23}	-0.03811	-2.83341	0.03903	3.50810
$XForm_1$	β_{25}	-0.87114	-57.61850	α_{25}	0.34996	38.25374	-0.21243	-26.50132
$XForm_2$	β_{26}	0.40065	26.15020	α_{26}	-0.04366	-6.70899	0.25860	46.64365
$Mills_1$				α_{28}	0.14068	4.95642	0.00215	0.08898
$Sigma_2$				α_{29}	0.50350	122.35026	0.44075	139.67058

Number of observations = 27072
Number of positive observations = 19042

Number of observations = 19042
$R^2 = 0.462364$

Table 4-3 Estimated Probit and Tobit Coefficients for Transactions

	Buyers based on Transactions				Transaction Shares Models			
					Florists Share		Supermarkets Share	
Variables	Probit	Coefficients	T-values	Tobit	Coefficients	T-values	Coefficients	T-values
	β_0	0.88724	74.70430	α_0	0.13627	11.61261	0.20188	18.22941
$XAge_1$	β_1	-1.16425	-63.34360	α_1	-0.04337	-3.58532	-0.10275	-8.84949
$XAge_2$	β_2	0.21645	11.97540	α_2	-0.00168	-0.25718	0.00033	0.05444
$XAge_3$	β_3	0.51070	26.55770	α_3	0.03642	5.15586	0.03830	5.70522
$XGnd_1$	β_5	0.51278	46.36870	α_5	0.01399	2.87573	0.07338	15.70986
$XPur_1$	β_7	0.77521	65.64910	α_7	0.23679	36.56254	-0.01069	-1.81563
$XInc_1$	β_9	0.11139	6.22818	α_9	-0.00684	-1.09601	-0.00620	-1.06278
$XInc_2$	β_{10}	0.32619	17.48720	α_{10}	-0.01935	-3.05088	0.05371	8.99824
$XInc_3$	β_{11}	-0.16076	-9.14078	α_{11}	0.02446	3.83456	-0.03832	-6.36662
XMt_1	β_{13}	-0.19054	-5.80531	α_{13}	0.00713	0.58409	0.03923	3.44324
XMt_2	β_{14}	0.16294	4.69842	α_{14}	-0.02147	-1.86785	0.06568	6.12739
XMt_3	β_{15}	0.08682	2.54620	α_{15}	-0.01278	-1.09623	0.01680	1.54508
XMt_4	β_{16}	0.26350	7.15493	α_{16}	0.00287	0.24169	0.00937	0.83857
XMt_5	β_{17}	0.39657	10.51640	α_{17}	-0.02293	-1.93285	-0.04283	-3.81800
XMt_6	β_{18}	-0.07716	-2.21815	α_{18}	-0.01844	-1.47370	-0.02892	-2.48029
XMt_7	β_{19}	-0.20629	-6.30172	α_{19}	0.01329	1.08297	-0.02450	-2.13158
XMt_8	β_{20}	-0.17233	-5.22679	α_{20}	0.02113	1.73545	-0.04379	-3.82450
XMt_9	β_{21}	-0.20322	-6.22130	α_{21}	0.00993	0.80951	-0.02705	-2.35192
XMt_{10}	β_{22}	-0.03606	-1.08034	α_{22}	0.01822	1.54068	0.00745	0.67294
XMt_{11}	β_{23}	-0.02868	-0.85625	α_{23}	-0.02865	-2.41960	0.02818	2.55180
$XForm_1$	β_{25}	-0.87143	-57.63000	α_{25}	0.39821	49.61143	-0.23908	-30.13249
$XForm_2$	β_{26}	0.40047	26.13730	α_{26}	-0.07376	-12.88202	0.27534	50.09437
$Mills_1$				α_{28}	0.02866	1.15040	0.03889	1.62000
$Sigma_2$				α_{29}	0.44281	122.35598	0.43836	138.51323

Number of observations = 27072
Number of positive observations = 19043
R^2= .462495

Number of observations = 19042

This study assumes a significance level of ninety five percent also denoted by an absolute t-value of 1.96 or greater. Figure 4-1 presents the distribution of the values for the first stage of the model considering either positive or negative responses to becoming a buyer of flowers. The graph shows that approximately on average 70 percent of the sample used chose to become a buyer of any type of flowers in any outlet. Although small, the percent of positive responses has increased by 3 percent over the 10 years. The graph also shows the importance of using a probit model for the first stage as a way to focus on actual flower consumers. The magnitude of the t-values indicated that all the variables were significant in the models. The variables that had the greatest influence on the propensity to become a buyer were purpose and form with t-values of 65.64 and -57.63 respectively. In purpose, gift buying had the greatest positive significant impact on the decision to purchase fresh flowers. Clearly, the probability of becoming a buyer increases when the reason for buying is not for self consumption. For forms, arrangements had a negative and significant impact on the probability to become a buyer. Thus suggesting that if a consumer decides to buy fresh flowers he will least likely choose arrangements preferring choosing instead non-arrangements and to a lesser degree flowering and green plants.

The ages of the household have a significant impact on the household's decision to become a buyer. However, the under 25 years of age group had a negative β coefficients indicating a negative relationship to the average buyer. In other words, people who fall in this category are less inclined to become a buyer than the average age. The coefficients indicated that the probability of becoming a buyer increases as the consumers age increases peaking in the 40 to 54 years age group and then a slight decline in the last

group. Recall that the last group equals the negative sum of the parameters for each dummy class.

As for the gender variable, females had the greatest effect on the decision to become a buyer. This result seems to be consistent with previous studies that argue that the majority of purchases of products available at supermarkets are done by females since they do most of the grocery shopping within the household.

Compared to the rest of the demographic variables, income is less significant to the decision of becoming a buyer. The first two groups, under $25,000 and $25 to $49,999 showed a positive relationship to the decision to become a buyer while the third level $50,000 to $74,999 showed a negative one. Clearly the probability of becoming a buyer does not consistently increase as income rise.

Apparently seasonality influenced the decision to become a buyer to a lesser degree than the rest of the variables. It is important to notice that the β coefficients showed positive signs from January through May and negative the rest of the year. This may not be surprising since the first period captures some of the most important calendar occasions like as Valentines and Mother's Day. Throughout the year, only the months of October and November were insignificant to the decision to become a buyer and that is consistent with the well known demand problems in the fall months

Second-Step Results: Intensity of Buying

The α parameters in equation 4-19 reflect the decision of much to consume in either florists or supermarkets once the decision of buying has been taken. Because this study only considers florists and supermarkets purchases to model their expected market shares, the α parameters could yield zero responses also known as "corner solutions". The corner solutions in this particular case could mean that a consumer is a buyer but did not buy

through either two mentioned outlets. Unlike the probit estimates the coefficients and t-values estimated for the second-stage Tobit differ considerably in terms of expenditures and transactions as would be expected. It is important to recognize that while the probit model dealt with either positive or negative answers, the Tobit model focuses on consumers that chose not to become buyers, buy some, or buy all the time in either florists or supermarkets. Figure 4-2 shows the distribution of values in the second stage Tobit model with the three possible outcomes in the distribution in for florists. The Tobit estimates focus on the part of the responses that fall within the middle category in the graph, which represent 61.7 percent. In Figure 4-3 the same portion for accounted for 49.3 percent of the distribution. In both graphs, the percent of values of the distribution that either reported no purchases or 100 percent purchases is considerable and had to be accounted for in the by using a censored model.

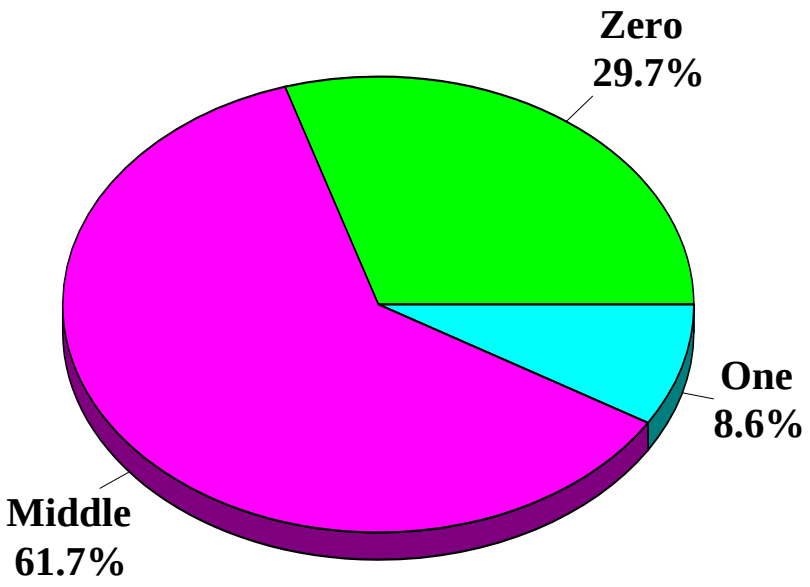

Figure 4-2 Distribution of values in the second stage tobit model for florists.

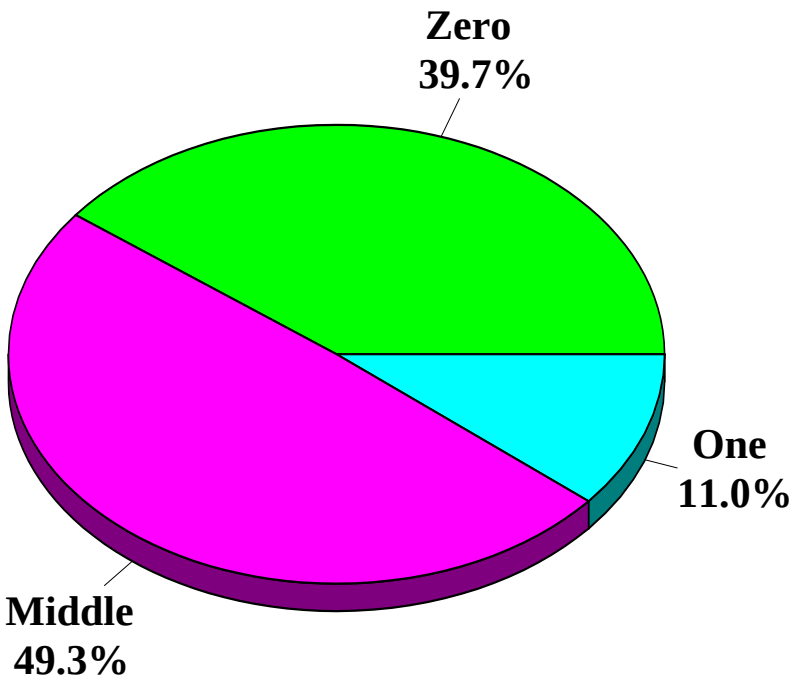

Figure 4-3 Distribution of values in the second stage tobit model for supermarkets.

The probit results indicated that purpose and form were the variables that had the greatest impact in becoming a buyer. In accordance, the Tobit estimates showed that the same variables had the greatest impact in selecting outlets. In terms of expenditures, the α coefficients for gift buying were positive for florists and negative for supermarkets and statistically significant based on their t-values. This shows that when it comes to buying fresh flowers as a gift the consumer prefers florists than supermarkets. In terms of transactions, the same relationship was seen in florists with supermarkets (t-value of -1.81) having no significance from the average.

Form was statically significant for both arrangements and non-arrangements for the two measurements. The relationship was clear with florists having positive and negative coefficients in terms of arrangements and non-arrangements respectively. The exact opposite was the true for supermarkets coefficients. In all, the magnitude of the significance was slightly greater in terms of transactions. This shows that arrangements

are bought more in florists than in supermarkets. The opposite is true for non-arrangements and flowering/green plants. Therefore, product type tends to dictate the type of outlet from where to purchase.

The previous results indicated that females were more inclined than males to become buyers. The Tobit estimates showed that females were also more predisposed to choose supermarkets than florists for their respective purchases. This intensity of buying is considerably greater in terms of transactions.

Income groups describe different intensities of buying between the two outlets. People under 25 years had negative and insignificant impact on outlet choice. The 24 to 40 years of age group showed negative and significant impact for florists and positive for supermarkets. The group clearly prefers to buy in supermarkets once a decision to buy was made. The third group, 40 to 54 years of age presents exact opposites parameters for florists and supermarkets preferring the former outlet. From this relationship, people with a less amount of income primarily buy in supermarkets until their income increases to a point in which they switch to florists.

Seasonality impacts on outlet selection were more heterogeneous than was initially expected. The months of March, April, June (only in florists), and October showed insignificant coefficients for the two outlets. Thus, showing that in those months there is no clear distinction of preference among buyers in the two outlets. The coefficients for florists were insignificant except in the months of June and November when they have negative values. To the contrary, supermarkets show significant coefficients with positive values in January, February and November and negative in the rest.

As stated before, the Inverse Mills Ratio is a decreasing function of the probability selected into the sample. The Inverse Mills Ratio coefficients were insignificant except in terms of florists' expenditures. This means that except for florists' expenditures a regular Tobit model could have been estimated using just these households that were buyers. The positive and significant coefficient in florists' expenditures shows a more complicated decision making process. A Tobit estimation in this case could have erroneously oversimplified the decision process faced by consumers. The sigma values represent the decision to become buyers in either florists or supermarkets. In this case the significant impact of the sigma coefficients, which represents the Inverse Mills Ratio for outlet selection, means that by running the model only among consumers of a particular outlet will create a sample selection bias. Clearly, the coefficients show that something influenced consumers' outlet selection once a decision to buy has been taken.

CHAPTER 5
MODEL SIMULATIONS

This chapter uses the estimates from the previous chapter to show simulated changes in the model variables. Simulations were conducted over each of the economic and socioeconomic variables in the model. Two simulations in particular combine the variables that had the greatest impact on outlet selection. Then, a ranking of the variables that showed the largest effect of the coefficients and range is discussed. Finally, time recursive methods are estimated to analyze the variation of the coefficient for the average consumer.

For any give combination of variables included in the models from Chapter 4, one can calculate the estimated market share either for those shares when the share lies between zero and one or for estimated shares across the full range of values including the limits. Since, each variable influences both the continuous and limits in the shares as well as the probability of being a buyer (i.e., as captured with the Inverse Mills ratio in the model), the following simulations will be based on the expected shares including the full range of share possibilities. For example, in Figure 5-1 the distribution of the shares clearly reflects the need for the Tobit estimates as presented in Chapter 4. Give the estimated model then the expected share can be for the non-limited share or for the full range as suggested with the three arrows combined in the upper expectation in Figure 5-1. Since most marketing policies intended to influence the outlet shares are likely over the full range of the independent variables suggest with Figure 5-1, the more useful information would be to have the expected shares over the full range.

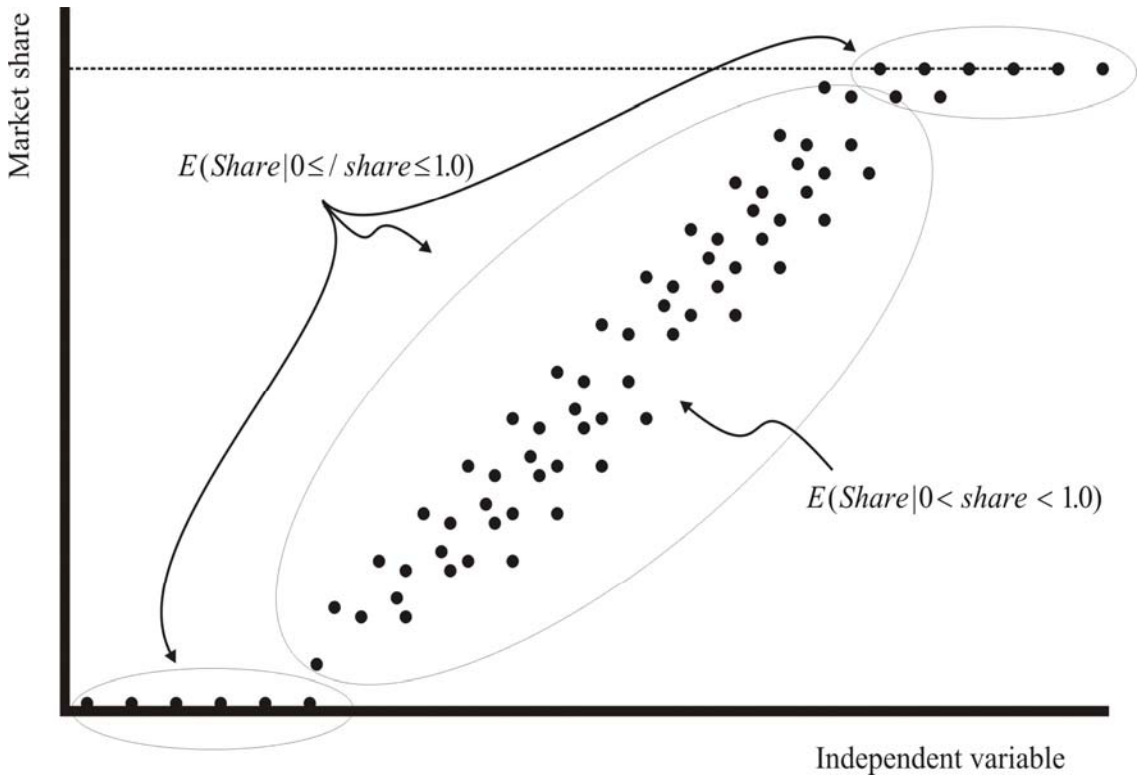

Figure 5-1 Distribution of shares

Hence, in all of the following simulations or sensitivity analyses, the expectations include the upper and lower limits alone with the continuous portion of the estimates. The exact procedures are demonstrated in the Appendix C.

Expected Share for the Average Conditions

Recall from Chapter 4 that each dummy variable was estimated by imposing the restriction that the sum of the coefficients for each dummy was set to zero. What this means is that each estimated coefficient is a deviation from the average household and the intercept in the model represents the average. Hence, as a reference point of the subsequent expectations across a number of variables, the expected shares using just the intercept for the outlet (florist and supermarket) and measurement (expenditures and transactions) equations provide those average shares. Later simulations are measured by

adjusting the variables relative to these means. Note also that these means are over the full range as discussed with Figure 5-1.

Figure5-2 shows the expected market shares for florists and supermarkets based on both expenditures and transactions. As discussed earlier, it is possible that someone may be a buyer but chose not to use either a florist (or supermarket) in a given period. That is the zero share is feasible with the right set of circumstances. Similarly, the circumstances could be that one type outlet is always used, thus giving the share of 100 percent. In this figure, on average florists and supermarkets account for approximately 58 percent of the total fresh flower expenditures and 55 percent of the transactions for the average household. Between the two outlets the distributions are quite similar especially for the expenditures. Note that supermarkets, on average, capture a slightly larger share of the transactions as would be expected given the volume of traffic through supermarkets versus florists.

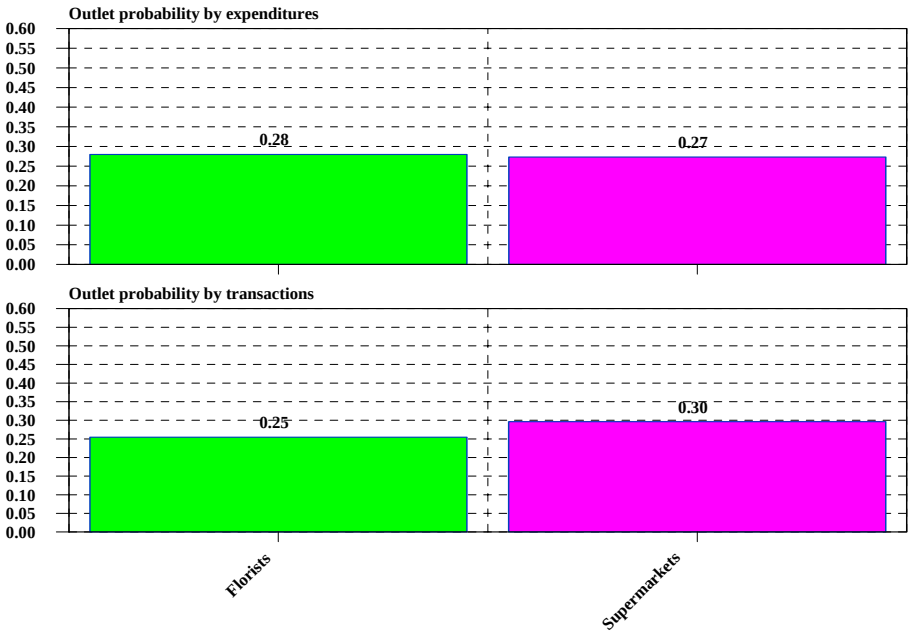

Figure 5-2 Average outlet shares the fresh flower market for florists and supermarkets.

Expected Outlet Shares by Demographics

Outlet Shares by Household Age Groups

Figure5-3 represents the outlet expected shares of the market for fresh flowers with the probabilities (shares) based on the four age groups defined in Chapter 4 and shown on the bottom axis of Figure 5-3. Each bar in Figure 5-3 shows the deviation from the average (see Figure 5-2) with bars below the average reflecting negative impacts and values above the mean indicating positive impacts. In addition to the direction, the magnitude of the change is directly comparable since all units are now in terms of market shares. Hence, one can draw meaning conclusions about the direction and degree of impact across the four age groups. For the most part in the graph, expenditures and transactions levels displayed similar distributions with each type outlet. Between outlets the impact of age is considerably different both in magnitude and direction. Supermarket selection probabilities showed the expected upward slope as age increases while florist's probabilities show a more erratic increase up to the 40 to 54 age group but then decreased among those 55 and older. The first and second age groups consistently showed probabilities either below or close to the means for both outlets. The third and fourth groups present opposite outlet selection inclinations with the 40 to 54 years old group more inclined to purchase in florists and the 55 years and more age group showing a higher probability of selecting supermarkets. Recall from the previous chapter that the 25 to 40 years age group showed the least impact on the decision to become a buyer in either outlet. In this case a less insignificant impact on the decision to become buyers could mean that people from that category are indifferent as to which outlet to choose for their purchases, thus showing probabilities closer to that of the average consumer. Note also that the range of impact of age somewhat greater for supermarkets than for florists. This

is particularly true for the transactions. Overall, the impact of aging on the use of outlets is far more consistent both in the direction and magnitude for supermarkets.

Outlet Share over Gender

Gender was one of the variables showing considerable impact on outlet selection as initially suggested with the Tobit responses from Table 4-2. Again using expected share relative to the average shares, Figure5-4 shows the outlet probabilities between male and female buyers. As expected, the simulations show that females have a higher probability than males of selecting the two outlets for fresh flower purchases. This difference is greater in terms of supermarkets than in florists and could possibly be related to grocery shopping periods where females are more likely buying the groceries. Going back to the estimates in the previous chapter the first Inverse Mills Ratio showed that the propensity to become a buyer was significant only when considering florists. This indicated that something influenced the consumers' decision to buy in florists. In this case, a more complicated outlet selection decision is reflected with a probability that is closer to the model means of selecting that particular outlet. From a marketing perspective, the clear implication from Figure 5-4 is that florist targeting gender would likely have far less impact than expected with supermarket programs. At least the potential gains for florists are substantially less than for supermarkets as evident from the relative sizes of the bars in Figure 5-4.

Buying Purpose Impact on Outlet Shares

The model estimates showed that purpose had the most significant impact among the variables expected to influence outlet selection. The simulations in Figure5-5 show major variations between outlet selections with gift buying depicting a higher probability for florists than for supermarkets. In addition, supermarkets showed a higher probability

of selection when considering buying for personal use (self). Also, the range of shares for supermarkets according to purpose was considerably less that the range for florists. As expected, the difference in outlet probabilities when considering purpose suggests that consumers tend to choose florists for gifts and to lesser degree supermarkets for self use. The range difference in florists could probably be attributed to customary behavior, where flowers are generally purchased for gifts on either calendar or non-calendar occasions.

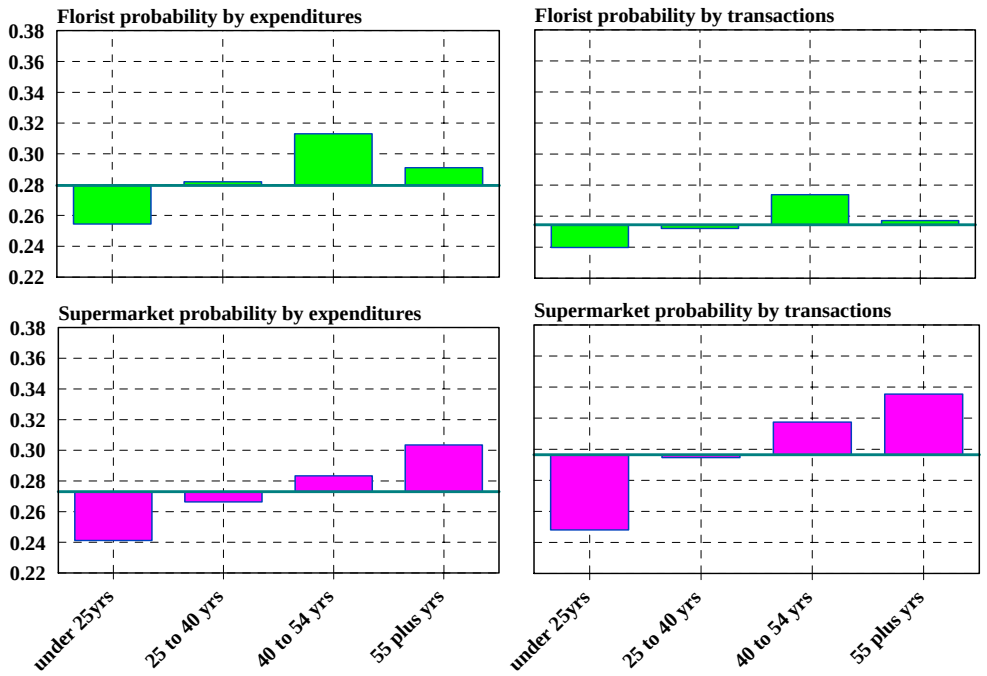

Figure 5-3 Florist and supermarket probabilities over age.

Outlet Shares Across Incomes

Outlet selection probabilities in the simulations in Figure5-6 show that the two lower income groups are more inclined to shop in supermarkets while the two upper income groups show a higher probability of buying in florists. This behavior suggests a

shift from supermarkets to florists as income rises and likely reflects with increased purchasing power buyers move to the more valued added goods found more in florists

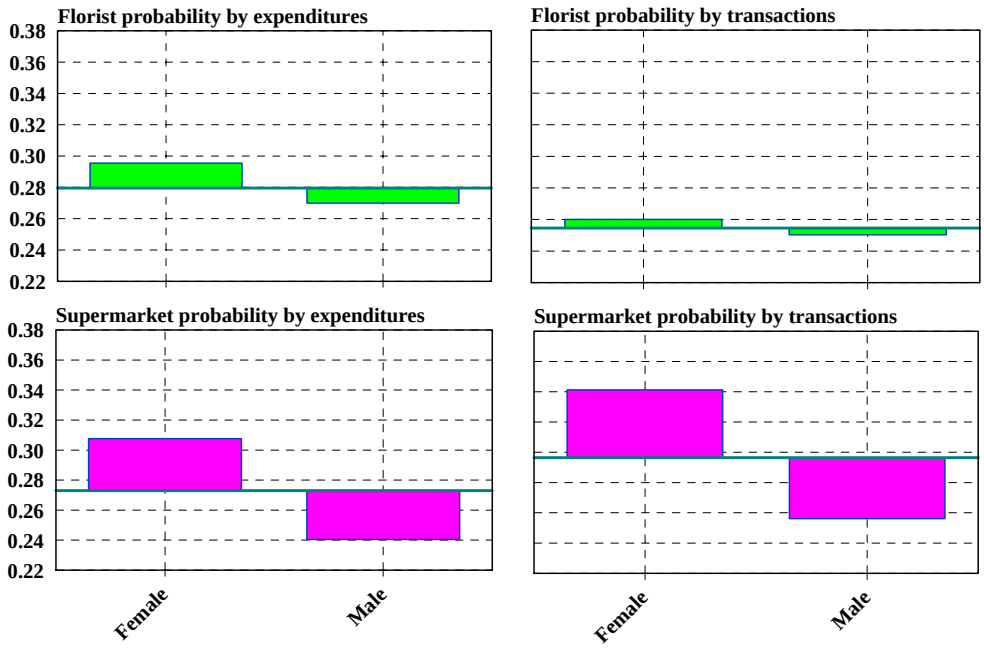

Figure 5-4 Florist and supermarket probabilities over gender.

Recall from Chapter 1 that florists usually charge a premium for the creative value added for their products while supermarkets offer lower priced products. The graphs also show that the first and last income groups have probabilities closer to the mean of the average consumer. In the case of the under $25,000 income groups, a probability slightly above the mean is seen only when considering supermarket expenditures and below the mean for the rest of the measurements. The second income group, $25,000 to $49,999, showed probabilities above average for supermarkets and below average for florists suggesting that supermarkets are generally preferred. The third group, $50,000 to $74,999 shows the opposite behavior, preferring florists for their fresh flower purchases. Finally, the last group, $75,000 and above, shows small increases above the mean for florists and below

for supermarket. The distribution of probabilities in the four income groups suggests that in the first and fourth group the demand for fresh flowers is more inelastic with respect to income than the third and fourth groups.

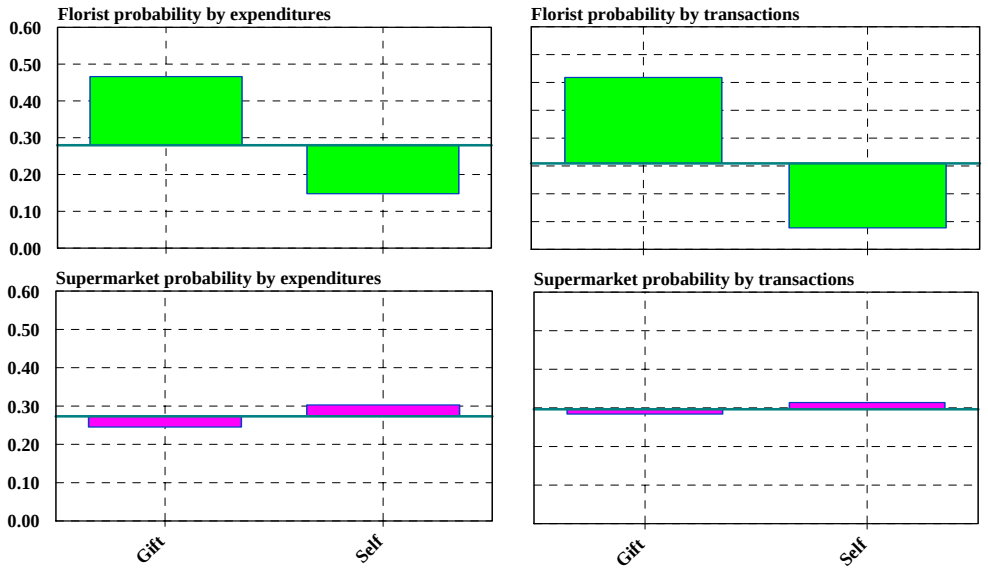

Figure 5-5 Florist and supermarket probabilities over purpose.

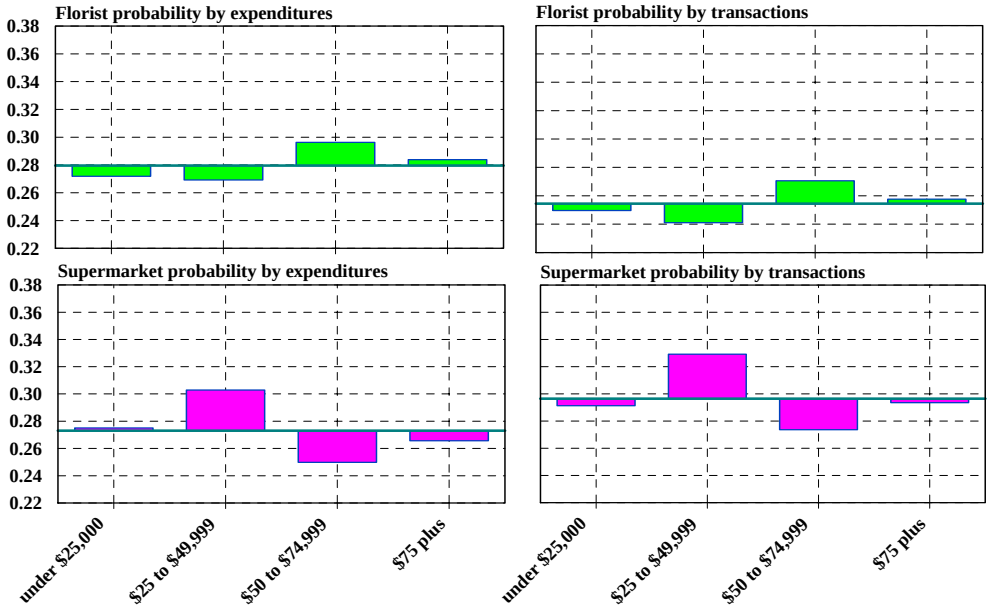

Figure 5-6 Florist and supermarket probabilities over income.

Outlet Shares over Flower Forms

One of the hypotheses in Chapter 1 was that outlet selection decision was closely related to the form of the product. This was validated by the significance of the estimates in Chapter 4. In addition, Chapter 3 showed that florists main source of business comprise the arrangement sector of the market while supermarkets focused on the non-arrangement sector. Figure5-7 presents the probabilities of selecting each outlet based on the product form with the forms being arrangements, non-arrangement, and flowering plants. As expected, when it comes to arrangements florists showed a higher probability (more than fifty percent) of being selected with supermarkets showing approximately the same probability for non-arrangements purchases. The probability distribution suggests a clear outlet selection decision for arrangements and non-arrangements. However, flowering/green plants probabilities are below the mean of the average consumer suggesting that the two outlets are less probable choices when it comes to this product form. Probably more than any other figure, the response to forms capture the fundamentally differences between florists and supermarkets in terms of the product offerings.

Combined Effect of Purpose and Form

Going back to the estimates in Chapter 4, purpose and form were the two variables that had the greatest impact on both the decision to become a buyer and on the outlet selection. Showing the combined effects of these two important variables give additional insight into the expected outlet shares. In Figure5-8 the horizontal dotted lines represent the probability of outlet selection for the average consumer as initially estimated in Figure 5-2. The graph illustrates changes in the probabilities of outlet selection as different combinations of form and purpose are considered. The graph shows that the

combinations for gift buying have a higher probability of selection than the combinations for self. Also, gift combinations were the only ones that showed above average probabilities of selecting florists, thus proving that gift buying weights considerably on the decision to choose florists. Furthermore, the arrangements sector was the only category that showed probabilities above the mean for the three flower forms.

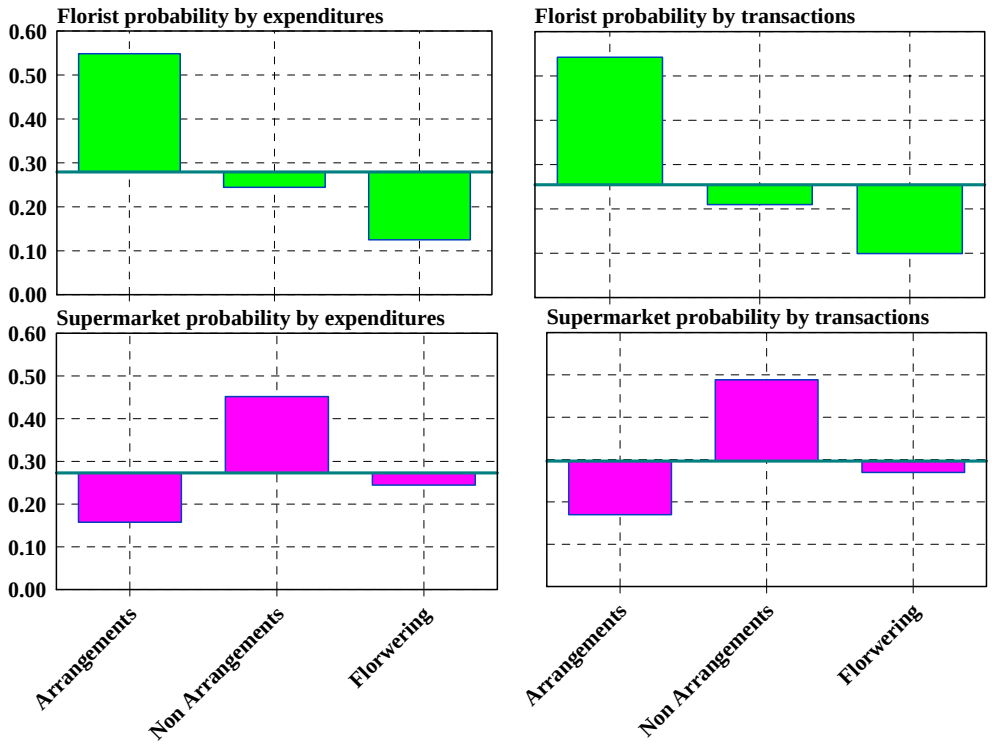

Figure 5-7 Florist and supermarket probabilities over form.

Flowering/green houseplants showed probabilities well below the mean suggesting that such fresh flower form is less probable of being bought at florists when compared to the other two. Note that the patterns are almost identical when based on expenditures and transactions.

Figure5-9 shows the probabilities of supermarket selection for the combination of purpose and form. Unlike florists, the distributions of the probabilities for supermarket selection show are more evenly distributed when considering purpose. Recall from

Chapter 3 that non-arrangements were the biggest component of supermarket fresh flower demand. As expected, the consumers' probability of selection was larger for non-arrangements than for the other two product forms. Unlike florists, some combinations did not show a large increase in the probability of selection in terms of purpose. In other words, self and gift displayed similar probabilities when compared against arrangements, non-arrangements, and flowering/green plants. As expected, arrangements had the lowest probability of selection among the three product forms with supermarkets.

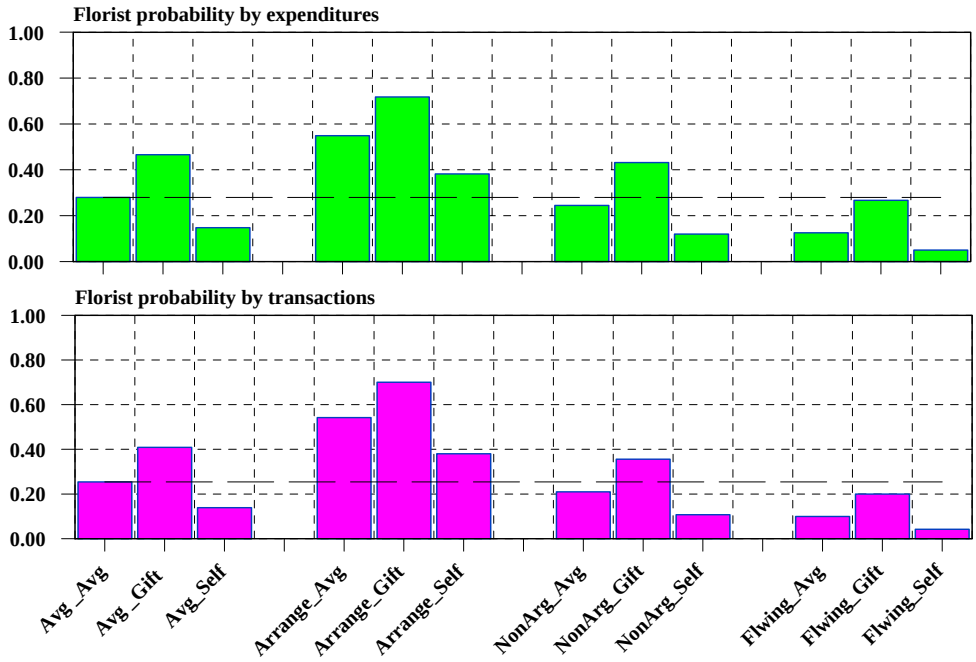

Figure 5-8 Florist probabilities over purpose and form.

Simulations by Seasons

Seasonality was expected to influence outlet selection in fresh flowers consumption to the extent that calendar occasions could influence where one buyers things for those special occasions. However, the model estimates showed that seasonality was only significant when considering supermarkets. This is consistent with the distribution of

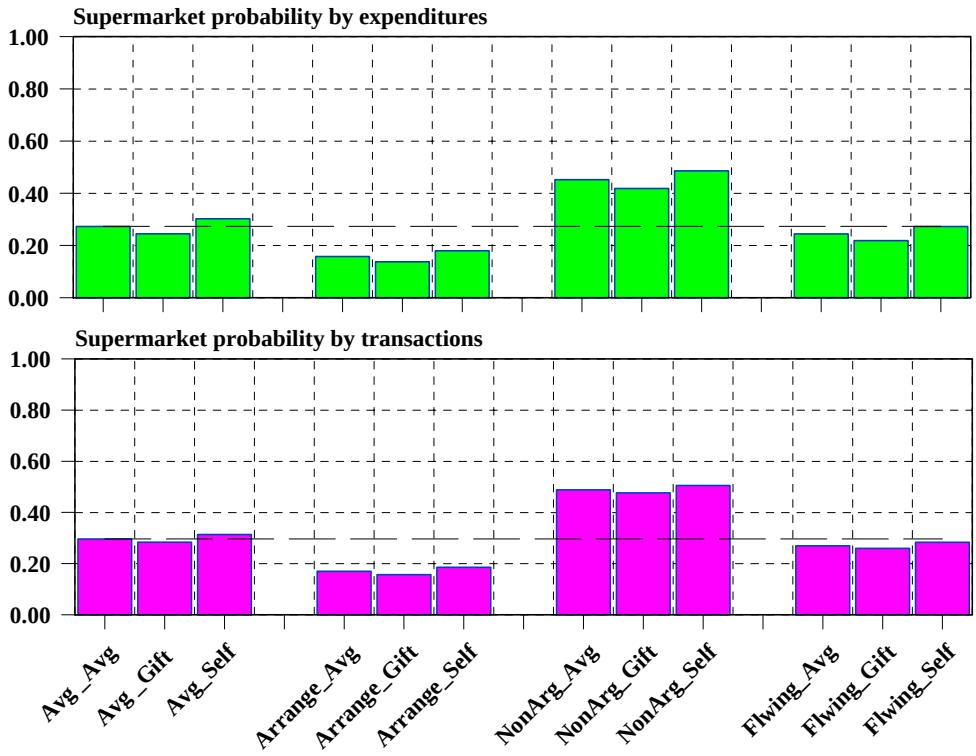

Figure 5-9 Supermarket probabilities over purpose and form.

probabilities in Figure 5-10 where supermarkets show a higher variance relative to the means of the model. The graph also shows that supermarkets have a higher probability of outlet selection in the first four months of the year while florists experience the same in the fall months. The graphs show that supermarkets are more probable to be chosen for Valentine's Day relative to the average consumer. Recall from Chapter 3 that demand for fresh flowers peaked in calendar occasions particularly in Valentines (February) and Mother's Day (May). The remaining calendar occasions do not affect the probability of outlet selection for florists and supermarkets. In fact, one could argue that the above-average probabilities seen in florists during Fall could be attributed to non-calendar occasions.

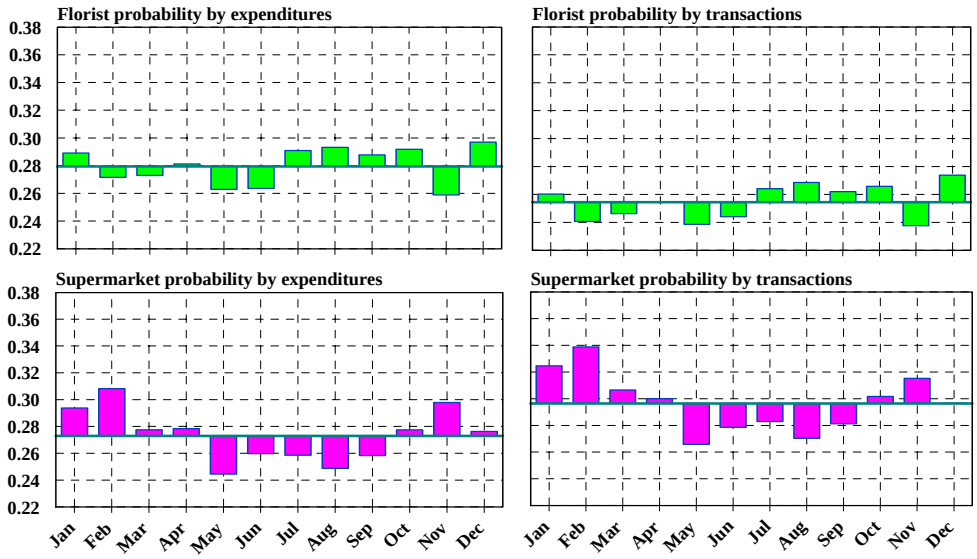

Figure 5-10 Florist and supermarket probabilities over months.

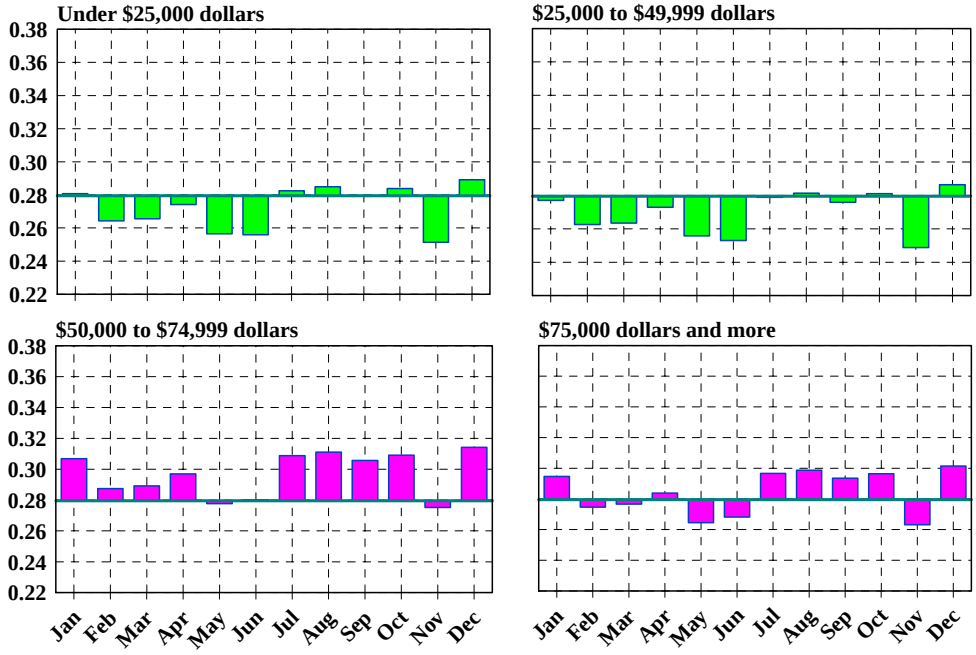

Figure 5-11 Florist probabilities over income and months by expenditures.

The last simulation combines income and months to show the monthly variation in the probabilities of selection as income rises. The variation in transactions and

expenditures levels is minimal and so they provide essentially the same information. In this case expenditures levels were selected to discuss changes between the two variables. From a previous simulation it was clear that outlet selection shifts from supermarkets to florists as income rises. Figure5-11 shows the same behavior among income groups throughout the year. The first two income groups showed probabilities either below or near the mean. For these groups the lowest probabilities of selection coincided with the February, May and June months showing that these groups are less inclined to purchase in florists in calendar occasions. The probability of selecting florists increases in the third income group especially in non-calendar months and decreases in the fourth group. In fact, the fourth group behaves more closely to the average consumer depicting a relative homogeneous probability of selecting florists.

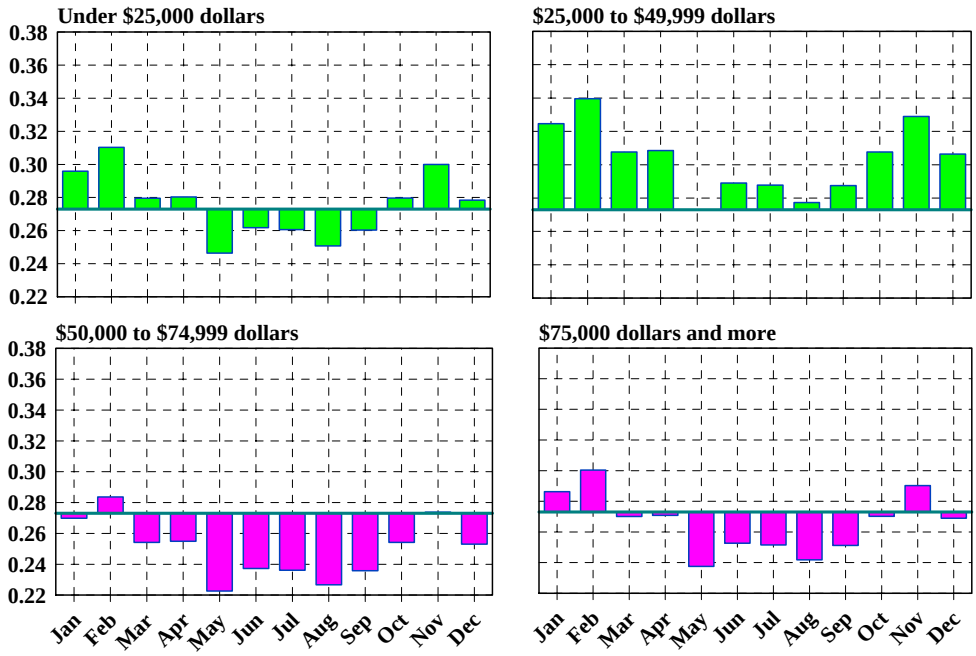

Figure 5-12 Supermarket probabilities over income and months by expenditures.

Figure5-12 shows the combined probabilities of income and months to account for the seasonality effect of different income groups. Unlike the previous graph the variation

in expenditures and transactions is clear. The first income group shows a probability of distribution above the mean from the January to April period then below the mean from May to September and then peaks back above the mean in the last three months. This distribution clear shows a higher probability in February coinciding with Valentine's Day and the lowest in May. The second income group shows above the mean probabilities except in May. The graph shows that summer months show the least probability of selecting supermarkets but still above to the probability for the average consumer. The third income group shows a different behavior showing above the mean probabilities for February and below the mean the rest of the year. The last group shows above probabilities on January, February and November and below the mean in the rest of the year. The graphs groups show that in the summer months the probability of selecting supermarkets decreases. It was expected that calendar occasions influence the probability of selecting supermarkets. However, only Valentines appears to influence the probability of selecting supermarkets.

Rankings Factors Impacting the Outlet Shares

In the previous figures a range of probabilities were shown and since the probabilities are comparable, they can be ranked in terms for the magnitude and direction of change. Figure5-13 shows the ranking of both the range of the variables as well as the absolute high and low expected market shares for florists. Recall from the model estimates that form and purpose were the variables that had the greatest impact on outlet selection decisions. In the florists' case, the same variables that showed the biggest range within each variable categories. The range difference is influenced by the magnitude of the coefficients and by the difference between the variable that showed the least and the variable that showed the greatest probability of outlet selection within each demographic

and socioeconomic variable category. Form showed 43 percent outlet selection probability difference in expenditures between arrangements (highest probability) and flowering/green houseplants (lowest probability). In addition, purpose showed a 32 percent outlet selection probability in expenditures between gift (highest) and self (lowest). The ranking in terms of transactions was similar to that of expenditures. The rest of the variables showed probabilities differences of less than 10 percent denoting a more homogenous distribution between each of the divisions within those variables. What is most apparent in Figure 5-13 is the relative low level of importance of demographics relative to form and purpose when considering what truly impacts the lower probabilities of using florists, i.e., product form and purpose of buying.

Figure 5-14 shows the variable ranking for supermarkets following the same criteria for florists except that the magnitude of change is somewhat less for supermarkets. Purpose was also the variable that showed the biggest range in outlet selection probabilities. Unlike florists, gender and age were the variables that followed purpose in the variable ranking with approximately 8 percent difference in each of them. The graph showed that purpose had the least probability range in the case of supermarkets. For supermarkets, form is the dominate variable impacting the likelihood for using supermarkets.

Dynamics in the Outlet Share Coefficients

Figure 5-15 shows the variation in the coefficient for the average consumer from 1993 to 2004. Recall from the previous chapter that β_0 is the coefficient for the average consumer after the dummy trap was corrected in the model. The coefficient was calculated recursively from 1993 to find out if there were any other variables that would influence the model above and beyond the socioeconomic and demographic ones

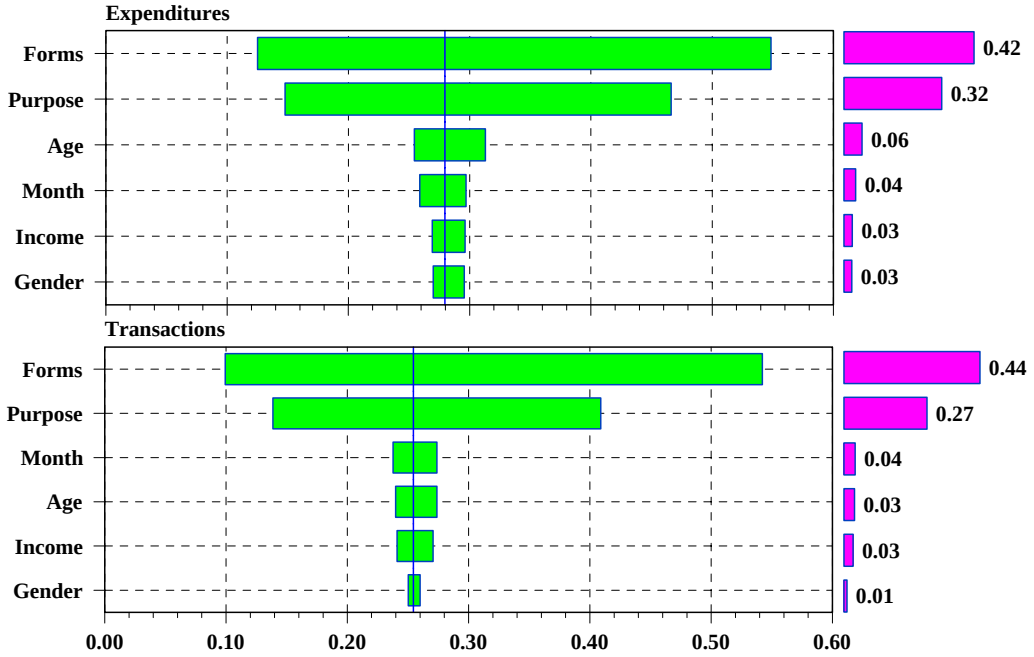

Figure 5-13 Variable rankings for florist.

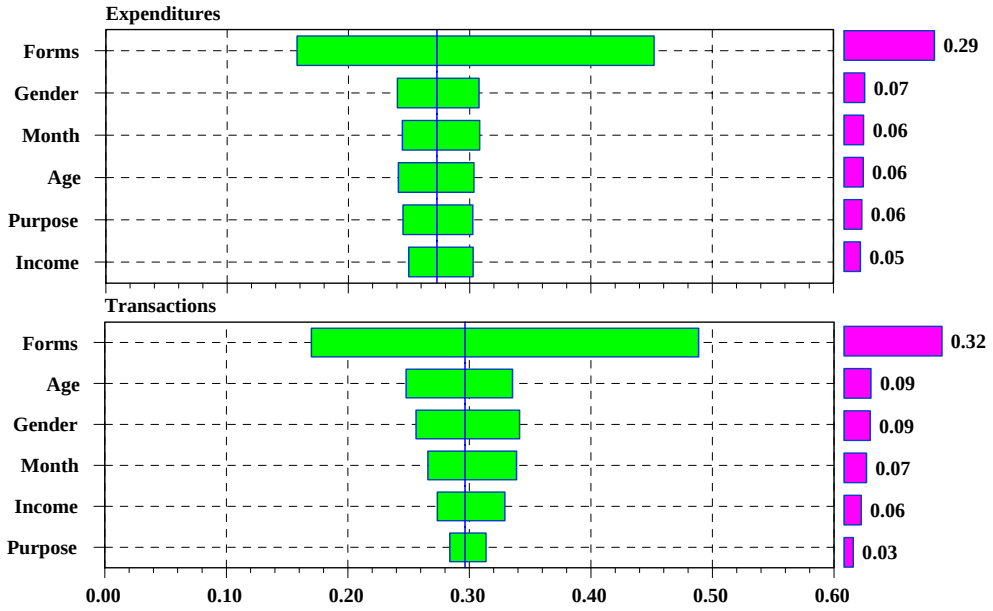

Figure 5-14 Variable rankings for supermarket.

considered in the study. The graph shows that when choosing an outlet for flower purchases, florists as an outlet choice is becoming less important for consumers. To the

contrary, supermarkets are becoming more important to the average consumer as an outlet selection choice. With the exception of the age coefficients, the rest of the coefficients showed no significant variation over the period considered and further discussion was not deemed necessary. Furthermore, any changes seen in the coefficients seemed to affect florists and not supermarkets which validate the information presented in the previous graph.

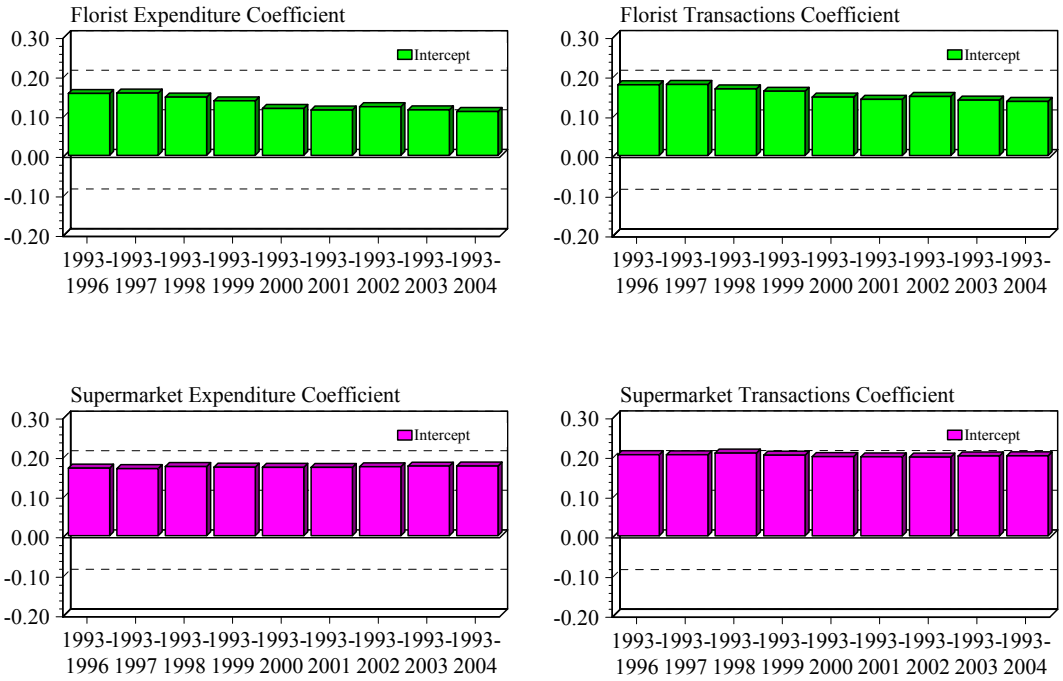

Figure 5-15 Time Varying Coefficients for the Average Consumer

CHAPTER 6
CONCLUSION

Introduction

This chapter presents the summary, findings and recommendations of the study. A brief summary of the previous chapters is presented outlining the major findings. Then, the conclusions of the chapter are discussed with a particular emphasis placed on whether the hypotheses from Chapter 1 were either validated or refuted. Finally, the implications and limitations of the study and the recommendations for further research are presented.

Overview of Outlet Analyses

The main objective of this study was to analyze outlet market share changes given a change in demographic and socioeconomic variables associated with fresh flower consumers. By focusing in the fresh flower section of the market, the study covers approximately 90 percent of all indoor flowers. A two-step estimation model was used to describe the outlet selection process faced by buyers in the fresh flower industry. In the first stage decision, the model used a probit model to differentiate between buyers and non-buyers of flowers. In the second stage, the analyses used a Tobit model to estimate the variables that had the greatest impact on the decision to choose either florists or supermarkets once they decided to buy fresh flowers. Estimates from the Tobit model were used to simulate the probability of selecting these two outlets. Finally, the parameters were recursively estimated to test if there were changes in the parameters over time. Parameter changes could suggest structural and/or preference changes not initially captured in the original Tobit estimates. Also, often there are not specific variables to

measure these changes and the use of time-varying parameters is an indirect way to test for such changes.

The flower industry in the United States was grouped into three categories: cut-flowers, flowering and green house plants, and artificial. This study focuses on the fresh flower portion of the market since it comprises nearly 90 per cent of the flower industry. Based on the major outlets used by consumers, the outlets were divided into 4 categories: mass merchandising, specialty, internet retail, and others. The data showed that supermarkets comprised the majority of mass merchandising purchases with florists capturing most of the purchases in the specialty category. Data for the retail internet purchases were not available until the year 2000 and, hence, were not included in the outlet share models. Florists and supermarkets were chosen in the study for the relative importance in their respective categories but also because in the last decade major structural changes have occurred in the industry as described by market share changes particularly in these two outlets.

Chapter 1 introduced the problematic situation and the major hypotheses of this study focused on the changes in market shares for both outlets. One of the strengths of the study is that the sample used was drawn from an extensive database which covered many aspects of the flower demand in the US. The database used is maintained by Ipsos, a private company who along with the National Panel Diary (NPD) collected the information from approximately 9,000 demographically balanced households every two weeks through the use of consumer diaries. The diaries included comprehensive information on actual purchases recording flower type, outlet selection, number of transactions, and occasions.

Chapter 2 presented a literature review that was divided in three parts covering the articles on choice theory and consumer preferences, market share theories, and econometric models for censored data. Chapter 3 presented an overview of the fresh flower industry for the years from 1992 through 2004. The chapter showed the relative change in market shares among outlets using expenditures and transaction market share levels based on cut-flowers and flowering/green house plants. The chapter covered seasonal and yearly trends over florists and supermarkets, as well, as changes in both arrangements and non-arrangements. The chapter showed the importance of florists and supermarkets in the flower industry and the relative changes in market shares over the study period.

Chapter 4 explained the theoretical framework and the model specification to model consumer behavior in the fresh flower industry. The model specification started with the neo-classical utility maximization theory and then explained the nature and problems of censored data with its alternatives for estimation. Unlike the original Heckman two-stage decision process which used a probit and a ordinary least squares (OLS) procedure, this study used a tobit model to account for the "corner solutions" previously discussed. In the first stage probit model, which assumed a significance level of 95 percent, the estimates showed that purpose and form were the two variables that had the greatest impact on the decision to become a buyer. The same variables had the greatest impact on the second stage decision to choose either florists or supermarkets for their flower purchases.

Chapter 5 presented simulations drawn from the model estimates to simulate expected outlet shares over a range of variable values. Purpose and form were combined

to show the effect of both variables on the outlet use. A ranking of the variables from the largest to smallest impacts on the probability of outlet selection was presented Finally, a time recursive model was used to determine if there were underlying structural changes taking place within the outlets.

Major Outlet Selection Conclusions

Estimates from the two-stage model showed that purpose and form were the variables having the greatest impact on both the decision to become a buyer and on the decision to choose either florists or supermarkets for their purchases. Assuming a significance level of 95 percent, almost all variables included in the probit and tobit models were statistically significant with the significance test being measured against the average consumer. The probit estimates showed purpose, gender, and form were the most importance factors impacting the likelihood of becoming a buyer. The combination of females buying non-arrangements for gifts had the largest impact on market penetration or attracting buyers. Among the variables that showed the least probability to become buyers were people of less than 25 years of age having an income of $50,000 to $74,999 and buying flower arrangements. In general, the majority of the variables were statistically significant given the mentioned confidence level. Seasonality showed the typical decline in the likelihood of buying flowers in the later half of each year, thus again highlighting the seasonal problem found throughout the flower industry.

The second stage tobit model estimates showed that purpose and form were the variables that had the greatest impact on the decision to buy in either florists or supermarkets. The estimates showed a marked difference between the two outlets in terms of the combination of the variables that increased their probability of selection. Recall from Chapter 3 that florists and supermarkets specialized in different sectors of the

industry as described by their market share levels. The estimated coefficients for the tobit model described the same level of market segmentation between the two outlets. For example, in the florists case the variables that had the greatest impact on outlet decision such as the second age group from 40 to 54 years old, females, gift, and arrangements are the same variables that has the least impact on the decision to choose supermarkets except for females who are important on both outlets. In the supermarkets case, the third age group from 40 to 54 years of age, non-arrangements and buying for self use had the greatest positive impact on consumer outlet selection decision. The result from the estimates reflected the market share conditions explained in Chapter 3 but also introduced some of the variables that have influenced fresh flower demand in the last few years. The demographic and socioeconomic variables used in the models therefore explained part of the difference in market shares between the two outlets.

Starting from Chapter 3 it is apparent that the fresh flower industry was experiencing major restructuring at the retail level. Furthermore, when analyzing florists and supermarkets alone the models show that over the past decade florists have lost market shares while supermarkets have improved their market position. The results indicated that florists' main source of business falls in the arrangement sector of the market while supermarkets are in the non-arrangement sector. The results also show that 1998 was a turning point for both outlets either widening the gap among them and even a switching of market share position relative to other outlets. The statistically significance of the estimates show that the variables considered for the study were accurate indicators of what the flower industry has been experiencing in recent years.

The perceived characteristics of the product play a major role in fresh flower demand as described by the purpose and form variables. The fact that both outlets specialize in different segments of the market with statistically significant coefficients associated with them implies that a degree of concentration in a sector could be achieved by product differentiation. Recall from Chapter 1 that florists charge a premium for the value added to their products in the form of arrangements and supermarkets focus on large quantities of non-arrangements. Since florists share of the market remain essentially the same in the arrangement section, the systematic market share loss in the non-arrangement section could be the reason why florists' market share levels have declined over time. In addition, the increasing market share in the non-arrangement section of the market could be the reason why supermarkets have experienced a steady increasing in total market participation. However, it is important to clarify that the results of this study do not imply that florists share loss has been totally captured by supermarkets. Recall that while the study focused on two outlets in particular all the outlets, some of the declines in market shares could be reflected in the smaller outlets not included in the modeling efforts.

Important to the overall analysis was the hypotheses that rising incomes and other demographics could impact the types of outlets used. Drawing from the outlet share model estimates, simulations where used to explicitly show the range of probabilities of selecting florists or supermarkets as each variable was considered. In Chapter 5, each simulation was completed by adjusting the variables relative to the mean of all the other variables with the expected market shares being shown for florists and supermarkets based on both expenditures and transactions. The probability means for florists were 28

percent in expenditures and 25 percent for transactions while the probability means for supermarkets were 27 percent in expenditures and 28 percent in transactions. As a general rule variations in income had a greater impact on using supermarkets than for using florists and generally the florists share gains while the supermarket shares decline as income increases.

When considering age, the simulations showed that the probability of selecting florists increased until the third age group 40 to 54 years of age and then dropped for people of 55 years of age or older. In direct contrast, supermarket shares consistently increased over the age groups.

Purpose of buying showed marked differences for the two outlets. The fact that florists main source of business comes from gift buying and supermarkets from self buying were apparent from the distributions in Chapter 3. However, in the simulation over purpose and interesting fact arises in that supermarkets probability of selection is approximately the same as of the average consumer. When it comes to gender, the simulations show that females have a higher probability of choosing both outlets than males. Yet, the gender effect on supermarkets is more than twice as great for supermarkets compared with florists.

The variable rankings in Chapter 5 showed that purpose and form were the two factors showing the biggest variation within their divisions for florists with approximately 40 and 30 percent, respectively. The ranking shows the variables that had the biggest range from the least and most probable selection. Interestingly, the variables form with 30 percent and gender to a lesser degree with approximately 10 percent were the ones that showed the biggest variation when considering supermarkets.

In general, the statistically significance of the estimates provided important information to modeling the fresh flower outlet demand given a set of socioeconomic and demographic variables. However, as it is sometimes the case in econometric analysis some variables are not considered in the study because of data limitations among others. To account for this, a time recursive models were estimated to see if the variables considered in the study became more or less important in modeling fresh flower outlet demand. The results indicated that the coefficients for the majority of the variables considered did not vary appreciably over time suggesting that the importance of the variables included in the analysis was fairly stable. In fact, Chapter 5 only presents the time varying coefficients for the average consumer for both florists and supermarkets. It is safe to conclude that when considering the two outlets only florists appear to become less important to the outlet selection decision faced by consumers.

Limitations

While many studies focus on pricing considerations and volume of sales as an approach to estimate market share changes in an industry, this study assumes a relationship between the characteristics of the buyer and the demand for fresh flowers. Unfortunately, there is not a wide array of studies to compare the results of this study. However, the methodology and the results are similar to several studies in agricultural commodities such as away-from-home food consumption, cigarette, and fresh vegetable consumption. Because a two-stage process was used to model first the decision to become a buyer and then the propensity to buy in either florists or supermarkets, the results from this study could be of interest from an outlet category or an industry point of view. While any member of the flower industry could use this information to better its position within the industry, efforts were made to present the information in the most

impartial manner possible. Therefore, this study does not provide any particular suggestions for improvements to any particular outlet category and only analyses and tries to explain the current trend in market share levels within the flower industry. A limitation of the study was that the simulations chapter only dealt with the combinations of variables that had the greatest impact on outlet selection yielding higher market share levels. One interesting aspect for further research could be to combine the variables that would represent the least market share level and analyze its implications to the industry. The negative impacts highlight targets for potential promotions or other marketing efforts to offset negative influences.

Recommendations

Information of the impact of the relative impact of various socioeconomic factors on the consumption of fresh flowers discussed in this study can benefit producers and consumers and may facilitate the decision making of policy makers. It is important to investigate the effect of socioeconomic and demographic variables on the decision to consume as a proxy to future market shares changes. The lost in market shares by the florists sector continues to be a troubling factor for that portion of the industry and anytime that helps them to counter the loss in shares would be beneficial. The negative factors impacting florists provide areas for marketing and promotion efforts that need to be explored in more detail. Also, it is important to remember that this study deals only with household data and that commercial transactions were not incorporated into the model. It is likely that florists capture a larger share of the commercial market but our analysis does not specifically show that. Therefore, incorporating commercial data into the analysis would be beneficial. Realistically, however, getting the commercial data is very difficult and often impossible. One of the strengths of the study was its ability to

pinpoint the divisions within each variable, for example the low probability of selection in the first age group, in which promotions or advertisement are needed to stimulate demand. Another is that by understanding what products comprise the main source of business of both outlets we can understand the effect that generic or brand promotions would have in the flower industry. An important extension would be to specifically design the marketing strategies using the targets suggested with this research. That has not been done since it was beyond the scope of the study.

APPENDIX A
INDUSTRY OVERVIEW

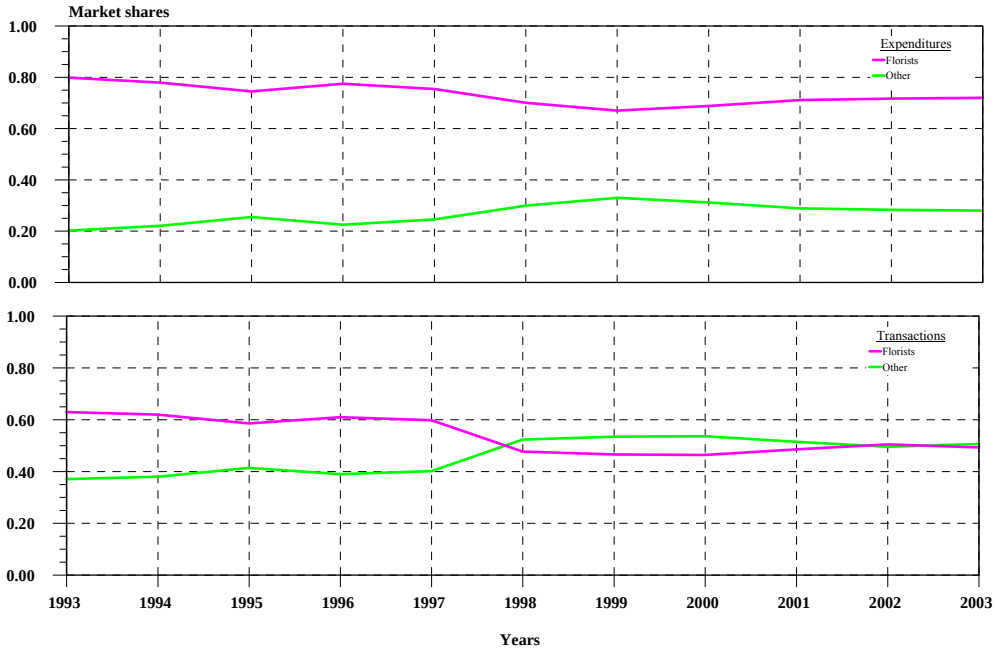

Figure A-1 Percent of yearly market shares for specialty based in cut flowers by expenditures and transactions. Source: AFE and Ipsos-NPD group

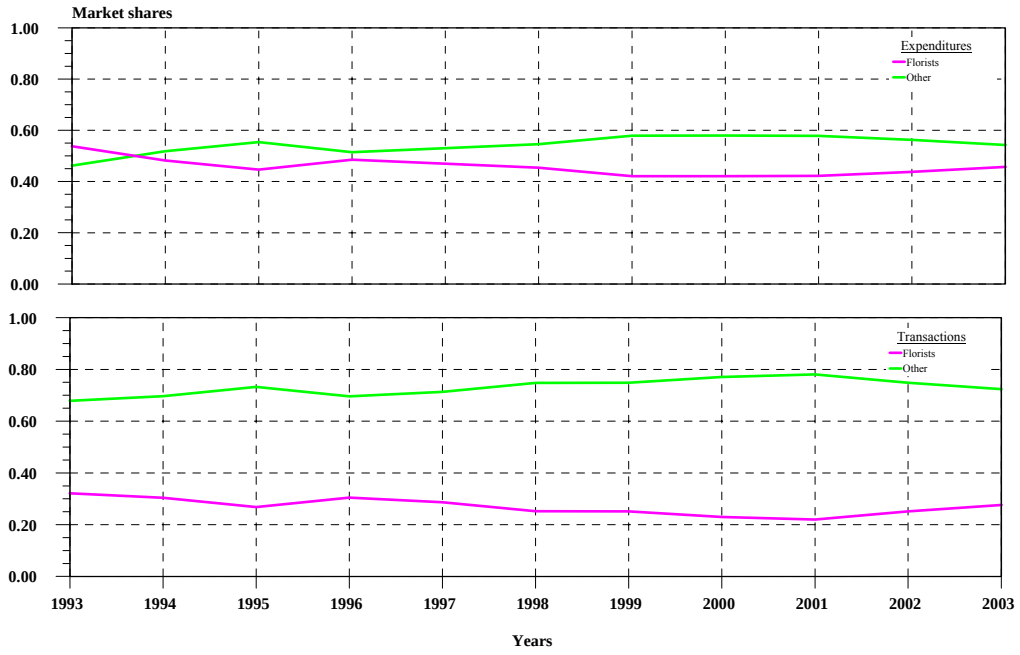

Figure A-2 Percent of yearly market shares for specialty based in flowering/green house plants by expenditures and transactions. Source: AFE and Ipsos-NPD group

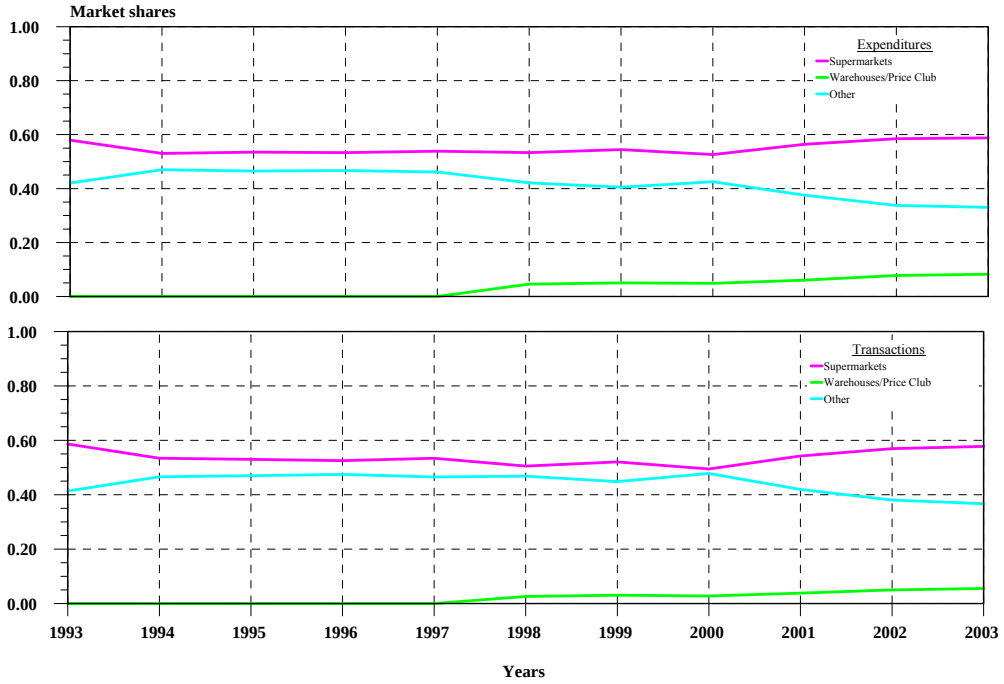

Figure A-3 Percent of yearly market shares for mass merchandising based in cut flowers by expenditures and transactions. Source: AFE and Ipsos-NPD group.

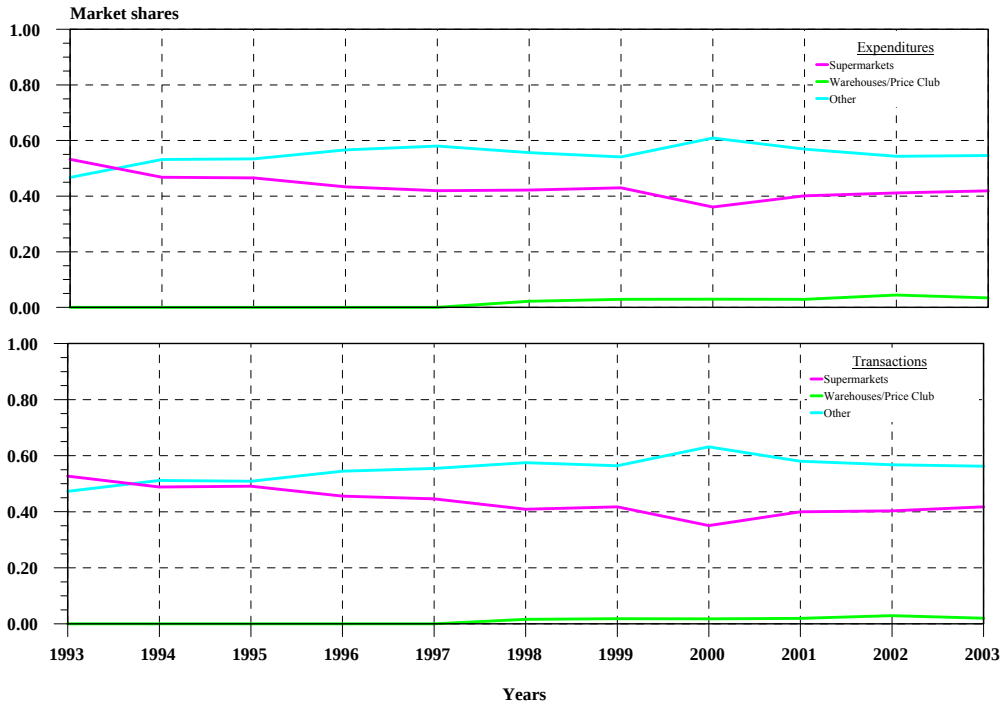

Figure A-4 Percent of yearly market shares for mass merchandising based in flowering/green house plants by expenditures and transactions. Source: AFE and Ipsos-NPD group.

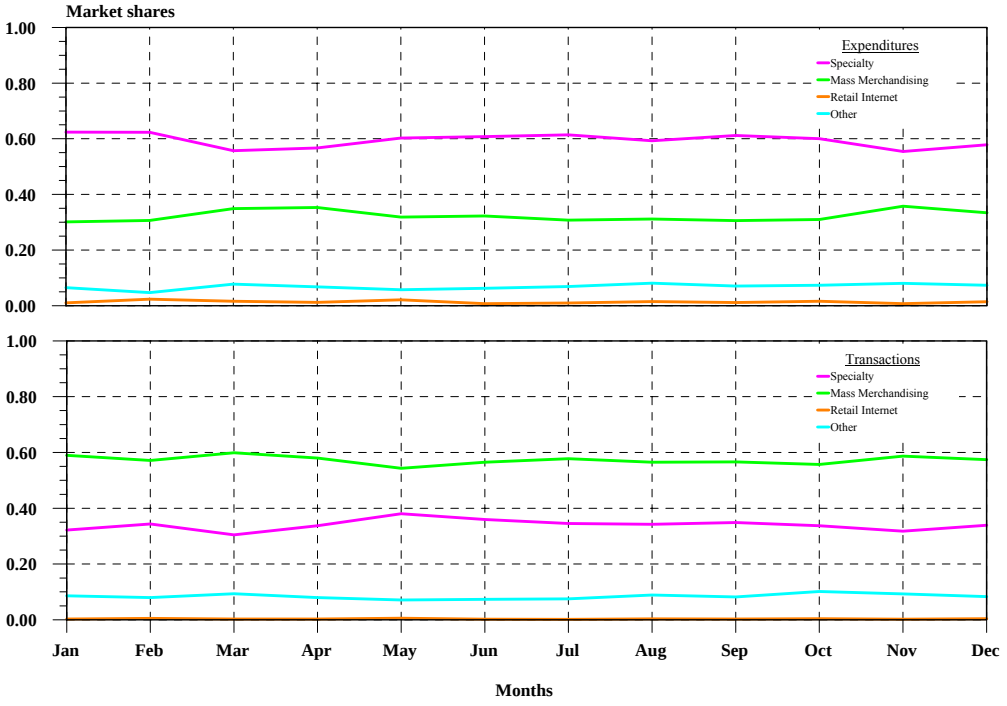

Figure A-5 Percent of monthly market shares based in cut flowers by expenditures and transactions. Source: AFE and Ipsos-NPD group.

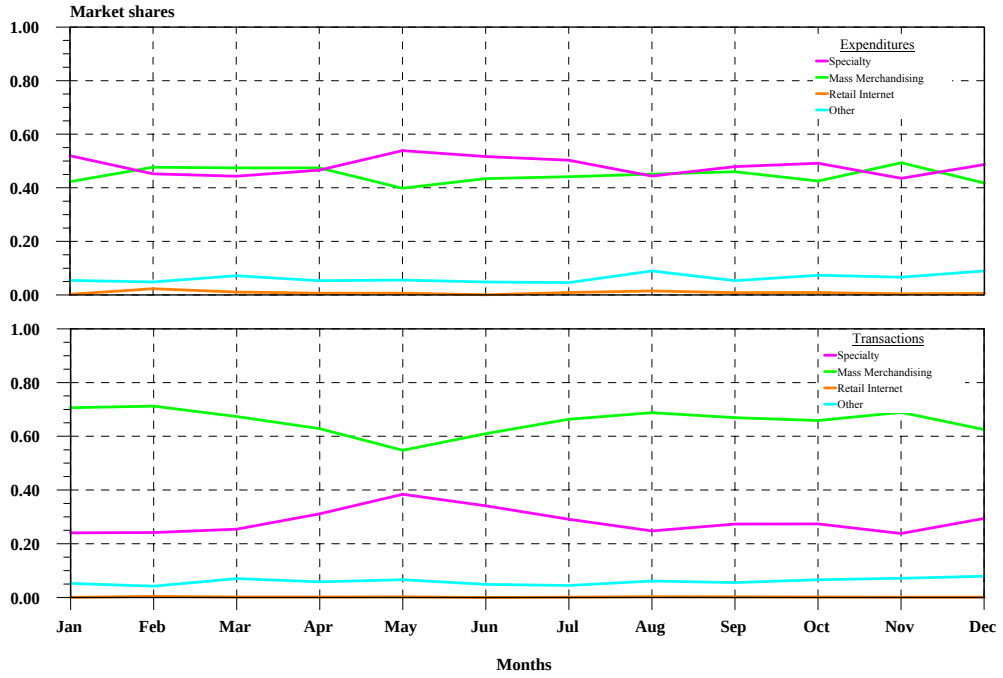

Figure A-6 Percent of monthly market shares based in flowering/green house plants by expenditures and transactions. Source: AFE and Ipsos-NPD group.

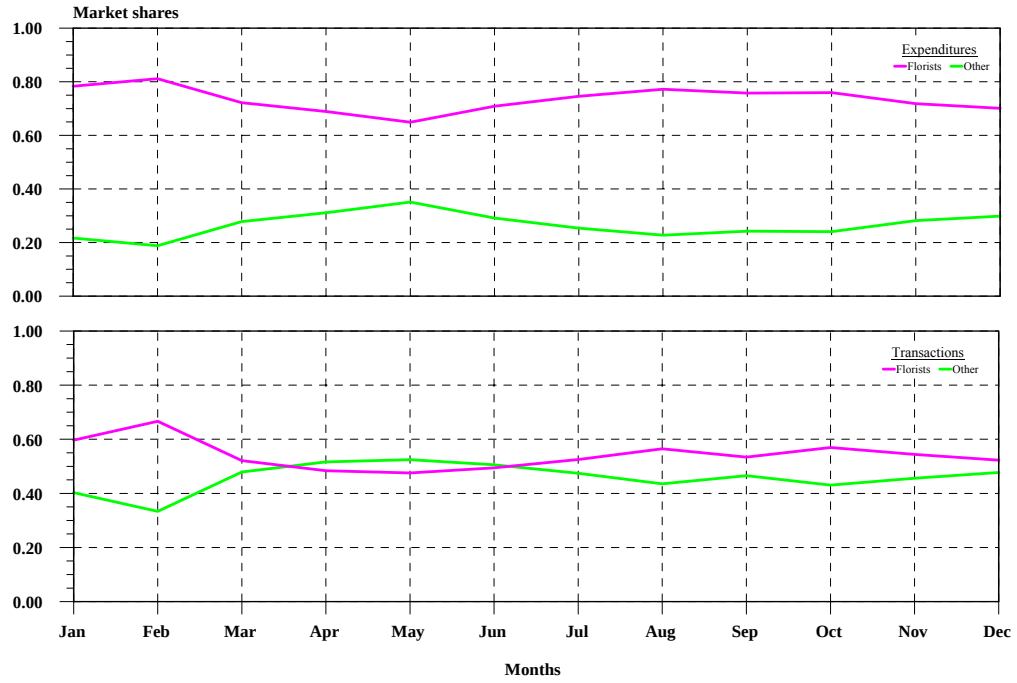

Figure A-7 Percent of monthly specialty market shares based in cut flowers by expenditures and transactions. Source: AFE and Ipsos-NPD group.

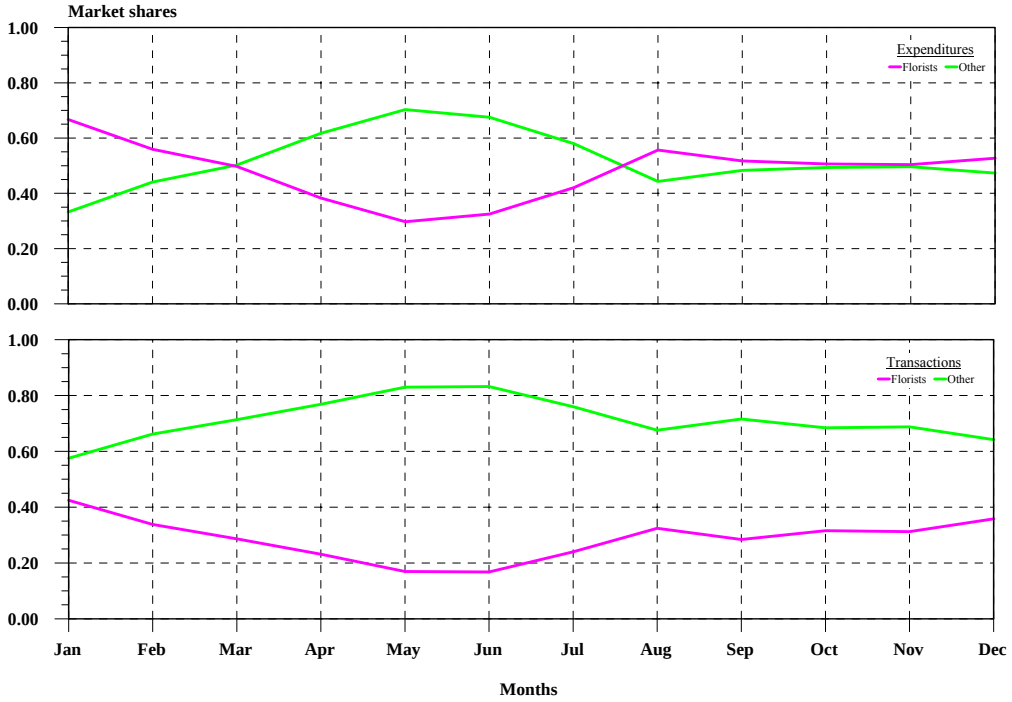

Figure A-4 Percent of monthly specialty market shares based in flowering/green house plants by expenditures and transactions. Source: AFE and Ipsos-NPD group.

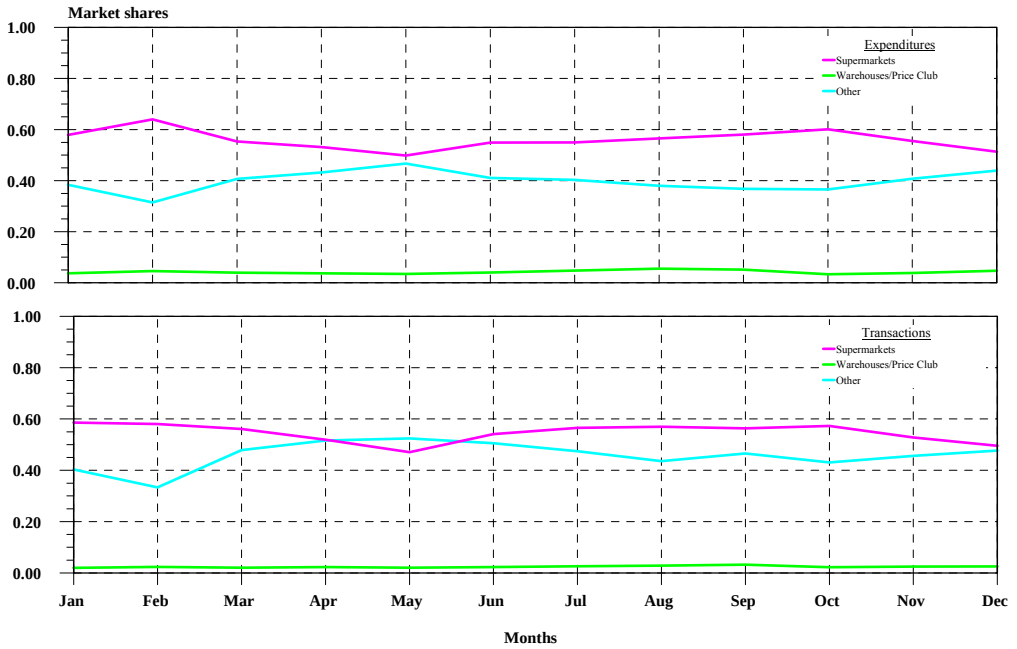

Figure A-5 Percent of monthly mass merchandising market shares based in cut flowers by expenditures and transactions. Source: AFE and Ipsos-NPD group.

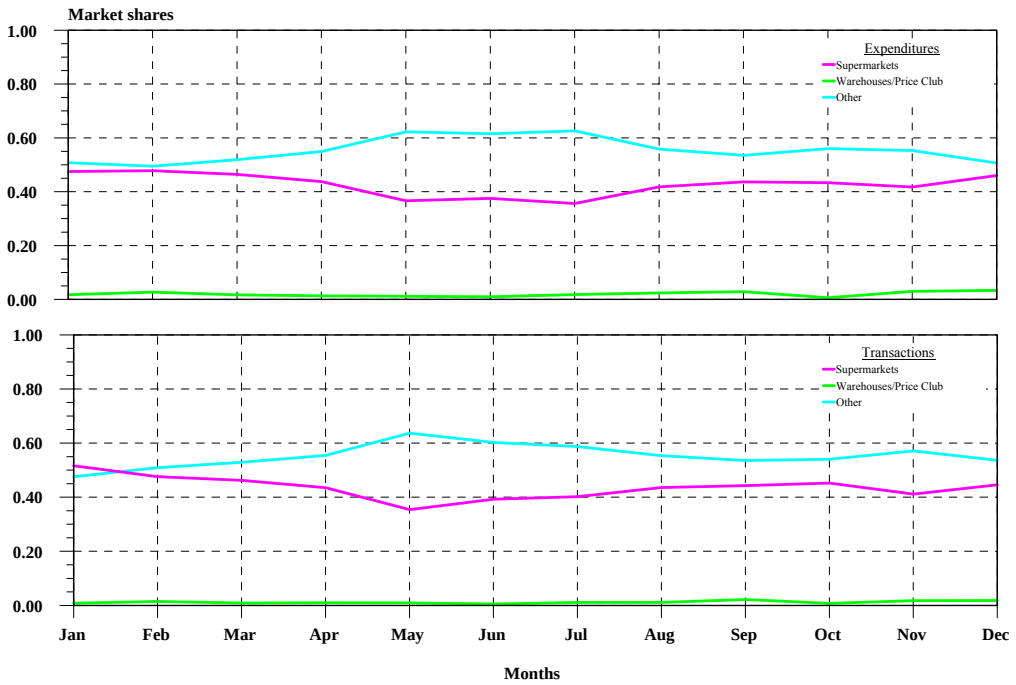

Figure A-6 Percent of monthly mass merchandising market shares based in flowering/green house plants cut flowers by expenditures and transactions. Source: AFE and Ipsos-NPD group.

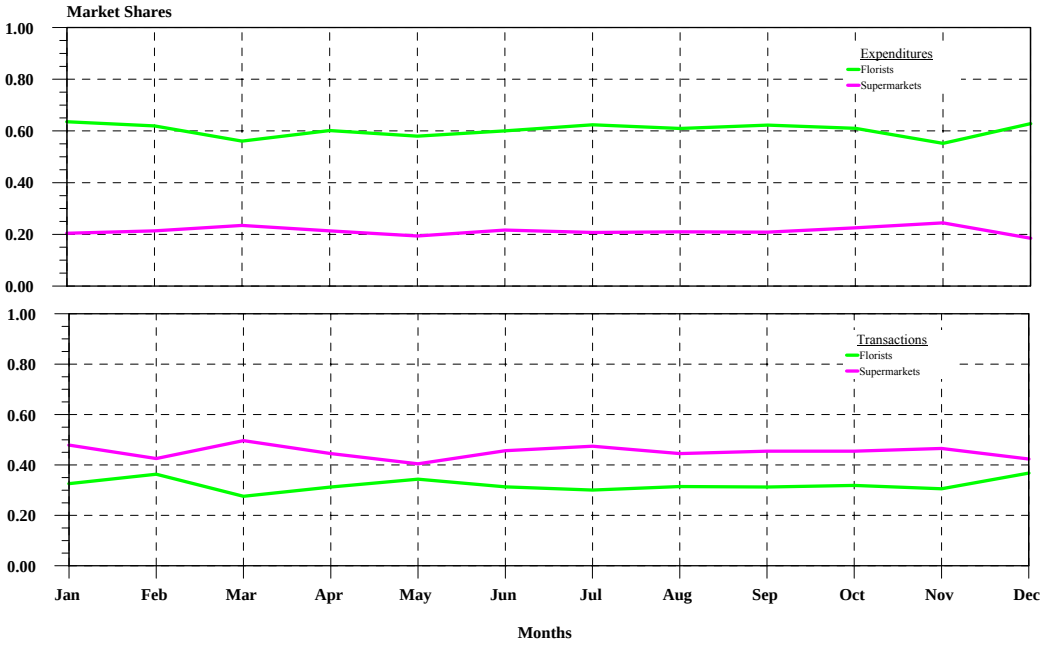

Figure A-7 Percent of monthly market shares in cut flowers for florists and supermarkets by expenditures and transactions. Source: AFE and Ipsos-NPD group.

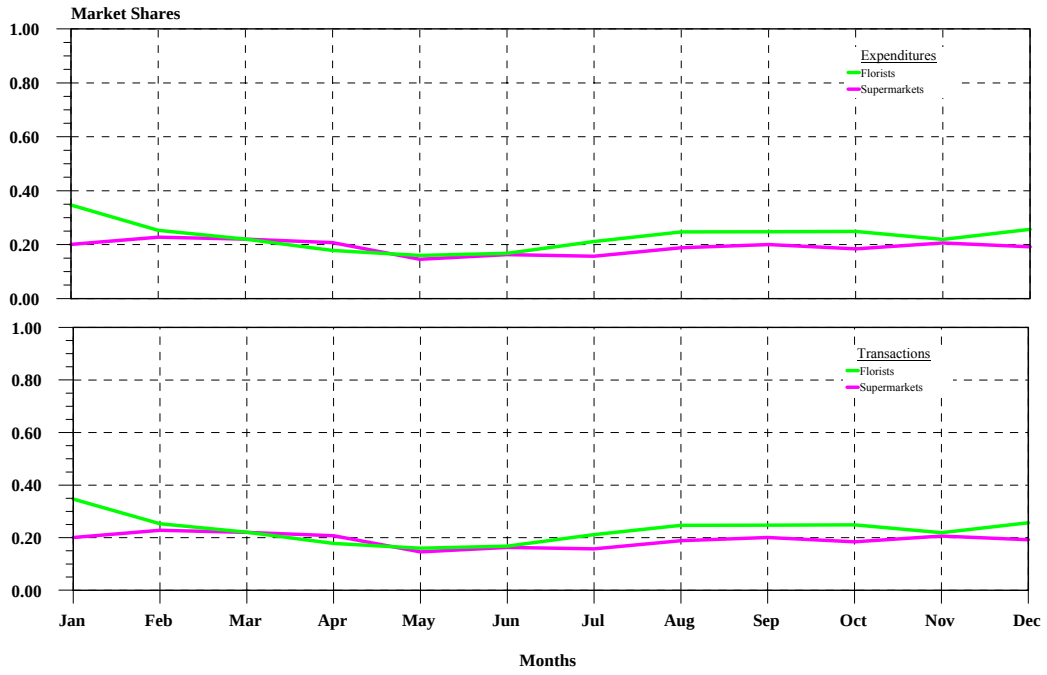

Figure A-8 Percent of monthly market shares in flowering/green house plants for florists and supermarkets by expenditures and transactions. Source: AFE and Ipsos-NPD group.

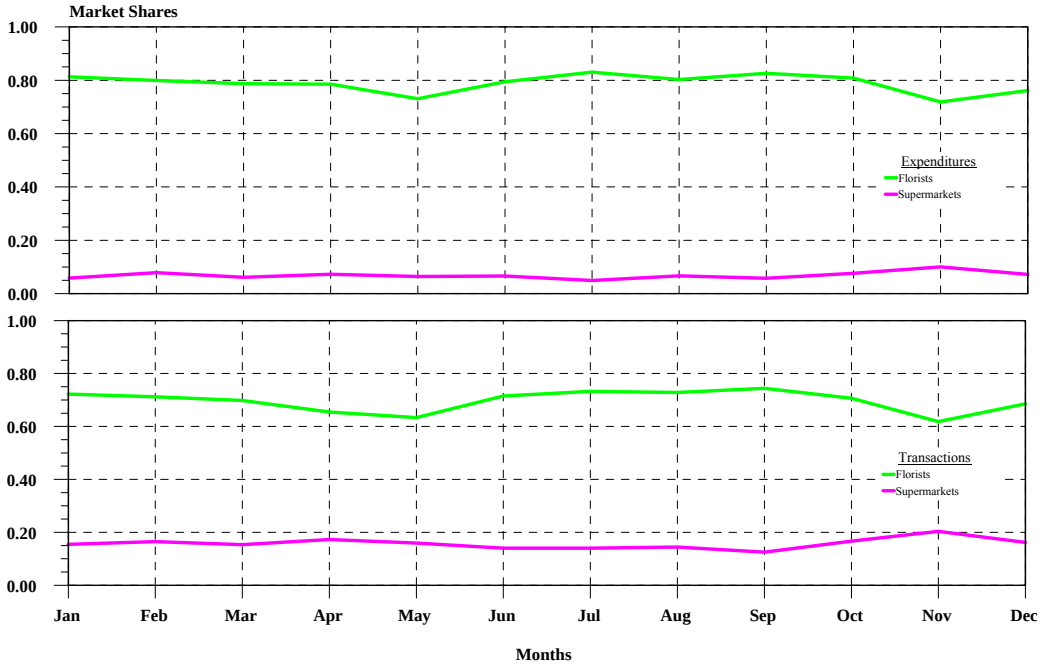

Figure A-9 Percent of monthly market shares in arrangements for florists and supermarkets by expenditures and transactions. Source: AFE and Ipsos-NPD group.

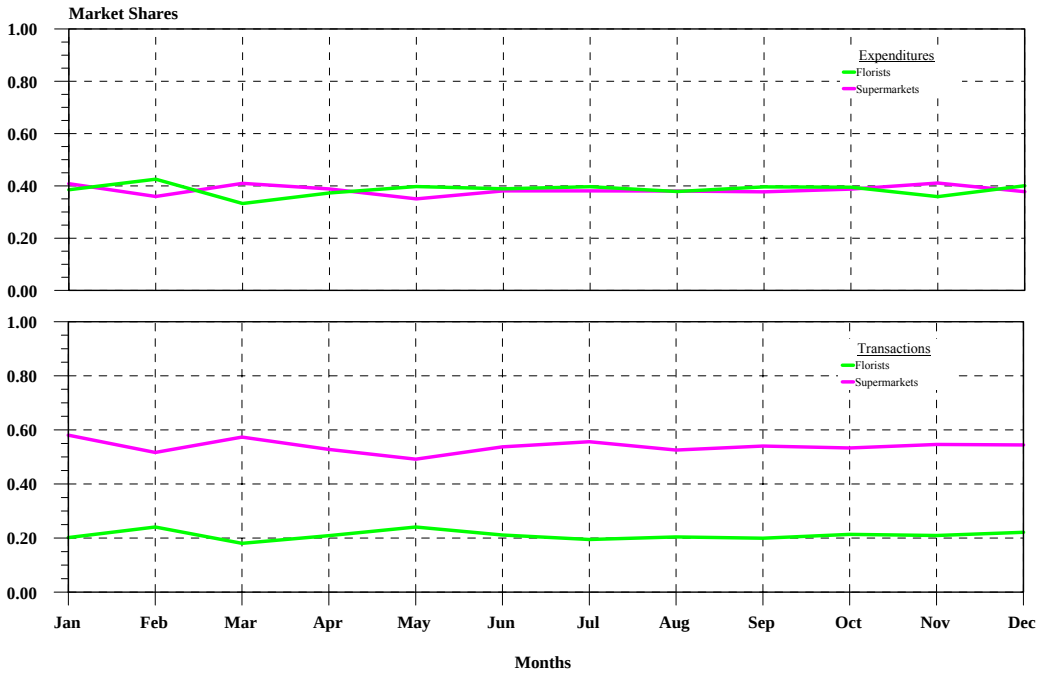

Figure A-10 Percent of monthly market shares in non-arrangements for florists and supermarkets by expenditures and transactions. Source: AFE and Ipsos-NPD group.

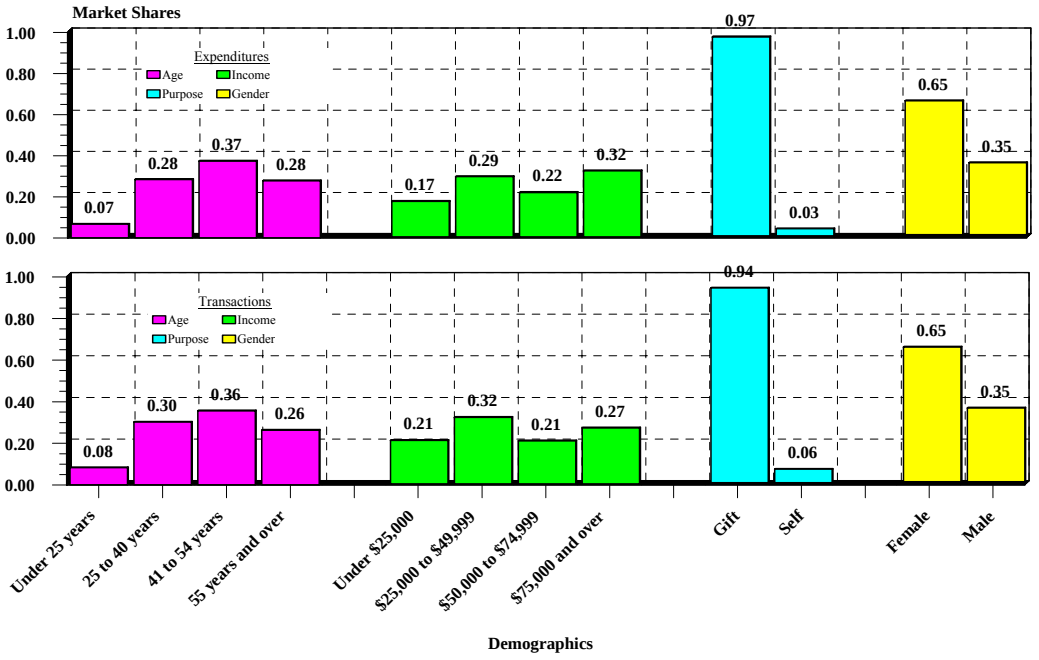

Figure A-11 Distribution of market shares based in cut flowers arrangements by expenditures and transactions. Source: AFE and Ipsos-NPD group.

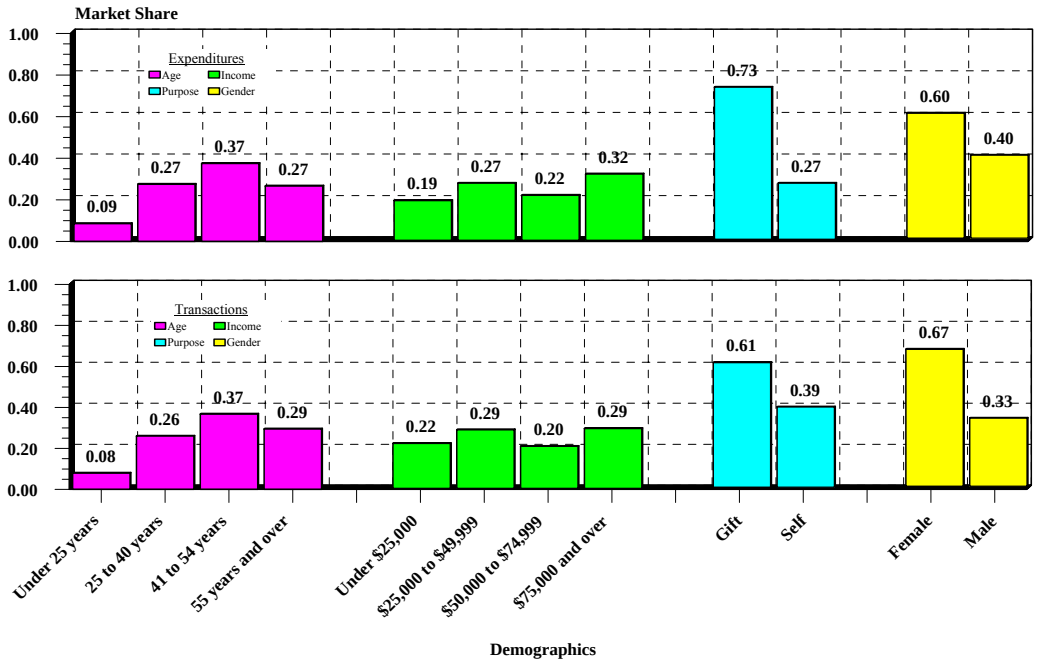

Figure A-12 Distribution of market shares based in cut flowers non-arrangements by expenditures and transactions. Source: AFE and Ipsos-NPD group.

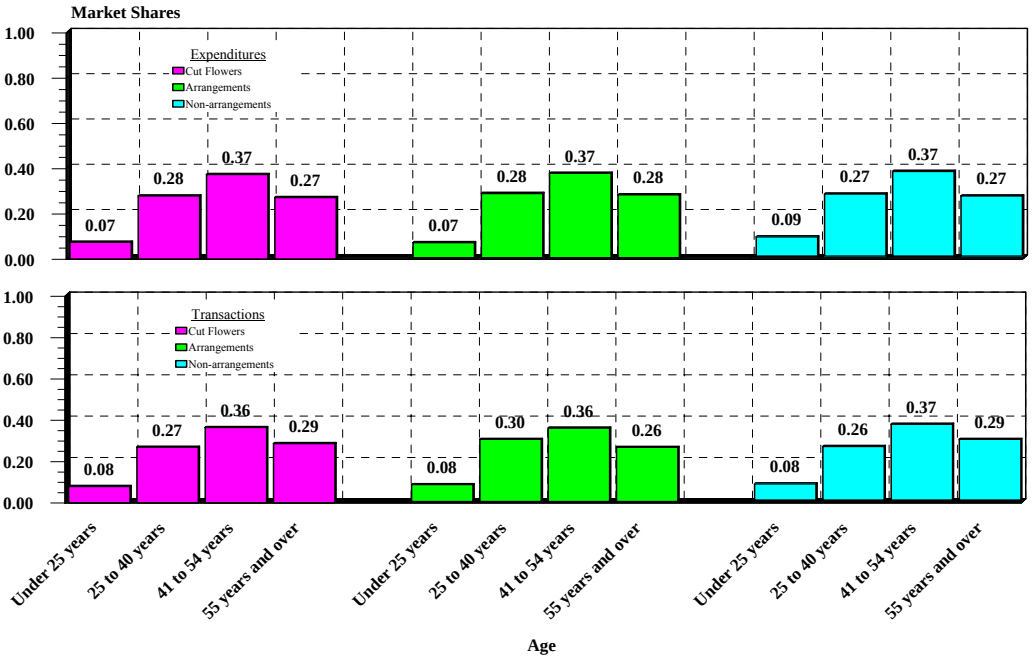

Figure A-13 Distribution of market shares based on age by expenditures and transactions. Source: AFE and Ipsos-NPD group.

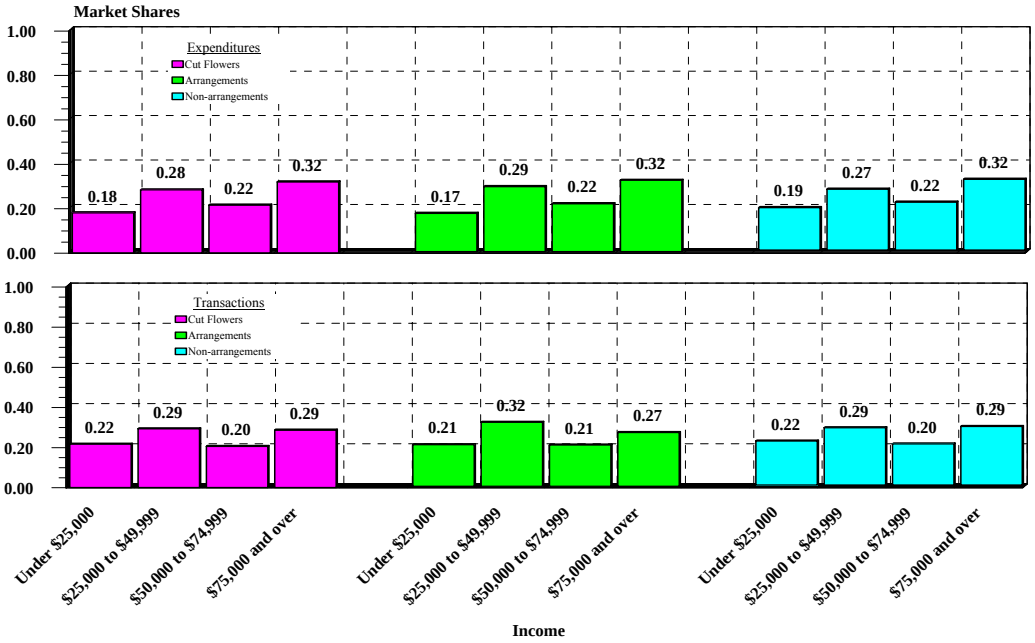

Figure A-14 Distribution of market shares based on income by expenditures and transactions. Source: AFE and Ipsos-NPD group.

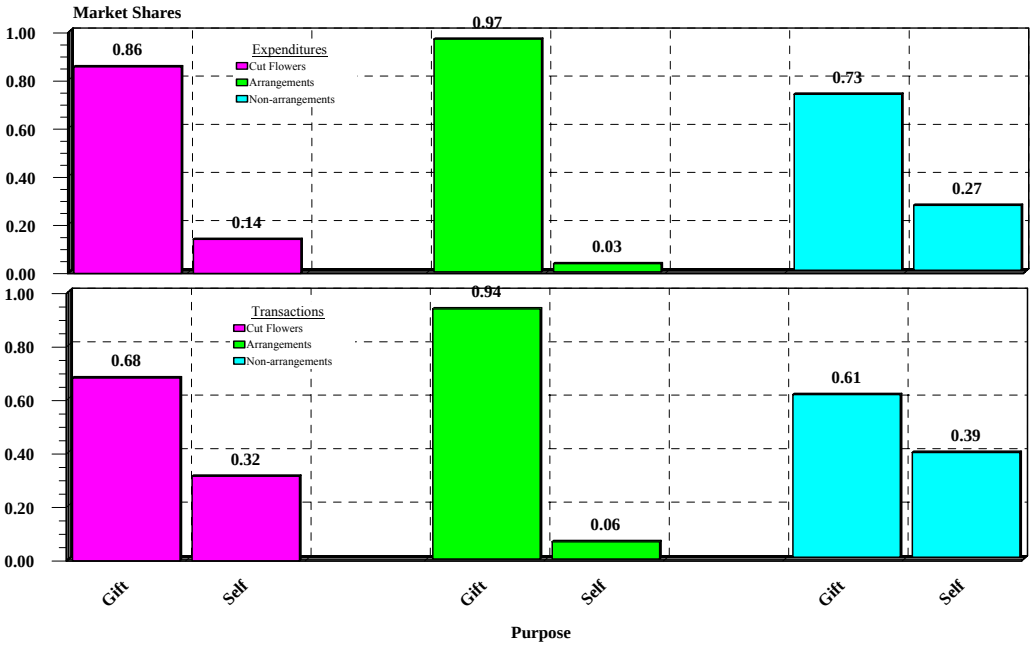

Figure A-15 Distribution of market shares based on purpose by expenditures and transactions. Source: AFE and Ipsos-NPD group.

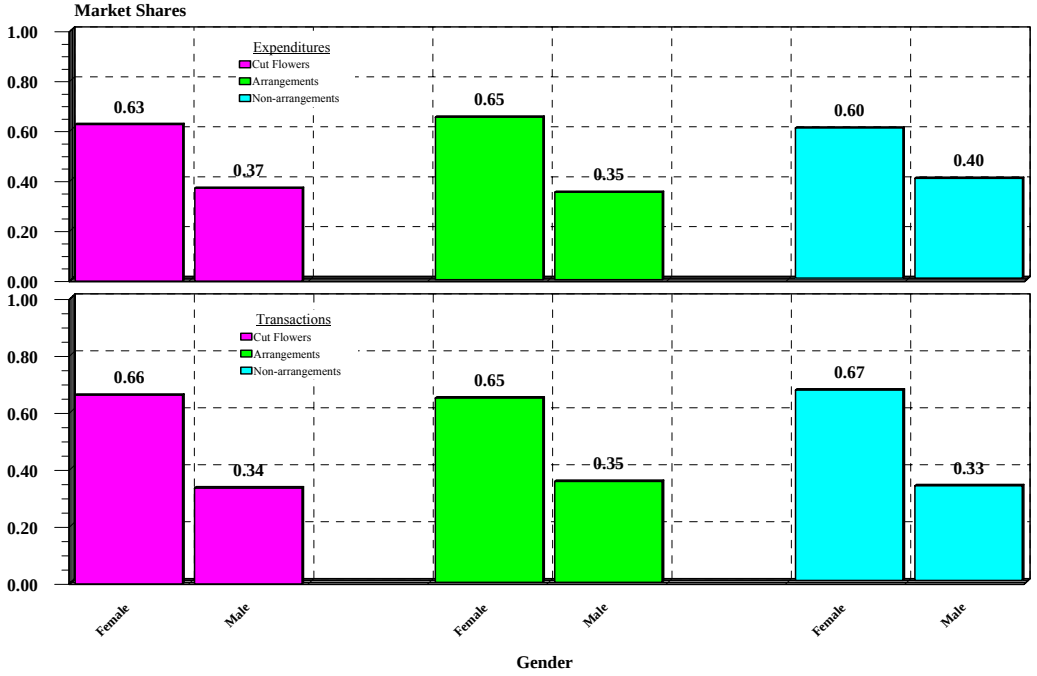

Figure A-16 Distribution of market shares based on gender by expenditures and transactions. Source: AFE and Ipsos-NPD group.

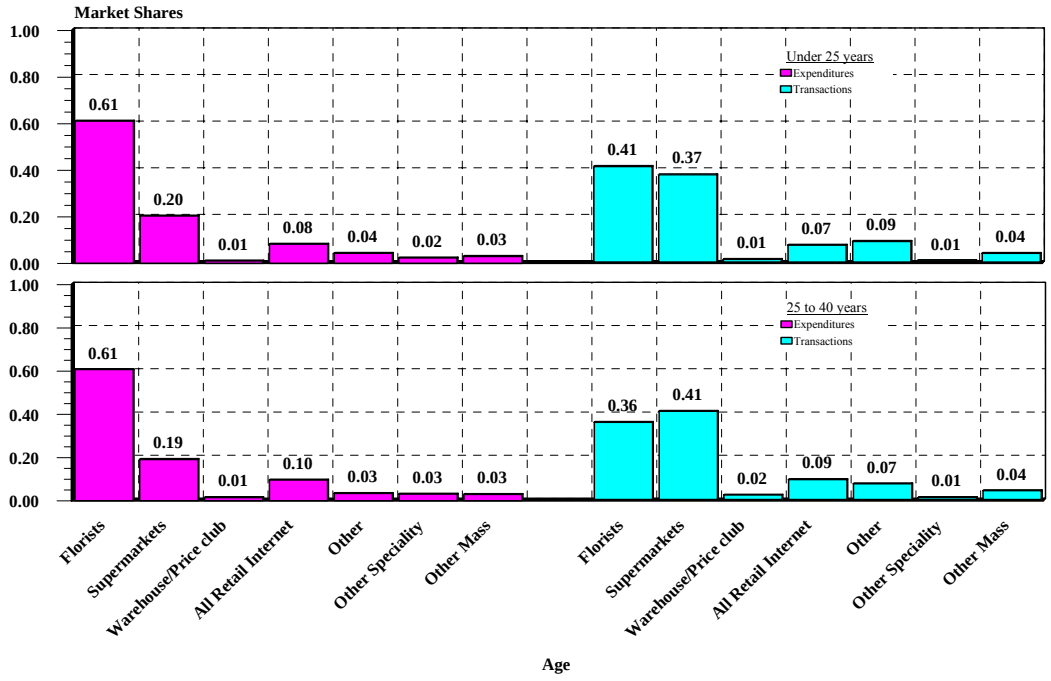

Figure A-17 Distribution of market shares for specific outlets in cut flowers based on age (first and second group) by expenditures and transactions. Source: AFE and Ipsos-NPD group.

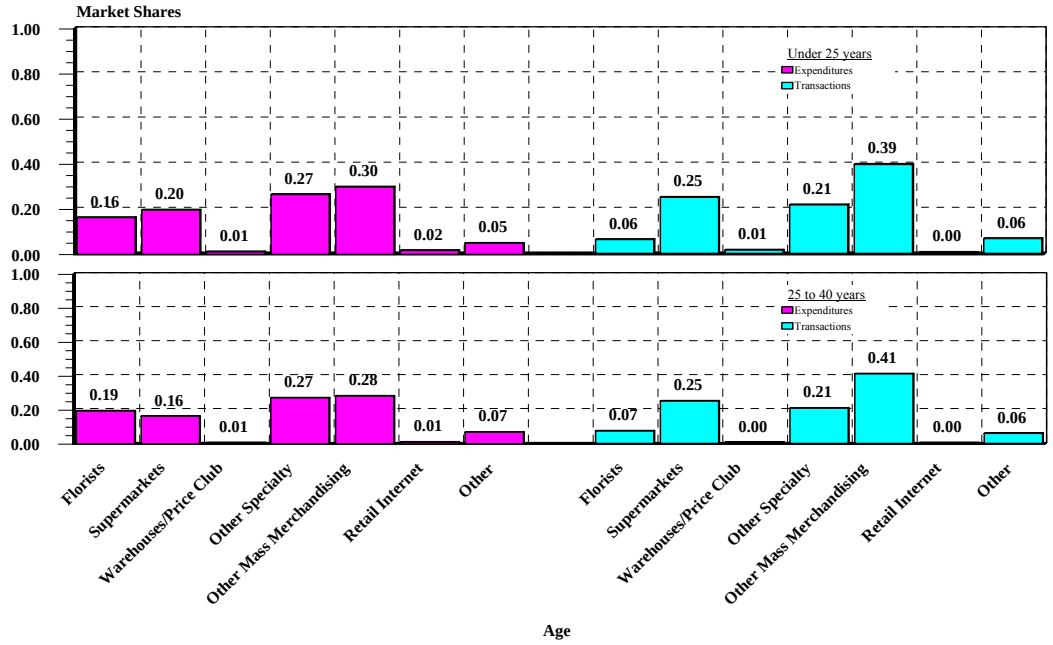

Figure A-18 Distribution of market shares for specific outlets in flowering/green house plants based on age (first and second group) by expenditures and transactions. Source: AFE and Ipsos-NPD group.

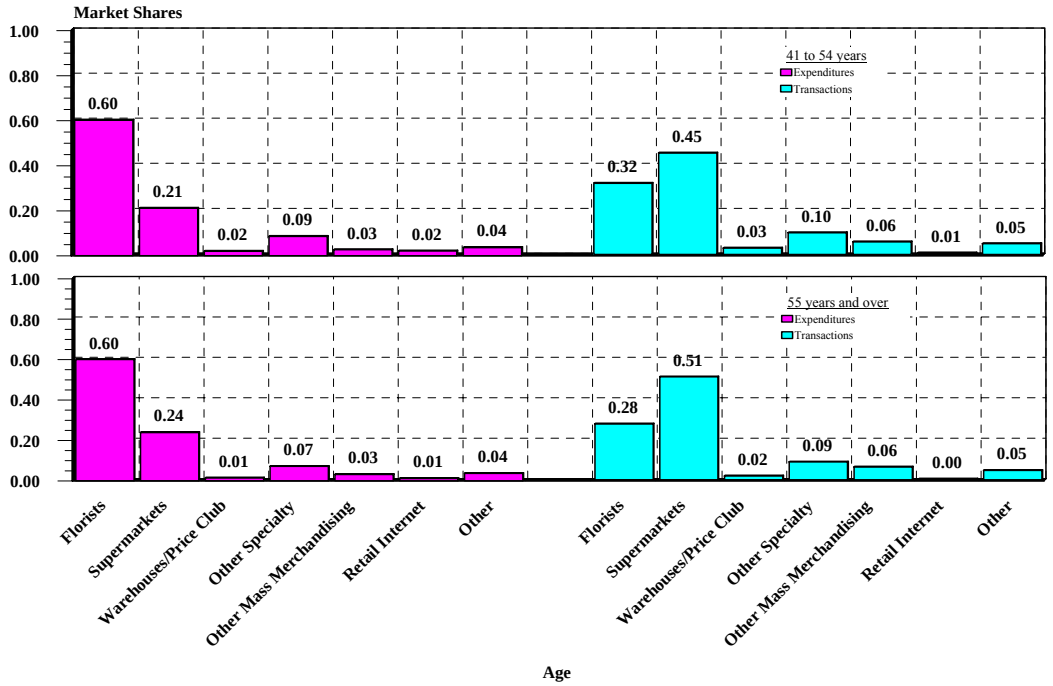

Figure A-19 Distribution of market shares for specific outlets in cut flowers based on age (third and fourth group) by expenditures and transactions. Source: AFE and Ipsos-NPD group.

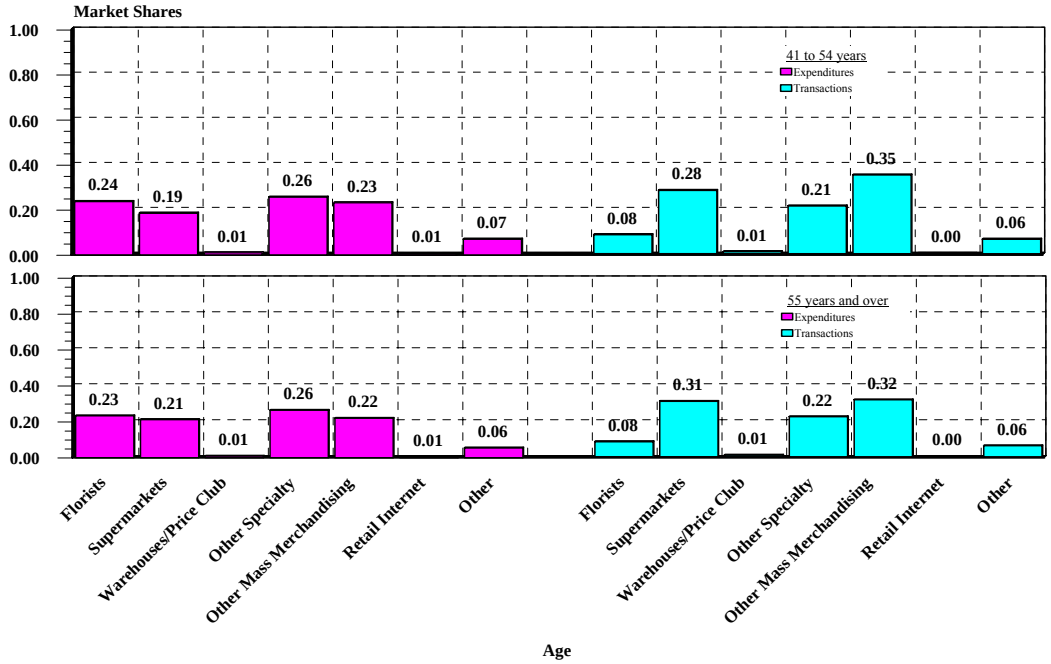

Figure A-20 Distribution of market shares for specific outlets in flowering/green house plants based on age (third and fourth group) by expenditures and transactions. Source: AFE and Ipsos-NPD group.

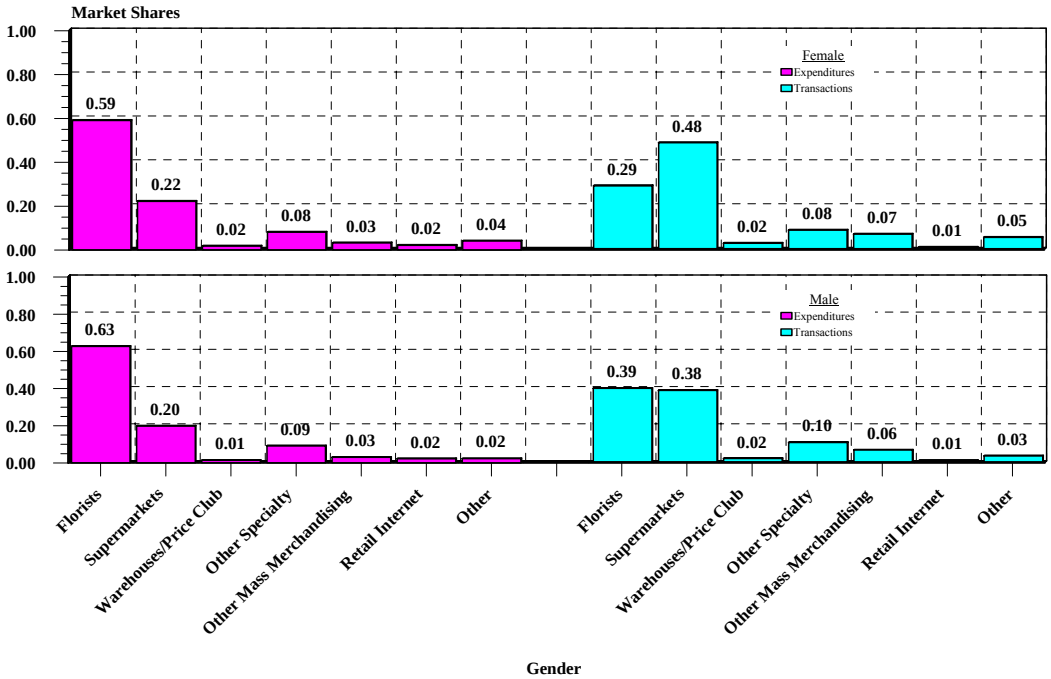

Figure A-21 Distribution of market shares for specific outlets in cut flowers based on gender by expenditures and transactions. Source: AFE and Ipsos-NPD group.

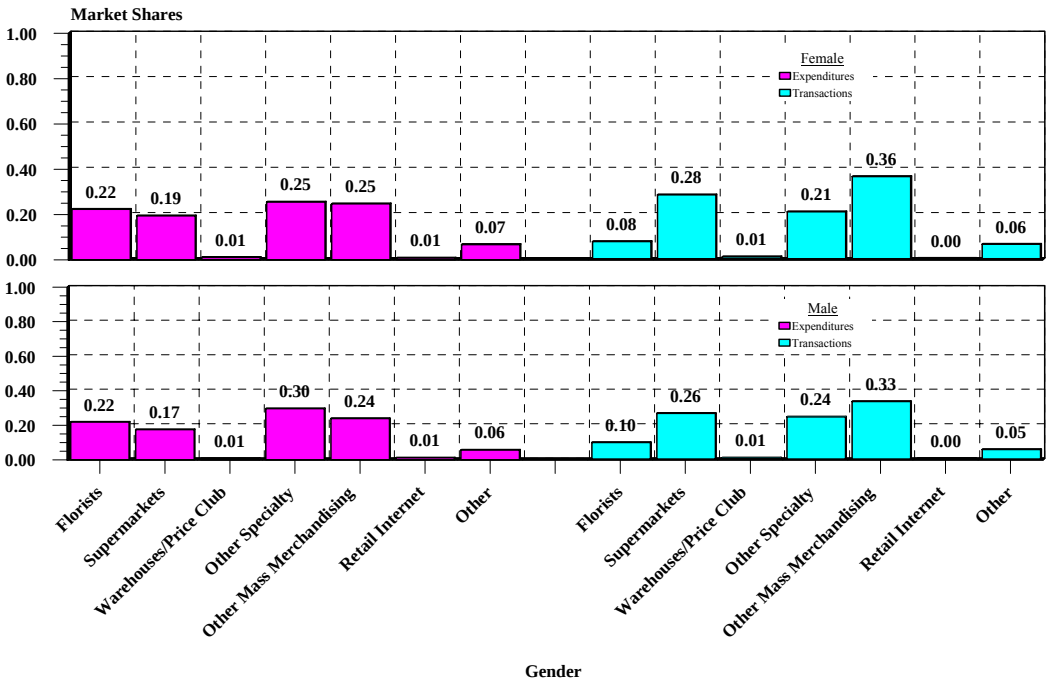

Figure A-22 Distribution of market shares for specific outlets in flowering/green house plants based on gender by expenditures and transactions. Source: AFE and Ipsos-NPD group.

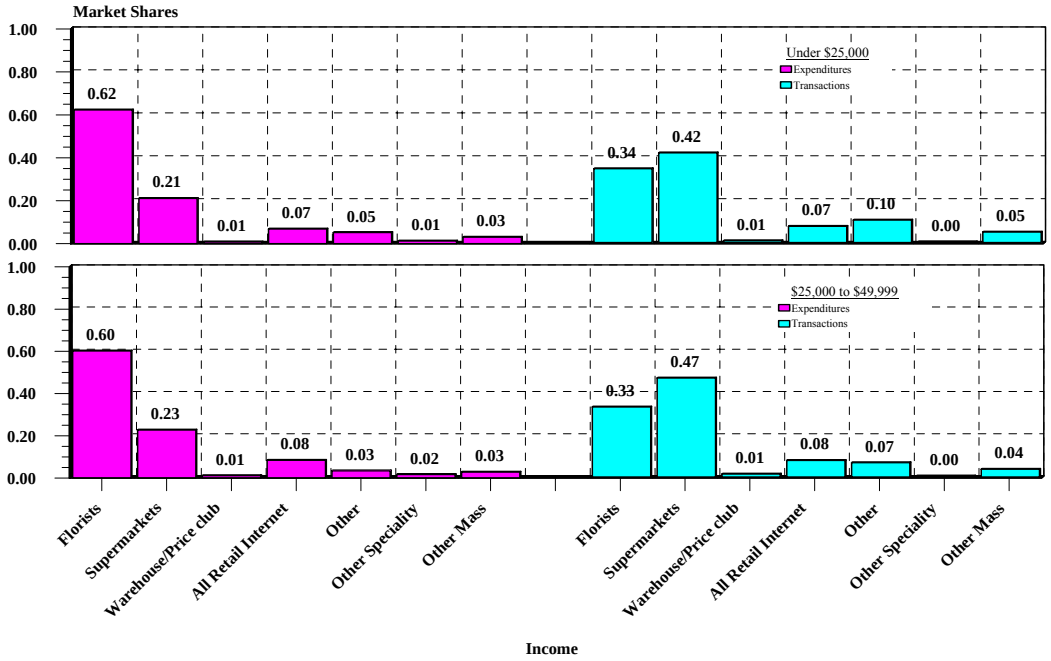

Figure A-23 Distribution of market shares for specific outlets in cut flowers based on income (first and second group) by expenditures and transactions. Source: AFE and Ipsos-NPD group.

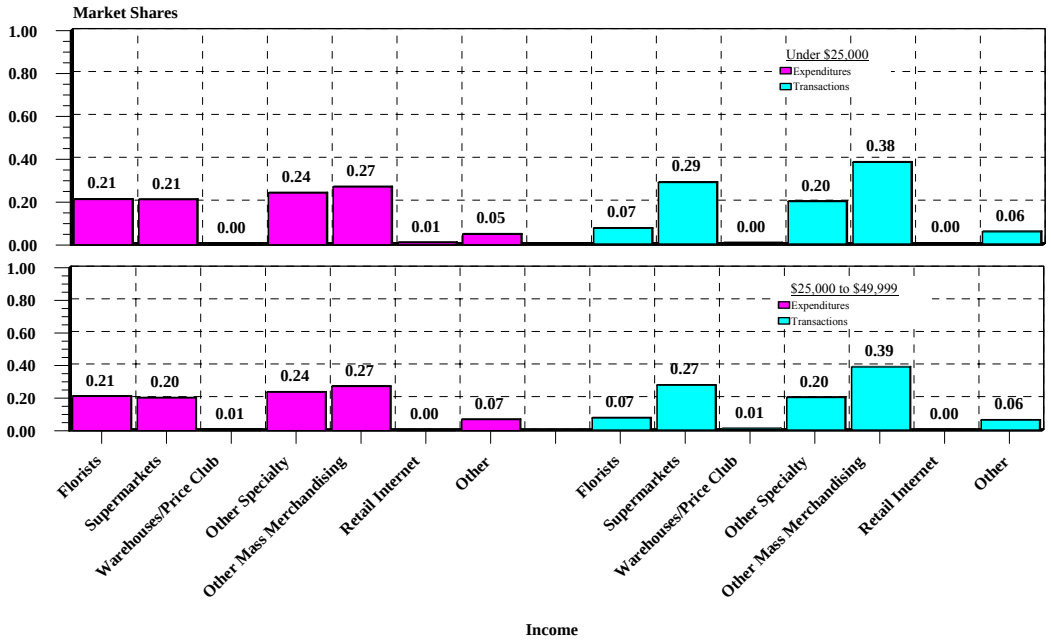

Figure A-24 Distribution of market shares for specific outlets in flowering/green house plants based on income (first and second group) by expenditures and transactions. Source: AFE and Ipsos-NPD group.

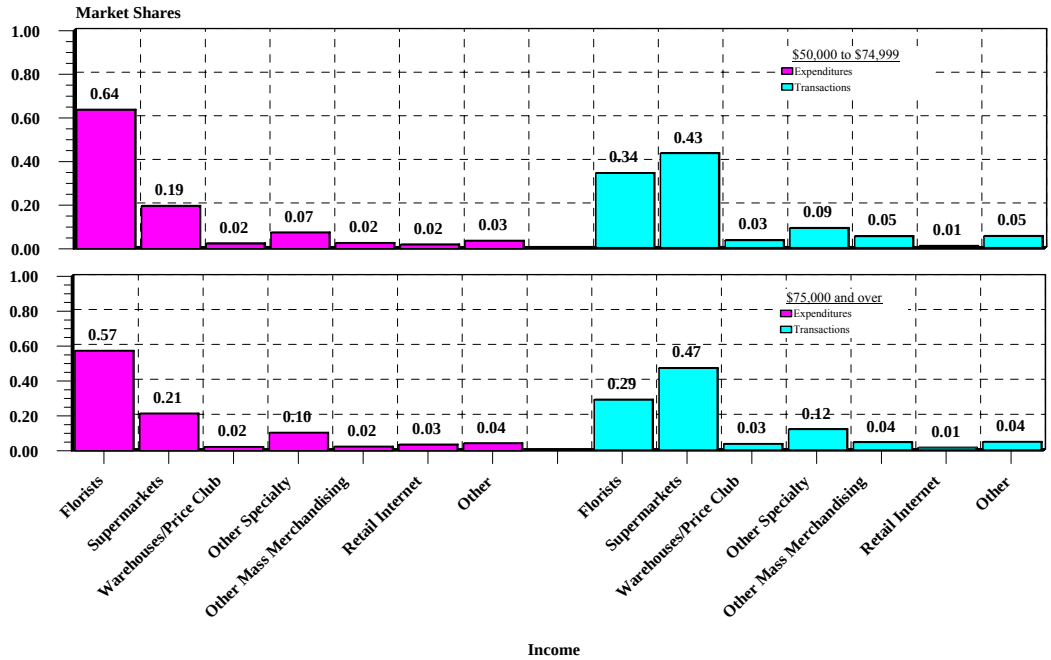

Figure A-25 Distribution of market shares for specific outlets in cut flowers based on income (third and fourth group) by expenditures and transactions. Source: AFE and Ipsos-NPD group.

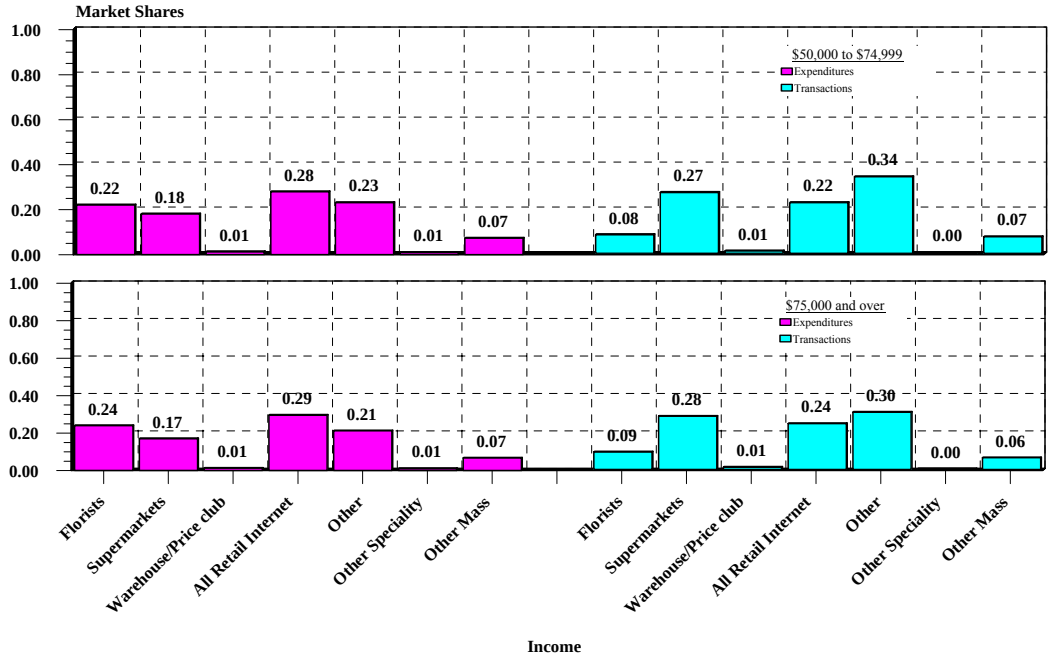

Figure A-26 Distribution of market shares for specific outlets in flowering/green house plants based on income (third and fourth group) by expenditures and transactions. Source: AFE and Ipsos-NPD group.

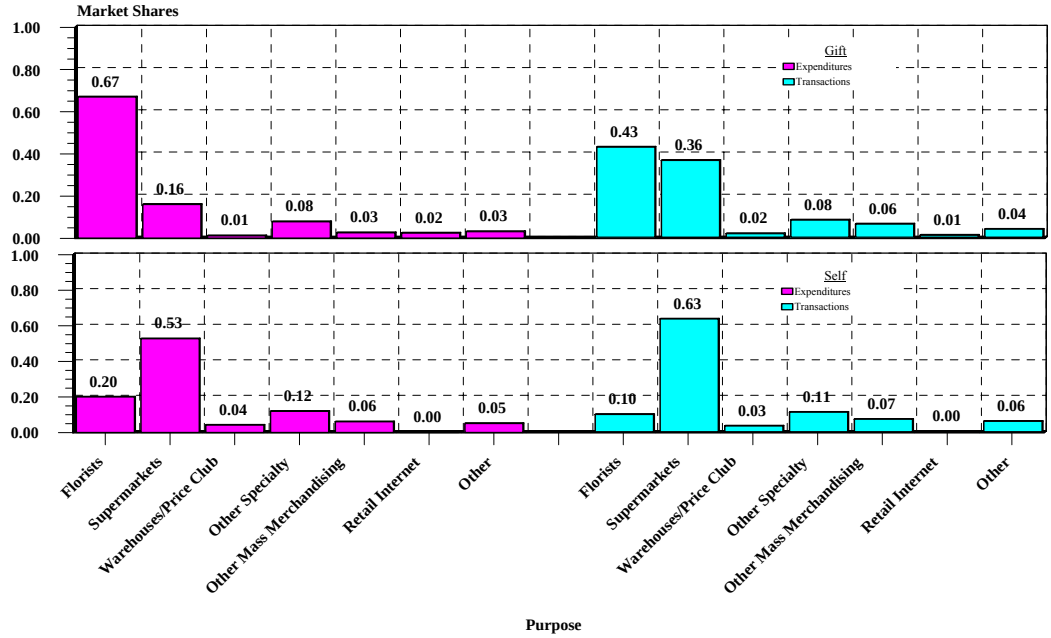

Figure A-27 Distribution of market shares for specific outlets in cut flowers based on purpose by expenditures and transactions. Source: AFE and Ipsos-NPD group.

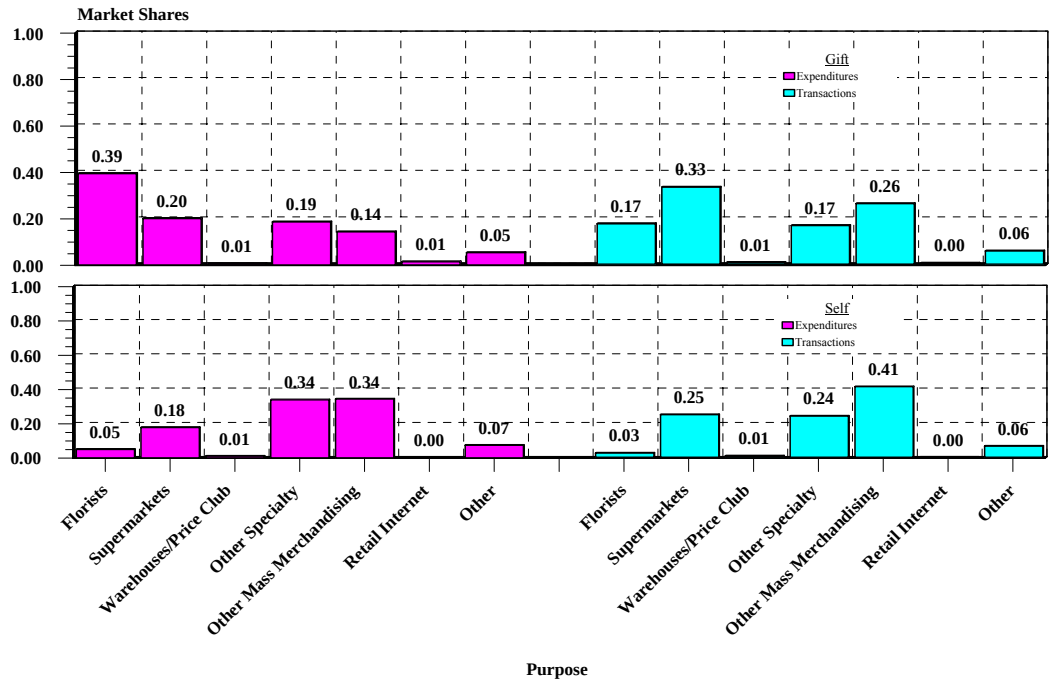

Figure A-28 Distribution of market shares for specific outlets in flowering/green house plants based on purpose by expenditures and transactions. Source: AFE and Ipsos-NPD group.

APPENDIX B
TIME RECURSIVE COEFFICIENTS

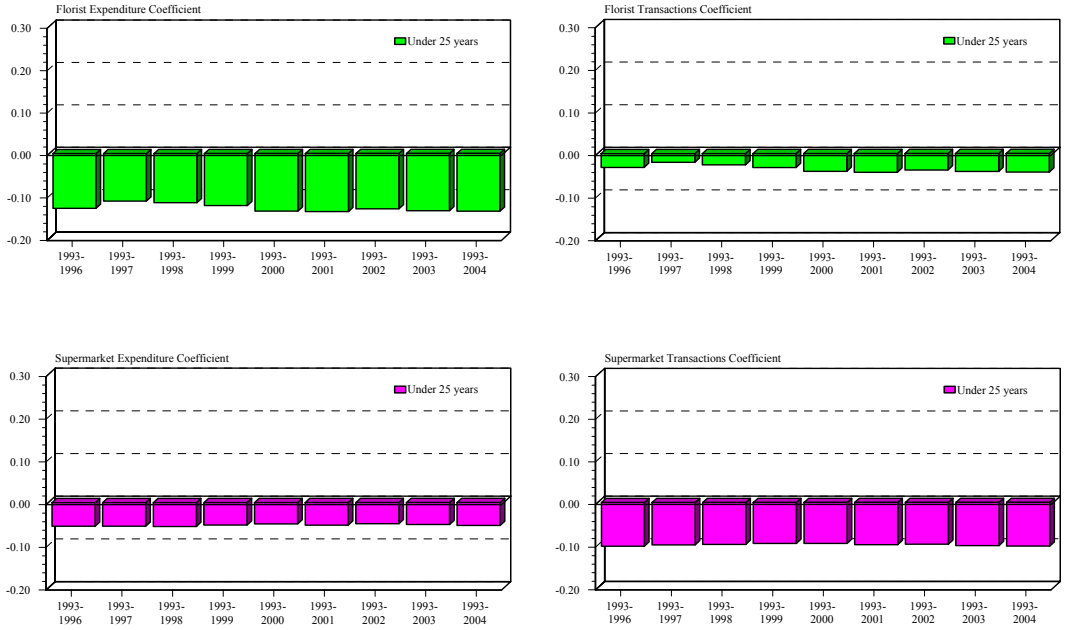

Figure B-1 Time recursive parameters for the under 25 years of age group.

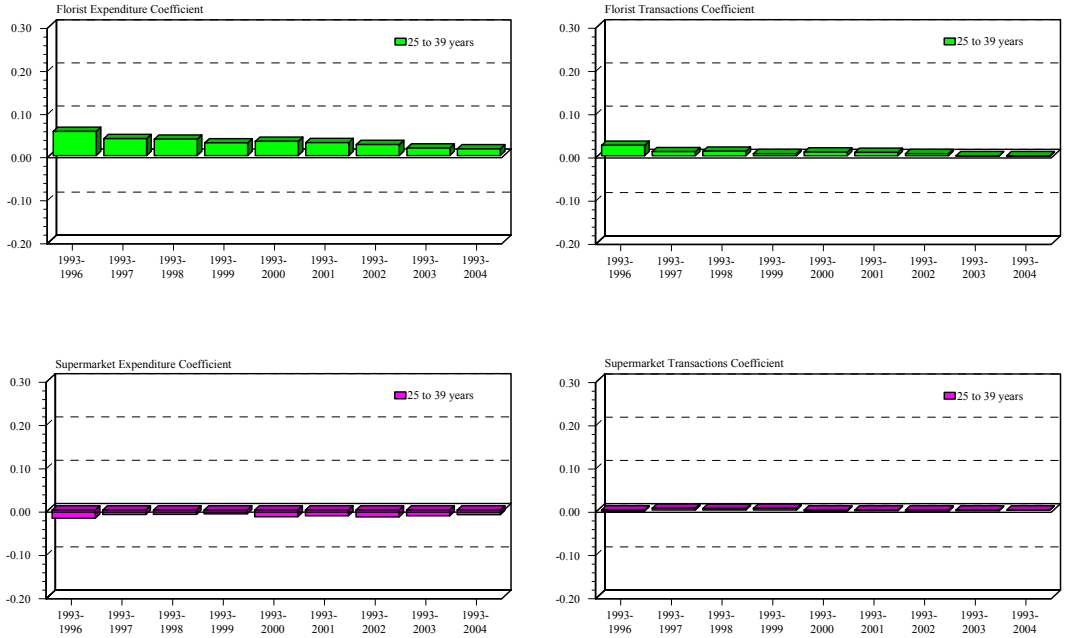

Figure B-2 Time recursive parameters for the 25 to 39 years of age group.

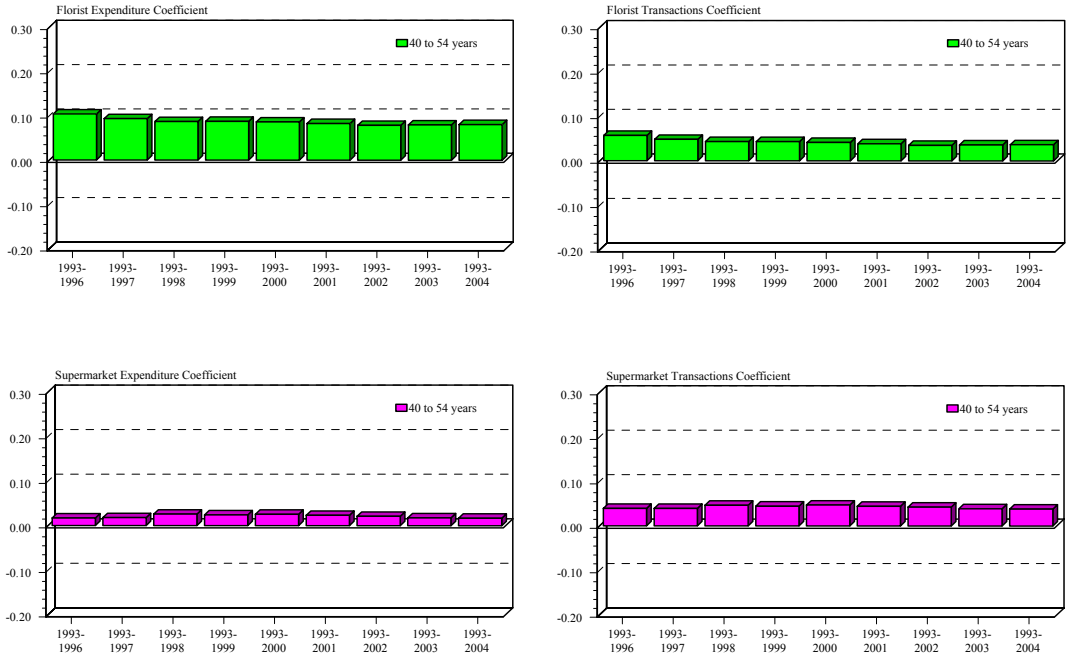

Figure B-3 Time recursive parameters for the 40 to 54 years of age group.

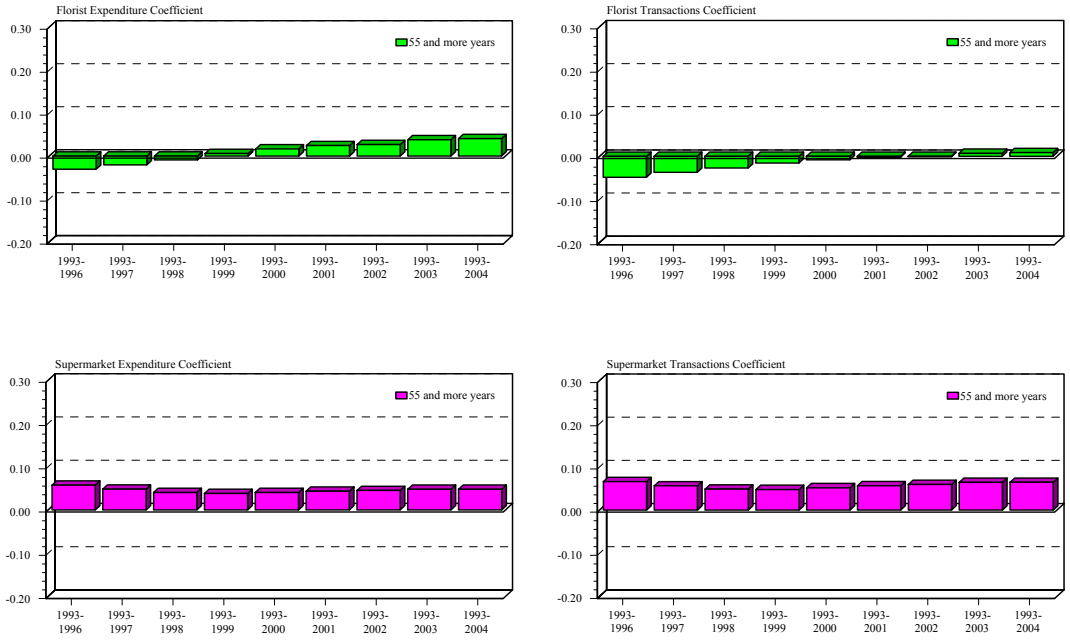

Figure B-4 Time recursive parameters for the 55 and more years of age group.

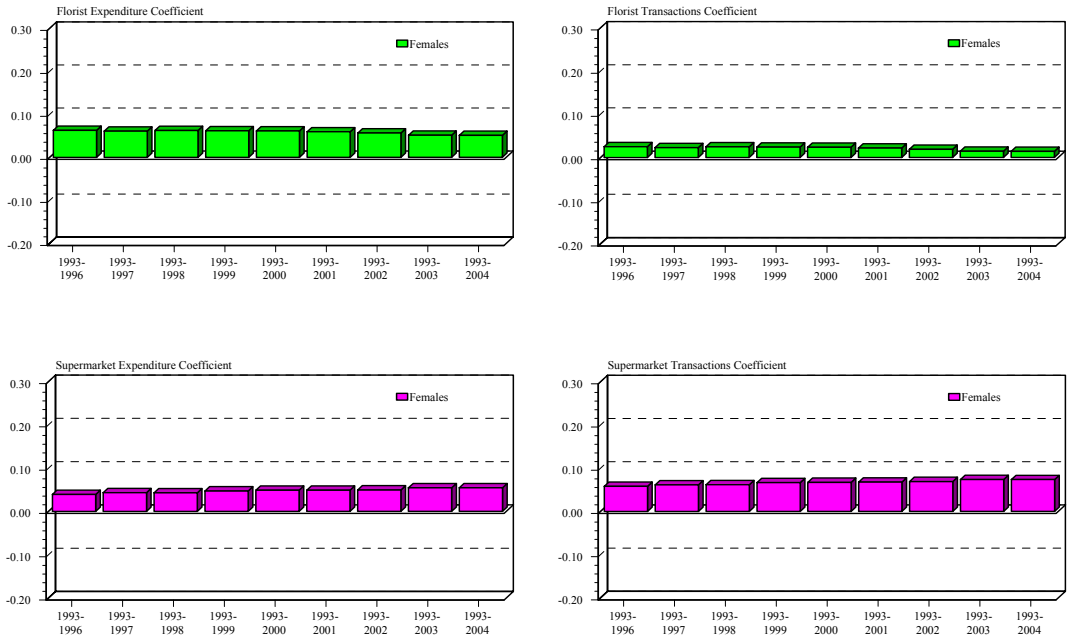

Figure B-5 Time recursive parameters for females.

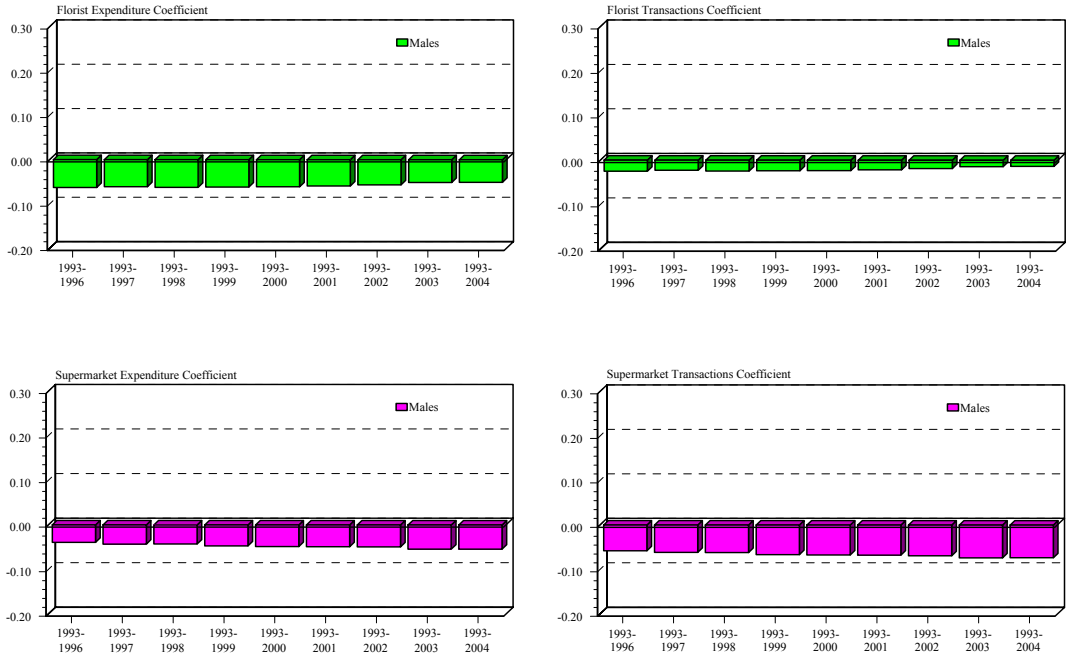

Figure B-6 Time recursive parameters for males.

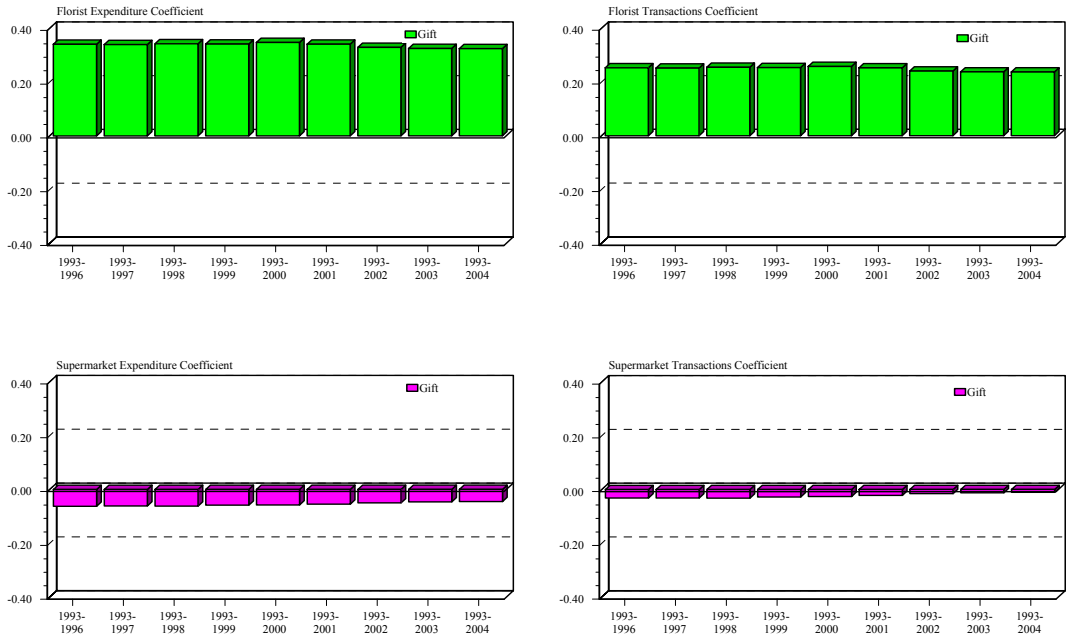

Figure B-7 Time recursive parameters for gift.

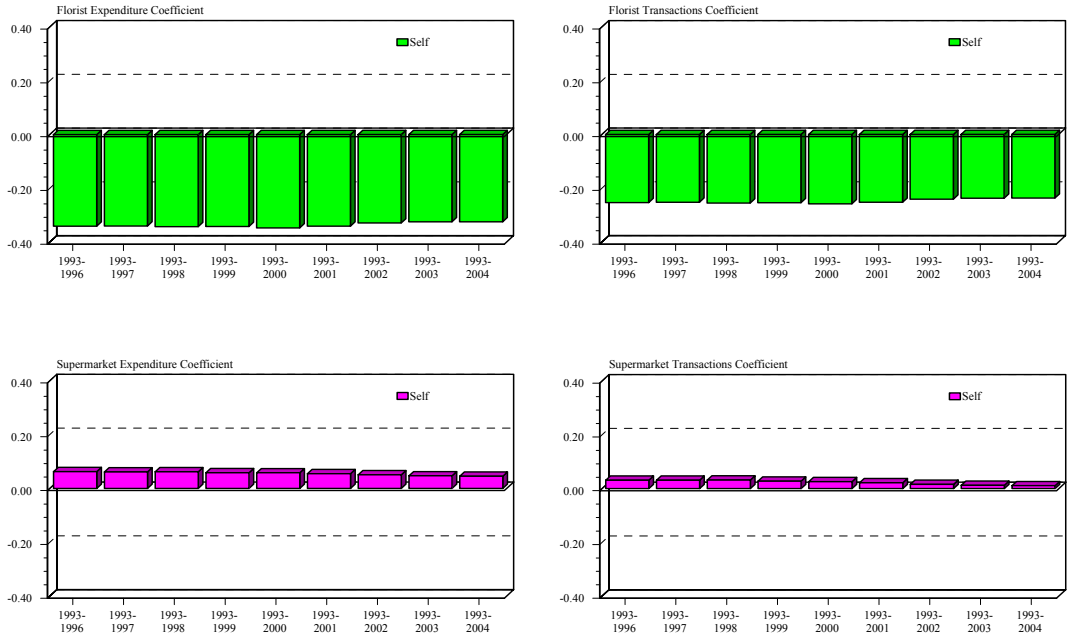

Figure B-8 Time recursive parameters for self.

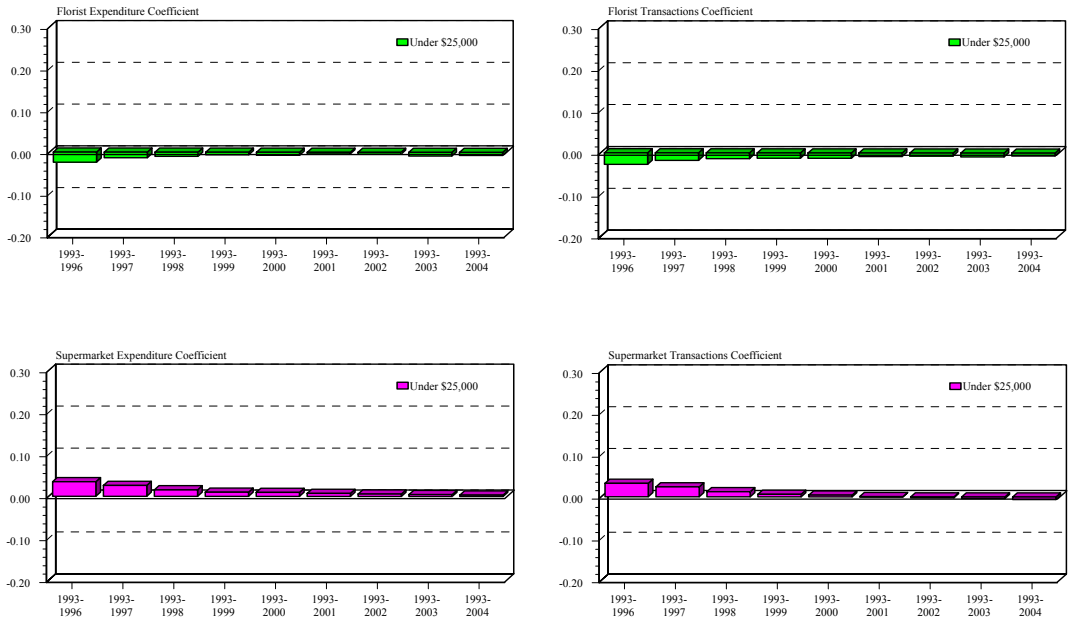

Figure B-9 Time recursive parameters for the under $25,000 income group.

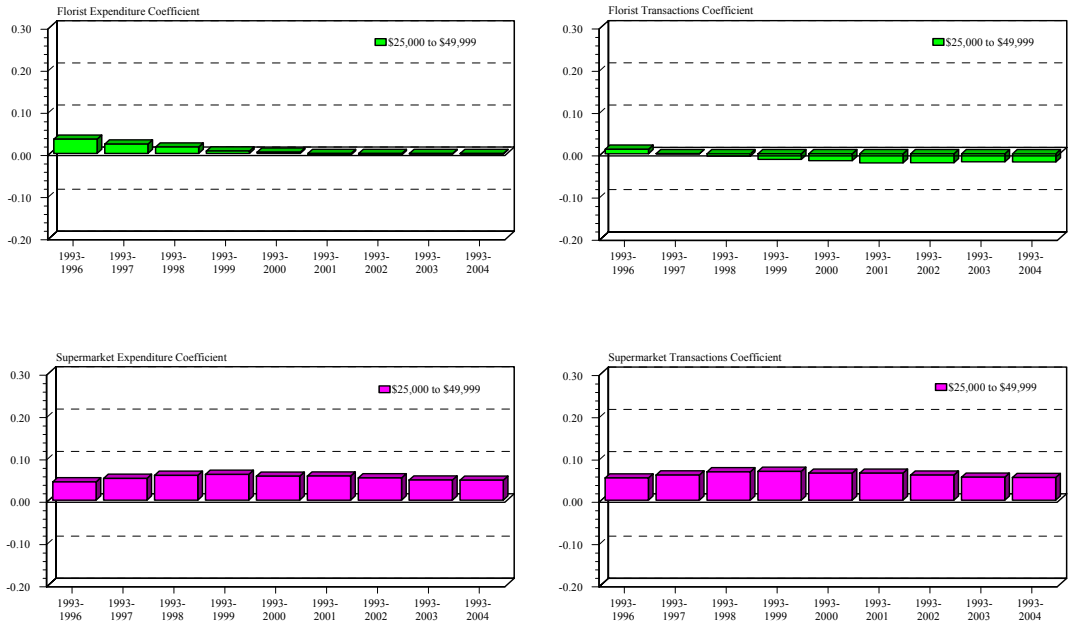

Figure B-10 Time recursive parameters for the $25,000 to $49,999 income group.

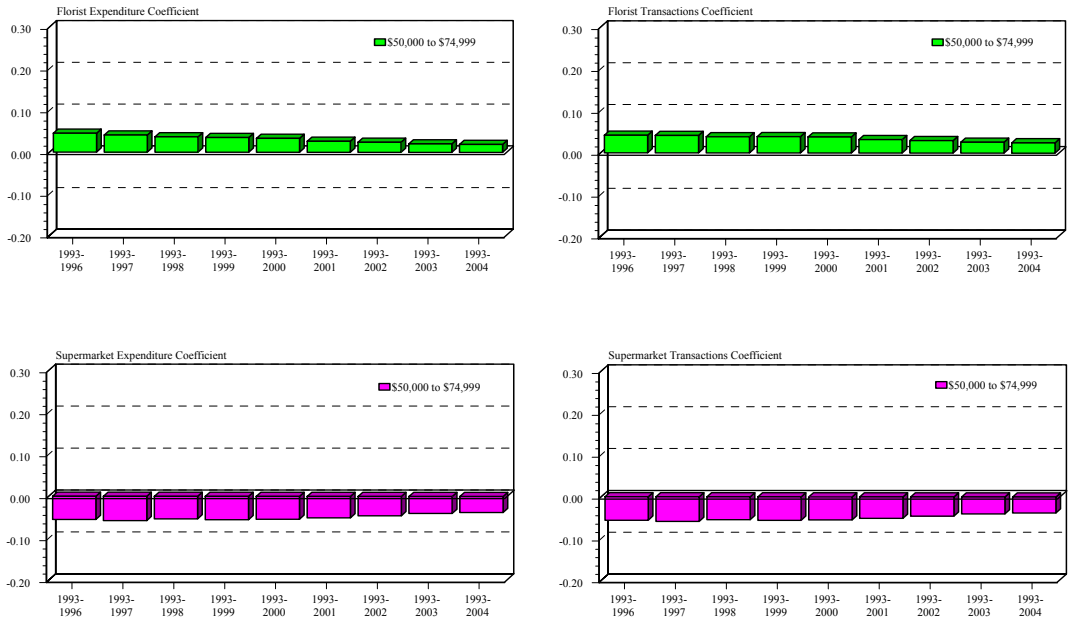

Figure B-11 Time recursive parameters for the $50,000 to $74,999 income group.

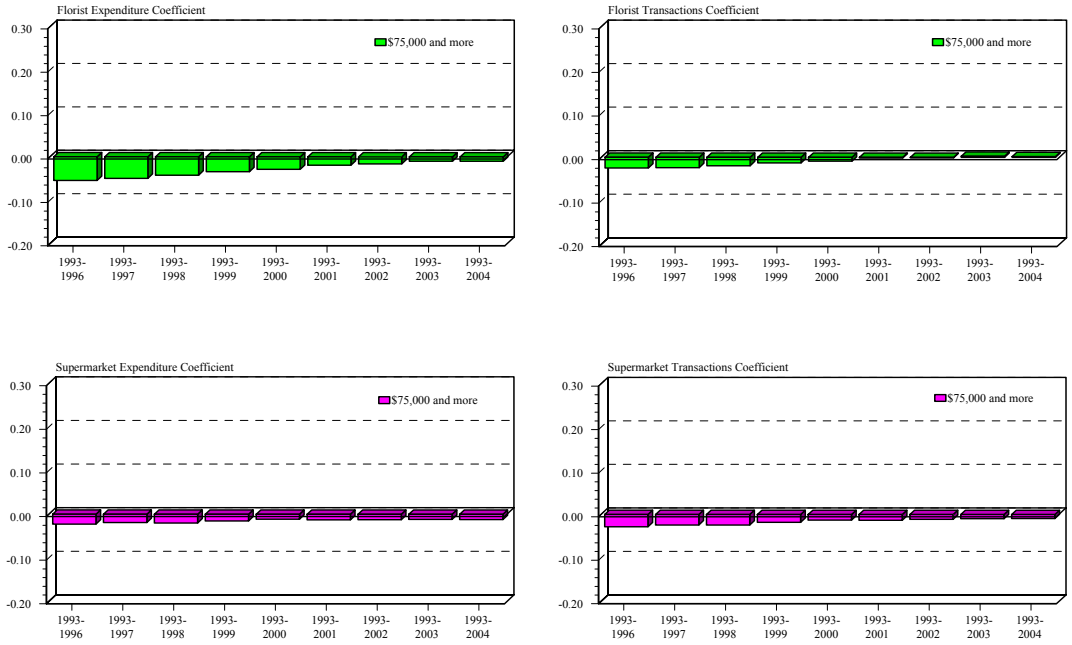

Figure B-12 Time recursive parameters for the $75,000 and more income group.

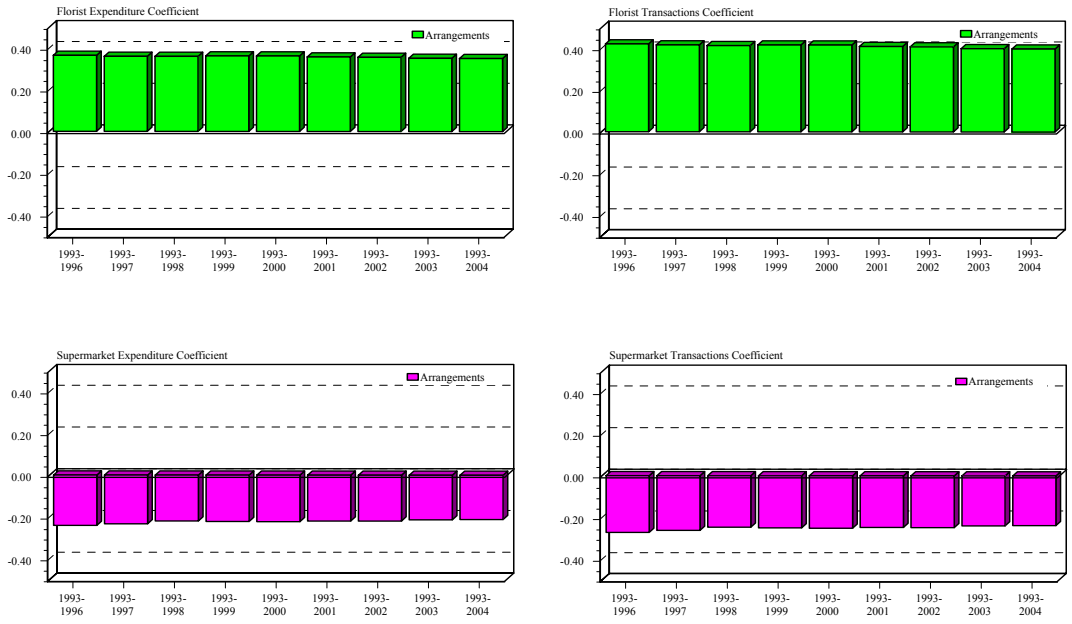

Figure B-13 Time recursive parameters for arrangements.

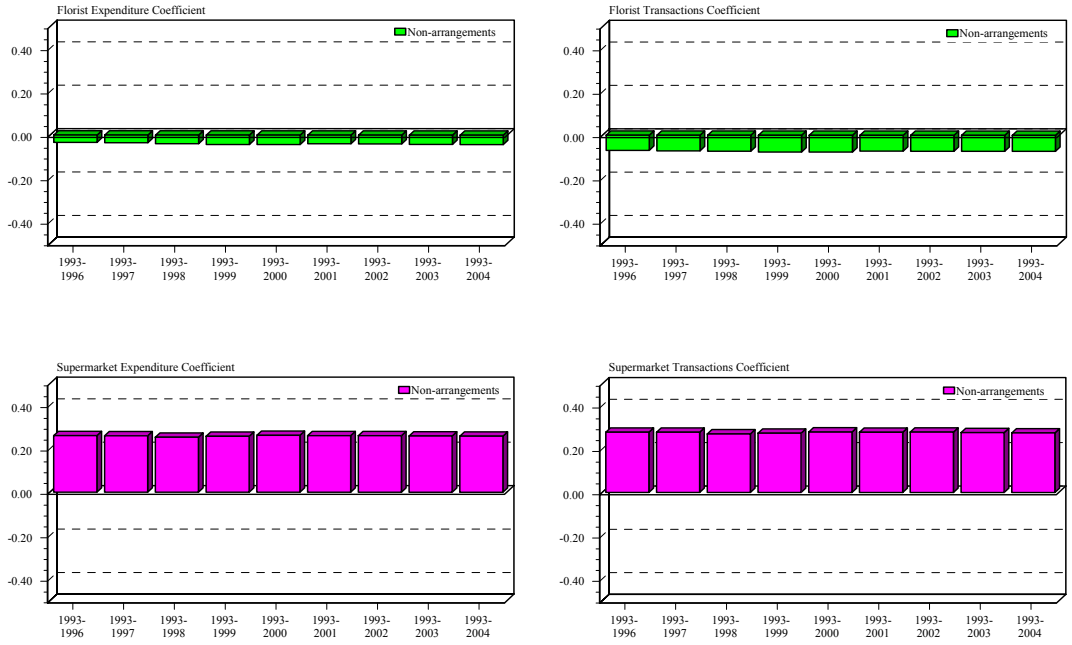

Figure B-14 Time recursive parameters for non-arrangements.

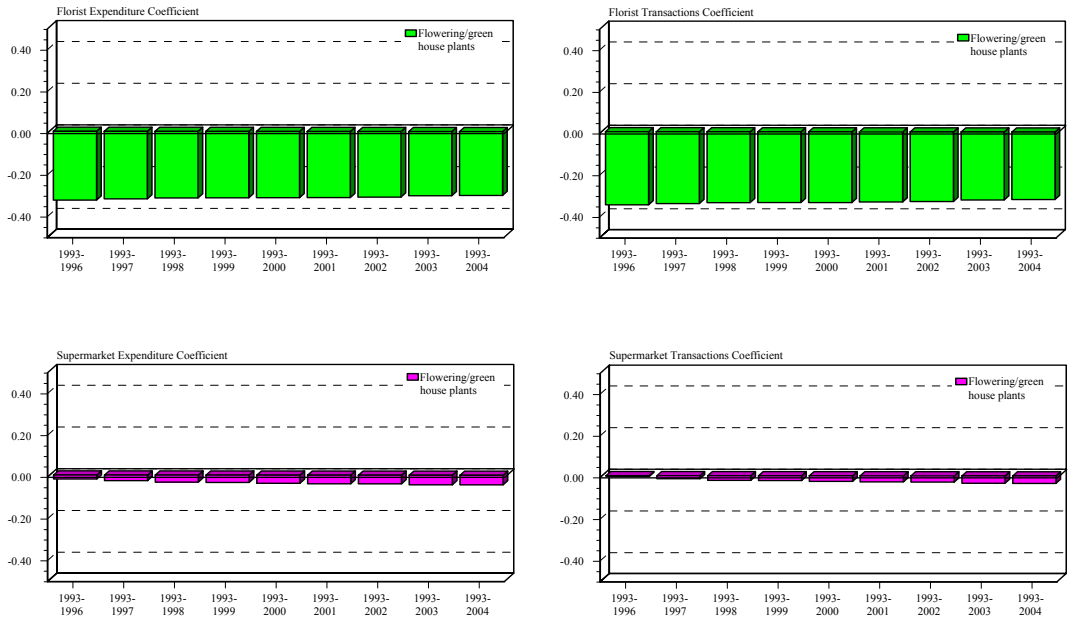

Figure B-15 Time recursive parameters for flowering/green house plants.

APPENDIX C
TSP CODE

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IN 'C:\zstudent\Christian_Iniguez\OUTFORM';
PRINT @NOB;
LIST ZVAR1 IDD  MT  YR  AGE  GND  INC  PUR  HWD;


? 0 ALL INDOOR FLOWERS
? 1 INDOOR FLOWERS
? 2 CUT FLOWERS
? 3  SUB(2) FLOWER ARRANGEMENT
? 4  SUB(2) NON-ARRANGEMENTS
? 5 FLWRG & GREEN HOUSE PLNTS
? 6  SUB(5) FLOWERING PLANTS
? 7  SUB(5) FOLIAGE

? 0     ALL GROUPS
? 1     TOTAL SPECIALTY
? 2     TOTAL MASS MERCHANDISERS
? 3       FLORIST SHOP SUB(1)
? 4       SUPERMARKET  SUB(2)
? 5       WAREHOUSE/PRICE CLUB SUB(2)
? 6     INTERNET RETAILER
? 7     OTHER
? 8     ALL OTHER SPECIALITY (NEW)
? 9     ALL OTHER MERCHANDISERS (NEW)
? 10    TOTAL OUTLETS (1)+(2) + (6) + 7) (NEW)
? IDD=1 THEN THE DATA IS ONLY FOR OBSERVATIONS BY DEMOGRAPHICS AND
FORMS.

LIST ZZOUTE EXP_S0  EXP_S0  EXP_S1  EXP_S2  EXP_S3  EXP_S4  EXP_S5  EXP_S6
EXP_S7  EXP_S8  EXP_S9  EXP_S10;
LIST ZZOUTT TRN_S0  TRN_S0  TRN_S1  TRN_S2  TRN_S3  TRN_S4  TRN_S5  TRN_S6
TRN_S7  TRN_S8  TRN_S9  TRN_S10;


?OC HWD 'NUMBER OF HOUSEHOLDS';
?OC IDD 'IDENDTIFER FOR MONTHS VS TOTALS';
?OC YR  'YEARS 1993 TO 2004';
?OC MT  'MONTHS 1-12';
?OC AGE 'AGE 1=UNDER 25, 2=25-40YRS, 3=40-54YRS, 4=55+';
```

```
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?OC INC 'INCOME UNDER $25=1, $25/$50=2, $50/75=3, $75+=4';
?OC PUR 'REASON FOR BUYING SELF=1, GIFT=0';
?OC FORM 'FLOWER FORM
TOTAL=0,INDOOR=1,CUT=2,ARRANG=3,NONARR=4,PLANTS=5,FLWING=6,FOLIAGE
=7';
?OC EXP_S0 'EXPENDITURES THROUGH ALL OUTLETS';
?OC EXP_S1 'EXPENDITURES THROUGH ALL SPECIALTY';
?OC EXP_S2 'EXPENDITURES THROUGH ALL MASS MERCHANDISING';
?OC EXP_S3 'EXPENDITURES THROUGH ALL FLORIST';
?OC EXP_S4 'EXPENDITURES THROUGH ALL SUPERMARKETS';
?OC EXP_S5 'EXPENDITURES THROUGH ALL WARESHOUSES/PRICE';
?OC EXP_S6 'EXPENDITURES THROUGH ALL RETAIL INTERNET';
?OC EXP_S7 'EXPENDITURES THROUGH ALL OTHER';
?OC EXP_S8 'EXPENDITURES THROUGH OTHER SPECIALTY';
?OC EXP_S9 'EXPENDITURES THROUGH OTHER MASS MERCHANDISING';
?OC EXP_S10 'EXPENDITURES THROUGH TOTAL OUTLETS';
?OC TRN_S0 'TRANSACTIONS THROUGH ALL OUTLETS';
?OC TRN_S1 'TRANSACTIONS THROUGH ALL SPECIALTY';
?OC TRN_S2 'TRANSACTIONS THROUGH ALL MASS MERCHANDISING';
?OC TRN_S3 'TRANSACTIONS THROUGH ALL FLORIST';
?OC TRN_S4 'TRANSACTIONS THROUGH ALL SUPERMARKETS';
?OC TRN_S5 'TRANSACTIONS THROUGH ALL WARESHOUSES/PRICE';
?OC TRN_S6 'TRANSACTIONS THROUGH ALL RETAIL INTERNET';
?OC TRN_S7 'TRANSACTIONS THROUGH ALL OTHER';
?OC EXP_S8 'TRANSACTIONS THROUGH OTHER SPECIALTY';
?OC EXP_S9 'TRANSACTIONS THROUGH OTHER MASS MERCHANDISING';
?OC EXP_S10 'TRANSACTIONS THROUGH TOTAL OUTLETS';

?=====================================================================
====;
? CREATING THE CONTROL FOR ZERO AND POSTITIVE TOTAL EXPENDITURES;
?=====================================================================
====;
TM = INT(YR*100 + MT);
MSD TM;
DD=(TM<200404) & IDD=1;
HIST(DISCRETE) FORM;
SELECT DD=1;
DOT EXP TRN; X._S0=(._S0>0);
HIST(DISCRETE) X._S0;
 ENDDOT;


?=====================================================================
=======;
? CREATING DUMMIES FOR FORMS - ARRANGEMENTS, NONARRANGEMENTS, AND
FLOWERING;
?=====================================================================
=======;
FZ=(FORM=3 | FORM=4 | FORM=5);
```

```
SELECT 1;
HIST(DISCRETE) FZ;
SELECT DD=1;

?=================================================================
====;
? CREATING OUR DUMMY VARIABLES FOR THE RIGHT-HAND-SIDE VARIABLES;
?=================================================================
====;

DOT MT AGE GND INC PUR ;    DUMMY .; ENDDOT;
? MONTHS;
DOT 1-11; DMT.=MT.-MT12; ENDDOT;
DOT 1-3;  DAGE.= AGE. - AGE4; ENDDOT;
DOT 1 ;   DGND. = GND. - GND2; ENDDOT;  ? FEMALE MINUS MALE (0 & 1);
DOT 1 ;   DPUR. = PUR. - PUR2; ENDDOT;  ? GIFT MINUS SELF (0 & 1);
DOT 1-3;  DINC. = INC. - INC4; ENDDOT;

SELECT DD=1 & FZ=1;  ? SELECTION ON TIME, ALL DEMOG, AND THREE FORMS;
PRINT @NOB;
HIST(DISCRETE) FZ FORM PUR;
DUMMY FORM; ? 1=ARRANGEMENTS 2=NON-ARRANGEMENTS 3=FLOWERING;
DOT 1-2; DFORM.=FORM. - FORM3; ENDDOT;
HIST(DISCRETE) FORM1 FORM2 FORM3;

?=================================================================
=======;
? PROBIT MODELS TO GET THE PROBABILITIES OF POSITIVE EXPENDITURES;
?=================================================================
=======;
PROBIT XEXP_S0 C DAGE1-DAGE3 DGND1 DPUR1 DINC1-DINC3 DMT1-DMT11
DFORM1-DFORM2;
MILLEXP = @MILLS;
SET MILLSEXP=NORM(@COEF(1))/CNORM(@COEF(1));
SET SIGMAEXP = @SSR/(@NCOEF -1);
PRINT SIGMAEXP MILLSEXP;
MAT COEF_EXP = @COEF;
PROBIT XTRN_S0 C DAGE1-DAGE3 DGND1 DPUR1 DINC1-DINC3 DMT1-DMT11
DFORM1-DFORM2;
MILLTRN = @MILLS;
SET MILLSTRN=NORM(@COEF(1))/CNORM(@COEF(1));
SET SIGMATRN =  @SSR/(@NCOEF -1);
PRINT SIGMATRN;
MAT COEF_TRN = @COEF;
?=================================================================
=======;
? NOW SELECTING FOR POSITIVE EXPENDITURES OR TRANSACTIONS;
?=================================================================
=======;
SELECT DD=1 & FZ=1 & ( XEXP_S0>0) & (XTRN_S0>0);
```

```
?==========================================================================
=======;
? CREATING THE OUTLET SHARES;
?==========================================================================
=======;
DOT 1-9;
SHEXP_S. = EXP_S. / EXP_S0;
SHTRN_S. = TRN_S. / TRN_S0;
HIST SHEXP_S.;
HIST SHTRN_S.;
ENDDOT;

CONST LOWLIM 0;  ? LOWER LIMIT TO THE SHARE OF THE MAREKT;
CONST UPLIM 1.0; ? UPPER LIMIT TO THE SHARE OF THE MARKET;

LIST XS C DAGE1-DAGE3 DGND1 DPUR1 DINC1-DINC3 DMT1-DMT11 DFORM1-
DFORM2 MILLS;



?==============================================================;
? WE WILL PASS YDEP AND MILL INTO THE PROCEDURE;
? UPPER AND LOWER LIMIT TOBIT MODEL;
? STARTING THE TOBET 2 LIMIT PROCEDURE;
?==============================================================;
 MFORM(TYPE=GEN,NROW=1,NCOL=1) @COEF=0;
 MFORM(TYPE=GEN,NROW=1,NCOL=1) @T=0;

PROC TOB2LIM ;

 LOCAL DYLOW DYUP DYMID XBEQ XB EOS EOSG SIGMA SIGI TOBIT2 TOBIT2G;
? CREATE DUMMY VARIABLES FOR LOWER, MIDDLE, AND UPPER LIMITS
  DYLOW = (YDEP=LOWLIM);
  DYUP  = (YDEP=UPLIM);
DYMID = 1 - (DYLOW+DYUP);
MSD(TERSE) DYLOW DYMID DYUP;

FORM(VARPREF=B) XBEQ XB XS;

FRML XB B0 + B1*DAGE1 + B2*DAGE2 + B3*DAGE3 + B4*DGND1 + B5*DPUR1 +
B6*DINC1 + B7*DINC2 + B8*DINC3
```

```
+ B9*DMT1 + B10*DMT2 + B11*DMT3 + B12*DMT4 + B13*DMT5 + B14*DMT6 +
B15*DMT7 + B16*DMT8 + B17*DMT9
+ B18*DMT10 + B19*DMT11 + B20*DFORM1 + B21*DFORM2  + B22*MILLS;

FRML EOS ((YDEP - XB)/SIGMA) ;  ? RESIDUAL/SIGMA
PARAM SIGMA 1 B0-B22; ?, SIGI,1;   ? POSITIVE STARTING VALUE FOR SIGI

? STRUCTURAL LOG LIKELIHOOD
FRML TOBIT2  LOGL = DYLOW*LCNORM(EOS) + DYMID*(LNORM(EOS) -
LOG(SIGMA)) +
                DYUP*LCNORM(-EOS);
EQSUB TOBIT2 EOS XB;

ML(HITER=N,HCOV=N) TOBIT2;
PRINT @COEF;
ENDPROC;
?=================================================================
=====================;



?=================================================================
=======;
? CREAT A LOGISTIC FORM FOR THE SHARES RECOGNIZING THAT SOME ZERO
CAN OCCUR;
? 3= FLORISTS   4=SUPERMAREKTS   5=WAREHOUSES  6=INTERNET;
?=================================================================
=======;
MFORM(TYPE=GEN, NROW=33,NCOL=1) ZMATZ=0;

SELECT DD=1 & FZ=1 & ( XEXP_S0>0) & (XTRN_S0>0);

DOT(CHAR=#) EXP TRN;
DOT(CHAR=%) 3 4; ?  5 6;  ? FLORISTS AND SUPERMARKETS ONLY;
YDEP = SH.#_S.%;
MILLS =  MILL.#;
TOB2LIM;
PRINT @COEF @T;

MMAKE COEF.#_S.%  @COEF;   ? SAVING THE COEFFICIENTS FOR USE IN THE
SIMULATIONS;
MAT MM = @COEF;
MMAKE(VERT) MS  0 0 0 0 0 0 0 0 0;
MMAKE(VERT) MN MM MS;
MMAKE ZMATZ ZMATZ MN;
MAT MM = @T;
MMAKE(VERT) MS  0 0 0 0 0 0 0 0 0;
MMAKE(VERT) MN MM MS;
MMAKE ZMATZ ZMATZ MN;
ENDDOT;
ENDDOT;
```

```
? WRITE(FORMAT=EXCEL,FILE='C:\zstudent\Christian_Iniguez\TOBITCOEFB.xls')
ZMATZ;



? DEFINE THE SIMULATED VARIABLES AS X AND THE COEFFICIENTS AS B;
? DEFINE L = THE LOWER VALUE;
? DEFINE U = THE UPPER VALUE;
MFORM(TYPE=GEN,NROW=500,NCOL=8) MSHAREM=0;



?=====================================================================
===============;
?                                                                    ;
?   STARTING THE SIMULATION SECTION                                  ;
?                                                                    ;
?  SIMULATOR FOR CALCUATING THE AVERAGE SHARE FOR EACH TYPE AND
OUTLET            ;
?  THE FOLLOWING MUST BE DEFINED:  SIMNUM, SIMTYPE, SIMOUTL
;
?  COEF_TOBIT COEF_PROBIT SIG_TOBIT SIG_PROBIT                       ;
?                                                                    ;
?=====================================================================
===============;
SET INTCP = 1;
LIST SIMVAR SIM_AGE SIM_GENDER SIM_PURPOSE SIM_INCOME  SIM_MONTH
SIM_FORM;
DOT SIMVAR; SET .=0; ENDDOT;

PROC INIT; ? INTIIALIZING THE SIMULATION VARIABLES TO ZERO;
DOT SIMVAR; SET .=0; ENDDOT;
ENDPROC INIT;


PROC ZSIMSHZ;
SET I=I+1;
SET ZAGE1 = (SIM_AGE=1)     -(SIM_AGE=4);
SET ZAGE2 = (SIM_AGE=2)     -(SIM_AGE=4);
SET ZAGE3 = (SIM_AGE=3)     -(SIM_AGE=4);
SET ZGND1 = (SIM_GENDER=1)  -(SIM_GENDER=2);   ? FEMALE MINUS MALE;
SET ZPUR1 = (SIM_PURPOSE=1) -(SIM_PURPOSE=2);  ? GIFT MINUS SELF;
SET ZINC1 = (SIM_INCOME=1)  -(SIM_INCOME=4);
SET ZINC2 = (SIM_INCOME=2)  -(SIM_INCOME=4);
SET ZINC3 = (SIM_INCOME=3)  -(SIM_INCOME=4);
SET ZMT1  = (SIM_MONTH=1)   -(SIM_MONTH=12);
SET ZMT2  = (SIM_MONTH=2)   -(SIM_MONTH=12);
SET ZMT3  = (SIM_MONTH=3)   -(SIM_MONTH=12);
SET ZMT4  = (SIM_MONTH=4)   -(SIM_MONTH=12);
SET ZMT5  = (SIM_MONTH=5)   -(SIM_MONTH=12);
```

```
SET ZMT6  = (SIM_MONTH=6)   -(SIM_MONTH=12);
SET ZMT7  = (SIM_MONTH=7)   -(SIM_MONTH=12);
SET ZMT8  = (SIM_MONTH=8)   -(SIM_MONTH=12);
SET ZMT9  = (SIM_MONTH=9)   -(SIM_MONTH=12);
SET ZMT10 = (SIM_MONTH=10)  -(SIM_MONTH=12);
SET ZMT11 = (SIM_MONTH=11)  -(SIM_MONTH=12);
SET ZFORM1= (SIM_FORM=3)    -(SIM_FORM=5);
SET ZFORM2= (SIM_FORM=4)    -(SIM_FORM=5);
MAT L = 0;
MAT U = 1.0;


MAT NR = NROW(COEF_TOBIT);
SET J=NR-1;
MMAKE(VERT) B COEF_TOBIT(1)-COEF_TOBIT(J);
MAT A = COEF_PROBIT;
MAT SIGT = COEF_TOBIT(NR);


MAT SIGP = (SIMTYPE=1)*(SIGMAEXP) + (SIMTYPE=2)*(SIGMATRN);

? MUST CREATE THE MILLS VALUE FROM THE SIMULATED X VALUES;
SET INTCP =1;
MMAKE Z INTCP ZAGE1-ZAGE3 ZGND1 ZPUR1 ZINC1-ZINC3 ZMT1-ZMT11 ZFORM1
ZFORM2;

MAT NNR=NROW(Z); MAT NNC=NCOL(Z);
  ? VARIABLES FOR THE PROBIT MODEL;
MAT ZA = Z'A;  ? PROBIT VARIABLES AND COEFFICIENTS;
SET ZMILLS =  NORM(ZA) /CNORM(ZA);
PRINT ZMILLS;
MMAKE X INTCP ZAGE1-ZAGE3 ZGND1 ZPUR1 ZINC1-ZINC3 ZMT1-ZMT11 ZFORM1
ZFORM2 ZMILLS; ? VARIABLES FOR THE TOBIT MODEL;
MAT XB = X'B;


SET NORM_L  =  NORM[ ( L(1) - XB(1) ) / ((SIGT(1) ) ) ];
SET CNORM_L = CNORM[ ( L(1) - XB(1) ) / ((SIGT(1) ) ) ];
SET NORM_U  =  NORM[ ( U(1) - XB(1) ) / ((SIGT(1) ) ) ];
SET CNORM_U = CNORM[ ( U(1) - XB(1) ) / ((SIGT(1) ) ) ];
SET MID = { XB(1) + ( SIGT(1) )*[ (NORM_L - NORM_U)/(CNORM_U - CNORM_L) ] };
SET EY = L(1)*CNORM_L    +    U(1)*[ 1 - CNORM_U]    +    MID*[ CNORM_U -
CNORM_L ]; ? EXPECTED VALUES ACROSS THE FULL RANGE OF SHARES;
SET MSHAREM(I,1)= SIMNUM;
SET MSHAREM(I,2)= SIMTYPE;  ? EXPENDITURES (1) AND TRANSACTIONS (2);
SET MSHAREM(I,3)= SIMOUTL;  ?  FLORISTS (3) SUPERMARKETS (4) ...;
SET MSHAREM(I,4)= K;        ? THE VARIABLE VALUES FOR EACH DUMMY;
SET MSHAREM(I,5)= CNORM_L;
SET MSHAREM(I,6)= 1- CNORM_U;
SET MSHAREM(I,7)= MID*[ CNORM_U - CNORM_L ];
SET MSHAREM(I,8)= EY;
```

```
ENDPROC ZSIMSHZ;;




SET I=0;
?==============================================================;
? SIMULATION =1                                ;
? AVERAGE HOUSEHOLD AND EXPENDITURES / FLORIST            ;
?==============================================================;
SET K =1;
SET SIMNUM      = 1;
SET SIMTYPE     = 1;         ? EXPENDITURES (1) AND TRANSACTIONS (2);
SET SIMOUTL     = 3;         ? FLORISTS (3) SUPERMARKETS (4);
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                      ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;
INIT;
ZSIMSHZ;



?==============================================================;
? SIMULATION =2                                ;
? OVER AGES OF HOUSEHOLDS AND EXPENDITURES / FLORIST        ;
?==============================================================;
SET SIMNUM      = 2;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                      ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 4;
INIT;
SET SIM_AGE=K;
ZSIMSHZ;
ENDDO;


?==============================================================;
? SIMULATION =3                                ;
? OVER GENDER OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
```

```
?==============================================================;
SET SIMNUM      = 3;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                      ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 2;
INIT;
SET SIM_GENDER=K;
ZSIMSHZ;
ENDDO;



?==============================================================;
? SIMULATION =4                                ;
? OVER PURPOSE OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 4;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                      ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 2;
INIT;
SET SIM_PURPOSE=K;
ZSIMSHZ;
ENDDO;



?==============================================================;
? SIMULATION =5                                ;
? OVER INCOME OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 5;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                      ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;
```

```
DO K=0 TO 4;
INIT;
SET SIM_INCOME=K;
ZSIMSHZ;
ENDDO;



?==============================================================;
? SIMULATION =6                                ;
? OVER SEASONS OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 6;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                      ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 12;
INIT;
SET SIM_MONTH=K;
ZSIMSHZ;
ENDDO;



?==============================================================;
? SIMULATION =7                                ;
? OVER FORMS OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 7;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                      ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DOT(VALUE=K) 0 3 4 5;
INIT;
SET SIM_FORM=K;
ZSIMSHZ;
ENDDOT;
```

```
?==============================================================;
? SIMULATION =8                                ;
? OVER FORMS AND PURPOSE OF HOUSEHOLDS AND EXPENDITURES / FLORIST
;
?==============================================================;
SET SIMNUM      = 8;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                      ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DOT(VALUE=K) 0 3 4 5;  ? FORMS;
DO G=0 TO 2;
INIT;
SET SIM_FORM=K; SET SIM_PURPOSE=G;
ZSIMSHZ;
ENDDO; ENDDOT;



?==============================================================;
? SIMULATION =9                                ;
? OVER INCOME OF HOUSEHOLDS AND EXPENDITURES / FLORIST     ;
?==============================================================;
SET SIMNUM      = 9;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                      ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=1 TO 4;
DO D=1 TO 12;
INIT;
SET SIM_INCOME=K; SET SIM_MONTH=D;
ZSIMSHZ;
ENDDO;
ENDDO;



?==================================================================
==============================;
```

```
? NOW TYPE =2 AND OUTL=3;
?=================================================================
==============================;
?==============================================================;
? SIMULATION =1                                ;
? AVERAGE HOUSEHOLD AND EXPENDITURES / FLORIST            ;
?==============================================================;
SET K =1;
SET SIMNUM      = 1;
SET SIMTYPE     = 2;         ? EXPENDITURES (1) AND TRANSACTIONS (2);
SET SIMOUTL     = 3;         ? FLORISTS (3) SUPERMARKETS (4);
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                        ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                        ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;
INIT;
ZSIMSHZ;



?==============================================================;
? SIMULATION =2                                ;
? OVER AGES OF HOUSEHOLDS AND EXPENDITURES / FLORIST        ;
?==============================================================;
SET SIMNUM      = 2;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                        ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                        ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 4;
INIT;
SET SIM_AGE=K;
ZSIMSHZ;
ENDDO;


?==============================================================;
? SIMULATION =3                                ;
? OVER GENDER OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 3;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
```

```
            COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                    ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                    ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 2;
INIT;
SET SIM_GENDER=K;
ZSIMSHZ;
ENDDO;



?==============================================================;
? SIMULATION =4                                ;
? OVER PURPOSE OF HOUSEHOLDS AND EXPENDITURES / FLORIST     ;
?==============================================================;
SET SIMNUM      = 4;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
            COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                    ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                    ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 2;
INIT;
SET SIM_PURPOSE=K;
ZSIMSHZ;
ENDDO;



?==============================================================;
? SIMULATION =5                                ;
? OVER INCOME OF HOUSEHOLDS AND EXPENDITURES / FLORIST     ;
?==============================================================;
SET SIMNUM      = 5;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
            COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                    ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                    ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 4;
INIT;
SET SIM_INCOME=K;
```

```
ZSIMSHZ;
ENDDO;



?==============================================================;
? SIMULATION =6                                ;
? OVER SEASONS OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 6;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                        ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                        ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 12;
INIT;
SET SIM_MONTH=K;
ZSIMSHZ;
ENDDO;



?==============================================================;
? SIMULATION =7                                ;
? OVER FORMS OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 7;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                        ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                        ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DOT(VALUE=K) 0 3 4 5;
INIT;
SET SIM_FORM=K;
ZSIMSHZ;
ENDDOT;



?==============================================================;
? SIMULATION =8                                ;
```

```
? OVER FORMS AND PURPOSE OF HOUSEHOLDS AND EXPENDITURES / FLORIST
;
?==============================================================;
SET SIMNUM      = 8;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                        ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                        ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DOT(VALUE=K) 0 3 4 5;  ? FORMS;
DO G=0 TO 2;
INIT;
SET SIM_FORM=K; SET SIM_PURPOSE=G;
ZSIMSHZ;
ENDDO; ENDDOT;




?==============================================================;
? SIMULATION =9                                  ;
? OVER INCOME OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 9;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                        ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                        ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=1 TO 4;
DO D=1 TO 12;
INIT;
SET SIM_INCOME=K; SET SIM_MONTH=D;
ZSIMSHZ;
ENDDO;
ENDDO;




?=================================================================
==============================;
? NOW TYPE =1 AND OUTL=4;
```

```
?==================================================================
==============================;
?==============================================================;
? SIMULATION =1                                  ;
? AVERAGE HOUSEHOLD AND EXPENDITURES / FLORIST              ;
?==============================================================;
SET K =1;
SET SIMNUM      = 1;
SET SIMTYPE     = 1;          ? EXPENDITURES (1) AND TRANSACTIONS (2);
SET SIMOUTL     = 4;          ? FLORISTS (3) SUPERMARKETS (4);
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                      ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;
INIT;
ZSIMSHZ;



?==============================================================;
? SIMULATION =2                                  ;
? OVER AGES OF HOUSEHOLDS AND EXPENDITURES / FLORIST        ;
?==============================================================;
SET SIMNUM      = 2;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                      ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 4;
INIT;
SET SIM_AGE=K;
ZSIMSHZ;
ENDDO;


?==============================================================;
? SIMULATION =3                                  ;
? OVER GENDER OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 3;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
```

```
                    ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                    ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 2;
INIT;
SET SIM_GENDER=K;
ZSIMSHZ;
ENDDO;



?==============================================================;
? SIMULATION =4                                ;
? OVER PURPOSE OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM       = 4;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
            COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                    ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                    ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 2;
INIT;
SET SIM_PURPOSE=K;
ZSIMSHZ;
ENDDO;



?==============================================================;
? SIMULATION =5                                ;
? OVER INCOME OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM       = 5;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
            COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                    ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                    ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 4;
INIT;
SET SIM_INCOME=K;
ZSIMSHZ;
ENDDO;
```

```
?==============================================================;
? SIMULATION =6                                ;
? OVER SEASONS OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 6;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                      ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 12;
INIT;
SET SIM_MONTH=K;
ZSIMSHZ;
ENDDO;



?==============================================================;
? SIMULATION =7                                ;
? OVER FORMS OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 7;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                      ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DOT(VALUE=K) 0 3 4 5;
INIT;
SET SIM_FORM=K;
ZSIMSHZ;
ENDDOT;



?==============================================================;
? SIMULATION =8                                ;
? OVER FORMS AND PURPOSE OF HOUSEHOLDS AND EXPENDITURES / FLORIST
;
```

```
?==============================================================;
SET SIMNUM      = 8;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                        ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                        ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DOT(VALUE=K) 0 3 4 5;  ? FORMS;
DO G=0 TO 2;
INIT;
SET SIM_FORM=K; SET SIM_PURPOSE=G;
ZSIMSHZ;
ENDDO; ENDDOT;



?==============================================================;
? SIMULATION =9                                ;
? OVER INCOME OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 9;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                        ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                        ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=1 TO 4;
DO D=1 TO 12;
INIT;
SET SIM_INCOME=K; SET SIM_MONTH=D;
ZSIMSHZ;
ENDDO;
ENDDO;



?=========================================================================
==============================;
? NOW TYPE =2 AND OUTL=4;
?=========================================================================
==============================;
```

```
?==============================================================;
? SIMULATION =1                                ;
? AVERAGE HOUSEHOLD AND EXPENDITURES / FLORIST            ;
?==============================================================;
SET K =1;
SET SIMNUM      = 1;
SET SIMTYPE     = 2;         ? EXPENDITURES (1) AND TRANSACTIONS (2);
SET SIMOUTL     = 4;         ? FLORISTS (3) SUPERMARKETS (4);
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                      ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;
INIT;
ZSIMSHZ;



?==============================================================;
? SIMULATION =2                                ;
? OVER AGES OF HOUSEHOLDS AND EXPENDITURES / FLORIST        ;
?==============================================================;
SET SIMNUM      = 2;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                      ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 4;
INIT;
SET SIM_AGE=K;
ZSIMSHZ;
ENDDO;


?==============================================================;
? SIMULATION =3                                ;
? OVER GENDER OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 3;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
```

```
                    ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 2;
INIT;
SET SIM_GENDER=K;
ZSIMSHZ;
ENDDO;



?==============================================================;
? SIMULATION =4                                ;
? OVER PURPOSE OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 4;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
            COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                    ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                    ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 2;
INIT;
SET SIM_PURPOSE=K;
ZSIMSHZ;
ENDDO;



?==============================================================;
? SIMULATION =5                                ;
? OVER INCOME OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 5;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
            COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                    ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                    ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 4;
INIT;
SET SIM_INCOME=K;
ZSIMSHZ;
ENDDO;
```

```
?==============================================================;
? SIMULATION =6                                ;
? OVER SEASONS OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 6;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                      ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=0 TO 12;
INIT;
SET SIM_MONTH=K;
ZSIMSHZ;
ENDDO;



?==============================================================;
? SIMULATION =7                                ;
? OVER FORMS OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 7;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                      ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                      ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DOT(VALUE=K) 0 3 4 5;
INIT;
SET SIM_FORM=K;
ZSIMSHZ;
ENDDOT;



?==============================================================;
? SIMULATION =8                                ;
? OVER FORMS AND PURPOSE OF HOUSEHOLDS AND EXPENDITURES / FLORIST
;
?==============================================================;
SET SIMNUM      = 8;
```

```
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                        ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                        ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DOT(VALUE=K) 0 3 4 5;  ? FORMS;
DO G=0 TO 2;
INIT;
SET SIM_FORM=K; SET SIM_PURPOSE=G;
ZSIMSHZ;
ENDDO; ENDDOT;




?==============================================================;
? SIMULATION =9                                  ;
? OVER INCOME OF HOUSEHOLDS AND EXPENDITURES / FLORIST      ;
?==============================================================;
SET SIMNUM      = 9;
MAT COEF_TOBIT   = COEFEXP_S3*(SIMTYPE=1 & SIMOUTL=3)+
COEFEXP_S4*(SIMTYPE=1 & SIMOUTL=4)+
              COEFTRN_S3*(SIMTYPE=2 & SIMOUTL=3)+  COEFTRN_S4*(SIMTYPE=2 &
SIMOUTL=4);
                        ? TOBIT COEFFICIENTS FOR EXPENDITURES THROUGH FLORISTS;
MAT COEF_PROBIT  = COEF_TRN*(SIMTYPE=2) +COEF_EXP*(SIMTYPE=1);
                        ? PROBIT COEFFICIENTS FOR EXPENDITURES ON ALL OUTLETS;

DO K=1 TO 4;
DO D=1 TO 12;
INIT;
SET SIM_INCOME=K; SET SIM_MONTH=D;
ZSIMSHZ;
ENDDO;
ENDDO;


WRITE(FORMAT=EXCEL,FILE='C:\zstudent\Christian_Iniguez\SIMPROB#3.XLS')
MSHAREM;

END;
```

LIST OF REFERENCES

Ahl, David H., "New Product Forecasting Using Consumer Panels," *Journal of Marketing Research*, May 1970, *7*, 160-167.

Amemiya, Takeshi, "Regression Analysis When the Dependent Variable Is Truncated Normal," *Econometrica*, November 1973, *41*, 997-1016.

American Floral Endowment. *American Flower Endowment Tracking Study*, 1992-2004

Bain, Joe S., "Relation of Profit-Rate to Industry Concentration: American Manufacturing, 1936-1940," *Quarterly Journal of Economics*, August 1951, *65*, 293-324.

Basmann, R.L., "A Theory of Demand with Variable Consumer Preferences," Econometrica, January 1965, 24, 47-58.

Blin, Jean-Marie, & Joe A. Dodson, "The Relationship between Attributes, Brand Preferences, and Choice: A Stochastic View," *Management Science*, June 1980, *26*, 606-619.

Blisard, Noel, & James Blaylock, "Distinguishing between Market Participation and Infrequency of Purchase Models of Butter Demand," *American Journal of Agricultural Economics*, May 1993, *75*, 314-320.

Blisard, Noel, & James Blaylock, "U.S. Cigarette Consumption: The Case of Low-Income Women," *American Journal of Agricultural Economics*, August 1992, *74*, 698-705.

Bothwell, James L., Thomas F. Cooley, & Thomas E. Hall, "A New View of the market Structure—Performance Debate," *The Journal of Industrial Economics*, June 1984, *32*, 397-417.

Bradburd, Ralph M., & David R. Ross, "Can Small Firms Find and Defend Strategic Niches? A Test of the Porter Hypothesis," *The Review of Economics and Statistics*, May 1989, *71*, 258-262.

Buzzell, Robert D., Bradley T. Gale, & Ralph G.M. Sultan [1975], "Market-Share – A Key to Profitability," *Harvard Business Review*, January, 97-106.

Byrne, Patrick J., Oral Capps, Jr., & Atanu Saha, "Analysis of Food-Away-from-Home Expenditures Patterns for U.S. Households, 1982-89," *American Journal of Agricultural Economics*, August 1996, *78*, 614-627.

Carpenter, Gregory S., Rashi Glazer, & Kent Nakamoto, "Meaningful Brands from Meaningless Differentiation: The Dependence on Irrelevant Attributes," *Journal of Marketing Research*, August 1994, *31*, 339-350.

Chauvin, Keith W., & Mark Hirschey, "Market Structure and the Value of Growth," *Managerial and Decision Economics*, May 1997, *18*, 247-254.

Chay, Kenneth Y., & James L. Powell, "Semiparametric Censored Regression Models," *The Journal of Economic Perspectives*, Autumn 2001, *15*, 29-42.

Clodious, Robert L., & Willard F. Mueller, "Market Structure as an Orientation for Research in Agricultural Economics," *Journal of Farm Economics*, August 1961, *43*, 515-543.

Cooper, Lee G. & Masao Nakanishi "Market-Share Analysis: Evaluating Competitive Marketing Effectiveness," Norwell, MA. Kluwer, 1988.

Cragg, John G., "Some Statistical Models for Limited Dependent Variables with Application to the Demand for Durable Goods," *Econometrica*, September 1971, *39*, 829 – 844.

Demsetz, Harold, "Industry Structure, Market Rivalry, and Public Policy," *Journal of Law and Economics,* October 1973, *16*, 1-9.

Feinberg, Fred M., Barbara E. Kahn, & Leigh McAlister, "Market Share When Consumers Seek Variety," *Journal of Marketing Research*, May 1992, *29*, 227-237.

Fossum, M. Truman, "Horticultural Specialties: A Neglected Segment of U.S. Agriculture," *Journal of Farms Economics*, November 1953, *35*, 622-628.

Gale, Bradley T., "Market Share and Rate of Return," *The Review of Economics and Statistics*, November 1972, *54*, 412-423.

Ghosh, Arabinda, "Market Structure Research: Comment," *Journal of Farm Economics*, August 1966, *48*, 751-753.

Ghosh, Avijit, Scott Neslin, & Robert Shoemaker, "A Comparison of Market Share Models and Estimation Procedures," *Journal of Marketing Research*, May 1984, *21*, 202-210.

Gilboa, Itzhak, & David Schmeidler, "Cumulative Utility Consumer Theory," *International Economic Review*, November 1997, *38*, 737-761.

Girapunthong, Napaporn and Ronald, Ward, "Demand Drivers for Fresh-cut Flowers and Their Substitutes: An Application of Household Expenditure Allocation Models," *Journal of American Agricultural Economics*, July 2003.

Gould, Brian W., "At-Home Consumption of Cheese: A Purchase-Infrequency Model," *American Journal of Agricultural Economics*, May 1992, *74*, 453-459.

Greene, William H., "Econometric Analysis," Fourth Edition, Englewood Cliffs, NJ: Prentice-Hall, Inc., 2003.

Grover, Rajiv, & V. Srinivasan, "An Approach for Tracking Within-Segments Shifts in Market Shares," *Journal of marketing Research*, May 1989, *26*, 230-236.

Haines, Pamela S., David K Guilkey, & Barry M. Popkin, "Modeling Food Consumption Decisions as a Two-Step Process," *American Journal of Agricultural Economics*, August 1988, *70*, 543-552.

Heckman, James J., "Sample Selection Bias as a Specification Error," *Econometrica*, January 1979, *47*, 153-162.

Holbrook, Morris B., & Elizabeth C. Hirschman, "The Experiential Aspects of Consumption: Consumer Fantasies, Feelings, and Fun," *The Journal of Consumer Research*, September 1982, *9*, 132-140.

Hoyer, Wayne D., "An Examination of Consumer Decision Making for a Common Repeat Purchase Product," *The Journal of Consumer Research*, December 1984, *11*, 822-829.

Ipsos-NPD Group. National Panel Diary Group, Inc., Chicago Illinois, 2004

Jacobson, Robert, "Distinguishing among Competing Theories of the Market Share Effect," *Journal of Marketing*, October 1988, *52*, 68-80.

Kotler, Philip, "Marketing management: Analysis, Planning, and Control," Fifth Edition, Englewood Cliffs, NJ: Prentice-Hall, Inc., 1984.

Long, J. Scott Long, "Regression Models for Categorical and Limited Dependent Variables. Advanced Quantitative Techniques in the Social Sciences" Thousand Oaks, CA: Sage, 1997.

Moriarty, Mark, "Cross-Sectional, Time-Series Issues in the Analysis of marketing Decision Variables," *Journal of Marketing Research*, May 1975, *12*, 142-150.

Naert, Philippe A. & Alain Bultez, "Logically Consistent Market Share Models", *Journal of Marketing Research*, August 1973, *10*, 334-340

Peltzman, Sam, "The Gains and Losses from Industrial Concentration," *Journal of Law and Economics*, October 1977, *20*, 229-63.

Reynolds, Anderson, "Analyzing Fresh Vegetable Consumption from Household Survey Data," *Southern Journal of Agricultural Economics*, December 1990, 31-38.

Rhodes, James V., "The Measurement of Consumer Preferences," *Journal of Farm Economics*, November 1955, *37*, 638-651.

Smirlock, Michael, Thomas Gilligan,& William Marshall, "Tobin's q and the Structure-Performance Relationship," *American Economic Review*, December 1984, *74*, 1050-60.

Smith, Frank J., Jr. & Dale C. Dahl, "Market Structure Research. How and for What?" *Journal of Farm Economics*, May 1965, *47*, 465-467.

Tobin, James, "Estimation of Relationships for Limited Dependent Variables," *Econometrica*, January 1958, *26*, 24-36.

U.S. International Trade Commission, "Industry & Trade Summary: Cut Flowers," USITC Publication 3580, February 2003.

Van den Broek, Luciano, John J.Haydu, Alan W. Hodges, & Evaristo M. Neves, "Production, Marketing and Distribution of Cut Flowers in the United States and Brazil," IFAS Extension, Food & Resource Economics Department, University of Florida, 2002.

Walsh, John, "Flexibility in Consumer Purchasing for Uncertain Future Tastes," *Marketing Science*, 1995, *14*, 148-165.

Ward, Ronald W., "National Report on Household Purchases of Fresh Flowers 1993 to 2002," *Consumer Tracking Study for the American Floral Endowment*, Glen Carbon, IL, April 2003.

BIOGRAPHICAL SKETCH

Christian Iniguez was born on October 15, 1980, in Cuenca, Ecuador. After studying two years at the Escuela Superior Politecnica del Litoral (ESPOL) in Guayaquil, Ecuador, he was awarded ESPOL's International Scholarship to continue his Bachelor of Science at the Worcester Polytechnic Institute (WPI) in Massachusetts, United States. After graduation he returned to his home country to teach advanced courses in management at ESPOL's Department of Economics. In 2002, he was accepted into the Master of Science program of the Food and Resource Economics Department at the University of Florida with a full research assistantship. He began his master's program in August of 2003 specializing in the fields of industrial organization and food marketing.