

MODELING CONSUMER EXPENDITURES AT THREE
YEAR-ROUND ROADSIDE MARKETS
IN OKLAHOMA

By

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PREFACE

The purpose of this study was to develop a framework for analysis of the relative importance of specific consumer segments to the income of year-round roadside markets. This is the first attempt at assessing the relationships of consumer characteristics with annual per capita expenditures per household on produce from roadside markets. This research is also unique in its comparison of consumer expenditures at direct markets at different times during the year.

I am very grateful for many hours of tutelage under Dr. Daniel S. Tilley as both a graduate student and an advisee. His efforts to train a horticulturist to use economic principles effectively are sincerely appreciated and I hope he has found some fruit in this attempt. The considerable time contributed by Dr. R. Joe Schatzer of my thesis committee deserves my deep thanks. His help in explaining complex modeling procedures was valuable to the development of this work. Dr. Jim Motes served on my thesis committee and helped me to better understand the scope of the Oklahoma vegetable industry and its growth potential. Both have been important aids in directing this research. Dr. Clem Ward served on my thesis committee and assisted in ironing out some of the

rough spots of this manuscript.

Several graduate students and departmental staff members helped to collect and enter the data. Jim Sleper was extremely helpful as a computer mentor, programmer, and researcher. His comradeship, sense of humor, and knowledge were invaluable through long hours of surveying, coding, and analyzing. Mike Wickwire, Jeff Dale, Mary Skinner, Becky Lowe, Dale Stemple, Matt Dickey, and Doug Edwards helped collect surveys. Several members of the departmental data entry staff entered large amounts of survey data. Several secretaries typed up market reports and research reports. Many faculty members indirectly aided in the development of this work through their instruction and guidance.

This study was part of a larger research effort to explore fruit and vegetable marketing alternatives for farmers in Southeastern Oklahoma. The entire project was funded by a grant from the United States Department of Agriculture. Congressman Wes Watkins was chiefly responsible for generating the availability of the funds and for organizing assistance from several agencies and groups to make this project more effective in achieving its goal.

My beloved wife, Dawn, made many sacrifices to enable me to complete the work necessary for this degree. I owe her my eternal devotion and shall attempt to give it to her. My son, Phillip, and my mother and father are appreciated for their patience and love throughout this research effort.

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CHAPTER I

INTRODUCTION

Statement of Problem

Direct marketing is the sale of products directly from the producer to the consumer. Direct marketing is one of the few available marketing alternatives for fruit and vegetable growers with relatively small acreages and without strong marketing organizations. Smaller producers lack the ability to attract principal produce buyers except where packing firms have accumulated large quantities and insured sufficient quality regulation. Direct markets can provide immediate market access to growers in areas where such organizations do not exist or are inaccessible.

The competitive advantage of direct marketing for fruit and vegetable growers with smaller acreages has apparently increased in the last few years, based on the renewed interest in this marketing method among growers (Toensmeyer and Ladzinski, 1983, p. 3). Weimer (1978, p. 23) proposes that the increased interest in direct marketing may have arisen due to "the increasing share of food expenditures that [go to] pay for food marketing costs." Increased labor and energy costs in food marketing are identified as major factors in decreasing the farmer's share of the food dollar.

The fitness and nutrition fad of the 1970's and 1980's has also contributed to the increased popularity of direct markets (Buitenhuis, Kezis, and Kerr, 1983, p. 1). Shipping distances often require produce to be harvested at the beginning of the ripening process. Some direct markets allow for same-day picking. A "freshness differential" may exist between direct markets and grocery produce departments, depending upon the produce-handling habits of the grower and the market, and the subjective evaluation of the consumer.

Producer and consumer interest in direct marketing was exemplified by the passage of the Farmer-to-Consumer Direct Marketing Act (Public Law 94-463) in October, 1976. This act set aside funds for assessing the importance of direct marketing and promoting the growth of such markets (Linstrom and Wiser, 1978, p. 14). The purpose was to "lower the cost and increase the quality of food to ... consumers while providing increased financial returns to the farmers." Numerous research projects funded through this act have helped to describe the importance and growth patterns of different types of direct marketing and some of the growth patterns of this marketing alternative in various states. Three notable examples are Linstrom and Henderson (1979 and 1981) and Henderson and Linstrom (1981).

The direct marketing of fruit and vegetables in Oklahoma has not been formally researched since the upswing of direct market activity began. Oklahoma fruit and vegetable production is characterized by farmers with small acreages of pro-

duce with very few marketing organizations. Marketing organizations are being developed in Oklahoma but will likely experience slow growth over the next decade. Produce acreage per farm is expected to increase slightly but to remain well under the average acreage in primary production states over the next decade. It appears likely that direct marketing will be a major outlet for Oklahoma fruit and vegetable growers through the mid-1990's.

Farmers who operate or participate in a direct market need to understand fundamental retailing principles. The marketing concept is perhaps the most basic guideline for marketers today. Assael (1984, p. 3) defines it as "the philosophy that marketing strategies must be based on defined consumer needs." Kotler (1980, p. 194) advises that "the firm, instead of competing everywhere, ..., should identify those parts of the market that are most attractive and that it could serve the most effectively." He indicates that a market should first be segmented or divided into distinguishable subgroups, and then one or more segments should be selected for targeting marketing resources.

Both the market segmentation and target marketing process are subjective. The target market selection is dependent upon the goals and values of the market management and management's interpretation of segmentation results. A higher degree of objectivity can be achieved in segmenting by collecting data on as many relevant consumer variables as feasible and comparing the values of these variables with

some predefined goal of management. The target marketing decision process is restricted by the quality of market segmentation research obtainable. Active efforts by managers to satisfy the differing needs of consumers can be stimulated by the availability of segmenting research that is as objective as possible and which is based upon an important goal of market managers.

Few direct market managers have the resources or training needed to conduct a formal segmentation study. Most research of this nature is contracted or conducted by corporations with in-house market researchers and is never published outside of the company. Public research of direct market shoppers in Oklahoma will directly benefit fruit and vegetable growers and direct market managers in the state. It could benefit growers and managers in other states in planning for sponsorship of segmentation research. This research could directly aid market researchers in designing their own studies. Lastly this research should indirectly benefit consumers by identification of differing needs and preferences which they hold and the market opportunities which these needs represent.

Objectives

The objectives of this study are:

- (1) to describe the number of consumers visiting roadside markets and the number of checkouts per hour at roadside markets:

- (a) On an annual basis
 - (b) On a seasonal basis
- (2) to determine how personal characteristics, habits, and preferences affect consumer expenditure on produce at roadside markets
- (3) to test the hypotheses described in Chapter III

Organization of Chapters

Chapter II reviews previous research in the description of direct market consumers and the modeling of consumer expenditures at direct markets. Chapter III builds a conceptual framework based on a mixture of past research and theory. In Chapter IV the markets and the trade area of the markets surveyed are described. The procedures and methods utilized in this research are discussed. This chapter also includes the report on the number of customers visiting roadside markets and the number of sales at the markets.

Chapter V is devoted to a description and discussion of the results of modeling of consumer expenditures on produce at roadside markets. The results of tests of hypotheses are also found in this chapter. Chapter VI summarizes research results and important implications, and suggests areas for further study.

CHAPTER II

REVIEW OF LITERATURE

Previous direct market shopper studies have primarily been descriptive summaries of consumer and market characteristics. Variables have usually been described by means or percent response by category. Few published studies have undertaken more extensive statistical analysis of data collected from consumers.

This chapter summarizes important published research describing direct market consumer characteristics. The consumer variables present in each research publication which are also used in the expenditure model of this study are listed. Six studies go beyond simple consumer description and use analytical statistics or two-way tables to explain consumer expenditures at direct markets. These will be reviewed in the second part of this chapter.

Descriptive Studies of Consumer Characteristics

The questionnaire used in this research built upon several previous studies of characteristics, habits, and preferences of direct market consumers. Each of the variables collected for this study has been reported in one or more research publications. Eleven of the most important

research reports are summarized in Table I. The table includes a brief description of each consumer survey along with a list of variables collected which are also part of this study. The publication by Roy, Leary, and Law (1977) was the most influential in the formulation of the questionnaire used in this research.

The relevant demographic, situational, and preference variables contained in each publication are listed in Table I. Complete references may be found in the selective bibliography. All of these studies involved a consumer survey of some kind, administered using the method described in Table I. The market category shows the type(s) of direct market(s) for which consumers and their shopping activity are described. Definitions of each market type are in the glossary of important terms in Appendix A. Mail survey results are often available only for the entire sample rather than being broken down by market type. The number of markets indicates the total number of different markets where self-completed surveys were distributed or personal interviews were conducted.

Several variables are common to a number of these studies. The relative importance placed upon each variable by direct market researchers may be possible to infer by the frequency of occurrence of the measure in separate studies. Variables are reported in groups according to the arrangement of concepts in Chapter III.

The six concepts provide an effective bridge between

TABLE I

LIST OF SELECTED DIRECT MARKET
CONSUMER VARIABLES REPORTED

Author(s)	Jack & Blackburn	Buitenhuis, Kezis, & Kerr	Toensmeyer & Lad- zinski	Adrian & Vitelli
Year	1984	1983	1983	1982
Area	West Va.	Maine	Delaware	Alabama
Method	Mail Surveys	Mail Surveys	Mail Surveys	Personal Interview
Sample Size	427	937	633	118
Market(s)	Roadside, Farmers', U-pick, and Tailgate Markets	Roadside, Farmers', U-pick, and Tailgate Markets	Roadside, Farmers', U-pick, and Tailgate Markets	Farmers' Markets
# Markets				24

Concept
VariableAnnual Per Capita Spending

<u>Visits Per Year</u>				
This Market	XXX	XXX	XXX	XXX
Spending				
Per Visit	XXX	XXX	XXX	
Spending				
Annually	XXX	XXX	XXX	
Household				
Size				XXX
<u>Age Composition</u>				
Age			XXX	XXX
<u>Budget Constraint</u>				
Income	XXX	XXX	XXX	XXX
Miles to				
Market	XXX	XXX	XXX	XXX
<u>Preferences</u>				
Market				
Grades	XXX	XXX	XXX	
Reasons for				
Shopping	XXX	XXX	XXX	XXX
<u>Time Constraint</u>				
Visits Per Year				
Other Markets	XXX		XXX	
Home Garden				
Status	XXX	XXX	XXX	XXX
Produce Use	XXX	XXX	XXX	
<u>Cultural/Lifestyle</u>				
Race				XXX
Occupation	XXX	XXX		
Residence	XXX	XXX	XXX	

TABLE I (Continued)

Author(s)	Thompson	Courter, Sabota, & Nyankori	Brooker & Taylor	Roy, Leary, & Law
Year	1982	1979	1977	1977
Area	Oklahoma	Illinois	Tennessee	Louisiana
Method	Telephone Survey	Self- Completed	Personal Interviews	Personal Interviews
Sample Size	286	1876	200	377
Market(s)	Roadside, Farmers', and U-pick Markets	U-pick Markets	Farmers' Market	Farmers' Markets
# Markets		17	1	19
<u>Concept</u>				
Variable				
<u>Annual Per Capita Spending</u>				
Visits Per Year				
This Market		XXX	XXX	XXX
Spending				
Per Visit			XXX	XXX
Spending				
Annually			XXX	
Household				
Size	XXX	XXX		XXX
<u>Age Composition</u>				
Age	XXX	XXX	XXX	XXX
<u>Budget Constraint</u>				
Income	XXX	XXX	XXX	XXX
Miles to				
Market		XXX	XXX	XXX
<u>Preferences</u>				
Market				
Grades				XXX
Reasons for				
Shopping			XXX	XXX
<u>Time Constraint</u>				
Visits Per Year				
Other Markets		XXX		
Home Garden				
Status	XXX			
Produce Use	XXX			XXX
<u>Cultural/Lifestyle</u>				
Race	XXX			XXX
Occupation	XXX			XXX
Residence	XXX	XXX		XXX

TABLE I (Continued)

Author(s)	Stuhlmiller, How, & Stone	Metzger, Prysunka, French, & Erhardt	Eiler & Rosenfeld
Year	1976	1974	1973
Area	New York	Maine	New York
Method	Mail Survey	Personal Interviews	Personal Interviews
Sample Size	3200	236	435
Market(s)	Roadside, Farmers', and U-pick Markets	Roadside Markets	Roadside Markets
# Markets		8	3
<u>Concept</u>			
Variable			
<u>Annual Per Capita Spending</u>			
Visits Per Year			
This Market	XXX		XXX
Spending Per Visit		XXX	XXX
Spending Annually Household Size	XXX	XXX	XXX
<u>Age Composition</u>			
Age		XXX	
<u>Budget Constraint</u>			
Income	XXX	XXX	XXX
Miles to Market		XXX	XXX
<u>Preferences</u>			
Market Grades	XXX	XXX	XXX
Reasons for Shopping		XXX	XXX
<u>Time Constraint</u>			
Visits Per Year			
Other Markets			
Home Garden Status	XXX		
Produce Use	XXX		
<u>Cultural/Lifestyle</u>			
Race			
Occupation			XXX
Residence	XXX		XXX

this chapter and the conceptual model in Chapter III where each is further defined. Each variable within each of the last five concepts can be regarded as relating to expenditures in the same general fashion as others in the same conceptual group. All of the variables reported are briefly summarized below by conceptual group with mention of variables which may be important in expenditure analysis but have not received previous attention.

Frequency of shopping at this market (at each different type of direct market in mail surveys) is listed in nine studies and spending per visit is found in seven of the nine publications. When these two variables are multiplied by each other, an amount spent annually at the market surveyed or at all direct markets can be calculated. Only four of the seven report a mean for this annual variable and only Brooker and Taylor (1977) report an annual amount spent at a single direct market. The combined annual variable conveys important information about how well the market is fulfilling the fresh produce needs of the household when compared with average annual consumer expenditures on fresh produce. The analytical treatments of the single and combined expenditure variables are discussed in the next section of this chapter.

Household size is reported in seven studies. Only two of these publications collected enough information to enable calculation of an annual per capita spending figure at a direct market. This can be done by multiplying amount spent

per visit by visits per year and dividing by household size. Neither of these research publications include such a value.

Age of respondent is listed in seven of the eleven studies. This variable is reported in the age composition concept since ages of all household members are presumed to affect produce consumption by the household. The age reported in most of the studies is the age of the respondent. The ages of each family member or their age-group classifications are not reported.

Income is listed as a variable in ten reports and miles to market is in nine of those ten. These budget constraint variables have been popular variables, probably because they give researchers information on purchasing power, size of the market trade area, and the relative costs to various consumers in traveling to the market. Income is one of the variables used most frequently for statistical treatments such as one-way analysis of variance and chi-square analysis.

Market grades of one form or another are published in seven studies and reasons for shopping are cited in eight. Six surveys included both variables. Most of these publications report that many consumers gave more than one reason for shopping at the market. Five publications involve consumer survey work at more than one direct market of the same market type. The market where the consumer is surveyed also provides information about the preference of the consumer when only shoppers that visit the market at least once a

year are considered. Only two of the studies involving multiple markets also report the other preference variables.

The frequency of shopping at other direct markets of the same or different type is only found in three studies. Of these only Courter, Sabota, and Nyankori (1979) report both the frequency of shopping at one specific market and shopping frequency at other competitive markets. The home gardening status of the household is included in six published works. The use the consumer has for produce purchased and/or produced is also in six studies. Two of the eleven studies include all three measures. These variables, when considered together, provide information about the probable produce preferences and economizing efforts of households and indicate how the household allocates its limited time among alternative activities. Any interaction between income and use for produce purchased is probably best categorized as a type of time constraint decision for the household. This variable has not been reported in previous studies.

Race is listed in only three of the publications, occupation in five, and residence in eight. These variables are grouped together since they provide information on the cultural background and social status of the household with general implications about probable lifestyle as well as spending power. Two studies report values for all three measures. Residence is another of the most popular variables used in further statistical analysis.

Month when the consumer is shopping does not fit in any

of the previously mentioned concepts. This variable has not been reported in previous studies but seems important due to the seasonality of direct markets. Different types of consumers may prefer produce items which are harvested locally at different times. The consumer in one season may not shop in other seasons and this can have important implications for market segmentation. This variable will be included in a separate concept called "seasonality".

The statistical profile of direct market consumers changes considerably from one study to the next. Much of the variation in survey results is likely due to the survey method chosen, the geographic and socioeconomic characteristics of the area selected for sampling, the season chosen for the survey, and the type of markets being investigated. The mail surveys report many variables by consumer response about each type of direct market. The market types varied somewhat in their customer profiles.

Reports of Consumer Spending Relationships

Capstick (1982) reports the only known regression analysis on consumer expenditures at direct markets. Data was collected through personal interviews of 38 consumers at community farmers markets in Arkansas during the summer of 1981. Average purchase per visit was regressed on income, group size (which included categories for singles, couples and family groups), age, miles from home to market, and difference in distance from home to market and home to

grocery store. Capstick reports a coefficient of multiple determination of .179 and a 58 percent probability for the model F statistic. No F statistics for inclusion of each variable in the model are reported.

Jack and Blackburn (1984) have published the results of the West Virginia portion of a three-state mail survey to gauge the shopping behavior of consumers at all types of direct markets. They report contingency tables for residence and both spending per visit to a roadside stand and annual amount spent at all direct markets. No chi-square statistics are included. Farm residents appeared to spend more per visit than the other groups. Rural nonfarm and suburban shoppers spent the most on an annual basis at all markets while town consumers spent the least.

Toensmeyer and Ladzinski (1983) have published the Delaware contribution to the three-state survey. Using chi-square analysis they found no significant relation between amount spent per visit at roadside stands and income. The contingency tables seem to indicate a direct relationship although the calculated chi-square was 12.3 compared with a table value of 31.4. The analysis is complicated by a very low percentage of lower income shoppers causing four empty cells.

Buitenhuis, Kezis, and Kerr (1983) add the Maine part of the three-state mail survey. They report a direct relationship between income and amount spent at roadside markets per visit at the 99 percent level of confidence. No signifi-

cant relationship was discovered between income and total amount spent annually at all direct markets. Place of residence was not significantly related to spending per visit to a roadside stand or annual spending at all direct markets.

Brooker and Taylor (1977) collected surveys from personal interviews at a Memphis farmers market. Using one-way analysis of variance on the mean values of amount of produce purchased they found age, group size, and annual household income of the consumer were not statistically significant. They list a 99 percent level of confidence in concluding different spending levels exist for different categories of miles from home to market. A direct relationship existed in their study with customers who traveled greater distance tending to spend more.

Shopping frequency at the market, measured as either regular or occasional, is also significantly related to consumer produce expenditures at the 95 percent level of confidence in chi-square analysis of data from this study. Occasional shoppers spent less than \$5.00 or more than \$20.00 more frequently than regular shoppers. Conversely, regular shoppers spent \$5.00 to \$20.00 more often. This seems to point toward two types of occasional shoppers: tourists who spend small amounts per visit for fresh use and people who travel fairly long distances for quantity purchases.

Metzger, Prysunka, French, and Erhardt (1974) conducted personal interviews with Maine roadside market shoppers.

They publish means of average amount spent on produce at a roadside market for different classes of several demographic variables. One-way analysis of variance statistics are not reported. Spending per visit increased with household size in their analysis. Consumers aged 60 years and older spent less per visit than younger people. An unusual spending relationship with income is reported. Consumers with incomes over \$20,000 spent the most, those with incomes under \$10,000 spent an intermediate amount, and those with incomes between \$10,000 and \$20,000 spent the least.

CHAPTER III

CONCEPTUAL MODEL

Definition of Model by Conceptual Groups

Tilley (1985) summarizes demand analyses of agricultural commodities in the absence of price variations with a general equation of the following form:

$$X = x (I, HS, O) \quad (3.1)$$

where X is household consumption of any commodity, I is the income level of the household, HS is the household size or the number of individuals living in the household, and O is set of other relevant socio-demographic or psychological variables.

A model of household demand for fresh produce from a specific direct market can be formulated using the same basic framework as Equation 3.1. The hypothesized model includes broad socio-demographic and psychological concepts which are believed to influence consumer behavior. The model is of the form:

$$X = x (HS, A, B, P, T, CL, S) \quad (3.2)$$

where X is annual spending of the household on produce at the market, HS is the household size, A is the age distribution of household members, B is the budget constraint on

the household, P represents the preferences and beliefs of the household members, T represents the time constraint on household adults, CL is the effect of cultural and lifestyle factors, and S is the effect of seasonality on consumer purchasing. If household size is incorporated into the dependent variable and budget constraints are considered on a per capita basis then the following equation is derived:

$$Y = y (A, B, P, T, CL, S) \quad (3.3)$$

where Y is annual per capita expenditure per household on produce at the market and other variables are defined as before except that the budget constraint is now viewed as a per capita measure. The model in Equation 3.3 is used in this study.

Hypothesized Expenditure Relationships

In this section of this chapter, each of the concepts of Equation 3.3 is discussed and its expected relationship with annual per capita household spending on produce at the market is described. The discussion centers around the variables used in this study to measure each concept and the expected effects of the variables on consumer expenditures.

Annual Per Capita Spending

The primary expenditure variable reported in the literature has been average expenditure per visit. A more logical variable for managerial planning and segmentation is annual per capita expenditures on produce at a specific direct mar-

ket. This measure indicates more accurately the importance of the market in fulfilling the produce needs of each household since it measures spending over a specific period of time and adjusts for household size. One year is a useful measure of time because of the variability of direct market sales from one quarter to the next.

Age Composition

The age and sex composition of the household has been shown by Price (1969) and others to affect the consumption of various food groups including fruits and vegetables. This is not surprising since individuals of different body size and activity levels should be expected to vary somewhat in their food consumption habits. The age composition is thought to affect the household's preferences. A higher prevalence of the higher consuming age-groups, with household size held constant, is expected to cause the preferences to be more heavily weighted toward consumption of fresh produce from the direct market. "Adult equivalence scales" have been calculated by researchers in this area to compare relative consumption levels of various age/sex groups. Estimated scales have varied considerably from one study to the next so a simple, per capita measure of household size was used in this research.

Buse and Salathe (1978, p. 467) found that the sex of household members did not significantly explain differences in household expenditures for fruits and vegetables but that

age of the members did have a significant effect. It is assumed in this study that sex of household members does not affect expenditures on produce at the market. Age composition of the household is expressed in a simplified form, with age of the respondent and the presence of various household age-groups included as independent variables.

Age affects the level of food consumed and could affect the familiarity of the consumer with certain types of markets. Consumption would be expected to rise moderately through childhood and then slowly if at all after early adulthood. A decline would be expected in later life, probably beginning around retirement age, as activity decreases. Older consumers would be expected to be more familiar with direct markets since such markets were more commonplace before the 1960's and they may depend more heavily on these markets as a primary produce source. The presence of children and teenagers in the household is hypothesized to lower per capita consumption of produce from the market since these age-groups are expected to consume less. The presence of household members 65 years and older is expected to lower consumption of fresh produce at the market since food quantity consumed decreases with decreased activity. This decrease will likely be less than is accounted for by the diet alone since older consumers are expected to buy a greater proportion of their produce from such markets.

Budget Constraint

All households face budget constraints. These constraints force consumers to choose between fresh produce purchased at a specific direct market and all other food and nonfood items which can be purchased. The consumer utility curve portrays the relative levels of satisfaction associated with additional units of each product category. It will ultimately determine what amount of fresh produce will be purchased from the direct market. The consumer will seek to reach the highest obtainable utility level given the budget constraint determined by the ratio of product prices.

Smallwood and Blaylock (1984, p. 11) report that as the purchasing power of households increases, with household size held constant, fresh fruit and vegetable expenditures represent a smaller proportion of expenditures but a higher dollar amount as households increase their consumption and/or switch to more expensive food products. The variable, gross annual per capita household income, is the principal measure of purchasing power and level of budget constraint used in this study. Households with higher incomes have more area under the budget constraint and should spend more per capita, *ceteris parabis*, if fresh fruits and vegetables purchased from direct markets are normal goods.

Miles to the market may also affect the budget constraint since greater travel distance means a higher price for similar produce purchased in similar quantities. This higher cost would normally be assumed to cause the budget

line to shift toward lower amounts of fresh produce purchased at the direct market. However, since direct markets usually give significant discounts for bulk purchases it is hypothesized that those traveling greater distances will try to spread the fixed cost of the mileage difference across more units and achieve bulk discounts as well. Those traveling longer distances should spend more per visit but pay only a slightly higher cost per unit purchased due to the travel cost.

If the budget constraining effects of mileage dominate other mileage effects, as expected, then those traveling greater distances to the market should spend less on an annual per capita basis. The overall effect of mileage on annual per capita spending will also depend upon the preferences of consumers for travel and shopping at direct markets. Since both budget constraint and preference effects are involved other possible overall effects are discussed with the time constraint concept.

Other variables used in this study can also provide some insight to the level of budget constraint being experienced by the household. When consumers indicate that one of their main reasons for shopping is "quantity discounts" on produce it may indicate that such savings are more important to them than to other households and that their budget constraints are tighter. Consumers who indicate that "good prices" is one of the most important reasons for shopping may be exhibiting a higher degree of price-consciousness. They are also

probably experiencing more severe constraints. Those who list one or both of these reasons are hypothesized to look for more special bargains and lower cost foods and spend less annually on produce at the market because of budget constraints.

Preferences

The preferences and beliefs of consumers have long been recognized as important determinants of demand. These account for much of the differences in shape of consumer indifference curves for produce from the direct market versus all other possible purchases with limited funds. Preferences are divided into two areas for this analysis. These include preference for produce from direct markets and preference for produce from a specific direct market. The first type of preference will be measured by the first two variables discussed while the latter preference is measured by the combination of the third and fourth variables discussed.

A response of "fresh produce" for the main reason given for shopping is thought to be a good measure of the preference of the consumer for fresh, quality produce from direct markets. Shoppers who give this reason should also visit other direct markets more frequently and are expected to spend more annually at all direct markets than other consumers. They should spend more per capita at the market if they prefer the market where they are shopping. The consu-

mers who list "other reason" as the main reason for shopping at the market are expected to spend less per capita annually. Other reasons are assumed to be minor and to have little effect on expenditure when compared with the four more commonly mentioned reasons.

The number of reasons given by the consumer for shopping also indicates how the consumer views direct markets in general. Consumer listing three or four main reasons for shopping at direct markets likely spend more annually at direct markets than other consumers. These consumers are hypothesized to also spend more per capita annually at the market if they prefer shopping at the market where they are surveyed.

The market where the consumer is surveyed can offer consumer preference information. When first-time shoppers and shoppers who visit the market less than once a year are excluded from the analysis, as in this study, the respondent could be termed a "regular shopper" at the market. Regular shoppers may visit other direct markets more often and spend more annually at the other markets, but they prefer or have enough interest in the market to visit once or more a year. Three markets are involved in this study. One market is larger, older, and has a wider selection of produce items. Another market is intermediate in size, and age. A third market is younger and smaller. Consumers at the largest market are expected to spend the most per capita while the consumers at the smallest market are expected to spend the

least per capita. Each market will be described more extensively in Chapter IV.

The other important variable used in this research to describe preference for a specific market is the market grade given for freshness of produce. It is hypothesized that consumers use a disjunctive type of decision rule in evaluating direct markets. When using such a rule, the consumer formulates minimally acceptable levels for one or a few key market attributes and then judges each market to see if they meet such standards (Assael, 1984, p. 655). Thus one or two market characteristics are likely to have greater impact on spending than the rest. It is assumed that freshness of produce is the most relevant grade for purposes of this study. This grade should help to distinguish shoppers who are at the market out of interest from those who consider the market their principal direct market. Those who are at the market out of interest, but visit another direct market more often, are likely to give the market lower grades than they would give their principal market for the produce items they usually purchase. This variable has four possible responses ranging from "excellent" to "poor". Those who give the response of excellent should spend the most per capita while those who give the response of poor should spend the least.

Time Constraint

The time pressure on household adults may be an impor-

tant factor in determining household consumption of fresh produce from a specific market. Becker (1965) theorized on the household time allocation decision and Blaylock and Gallo (1983) extended his household production model to the home gardening decision. The true shape of the consumer budget line is, intuitively, determined not only by the ratio of product prices (with travel costs considered) but also by the implicit cost of time associated with purchase, preparation, and consumption of each product.

Time is usually valued by economists as the attainable market wage foregone or the opportunity cost. The value of time to the individual is also strongly conditioned by the degree of personal preference for the activity which affects the perceived value of the time-consuming activity. The time constraint concept includes those variables which are affected by the budget constraint and the preferences and beliefs of the consumer and for which the dominant influence cannot be hypothesized *a priori*.

The frequency of shopping at other types of direct markets such as u-pick markets, roadside stands, or farmers' markets affects the amount of time allotted by consumers for shopping at the direct market. Shopping at any number of roadside markets and farmers' markets would appear to be a similar type of activity although it offers some changes in scenery, selection, and price. More of the same type of time allocation will lead to less marginal satisfaction in each additional unit consumed. The speed with which the consumer

reaches the point where additional direct market shopping yields less marginal utility than other activities depends upon the preferences of the consumer for produce shopping at direct markets, the number and type of direct markets within reasonable distance of the household, and the economic incentives for shopping at the markets.

Consumers may shop more often at other markets when they are in the same vicinity to compare prices and save money. Consumers may also shop at other markets more often because they prefer a wider selection of produce and a higher degree of freshness than can be supplied by one market, alone, for all items on their shopping list. If the budgetary effect dominates, frequent shoppers at other markets would be expected to spend less annually at the market where they are surveyed than consumers who shop less often at other direct markets. If the preference effect is greater then frequent shoppers at other markets should spend more at the market where surveyed than other consumers. The direction of the net effect of frequency of shopping at other types of direct markets on annual spending is unknown but some relationship is anticipated.

The home gardening status of the household can be viewed in a similar time allocation framework as was frequency of shopping at other direct markets. Kaitz (1977, p. 3) reported that half of all home gardeners list preference for fresh taste as the main reason for maintaining a home garden and just under half state that the desire to save money was the

primary factor in the home gardening decision. This points to another price/quality tradeoff. Those who are gardening to save money are likely to not only do more price comparison at other direct markets but also to buy less expensive types of produce items and to hunt for special bargains. They probably view their time spent shopping at the market as a means of saving money. Those who garden because of preference for fresh produce are likely to buy a greater variety of items and to look for premium quality rather than cheapest price. The time they spend shopping at the direct market may be seen as a means of improving their diet, satisfying varied household preferences, and increasing the quality of their lives. Blaylock and Gallo (1983, p. 722) report that "gardening households used more vegetables but purchased less at retail than nongardening households." It is hypothesized that quality-conscious gardeners spend more annually per capita than nongardeners at the direct market and that price-conscious consumers spend less than nongardeners. Since the two types of gardeners are not specifically segregated in this study the net effect of home gardening status on annual per capita expenditure is not known.

The use for fresh produce purchased at the market has time constraint effects. Consumers using some produce other than fresh choose to budget time for food processing. Different processing methods are probably used for different reasons (Johnson, 1976, pp. 7-8). Consumers who freeze some

produce can usually do so much more quickly and "keep foods closer to fresh than any other method of preservation." Canning is typically the cheaper method of preserving produce but requires more time, effort, and more extensive product knowledge. Consumers who freeze are assumed to be less price-conscious consumers than those who process produce but do not freeze. Quality-consciousness should dominate their spending at the direct market and they are hypothesized to spend more annually at the markets than others with nonfresh produce uses. Consumers who use all produce fresh are likely similar in budget and preference factors to those who freeze although they are probably distinguish less strongly between produce quality in-season and out-of-season, assuming that consumers who freeze do so with in-season produce. Since the availability of local produce in-season is considered the primary factor behind any existing "freshness differential" in favor of direct market produce, it is hypothesized that consumers who freeze some of the produce purchased at the direct market will spend more annually at the market.

A nonfresh use interaction with per capita income is hypothesized to exist. Based on the valuation of time by wages foregone, it would be expected that higher income households who use some produce other than fresh, when compared with lower income households with the same usage pattern and comparable size, would spend less per capita than is explained by the income difference. Hatfield (1981, p. 24) indicated that freezing has become the most popular

method of processing fruits and vegetables especially among higher income households. Since households that freeze probably spend more than those that use all produce fresh due to preference considerations, it is expected that the income/nonfresh use interaction is positive. This means that households with higher incomes that use produce other than fresh should spend more than lower income households who use produce nonfresh.

Since direct markets are less numerous and often not as conveniently located to population centers as grocery stores, and since many consumers bypass closer direct markets to buy from a specific market, most consumers must take more time for produce shopping when they visit a direct market instead of the nearest grocery store. Miles to market is a fairly direct measure of the time required for each consumer. Generally, the greater the distance the consumer has to travel, the greater the time constraint added to the household's other activities.

Those who travel long distances several times during the year to revisit the market exhibit a greater tendency to allocate time for this activity. Additional time allotted for direct market shopping could be a result of high perceived value due to preference for time spent traveling and shopping at the direct market, or economic value due to significant cost savings through bulk purchases and/or low attainable wages. Those who travel greater distances only once a year show stricter levels of household time con-

straints which may be due to higher attainable wages or lesser preference for the travel and preparation time involved in purchases of fresh produce from the direct market. The mileage variable is expected to show an indirect relationship with annual per capita spending due to the anticipated dominance of budgetary effects in decreasing the number of visits to the market for those from greater distances.

The consumers who list "convenient location" as a primary reason for shopping are expected to allocate time for a shopping trip to the market much more readily than other consumers. Even if the consumer traveled some distance from home to market this response would seem to indicate that it did not represent a significant cost in travel or time to them. This could be an indication that the market was close to a regular travel route to work or other shopping. Stafford and Wills (1978, p. 16) reported on the growing demand of consumers for convenience in their food markets. Respondents who prefer the convenience of the location also probably exhibit high levels of preference for convenience in their food shopping and may spend more because of this preference. Consumers who listed this response should spend more on an annual per capita basis than those who did not.

Cultural/Lifestyle

Variables which measure the cultural background and offer implications about the lifestyle of the household allow the researcher to explore possible sociological rela-

tionships with purchase behavior. Consumer behaviorists have begun to use cultural and lifestyle measures regularly (Assael, 1984) but marketing economists have been slower to implement such variables in their published research. The cultural/lifestyle variables used in this study have all been used by economists specializing in food marketing and have been found to significantly influence food expenditures. Each of these measures could also be termed "demographic" but are termed "cultural/lifestyle" in this study because of the way they are hypothesized to influence expenditures at a direct market.

The race or ethnic group of the respondent has been reported to significantly affect the marginal propensity to spend on various food items including fruits and vegetables by Buse (Tilley, 1985, p. 14). Smallwood and Blaylock (1984, pp. 12-14) reported that nonwhites spent more per capita on fruits and vegetables than whites. Most of the additional expenditure was due to higher spending by nonwhites other than blacks. Since the market area in this study includes less high-income Japanese Americans and a higher proportion of low-income American Indians in the nonwhite category than national averages, whites are hypothesized to spend more per capita annually than nonwhites at the market.

Occupation of the shopper gives information on the social status and employment status in the household. Occupation of the respondent should normally apply to the adult

female in the household since this group makes up well over over one-half of the direct market shoppers. Professionals and managers/owners might do more entertaining at home in situations where fresh produce is an expected part of the menu. Retirees and housewives may find it easier to find time to visit the market. The overall influence of occupation on expenditures at the market cannot be specified a priori.

The residence of the household was found by Jack and Blackburn (1984, p. 22) to influence the amount spent annually at all direct markets in West Virginia. Rural nonfarm and suburban residents spent more annually at all direct markets while town residents spent the least. Residence is associated with factors such as the propensity to garden and to process foods, familiarity with direct markets, and distance to various types of produce markets. Farm residents should spend less than residents in other areas because of their more self-sufficient lifestyles and available equipment for maintaining large gardens. Town residents are expected to spend the most at the market because of their closer proximity to and greater familiarity with the markets in this study. Rural nonfarm and suburban shoppers are hypothesized to spend the next highest amounts annually at the market due to their propensity to travel larger distances regularly for shopping and/or work. City and large city shoppers are thought to spend intermediate amounts.

Seasonality

The variance of consumer expenditures at direct markets by season has received very little attention. The three publications listed in Chapter II as being part of the three-state mail survey collected information on in-season versus out-of-season expenditures at all types of markets. They concluded that consumers spent the same amount on produce weekly in both periods. Smallwood and Blaylock (1984, p. 15) reported that, nationally, fresh vegetable purchases other than potatoes, were highest in spring, slightly lower in summer, and lowest in fall. Fresh fruit spending was highest in summer, lower in spring, and considerably lower in fall and winter. Fresh potatoes expenditures were highest in winter, slightly lower in fall, and lowest in summer. Seasonality at direct markets can be more complicated than a simple measure of four seasons. The berry season may last one to two months, sweet corn grown locally may be available for purchase over a month-long period. Pumpkins are at their popularity peak for as little as two to three weeks leading up to halloween. A more frequent measure is needed.

A bimonthly measure of seasonality is employed in this research. The survey months include August, October, December/January, March, May, and July. The expected pattern of expenditures per visit by month should not be the same as the pattern for annual per capita spending by month. Pumpkin promotions in October should attract more spending per visit but is likely to involve larger families who view it prima-

rily as a recreational event and shop less frequently. October spending should be lower on an annual per capita basis. March and August are the two slowest months to be included in this survey in terms of produce sales but should include a higher proportion of the regular shoppers, who visit the market even when little locally grown produce is available. These two months should have the highest per capita spending. May shoppers may include many berry buyers who visit less often in other months. Likewise December/January shoppers probably visit the market specifically for pecans or fruit baskets and shop less frequently in other months. Both of these months should be relatively low in per capita spending. July features sweet corn buyers and high traffic flows. It is likely to feature an intermediate level of annual per capita expenditures since the market area is best known for sweet corn production and many of the loyal shoppers at the market were probably first introduced to the market during this season and consider it a prime time to shop.

CHAPTER IV

METHODS AND PROCEDURES

Description of Markets and Trade Area

Three year-round roadside markets in an Oklahoma Standard Metropolitan Area (SMSA) were selected for conducting consumer research. Between August of 1983 and July of 1984, survey responses were collected from twelve days of survey work. One weekday and one Saturday were selected about every two months to survey customers. Oklahoma has five SMSA's. One SMSA was selected because of the interest of managers in the area to cooperate in such a research effort. The SMSA selected was a major metropolitan area with a high degree of direct market activity. The markets which cooperated with this research were within four miles of each other. These markets were within 15 miles of the center of the metropolitan area but were located outside of the central city in a small town. A high-income suburban area was located between the markets and the central city. This suburban area was one of the highest-income areas in the SMSA.

These three markets were the only year-round direct markets in the area when the survey began. A year-round corporate farmers' market operated within ten miles of the

markets before ceasing operation in June, 1984. This market, which was not a farmer-owned or direct market, attracted a large volume of consumers, some of which also shopped at the year-round direct markets. The absence of this market in the final survey period undoubtedly led to increased traffic flows at the three markets. Another year-round direct market began operation within 15 miles of the markets in June, 1984. It is not believed that this market had an appreciable effect on the three markets surveyed because of its newness. Other seasonal direct markets operated in the immediate area of these markets. The three markets probably accounted for 5 to 25 percent of the total direct market sales during the local produce-harvesting season of March to December.

Managers of the three markets possessed varying degrees of experience in produce retailing. Years of experience of managers ranged from under five to more than thirty years. Years the markets had been in operation ranged from less than one to over fifty. Each market used its own unique strategies and promotions.

Each of the market owners or their families had over 100 acres in fruit and vegetable production. The markets supplemented their own produce with produce purchased from others. Most produce capable of being grown in Oklahoma was locally grown in-season and all other produce was supplied from other states. Thus these markets were actually combined direct markets and specialty produce markets but primary income in-season for the markets came from sale of self-

produced produce. All of the markets offered a wide selection of produce and they also carried complementary items including: plants, seed, gardening supplies, food processing supplies, and candy.

These markets were selected because of their year-round business cycles and their close proximity to each other and a metropolitan area. Survey work at adjacent seasonal markets was considered but it was concluded that the three markets would provide a more cohesive and cost-effective sample. The three markets represented about 75 to 95 percent of the direct market sales from March to December and 100 percent of the sales from January to February.

Sample and Sampling Procedure

One or two survey personnel visited each of the markets simultaneously on each survey day. Each survey day consisted of two-and-a-half to seven-and-a-half hours of survey work per market. As many customers as possible were approached and asked to participate in the survey. Those who expressed a willingness to do so were given a legal-sized survey form on a clipboard and were asked to complete the questionnaire at their leisure while they shopped. Survey forms were collected as the respondents left the market or at any earlier time they were returned by the customer. Personnel distributed and collected surveys, counted individuals entering the market and number of sales, and took price and quality inventories of all produce items in the market.

Survey personnel were instructed to approach each shopping group entering the market or as many as could be approached. Some individuals requested that the survey be read to them while they shopped and these requests were accommodated. Still it is likely that the survey method discriminated slightly against certain small groups including: mothers with infants or multiple children with them, consumers which were very rushed due to time pressures, individuals that could not speak English, and those that could not read and did not request the survey to be read to them.

Table II shows the traffic flows, number of sales, and survey collection information by day, period, and the six-period totals. The dates when surveys were collected were August 18 and 20, October 25 and 29, December 17 and January 5, March 5 and 10, May 16 and 19, and July 3 and 7. Survey dates were selected mainly according to the availability of survey personnel although bad weather delayed the January 5 survey from December to January and low traffic flows delayed the next survey until March. No prescribed number of hours of survey work per day or survey hours per market were maintained. Usually survey work began at the markets between 9:00 and 10:00 a.m. and continued until 3:30 to 6:00 p.m.

The 2,282 survey responses collected represented 16.9 percent of all adults, children, and infants entering the markets during the survey periods. This percentage of customers surveyed varied each survey day from a low of 9.8 per-

TABLE II
CUSTOMER TRAFFIC FLOW AND SAMPLING SUMMARY

Measure/ Day(s)	Aug.	Oct.	Month			Jul.	All Months
			D/J.	Mar.	May		
-----Number of Observations-----							
Number of Hours of Simultaneous Survey Work at Markets							
Weekday	5.25	5.00	5.00	5.00	6.75	6.50	33.50
Saturday	6.25	5.00	5.00	6.00	7.25	5.00	34.50
Total	11.50	10.00	10.00	11.00	14.00	11.50	68.00
Persons Entering Markets During Survey Period							
Weekday	287	1217	154	238	599	1672	4167
Saturday	1471	2041	971	628	1848	2351	9310
Total	1758	3258	1125	866	2447	4023	13477
Persons Entering Markets Per Hour							
Weekday	54.7	243.4	30.8	47.6	88.7	257.2	124.4
Saturday	235.4	408.2	194.2	104.7	254.9	470.2	269.9
Weighted av.	152.9	325.8	112.5	78.7	174.8	349.8	198.2
Number of Sales							
Weekday	156	422	90	142	413	1115	2338
Saturday	814	886	479	329	1496	1445	5449
Total	970	1308	569	471	1909	2560	7787
Number of Sales Per Hour							
Weekday	29.7	84.4	18.0	28.4	61.2	171.5	69.8
Saturday	130.2	177.2	95.8	54.8	206.3	289.0	157.9
Weighted av.	84.3	130.8	56.9	42.8	136.3	222.6	114.5
Ratio of Number of Sales to Customers							
Weekday	.544	.347	.584	.597	.689	.667	.561
Saturday	.553	.434	.493	.524	.810	.615	.585
Weighted av.	.552	.402	.505	.544	.780	.637	.578
Survey Respondents							
Weekday	80	119	42	75	149	364	829
Saturday	237	224	132	179	295	386	1453
Total	317	343	174	254	444	750	2282
Survey Respondents Per Hour							
Weekday	15.2	23.8	8.4	15.0	22.1	56.0	24.7
Saturday	37.9	44.8	26.4	29.8	40.7	77.2	42.1
Weighted av.	27.5	34.3	17.4	23.1	31.7	65.2	33.6
Ratio of Survey Respondents to Customers							
Weekday	.279	.098	.273	.315	.249	.218	.199
Weekend	.161	.110	.136	.285	.160	.164	.156
Weighted av.	.180	.105	.155	.293	.181	.186	.169

cent to a high of 31.5 percent. Consumers in groups typically took only one survey for the group however, so more than one person often had input on a survey particularly in grading the various characteristics of the market. Respondents answered an average of 83.2 percent of the questions on the survey instrument.

Customers entering the market, number of sales, and the ratio of number of sales to customers varied considerably from one survey day or period to the next. Customers included all adults and children which entered the market. Number of sales were all separate transactions between the markets and the customers. When customers pooled their purchases it was counted as a single sale. Both the customer and sales counts should be considered approximations since survey personnel counted both measures while handing out and occasionally reading surveys to consumers. The customer traffic flow and sales information is provided as evidence of the seasonal effects on these markets. The period of April through July was the peak season for these markets. The October to December period was the next highest sales season. In contrast, traffic and sales during January and February were quite low. March was important for garden supply sales.

Market shares are not indicated by the Table II figures. The largest market maintained a 40 to 60 percent share of traffic flow and number of sales during the six-period study. The intermediate-sized market had a 25 to 45 percent

share and the smallest market had developed a 5 to 25 percent share in its first year of operation.

CHAPTER V

EMPIRICAL ANALYSES

A generalized least-squares (GLS) regression model was estimated to clarify the differences in spending on produce at roadside markets by various subgroups of consumers. The model-building process is discussed in the first section of this chapter. In the latter part of this chapter the variables used in the full model are each defined and the statistics of the GLS model are presented. The model results are discussed by variable groups first and then by the conceptual groups described in Chapter III. A partial descriptive summary of the data collected is found in Moesel and Tilley (1985b). A complete summary of the data by month is forthcoming (Moesel and Tilley, 1985a).

The Model-building Process

Annual per capita expenditure on produce at the market by each household was chosen as the response variable for the regression procedure. This variable was obtained through a combination of three survey responses. The usual amount spent on produce at the market per visit was multiplied by a number which approximated the number of visits per year. The result was an annual expenditure on produce at the market

per household. This variable was then divided by the household size to obtain an estimate of annual per capita spending for produce at the market for each household.

The independent variables were selected to represent the concepts discussed in Chapter III and to reflect the findings of previous research. When one variable appeared to dominate others in a concept group, the variable(s) which appeared to best represent the concept were retained.

Most of the data that was collected for this study was qualitative. Because of this, binary or dummy variables were used to indicate the difference in consumer spending from having a certain personal characteristic or attitude as opposed to another. When using dummy variables in a regression procedure one variable in the variable group is deleted and its coefficient is set equal to zero. All variables in the variable group that are included in the model are assigned coefficients by the procedure which reflect the difference between this variable spending level and the variable set to zero.

Cross-sectional data such as this frequently exhibits a high level of heteroscedasticity. Heteroscedasticity is defined by Neter, Wasserman, and Kutner (1983, p. 170), as the condition of the error variance not being constant across all observations. The presence of this condition in the data results in estimators which are unbiased and consistent, but are not minimum variance. A GLS procedure such as that originally described by Glejser (1969) is used to

remove most of the undesirable effects of heteroscedasticity from an ordinary least-squares (OLS) model.

To determine the degree of heteroscedasticity present in the OLS model a stepwise forward regression model was employed. All of the independent variables and the predicted value of the dependent variable were specified to be available to the algorithm for inclusion in the model. Inclusion in this model was based upon the variable being significantly related with the absolute value of the residuals at the 50 percent level of confidence.

The stepwise regression procedure identified a model of the absolute value of the residuals of the OLS model with 38 independent variables and a coefficient of multiple determination of .319. This model is described in Appendix B. The remainder of the GLS procedure was implemented to minimize the heteroscedasticity apparent in the OLS model. The absolute value of the predicted values of the residuals of the OLS model was used as a divisor for all variables in the OLS model. The full model was then estimated once again using OLS and the transformed data. This resulted in a set of unbiased and consistent estimators with minimum variance.

Variable Definitions

Definitions of each of the variables are reported in Table III. Variables are arranged, as closely as possible, into the same concept groups used in Chapter III. Most of the measures are in the form of dummy variables. Exceptions

TABLE III
DEFINITIONS OF VARIABLES
BY CONCEPT GROUP

<u>Concept</u>	<u>Variable</u>	<u>Description of Variable</u>	<u>Description of Group</u>
<u>Annual Per Capita Spending</u>			
	APCSPEND	Amount spent x visits per year / household size	Dependent variable
<u>Age Composition</u>			
	AGE1	0-24 years	Age of respondent
	AGE2	25-44 years	
	AGE3	45-64 years	
	AGE4	65-70 years	
	AGE5	71 or more years	
	PEOPLE1	0-11 year olds in household	Presence of each age-group in household
	PEOPLE2	12-18 year olds in household	
	PEOPLE3	19-24 year olds in household	
	PEOPLE4	25-44 year olds in household	
	PEOPLE5	45-64 year olds in household	
	PEOPLE6	65-70 year olds in household	
	PEOPLE7	71+ year olds in household	
<u>Budget Constraint</u>			
	PCINCOME1	\$5,000 / household size	Per capita income of household based on midpoint of income range of respondent's household
	PCINCOME2	\$15,000 / household size	
	PCINCOME3	\$25,000 / household size	
	PCINCOME4	\$35,000 / household size	
	PCINCOME5	\$45,000 / household size	
	PCINCOME6	\$55,000 / household size	
	MILES1	0-4.9 miles	Miles from home to market
	MILES2	5-9.9 miles	
	MILES3	10-14.9 miles	
	MILES4	15-19.9 miles	
	MILES5	20-24.9 miles	
	MILES6	25 or more miles	
<u>Preferences</u>			
	REASON1	Good prices	Specific reason given for shopping at market
	REASON2	Fresh produce	
	REASON3	Convenient location	
	REASON4	Quantity discounts	
	REASON5	Other reason	
	TREASON1	One reason	Total number of reasons given for shopping at market
	TREASON2	Two reasons	
	TREASON3	Three or more reasons	
	MARKET1	Newest and smallest market	Market at which person completed survey
	MARKET2	Oldest and largest market	
	MARKET3	Intermediate sized market	
	FRESHNESS1	Excellent	Grade given market for freshness of produce
	FRESHNESS2	Good	
	FRESHNESS3	Fair	
	FRESHNESS4	Poor	

TABLE III (Continued)

<u>Concept</u>	<u>Variable</u>	<u>Description of Variable</u>	<u>Description of Group</u>
<u>Time Constraint</u>			
	OTHER1	First time	Shopping frequency at other roadside markets and farmers' markets
	OTHER2	Once a week	
	OTHER3	Twice a month	
	OTHER4	Once a month	
	OTHER5	Four times a year	
	OTHER6	Once a year	
	OTHER7	Seldom	
	PY01	Never	Shopping frequency at pick-your-own markets
	PY02	Once a week	
	PY03	Twice a month	
	PY04	Once a month	
	PY05	Twice a year	
	PY06	Once a year	
	GARDEN1	No home garden	Home gardening status of household
	GARDEN2	Have home garden	
	FRESHUSE1	Use all produce fresh	Use all produce for fresh consumption
	FRESHUSE2	Not all produce used fresh	
	FREEZEUSE1	No produce for freezing	Use some produce for freezing
	FREEZEUSE2	Some produce for freezing	
	INTERACT1	PCINCOME1 x FRESHUSE2	Interaction of per capita income and nonfresh use of produce by respondent's household
	INTERACT2	PCINCOME2 x FRESHUSE2	
	INTERACT3	PCINCOME3 x FRESHUSE2	
	INTERACT4	PCINCOME4 x FRESHUSE2	
	INTERACT5	PCINCOME5 x FRESHUSE2	
	INTERACT6	PCINCOME6 x FRESHUSE2	
<u>Cultural/Lifestyle</u>			
	RACE1	White	Race of respondent
	RACE2	Nonwhite	
	OCCUPATN1	Full or part-time housewife	Occupation of respondent
	OCCUPATN2	Professional	
	OCCUPATN3	Manager or owner	
	OCCUPATN4	Retired	
	OCCUPATN5	Other occupation	
	RESIDE1	Large city (50,000+)	Area of residence
	RESIDE2	Suburb	
	RESIDE3	City (10,000-49,999)	
	RESIDE4	Town (9,999 or less)	
	RESIDE5	Rural nonfarm	
	RESIDE6	Rural farm	
<u>Seasonality</u>			
	MONTH1	August	Month during which person completed survey
	MONTH2	October	
	MONTH3	December and January	
	MONTH4	March	
	MONTH5	May	
	MONTH6	July	

are explained below.

The variables, PEOPLE1-PEOPLE7, are not one large set of dummy variables but seven separate binary variables. A value of one indicates that the household contains one or more people in that age-group while a value of zero shows that the household has no individuals in that age-group. Coefficients of these variables should be considered together with the variable group, AGE1-AGE5. For example, a respondent between 25 and 44 with a spouse in that same category and two children under 11 would be represented by the sum of the coefficients for AGE2, PEOPLE1, and PEOPLE4.

The variables, REASON1-REASON5, are exceptions because a response that the reason was a main reason for shopping at the market is shown as the slope shifter while all respondents who did not check this reason as a main reason are set equal to zero. Although consumers were asked to indicate their main reason for shopping, many people listed two or more of these reasons. The total number of reasons given by the consumer are shown by the variable group, TREASON1-3. All of the parameter estimates dealing with reasons given by consumers should be considered together. For example, a consumer who gave three main reasons for shopping has a relative spending level reflected by the sum of the parameter estimates for TREASON3 and the three specific reasons listed out of the group of variables, REASON1-REASON5.

The variables, PCINCOME1-PCINCOME6, were created by dividing the midpoint of the income class by the household

size. Each respondent is represented by only one of the six variables according to which of the six income classes was checked. Some difficulties are inherent in this approach. The true mean of each range may be different from the midpoint, especially for the lowest and highest ranges. The lowest range used \$5,000 as the midpoint of the under \$10,000 class. The resulting coefficient for PCINCOME1 is likely larger than a coefficient based on the true mean of the range. The highest range used \$55,000 as the midpoint of the over \$50,000 class. The resulting coefficient for PCINCOME6 is probably larger than coefficient based on the true mean of the range.

The variable group, INTERACT1-INTERACT6, represents the interaction of the variables, PCINCOME1-PCINCOME6, with the variables, FRESHUSE1-2. The variable group, FRESHUSE1-2, shows whether or not the consumer used all produce purchased at the market fresh or whether some was to be used otherwise such as for processing or to give away. FRESHUSE2 equals one if some other uses were envisioned and zero if produce was to be used only for fresh eating by the household. The variable numbers from the INTERACT group correspond to the same income levels as indicated by the variable numbers for the PCINCOME group. Each respondent is represented by only one of the variables.

INTERACT variables have a value of one multiplied by the corresponding PCINCOME variable value if FRESHUSE2 equals one. If FRESHUSE2 equals zero then the effects of the inter-

action of income and use are to be found in the intercept. The relative expenditures level of a household with income over \$50,000 who used some produce for other than fresh consumption would be represented by the coefficient for INTERACT6. Another household of similar income who used all of the produce purchased for fresh consumption would have a coefficient with value equal to zero.

The variable group, FREEZEUSE1-2, should also be considered with FRESHUSE1-2. FREEZEUSE2 equals one when the consumer indicated some of the produce was to be used for freezing. FREEZEUSE2 can only equal one when FRESHUSE2 equals one since this indicates that the consumer did not use all of the produce for fresh consumption. If FRESHUSE2 equals one then FREEZEUSE2 may equal one or zero depending upon whether the other use(s) for produce did or did not include freezing. A consumer who used some produce other than fresh but did not freeze any produce purchased at the market has a spending level shown by the coefficient of FRESHUSE2. Another consumer who did some freezing has a relative expenditure level reflected by the sum of coefficients for FRESHUSE2 and FREEZEUSE2.

Regression Results

Model statistics for the OLS and GLS full models are presented in Table IV for comparison. Since the OLS estimators are not minimum variance due to heteroscedastic effects, only the GLS model statistics will be discussed in

detail throughout the remainder of this chapter since these are the appropriate estimators.

TABLE IV
COMPARISON OF MODEL STATISTICS

Statistic	<u>Model</u>	
	OLS	GLS
Mean of Dependent Variable	106.946	2.565
Covariance of Dependent Variable	137.825	73.062
Coefficient of Multiple Determination	.3217	.9811
Adjusted Coefficient of Multiple Determination	.2390	.9788
Model F Statistic	3.890	419.691
Probability of F Value	.0001	.0001
Mean Square Error	21726.138	3.511

Using the GLS model, a series of general linear hypotheses were tested to determine which groups of dummy variables and classification variables other than dummy variables had significant F statistics for inclusion in the model. The parameter estimates, t statistics for each parameter estimate, and F statistics for each group of variables are reported in Table V for the GLS full model.

The OLS model did a reasonable job of explaining annual per capita expenditures per household on produce at the market. Eight of the seventeen groups of variables were

TABLE V
 MODEL ESTIMATES AND RELATED
 STATISTICS FOR GLS MODEL

Variable	Parameter Estimate	t Value	F Value	Number Out of Sample of 636 Represented by Variable
INTERCEPT	267.5	1.456		636
AGE1	0.00		11.951	23
AGE2	149.9	6.288	(.001)	351
AGE3	56.12	2.367		213
AGE4	44.29	0.907		33
AGE5	87.51	1.986		16
PEOPLE1	-17.72	-2.367	7.811	240
PEOPLE2	-11.14	-1.719	(.001)	138
PEOPLE3	37.65	4.568		128
PEOPLE4	-45.99	-2.172		394
PEOPLES	-0.7122	-0.050		256
PEOPLE6	49.86	1.849		50
PEOPLE7	-50.50	-2.906		26
PCINCOME1	0.03315	2.945	4.240	33
PCINCOME2	0.01243	4.077	(.001)	92
PCINCOME3	0.006343	4.077		142
PCINCOME4	0.002429	1.885		131
PCINCOMES	0.002932	3.078		113
PCINCOME6	0.002758	3.168		125
MILES1	0.00		3.220	101
MILES2	2.829	0.373	(.01)	147
MILES3	-8.610	-1.053		145
MILES4	-19.53	-2.315		78
MILES5	6.711	0.558		62
MILES6	9.177	0.740		103
REASON1	-75.48	-1.392	13.158	294
REASON2	-65.13	-1.192	(.001)	555
REASON3	-18.18	-0.331		111
REASON4	-42.62	-1.100		44
REASON5	-118.3	-2.144		46
TREASON1	-170.9	-1.556	3.430	326
TREASON2	-71.93	-1.273	(.05)	224
TREASON3	0.00			86
MARKET1	-23.72	-3.121	4.881	90
MARKET2	0.00		(.01)	325
MARKET3	-8.629	-1.456		221
FRESHNESS1	63.32	0.901	11.627	258
FRESHNESS2	42.82	0.612	(.001)	324
FRESHNESS3	11.40	0.164		51
FRESHNESS4	0.00			3

TABLE V (Continued)

Variable	Parameter Estimate	t Value	F Value	Number Out of Sample of 636 Represented by Variable
OTHER1	-131.0	-2.865	5.604	1
OTHER2	0.00		(.001)	73
OTHER3	-99.76	-3.138		76
OTHER4	-86.95	-2.688		98
OTHER5	-121.0	-3.775		155
OTHER6	-110.0	-3.375		28
OTHER7	-101.6	-3.191		205
PY01	8.073	0.783	8.605	255
PY02	0.00		(.001)	79
PY03	39.94	3.844		71
PY04	-6.663	-0.597		59
PY05	-11.65	-1.113		86
PY06	2.518	0.234		86
GARDEN1	0.00		2.130	257
GARDEN2	-7.232	-1.460	(.50)	379
FRESHUSE1	0.00		3.979	278
FRESHUSE2	-37.73	-1.995	(.05)	358
FREEZEUSE1	0.00		13.100	363
FREEZEUSE2	47.61	3.619	(.001)	273
INTERACT1	0.01170	0.497	1.028	19
INTERACT2	-0.002318	-0.666	(.50)	50
INTERACT3	0.002677	1.541		68
INTERACT4	-0.0002318	-0.165		75
INTERACT5	0.0005769	0.547		65
INTERACT6	0.0007823	0.948		75
RACE1	0.00		30.745	593
RACE2	-49.21	-5.545	(.001)	43
OCCUPATN1	-2.273	-0.345	3.101	205
OCCUPATN2	-17.80	-2.648	(.025)	164
OCCUPATN3	30.43	1.068		53
OCCUPATN4	15.18	0.697		51
OCCUPATN5	0.00			163
RESIDE1	0.00		16.423	278
RESIDE2	-36.13	-4.893	(.001)	56
RESIDE3	21.87	2.239		96
RESIDE4	6.448	0.654		133
RESIDE5	-46.91	-5.277		43
RESIDE6	-48.13	-3.331		30
MONTH1	0.00		7.745	75
MONTH2	-40.63	-4.421	(.001)	97
MONTH3	-48.96	-4.774		45
MONTH4	-10.39	-0.732		87
MONTH5	-46.62	-4.684		143
MONTH6	-26.49	-2.633		189

significant at the 95 percent level of confidence for inclusion in the full model. The model F statistic was significant. The coefficient of multiple determination was fairly high for cross-sectional data such as this.

The GLS model did a much better job of explaining the dependent variable because of the transformation to minimize heteroscedastic effects. Fifteen of the seventeen variable groups were significant at the 95 percent confidence level for inclusion in the full model. The model F statistic was significant. The coefficient of multiple determination was high for cross-sectional data. The hypothesis test changes result because OLS overestimates the variance of the estimates while GLS provides minimum variance estimators.

Discussion of Results by Variable Group

The regression coefficients for each variable group are discussed briefly in this section. Variables are discussed in the same order in which they appear in Table V. The results of tests of hypotheses, suggested for each variable group in Chapter III, are reported.

Age and the presence of various age-groups in the household are considered together. Both variable groups are significant at the 99.9 percent confidence level in explaining annual expenditures per capita. Construction of hypothetical families is helpful in interpreting these coefficients. A single 19-24 year old or a couple with both in that age-group would have an estimated spending level of

\$37.65 per capita compared to a single or couple in the 25-44 year age-group with \$103.92. The comparable figure for the 45-64 age-group is \$55.41, for 65-70 is \$94.15, and for 71 or more is \$37.01. Children can be added by simply adding the negative coefficients of either or both age-groups to the respondent age-group. A spouse of different age-group is added in the same manner. A 25-44 year old respondent with a 45-64 year old spouse and children in both the 0-11 and 12-18 age-groups would be represented by \$74.35.

Respondents in the 25-44 age category seem to have per capita expenditures too high to reflect their greater consumption levels alone. Since many shoppers in this age-group probably have children in one or both of the first age-group categories, the estimate of per capita expenditure can be lowered by as much as \$28.86 to a value of \$75.06. Shoppers in the 45-64 age-group probably often have higher per capita spending due to the presence of college-aged children in the home which would raise the estimate for a couple in that age-group to \$93.06. Older households, with at least one household member aged 65-70, spend a surprisingly high amount per capita annually. In addition to the estimate of \$94.15 for singles or couples in the 65-70 age-group, respondents aged 71 or more with another household member aged 65-70 are estimated to spend \$86.87.

These results confirm the hypotheses about how the age composition of the household affects annual per capita spending. The presence of children does lower the spending

levels as does the presence of consumers aged 71 or more. Households with adults from 25-70 years spend the highest amounts. Couples aged 25-44 with one or more teenagers spend approximately the same amount (\$92.78) as couples aged 45-64 with one or more college-aged household members (\$93.06) or 65-70 year old couples with no other household members (\$94.15). It was anticipated that older households might spend more per capita than would be explained by food consumption alone since they probably are more familiar with direct markets. This effect was even greater than expected among 65-70 year olds.

Annual per capita income of the household is significantly related to expenditures at the 99.9 percent level of confidence. The relationship is a complex one. By multiplying each coefficient by the corresponding midpoint of its income range the annual spending estimates for each income group can be derived. Annual spending levels for each income group, from lowest to highest are: \$165.75, \$186.45, \$158.58, \$85.02, \$131.94, and \$151.69. Annual per capita estimates can be calculated by dividing these annual spending values by the appropriate household size mean for each income level. The means for household size are listed in order from lowest income group to highest as follows: 2.71, 2.68, 3.07, 3.17, 3.06, and 3.25. The calculated estimates of annual per capita spending for each income group, listed in the same order, are: \$61.16, \$69.57, \$51.65, \$26.82, \$43.12, and \$46.67. The coefficients for the lowest

and highest income groups were expected to be higher than the true parameters due to the effects of using a midpoint value for all classes. This would explain some of the surprisingly high estimate for the under \$10,000 income group.

The hypothesized direct relationship between per capita household income and annual per capita spending on produce at the market is rejected. It appears that some of the unusual income/expenditure pattern may be explained by the differing household sizes of each income group. The four highest income groups have larger households than the lower two and may be enjoying greater economies of scale in their fruit and vegetable purchases at the direct market. The \$30,000-39,999 income group spends considerably less at the market than other groups. This may be due to additional time constraints such as more household members employed, more travel or time costs in visiting the market, or lesser preference for direct market shopping, or some other factor.

The number of miles from home to market has a significant effect on annual per capita expenditures at the market at the 99 percent level of confidence, but the relationship is, again, complex. Consumers from the 15-19.9 mile range spent the least amount annually. Consumers within the 10-14.9 mile range spent the next lowest amount. Those living close to the market, from 0-9.9 miles, spent intermediate amounts annually per capita. Those shoppers traveling the longest distances, 20 or more miles, spent the highest

amounts at the markets and represented just over 25% of the sample.

The results generally confirm the inverse relationship expected between mileage and expenditures within the first four ranges. The longest two ranges lead to a rejection of this hypothesis however. It is possible that the preference effect described under the time constraint hypotheses dominates for the latter two mileage groups. This would mean that the consumers who take the time to visit the market from relatively long distances may prefer the time spent traveling to and shopping at the market more than other consumers. This is more likely when shoppers that are visiting for the first time or that visit less than once a year are excluded such as in this analysis.

The reasons given for shopping at the market were found to be related to spending at the 99.9 percent confidence level. "Convenient location" was the reason associated with the highest spending level. "Quantity discounts" was the reason given by the next highest spending segment of consumers. "Fresh produce" and "good prices" were both reasons given by consumers with intermediate levels of spending. "Other reasons" was checked by consumers with the lowest levels of spending.

The quantity discount and good price reason results refute the hypothesized relationships with expenditures. It was expected that both of these responses would be characteristic of more price-conscious and lower spending

consumers while those responding with the fresh produce reason would spend higher amounts. The price reason is estimated to result in slightly lower spending levels than the fresh produce answer. The spending difference between these two responses is not sufficient to confirm the hypothesis. The other three reasons all appear to show clear differences. As expected, consumers listing convenient location as a major shopping purpose spent the highest amounts. This could be due to the lower perceived travel costs involved and/or the high preference for time convenience among such consumers. The high spending level of those who listed discounts as a principal reason was surprising. This might indicate that the consumer is price-conscious and is saving on the household fruit and vegetable expenditure by spending a greater proportion of it at the direct market than other consumers. These households might also consume more per capita annually of produce purchased fresh from all sources due to preferences of household members. The much lower spending levels of consumers listing "other reason" verifies the hypothesized relationship. It is likely that the the first four reasons given by consumers are more important motivations in consumer spending at direct markets than other reasons or that consumers responding "other reasons" are less certain of their reasons for shopping and spend less.

The number of reasons given by the consumer was found to significantly affect household spending at the 95 percent

level of confidence. In general, consumers who gave more reasons for shopping spent more than those who offered fewer reasons. Since 35 percent of the sample gave two reasons and 14 percent gave three or more it is important to consider the most frequent combinations of responses. 87.3 percent of all responses in the sample contain "fresh produce" as a reason so it is by far the most common single reason given. Most of the double answers include "good prices." Close to half of the consumers who gave three or more reasons mentioned "convenient location." The sum of the coefficients for each of these combinations, in order, are: -\$235.98, -\$212.54, and -\$158.79, respectively. Substitution of "quantity discounts" into any of these calculations except the last increases the annual spending estimate while substitution of "other reason" dramatically decreases it.

The result of tests of the number of reasons variable confirms the hypothesis. It is believed that consumers who offer more reasons for shopping at the market have a greater preference for either all direct markets as a source of produce or the market where they give the response.

The market where the consumer responds is an effective variable in explaining consumer expenditure variation. It was significant at the 99 percent confidence level. The largest and oldest market with the widest selection and volume of produce attracted higher spending per capita than the market of intermediate size, age, and volume. The new market with smaller store space had the lowest annual per

capita spending on produce. This was as hypothesized and reflects the relative market share of each market accurately when combined with the traffic flow and sampling information reported in Table II. This is probably the result not only of wider produce selection, volume, and more experienced management, but also of accumulated reputation and goodwill for older markets.

The market grade for freshness of produce is significant at the 99.9 percent level of confidence in relation to expenditures. 41 percent of the shoppers gave the market a grade of "excellent" representing the highest spending group. 51 percent of consumers sampled thought the freshness of the produce rated "good" and they spent a somewhat lower amount. Only eight percent of the respondents thought "fair" was the most appropriate grade and they spent considerably less than the first two groups annually. Less than one percent thought the freshness was "poor" and this group spent slightly less than those who gave the fair grade.

Freshness of produce is the major reason given by consumers for shopping at direct markets. Results of the freshness grade for the market confirm the hypothesized relationship and suggest that this is an effective measure of consumer preference for the market. The belief that market produce is fresh probably lends confidence to the consumer and reinforces purchase behavior at the market.

The frequency of shopping at other roadside markets and farmers' stands is significant at the 99.9 percent confi-

dence level in explaining expenditure differences. Respondents who shopped once a week at one or more of these other markets spent considerably more on an annual per capita basis. About 65 percent of those shopping once a week at such markets also shopped once a week at the market where they were surveyed. It is presumed that in most cases the other market(s) was one or both of the other markets involved in this study. Thus a trip to one market for the most frequent shoppers often included trips to two or more of the markets. Other expenditure differences among this variable group may exist but they are not as apparent as the once a week versus other frequency of shopping at other roadside stands and farmers' markets.

No specific hypothesis was made for this variable group except that some relationship was likely. A greater preference among the once a week shoppers for produce freshness and selection may be active in stimulating higher levels of expenditures.

The shopping frequency at pick-your-own operations is significant at the 99.9 percent confidence level in explaining annual spending variation between different consumers. Twice a month shoppers at u-pick outlets spent more than the other groups. 46 percent of the twice a month shoppers at u-pick markets visited the market where they were surveyed twice a month. Another 12 percent of these consumers visited this market once a week. One of the markets had some u-pick merchandising in one of their nearby fields and it is possi-

ble that some of the visits to a u-pick market were also visits to the roadside market.

No specific relationship was hypothesized for u-pick shopping frequency but some expenditure relationship was expected due to the similarity in the time allocation decision for shopping at direct markets of all types. It may be that consumers with very strong preferences for produce freshness and variety regularly visit multiple direct markets to find what they seek.

Home gardening status is not statistically significant in its effects on spending in this study. No specific direction of net effect was hypothesized but a relationship was expected. Perhaps the reason why gardening status was not significant was because of different segments of home gardeners as suggested in Chapter III. A price-conscious segment with lower spending might be combined in the gardening variable with a more quality-conscious segment with high spending. This cannot be tested from this research.

Both the use of produce for nonfresh purposes and the use of produce for freezing are significantly related with annual expenditures in this study. The use for freezing variable was significant at the 99.9 percent confidence level while the fresh use variable was significant at the 95 percent level. Consumers using at least some of the produce purchased other than fresh are estimated to spend \$37.73 less than those who use produce only fresh. Consumers who

freeze some of the produce (and therefore use some of it nonfresh) spend \$9.88 more than those who use all produce fresh.

The spending levels of each of these three consumer groups were correctly hypothesized. Nonfresh users who do not freeze probably are trying to save money and buy in-season, accounting for some of their lower spending. Those who use all produce fresh may have less preference for local produce and may spend less at direct markets of all types. Consumers who freeze could prefer the convenience this method offers and may have a greater appreciation for the freshness of produce sold at direct markets.

The income/nonfresh use interaction variable group is not significant in its relation to annual per capita spending. It is concluded that consumer spending does not interact with per capita income and use of some produce nonfresh. The positive interaction hypothesized is rejected.

Race was found to significantly affect annual per capita spending at the 99.9 percent level of confidence. In this particular market area, whites spend an average of \$49.21 more than nonwhites per capita annually. This sustains the hypothesis that whites should spend more in this market area. American Indians are second only to blacks in size in the nonwhite category. This group has low incomes and larger households. It is likely that the significantly larger household sizes of nonwhites had a large effect on the per capita spending patterns.

Occupation was found to significantly affect consumer expenditures at the 97.5 percent level of confidence. Managers, owners, and self-employed persons were found to spend the most on produce. Retired persons spent the next highest amount. "Other occupation" and full or part-time housewives spent intermediate amounts. Professionals were found to exhibit the lowest levels of annual per capita spending.

The relationship between occupation and expenditures was not directly specified but some effect was expected. Since adult females were the most frequent respondents, occupation generally refers to their employment rather than the adult male of the household. Housewives have the largest households and retirees have the smallest. Household size is important in explaining the relative spending levels of these two occupations. Professionals are probably experiencing considerable time pressures and may prefer the convenience of closer produce sources than direct markets. Retirees likely have greater knowledge of the markets and may enjoy visiting the market for social reasons. Managers, owners, and self-employed, present somewhat of a puzzle because of their frequent, high dollar purchases. Perhaps they are entertaining guests regularly. The explanation may go further to include a greater propensity for fresh produce purchased at roadside markets. This could involve the lifestyles that such individuals prefer. Housewives probably enjoy the benefits of economies of scale because of the larger household sizes they represent.

Residence is significant in terms of annual expenditure per capita at the 99.9 percent level. City residents spend the most while town and large city dwellers spend the next highest amounts. Suburbanites spend an intermediate amount. Rural nonfarm and farm residents spend the least.

Farm residents were hypothesized to exhibit the lowest spending levels and this is confirmed. These consumers and rural nonfarm residents probably grow much of their own produce or receive it from friends. They may maintain a more self-sufficient lifestyle. Suburbanite spending was expected to be higher relative to the other residence categories. The lower spending may be related to time pressures and perceived inconvenience in making the trip to the market. Town consumers spent high levels at the market, although not the highest as expected. The higher spending of town inhabitants is probably due to the close proximity of the market and its convenience for most produce needs. The high spending levels for city and large city residents were somewhat surprising. When viewed together with the mileage coefficients they may take on more moderate levels. Most of the city and large city residents came from the 10-19.9 mile range. This might help to explain some of the lower spending estimates found for these mileage groups earlier.

The month in which the consumer shopped at the market and completed the survey is significantly related to annual per capita expenditures at the 99.9 percent confidence level. August was the highest annual spending month, fol-

lowed by March. July was intermediate in annual spending levels. October, December/January, and May all had lower levels of per capita expenditures.

The regression results for each month are relatively close to the hypothesized relationships. August and March were the two highest months in annual per capita spending of all households. It appears that more of the regular shoppers are at the market, proportionately, in these two months than during the other survey months. July was also a high spending month. This may be because more of the frequent consumers came to buy sweet corn than came in other high traffic months. October, December/January, and May all have low levels of annual spending as expected. This is most likely because of the high demand for one or two crops during each period which attract many more infrequent shoppers who spend less annually at the market.

Discussion of Results by Concept

This section will review the regression results as they relate to informal tests of the significance of each type of conceptual group in influencing the annual per capita expenditures per household on produce at the market. The concepts will be reviewed in the same order in which they have been arranged before.

Age Composition

The age composition concept, including the variables

AGE1-5 and PEOPLE1-PEOPLE7, was hypothesized to measure differences in actual consumption due to ages of household members and to cause differing preferences for fresh fruits and vegetables among households of different age makeup. The combination of these two variable groups seemed to do a good job in explaining such differences. Some degree of preference differences, by age, for shopping at direct markets also appeared to creep into the analysis using these variables. In general, the effect of age of each household member on household per capita consumption was to lower this measure in early childhood, to gradually produce a less negative effect through teenage years, to increase consumption in adulthood, and then to cause levels to generally decline by the 71st year.

Budget Constraint

The budget constraint conceptual group was hypothesized to influence annual per capita spending at the market by defining the budget line which the household faces that forces it to choose the highest attainable indifference curve between produce purchased at the direct market and all other possible purchases. The variables hypothesized to act as budget constraining measures in this analysis were: per capita household income, miles from home to market, the reason, "quantity discounts," and the reason, "good prices."

Income did not appear to exhibit a solely economic effect in this study. Both economic and preference factors

seem to be involved. Higher income families with their generally larger households probably enjoy economies of scale in their food purchasing. The income elasticity of low-income consumers for fresh fruits and vegetables is apparently much higher than for high-income households since a larger proportion of their current income is spent on food.

The preference factor that is active with the income variable group is not clearly understood but could be related to perceived enjoyment from visiting the market or direct markets in general. This perception affects the value consumers place upon the leisure time spent at direct markets. High-income consumers may have to have stronger preferences for this type of activity in order to justify foregoing a larger attainable market wage to visit the market.

Mileage to the market displays the budget constraint effect of an inverse relationship with expenditures within the 0-19.9 mile trade area. However a preference effect appears to dominate for further distances. Those traveling 20 or more miles appear to have a higher preference for time spent traveling to and from and shopping at direct markets. This is evidenced by the fact that many are willing to make the trip several times a year.

The "quantity discounts" reason for shopping seemed to evidence a chiefly budgetary effect. This effect was not in the direction originally expected. It was assumed that this

signaled higher price-consciousness and less total spending on an annual basis. Apparently this price-awareness may lead to increased patronage of the direct market over other alternative outlets and results in higher annual spending than most other consumers.

Consumers who listed the "good prices" reason did not appear to have spending levels significantly lower than those that listed "fresh produce" as a primary shopping reason. This variable may signal greater shopping frequency at all direct markets for price savings but it does not seem to translate into lower spending at the market.

In summary, the budget constraint is an important concept in determining consumer expenditures at a direct market. It is a factor which is difficult to directly measure in a specific market area, however, because consumers can use a combination of several food sources to maximize their utility with a given constraint.

Preferences

The preference concept was hypothesized to affect consumer expenditures at the market by influencing the shape of household indifference curves. Preferences favoring direct markets in general, and the market in particular, were thought to cause the indifference curve to be skewed more heavily toward spending at the market. The variables expected to exhibit preference effects were: the reason, "fresh produce", the reason, "other reason", the number of

reasons given, the market where the consumer was shopping when surveyed, and the grade given the market for freshness of produce.

The variable, fresh produce reason, did not exhibit the expected significant difference in spending effect with the reason, "good prices". If they measure quality-consciousness and price-consciousness as originally hypothesized then consumers must be concerned enough with both that the variables do not produce significant spending differences. However the differences between these two reasons and the other three reasons are important. These differences indicate preference effects.

The reason, "other reason", was expected to be representative of lower per capita spending. This was confirmed, probably because other reasons have much less influence on consumer expenditures.

The number of reasons variable group displayed the expected relationship with spending. Consumers giving multiple reasons generally spent more. This is assumed to be a signal of consumer preference for direct markets in general. The market variable also exhibited the hypothesized relationship. The largest and oldest market has the highest spending while the youngest and smallest market has the least. This is assumed to be due to the preference of consumers for markets with wider variety and greater selection of each type of produce. The grade given the market for freshness of produce affected spending as

expected. Consumers who responded "excellent" spent the most while those who thought the freshness at the market was "poor" spent the least. This measure was believed to show the preference of the consumer for shopping at the market rather than other direct markets.

The preference concept variables seem to act in a straightforward way to affect spending at the direct markets either favorably or unfavorably. Preferences are important aids to segmentation and do significantly affect consumer expenditures at the markets.

Time Constraint

The time allocation decision is hypothesized to affect consumer spending at the market both by helping to define the relevant budget line and by affecting the shape of household indifference curves. Each variable in this concept is a mixture of both budget constraint influences and preference factors. The variables hypothesized to show time allocation effects were: frequency of shopping at other farmers' markets or roadside stands, frequency of shopping at u-pick markets, home gardening status, nonfresh use of produce, use of produce for freezing, income/nonfresh use interaction, and the reason "convenient location".

Frequency of shopping at other farmers' markets and roadside stands and at u-pick markets both exhibited similar patterns. The once-a-week shoppers in the first variable group and the twice-a-month shoppers in the second group

showed higher per capita spending levels than other variables in the same group. Some slight differences might exist among less frequent shoppers as well but the differences are not as obvious. These consumers are apparently trying to save money by shopping around and stopping at multiple markets in the same trip. They may exhibit a strong preference for shopping at all types of direct markets and shopping between markets for quality and variety.

Home gardening status was found to be insignificant, as was per capita income/nonfresh use interaction, in explaining differences in annual per capita spending.

Nonfresh use and use for freezing affected spending as expected. Those freezing some produce spent the most, followed by those who use all produce fresh, and then those who process other than freezing. The latter use is cheaper, more time-consuming, and inconvenient. Those using this method are likely more cost-conscious. Freezing is more convenient and lends itself better to the quality-conscious consumer who prefers to stock up on local produce and preserve the fresh taste as nearly as possible.

The convenient location reason followed expectations in explaining spending. Those listing this reason spent more than those listing any other single reason. This is likely due to the lesser perceived travel and time costs of visiting the market and perhaps also due to a greater preference for convenience.

The time constraint concept is a key determinant of

annual per capita expenditures at a specific direct market. When an individual market or small group of markets is selected for such a study the preferences of the individual in the market decision process become very important. The budget effects and preference effects become difficult to separate.

Cultural/Lifestyle

The cultural/lifestyle conceptual group further defines the relative shape of consumer indifference curves by entering sociological variables into the analysis. The variables specified as displaying this type of effect were race or ethnic group, occupation of respondent, and location of residence.

Whites spent more per capita annually at the markets than nonwhites. This was probably due in part to the larger household size of nonwhites and the large percentage of American Indians in this market area.

The expected effect of occupation was unknown. Managers, owners, and self-employed persons spent the most at the market per capita. Perhaps this is due to a lifestyle including more entertaining at home. Retirees were the next highest spenders, while professionals spent the least per capita. The latter could be due to time constraints or eating away from home more often.

Farm residents were expected to spend the least and town inhabitants the most. Rural nonfarm and farm residents spent

the least at the markets, likely because of their greater food production capacity and more self-sufficient lifestyles. Suburban shoppers spent low amounts. City, town, and large city residents spent the most at the market. Perhaps urbanization of the household increases the preference for markets such as these.

Cultural/lifestyle influences such as these do have significant effect on annual per capita consumer spending at the market. These could, perhaps, be classified as preference variables but their mode of operation and ready availability for segmentation justify some distinction.

Seasonality

The seasonality of the market influences the annual per capita spending level of the average customer represented at the market in each season. This concept allows marketers to visualize how the expenditure profile of consumers varies throughout the year. Month in which the consumer was surveyed was the sole variable used to describe this variation.

March and August were expected to be the two highest months for spending annually because of a greater percentage of regular customers in these months. October, December/January, and May were expected to be the lowest spending months. These hypotheses were confirmed. Seasonality is a significant factor in explaining annual per capita spending.

CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary of Survey and Model

A consumer segmentation study was conducted to determine the effects of consumer characteristics on annual per capita expenditures of the household on produce at year-round direct markets. Three roadside markets of varying size and age and in close proximity were selected for the survey work. Surveys were conducted bimonthly over an annual business cycle so that the survey month could be used as one of the independent variables. Out of 2282 surveys collected, 636 were complete for all variables used in the expenditure model. Descriptive data from this survey with results listed by survey month and all survey months are found in Moesel and Tilley (1985a and 1985b).

A model of 69 binary and qualitative variables was estimated using a generalized least-squares (GLS) regression algorithm. F statistics for inclusion of each variable group in the full model were calculated. A GLS technique (Glejser, 1969) was used to minimize the effects of heteroscedasticity in the ordinary least-squares (OLS) model and to get minimum variance, unbiased, and consistent estimators. This

transformation dramatically affected the explanatory powers of the GLS over the OLS model and indicated more significant relationships with annual per capita expenditures. Fifteen of 17 variable groups were found to be significant. These include: grade given the market for freshness of produce, frequency of shopping at pick-your-own markets, per capita household income, use of produce other than fresh, race of consumer, residence of consumer, miles to market, and month the consumer was surveyed. Other variables significant at the 95 percent confidence level were: age of respondent, presence of various age-groups, number of reasons given for shopping, the specific reasons given for shopping, occupation of the respondent, use of produce for freezing, and frequency of shopping at other farmers' markets and roadside markets.

The combined effects of age of respondent and age-groups present in the household indicate that consumers in the 65-70 year range have a large influence upon annual per capita spending. Spending climbs moderately until 25 years then flattens out and may be decreased by the presence of small children. Per capita expenditures peak at 65-70 and then fall rapidly after this.

Consumers with incomes under \$20,000 spent the most while those between \$30,000 and \$40,000 spent the least. Part of this effect was likely due to larger household size in the upper income groups. Time constraints may have decreased spending in the upper income groups.

Miles to market exhibited an inverse relation with spending except for the 20 or more mile range where annual spending was the highest. The inverse relation in the lower mileage ranges appears to be primarily a budgetary effect. The highest spending classes appear to have a stronger preference for produce from the direct market.

"Convenient location" was the reason given by the highest spending consumers. "Quantity discounts" had the next highest effect. "Fresh produce" and "good prices" were given as reasons by consumers with intermediate levels of spending. "Other reason" was the reason given by shoppers with the lowest expenditures. Consumers who gave additional reasons up to three spent more annually.

The oldest and largest market had the largest level of annual per capita expenditure while the newest and smallest market had the least. Estimated effects on spending seemed to be roughly comparable to the relative market shares.

Freshness grades followed their logical order in terms of expenditures. Grades of "excellent" were correlated with the highest spending and grades of "poor" with the lowest spending. This seems to be a good measure of preference for the specific market.

Frequency of shopping at other farmers markets and roadside stands and at u-pick markets were both significantly related to expenditure. Once a week shoppers at other roadside and farmers' markets spent more than other groups. Twice a month u-pick shoppers were the biggest spenders of

all the groups of u-pick shoppers. It appears that shoppers that visit other markets in the area frequently, are high spenders annually at the direct market.

Consumers who used some produce other than fresh spent significantly less than those who used produce all fresh. Those who froze produce were an exception to this however and actually spent more than those using all fresh. Consumers who process food but do not freeze are probably more price-conscious than other consumers and face tighter budget constraints. Those shoppers which freeze some produce likely have the greatest preference for fresh produce purchased in-season.

Whites were found to spend more annually per capita than nonwhites. This was likely due to the larger households of nonwhites and their lower incomes.

Managers, owners, and self-employed spent more annually than other occupations. This may reflect a lifestyle with more entertaining at home or simply a stronger preference for direct market produce. Professionals were found to spend the least of all groups, perhaps due to greater time constraints.

City residents had the highest levels of annual per capita spending followed by town and large city residents. Rural residents spent less than those in other categories and probably provide more of their own produce.

March and August were found to be the months when consumers had the highest overall annual spending profile.

This seems to indicate that a larger share of customers during these times are very loyal customers. During the higher traffic flow months of July, October, and May, many less frequent shoppers were present at the market.

Home gardening status and nonfresh use/income interaction were the only two variable groups found to be insignificant in the GLS full model.

Independent variables in the full model were grouped into one of six general concepts according to the manner in which they acted upon the annual per capita expenditure on produce at the market. All six concepts were hypothesized to significantly influence spending. Informal tests, using the results of individual variable group tests, seemed to indicate that all six concepts had significant explanatory power. The concepts included: age composition of the household, budget constraints on the household, preference factors, time constraints, cultural/lifestyle influences, and seasonality.

Conclusions

It appears that older, retired consumers on fixed incomes make up an important segment of the direct market consumers in this market area. 12 percent of the households represented in the sample had household members 65 years or older. Approximately eight percent of all consumers listed retired as their occupation. Just under 20 percent of the sample had incomes under \$20,000. This income level proba-

bly includes many retirees on social security. The age composition estimates for older households, along with the relatively high spending estimate for retirees, and the large estimate of expenditures for the lowest two income groups, paint a portrait of a small group with large per capita expenditures at the market. The aging of the population and medical advancements in the next decade make this a more promising group than it may at first appear.

Regular customers that travel 20 or more miles to the market make up a suprisingly large portion of the sample. Those consumers who travel to the market over 20 miles, once a year or more, comprise 26 percent of all regular consumers. These shoppers also had the highest expenditure coefficients for mileage. Although this group might be difficult to target in the general population other than through ads or promotions in distant cities, the present shoppers can be targeted with direct mail such as seasonal newsletters with special promotional features.

The expenditure estimates for race indicate that substantial potential sales could lie in more effectively attracting nonwhites to the market or increasing sales to nonwhites already frequenting the market. Only about seven percent of the sample was nonwhite. Strategies such as targeting promotions to specific minorities or adding some crops with more ethnic appeal could be profitable.

Those with incomes of \$30,000 or more make up 58 percent of the sample but seem to spend relatively low amounts per

capita. Suburbanites make up almost nine percent of the sample and also spend fairly low amounts. Professionals represent the lowest spending occupational level but account for 26 percent of the sample. There is considerable overlap across these categories. These consumers make up a sizeable segment of the market but account for a relatively small proportion of the average annual amount spent per capita. The reasons for this small spending deserve further attention. If attitudes are deeply set among this segment that direct markets are for recreational outings on occasion rather than regular produce shopping then these beliefs may be hard to change. Freezing-type promotions may be effective with many in this group.

The consumer expenditure results for those which shop frequently at other direct markets suggests that joint promotions with nearby markets can be potentially profitable. By pooling some of the advertising budget of each market a larger potential audience can be reached and consumers may be attracted to each cooperating market more frequently than before.

Recommendations

This research represents a fairly thorough framework for further research in direct market consumer segmentation. Improvements that could be made in future research follow. It is suggested that the following variables be considered for analysis: household size should also be included as an

independent variable; the number in the household which are employed would be an excellent time constraint measure; and some measure of expenditures on produce at other markets would help to broaden the narrow, one market focus of this expenditure study.

Further research into some of the surprising results of this research seems warranted. The irregular income effect and the interesting mileage expenditure relationship may provide clues to important variables not used in this study. The low spending levels of suburbanites and professionals was surprising since the market area appeared to be well located to appeal to both.

Future studies in promotional strategies for direct markets may be needed to assist market managers in taking full advantage of this type of research. Oklahoma direct market managers would benefit from research of this type.

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APPENDIX A

GLOSSARY OF IMPORTANT TERMS

Community Farmers Market: a retail produce market usually not owned by a grower where fruit and vegetable growers are invited to rent space to sell to the public. These markets are usually located in towns or urban areas. The market management assumes responsibility for publicizing the market, establishing rules, and collecting rental fees.

F Statistic for Inclusion in the Full Model: the statistic used to determine whether a variable or group of variables contributes significantly to the explanation of variation of the dependent variable in the full model. This statistic is used in this study for general linear hypothesis tests to see which variable groups are statistically significant at the 95 percent confidence level when included in the model.

Generalized Least-Squares Regression Transformation (GLS): a two-stage algorithm using an ordinary least-squares (OLS) regression procedure as the first step and one of several possible statistical alterations to the first step model as the second step. The transformation is conducted to overcome one or more violations of OLS regression assumptions. In this study the transformation used involves first estimating a stepwise regression model on the absolute value of the residuals of the OLS model. Next the dependent variable, the intercept, and all independent variables are divided by the value of the predicted residual. Finally, the transformed variables are reestimated using the OLS procedure. This is theorized to result in minimum variance and unbiased estimates (Glejser, 1969).

Heteroscedasticity: "the condition of the error variance not being constant over all observations." This violation of ordinary least square regression assumptions leads to unbiased estimators which are not minimum variance estimators (Neter, Wasserman, and Kutner, 1983, p. 170). A generalized least-squares transformation is used in this study to minimize heteroscedasticity.

Pick-Your-Own or U-Pick Market: a retail produce market owned by a fruit and/or vegetable grower and located at one or more of the grower's production areas. Consumers are invited to enter the production fields specified and harvest the crop(s) themselves in accordance with the rules established by the owner. Prices are lower than for preharvested crops to reflect the savings in harvest labor costs for the grower.

Roadside Market: a retail produce market operated by a grower of fruit and/or vegetables. A substantial portion of the produce sold in the market is grown by the owner/operator. This market is located on land owned or leased by the grower.

Standard Metropolitan Statistical Area (SMSA): a Census Bureau classification used to categorize large urban areas. It is defined as one or more cities with contiguous boundaries, constituting a single economic and social community, with a combined population of at least 50,000. The smallest city in a multiple-city community must have a population of at least 15,000. This unit includes both the county in which the central city is located and the surrounding counties, that are both metropolitan in character and economically and socially integrated with the county of the central city (Dutka, Frankel, and Roshwalb, 1970, p. 16).

Tailgate Market: a retail produce market which is mobile. It usually involves sales off the tailgate of a truck. The produce grower or a representative of the grower finds a high-traffic place in town or along the highway to sell produce immediately after harvest.

APPENDIX B

OLS RESIDUAL MODEL STATISTICS

TABLE VI
ORDINARY LEAST-SQUARES
RESIDUAL MODEL

Variable Model Statistic	Parameter Estimate	t Value
PREDICTED APCSPEND	0.6607	10.532
INTERCEPT	4.658	0.186
AGE4	50.39	2.541
PEOPLE1	-10.95	-0.996
PEOPLE2	4.184	0.395
PEOPLE4	19.68	1.523
PEOPLE5	9.100	0.780
PEOPLE7	-23.69	-1.141
PCINCOME2	-0.002764	-1.064
PCINCOME3	-0.002380	-1.759
PCINCOME4	-0.001709	-1.783
PCINCOME5	-0.002190	-2.688
PCINCOME6	-0.0006069	-0.729
MILES2	23.35	1.829
MILES3	30.80	2.372
MILES4	24.35	1.614
MILES5	20.92	1.301
MILES6	47.33	3.255
REASON2	-13.74	-1.152
REASON4	27.09	1.657
TREASON2	-7.078	-0.845
MARKET1	11.95	0.978
MARKET3	20.70	2.275
FRESHNESS1	-7.241	-0.890
OTHER3	-15.46	-1.219
OTHER4	9.904	0.848
OTHER5	10.67	1.012
PY06	-8.557	-0.740
FRESHUSE2	13.12	1.177
INTERACT1	0.008789	0.929
INTERACT2	-0.004608	-1.600
INTERACT3	-0.001675	-0.965
INTERACT6	-0.001788	-1.886
OCCUPATN1	-9.995	-1.126
OCCUPATN3	12.06	0.765
RESIDE2	15.54	1.090
RESIDE5	-31.53	-2.009
RESIDE6	-13.15	-0.713
MONTH3	-22.70	-1.482
R-square	.3186	
Mean of Dependent Variable	82.52	
Model F Value	7.346	
Probability of Model F Value	.0001	
Mean Square Error	9092	

VITA 2

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